# ATMOSPHERE-OCEAN

# 15th ANNUAL CONGRESS 27–29 May 1981 University of Saskatchewan

Canadian Meteorological and Oceanographic Society La Société Canadienne de Météorologie et d'Océanographie

# ATMOSPHERE-OCEAN

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# FIFTEENTH ANNUAL CONGRESS CANADIAN METEOROLOGICAL AND OCEANOGRAPHIC SOCIETY

The Fifteenth Annual Congress and Annual General Meeting of the Canadian Meteorological and Oceanographic Society will be held at the University of Saskatchewan, Saskatcon, Saskatchewan, May 27–29, 1981. The theme of the meeting is Hydrometeorology. A special air pollution session has been organized by the Air Pollution Special Interest Group of CMOS.

This meeting affords members of the Society the opportunity to attend sessions covering all aspects of the hydrologic cycle. There are many sessions which focus attention on Western Canadian problems. The number of contributions, particularly those from hydrologists and hydrometeorologists from outside the Society, has been most gratifying.

The scientific programme of the meeting was organized by:

Barry Goodison	Gord McBean
Des O'Neill	John Gregory
Peter Smith	John Reid

Local arrangements are the responsibility of: Jeff Whiting, Elaine Wheaton, John Maybank, John Gregory, John Dublin, Don Bauer, Stan Shewchuk, SED Systems Inc., and the Extension Division, University of Saskatchewan.

# QUINZIÈME CONGRÈS ANNUEL

# SOCIÉTÉ CANADIENNE DE MÉTÉOROLOGIE ET D'OCÉANOGRAPHIE

Les quinzièmes congrès annuel et assemblée générale annuelle de la Société canadienne de météorologie et d'océanographie auront lieu à l'université de la Saskatchewan, à Saskatoon (Saskatchewan) du 27 au 29 mai 1981. Le congrès a pour thème l'hydrométéorologie. Une session spéciale sur la pollution atmosphérique à été organisée par le groupe spécial d'étude météorologique de la pollution atmosphérique (SCMO).

Ce congrès offre aux membres de la Société l'opportunité d'assister à des séances qui englobent tous les aspects du cycle hydrique. Plusieurs séances porteront sur les problèmes de l'Ouest du Canada. Le nombre des communications, spécialement pour celles des hydrologistes et des hydrométéorologues qui n'appartiennent pas à la Société, est satisfaisant.

Le programme scientifique du congrès a été préparé par:

Barry Goodison	Gord McBean
Des O'Neill	John Gregory
Peter Smith	John Reid

Les responsables des arrangements locaux sont: Jeff Whiting, Elaine Wheaton, John Maybank, John Dublin, Don Bauer, Stan Shewchuk, SED Systems Inc. et la division externe de l'université de la Saskatchewan.

# SUMMARY OF SESSIONS

TUESDAY,	MAY 26		Location
Tours			
0800-1630		Prince Albert Satellite Station	
1100-1700		Cominco Potash Mine	
1300-1700		Gardiner Dam	
Meetings			Physics Building
0900-1200		Editorial Committee Meeting	Room 175
1330-1700		Scientific Committee Meeting	Room 175
1330-1700		Public Information Committee Meeting	Room 127
1330-1700		Membershin Committee Meeting	Room 126
1800-2300		Registration	Marquis Hall
1000-2300		CMOS Council Manting	Dage 175
1900-2300		Wine and Chasse Passation	Koom 175
1900-2300		white and Cheese Reception	Marquis rian
WEDNESDA	Y, MA	¥ 27	
0/45-1000		Registration	Physical Building
0830-0845		Opening Welcome	Room 107
0845-0930		Theme Presentation: Hydrometeorology	Room 107
1000-1200	1A	Hydrometeorology 1	Room 107
1000-1200	1B	Atmospheric Dynamics	Room 165
1000-1200		Air Pollution Meteorology Group	
		<ul> <li>Business Meeting</li> </ul>	Room 103
1300-1450	2A	Drought	Room 107
1300-1450	2B	Forecasting	Room 165
1300-1450	2C	Entrainment, Mixing and Upwelling	Room 103
1520-1700	3A	Hydrometeorology II	Room 107
1520-1700	3B	Boundary Layer	Room 165
1520-1700	3C	Estuarine Circulation and Coastal Currents	Room 103
1900-2200		Annual General Meeting of CMOS	Room 103
THURSDAY	MAY:	28	
0800-1030		Registration	Physics Building
0830-0945	4A	Special Presentation: Air Pollution	Room 107
0830-1000	4B	Agrometeorology	Room 103
0830-1000	4C	Low-Frequency Wayes and Surges	Room 165
1030-1150	5A	Air Pollution Field Studies - Planned and	
		Inadvertent	Room 107
1030-1200	5B	Energy and Water Balance	Room 103
1300-1400		Poster Session	Rooms 112, 115
1400-1540	6A	Acidification in Western Canada	Room 107
1400-1530	6B	Polynya I	Room 165
1400-1540	6C	General Meteorology	Room 103
1610-1710	74	Alberta Oil Sands Environmental Studies	Room 107
1600-1700	78	Polynya II	Room 165
1600-1720	70	Hydrometeorology III	Room 103
1830-1900	10	Cocktails	Marmie Hall
1900-		Awards Banquet	Marquis Hall
EDIDAN NA	11/20	, and building	tringers riser
PRIDAY, MA	91 29	A in Dollarian Madalline and Assess	Dec. 107
0830-1000	OA	Air Pollution Modelling and Assessment	Room 107
1020 1010	88	Precipitation and Severe Storms	Room 103
1030-1210	9A	Air Pollution Modelling and Assessment;	Dana 107
1030-1710	OR	Climate	Room 107
1000-1210	10	Cimier	Addin 105
LOURS		C	
1100-1700		Cory Postash Mine	
1300-1600		Riverboat Trip	
Exhibits			Rooms 128, 129, 131



# **RÉSUMÉ DES SESSIONS**

MARDI LE	26 MAI		Lieu
Excursions:			
0800-1630		Station de réception satellite Prince Albert	
1100-1700		Mine de potasse Cominco	
1300-1700		Barrage Gardiner	
D.C.		6. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	fre i p
Reunions:			Edifice de la Physique
0900-1200		Réunion du Comité de rédaction	salle 175
1330-1700		Réunion du Comité scientifique	salle 175
1330-1700		Réunion du Comité permanent d'information	
		publique	salle 127
1330-1700		Réunion du Comité d'éligibilité des membres	salle 126
1800-2300		Enregistrement	Marquis Hall
1900-2300		Réunion du Conseil de la SCMO	salle 175
1900-2300		Vins et fromages	Marquis Hall
MEDCOFDI	1 8 97 1	MAT	of the other the state of the s
OTAS 1000	LE LI	Engelister	Édifica de la Divisione
0745-1000		Enregistrement	Editice de la Physique
0830-0843		Ouverture du congres	salle 107
0845-0930		Presentation thematique: L. hydrometeorologie	salle 107
1000-1200	IA	Hydrométéorologie – 1	salle 107
1000-1200	1B	Dynamique de l'atmosphère	salle 165
1000-1200		Groupe sur la météorologie de la pollution de l'air	
		<ul> <li>Séance de travail</li> </ul>	salle 103
1300-1450	2A	La sécheresse	salle 107
1300-1450	2B	La prévision	salle 165
1300-1450	2C	Entraînement, mélange et rémontée	salle 103
1520-1700	3A	Hydrométéorologie – II	salle 107
1520-1700	38	La couche limite	salle 165
1520-1700	30	Circulation en estuaires courants littoraux	salle 103
1900-2200	50	Accemblée générale annuelle de la SCMO	salle 103
1700 2200		risemplee generale annuelle de la Selvio	3410 105
JEUDI LE 2	8 MAI	TEXT Merchan	
0800-1030		Enregistrement	Edifice de la Physique
0830-0945	4A	Présentation spéciale: La pollution de l'air	salle 107
0830-1000	4B	L'agrométéorologie	salle 103
0830-1000	4C	Vagues de fréquences basses et marées	salle 165
1030-1150	5A	Études de la pollution de l'air - planifiées ou	
		résultat d'accidents	salle 107
1030-1200	5B	Énergie et bilan hydrique	salle 103
1300-1400		Affichage	salles 112, 115
1400-1540	6A	Acidification dans l'Ouest du Canada	salle 107
1400-1530	6B	Polynya – I	salle 165
1400-1540	60	Météorologie générale	salle 103
1610-1710	74	Sables hitumineux de l'Alberta étude ecologique	calle 107
1600-1700	78	Polynya - II	salle 165
1600 1720	20	Polynya – n Hudromátáorologia – III	salle 103
1000-1720	n.	Carlos ile	Salle 105
1830-1900		Cocktails	Marquis Hall
1900-		Banquet - Prix et Citations	Marquis Hall
VENDREDI	LE 29 M	IAI	
0830-1000	8A	Modélisation et évaluation de la pollution de l'air	salle 107
0830-1000	8B	Précipitations et orages	salle 103
1030-1210	9A	Modélisation et évaluation de la pollution de l'air:	
		Exposé des réactions	salle 107
1030-1210	9B	Climat	saile 103
		a particular and a second s	
Excursions:			
1100-1700		Mine de potasse Cory	
1300-1600		Promenade en bateau de rivière	
Exhibitions:			salles 128, 129, 131
- aprile care rate.			

# PROGRAMME

# Wednesday Morning, May 27, 1981

Opening welcome:	Dr L.F. Kristjanson President, University of Saskatchewan	Wed. 0830-0845 Room 107
	Dr John Maybank, President Canadian Meteorological and Oceanographic Society	
THEME SESSION	Hydrometeorology	Wed. 0845-0930
Chairman:	B.E. Goodison	Room 107

HYDROMETEOROLOGY IN CANADA J.P. Bruce, Assistant Deputy Minister Atmospheric Environment Service

Coffee (0930-1000)

SESSION IA	Hydrometeorology 1	Wed. 1000-1200
Chairman:	A.D.J. O'Neill	Room 107
HYDROMETEOR J.M. Whiting, E	OLOGICAL SENSORS FOR DATA COL ingineering Division, Saskatchewan Researc	LECTION PLATFORMS (DCP) th Council, Saskatoon, Sask. S7N 0X1
RECEPTION AND COLLECTION PL	DISTRIBUTION OF ENVIRONMENTA	AL DATA FROM DATA
B. Ford, SED S S6V 7G3	ystems Inc., Prince Albert Satellite Station, F	P.O. Box 2500, Prince Albert, Sask.
THE AES AUTON	AATIC ARCHIVING SYSTEM USING T (AS/6)	THE CAPABILITIES OF THE NEW
Y. Durocher and Ont. M3H 5T4	d T. Won, Canadian Climate Centre, Atmosp	oheric Environment Service, Downsview,
RAPPORTS HEBI D'UN SYSTÈME	DOMADAIRES DE GESTION DES RESS D'INFORMATION HYDROMÉTÉOROL	SOURCES HYDRAULIQUES ISSUS
R.M. Thompsto Québec Société	ne, R. Bergeron, J. Girard, G. Perron et L. S d'électrolyse et de chimie Alcan Ltée, C.P. 8	Salesse, Exploitation, Énergie électrique, 300, Arvida (Québec) G7S 4R5
VARIATION SAIS	SONNIÈRE DE L'HOMOGÉNÉITÉ SPAT GIONALES DE LA PLUIE AU QUÉBEC	TIALE ET DES FONCTIONS DE
J.P. Fortin, G. M (Québec) G1V	Morin et L. Dupont, INRS-Eau, Université du IC7	u Québec, C.P. 7500, Saint-Foy
G. Jacques, Ser (Québec) GIN 4	vice de météorologie, Environnement Québe 115	ec, 194 ave St-Sacrement, Québec
ON ESTIMATING	CATEGORICAL MONTHLY PRECIPIT METHOD	TATION LEVELS BY
L.O. Mapanao, M3H 5T4	Hydrometeorology Division, Atmospheric I	Environment Service, Downsview, Ont.

SESSION 1B Chairman: Atmospheric Dynamics

G.J. Boer

Wed. 1000-1200

Room 165

EVIDENCE FOR SOLAR CYCLE MODULATION OF CIRCULATION IN THE RANGE 30-110 KM

J.B. Gregory, A.H. Manson and C.E. Meek, Institute of Space and Atmospheric Studies, University of Saskatchewan, Saskatoon, Sask. S7N 0W0

ON THE INTERACTION OF LONG BAROCLINIC WAVES WITH TOPOGRAPHY T. Warn, Dep. of Meteorology, McGill University, Montréal, (Québec) H3A 2K6

A. Patoine, Canadian Climate Centre, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

THE EFFECTS OF THE 1980/81 STRATWARM UPON MESOSPHERIC WINDS, TIDES AND TURBULENCE AT SASKATOON ( $52^{\circ}N$ ,  $107^{\circ}W$ , L=4.3)

A.H. Manson, J.B. Gregory and C.E. Meek, Institute of Space and Atmospheric Studies, University of Saskatchewan, Saskatoon, Sask. S7N 0W0

A GLOBAL AVAILABLE POTENTIAL ENERGY—KINETIC ENERGY BUDGET IN TERMS OF ZONAL WAVENUMBER FOR JANUARY 1979

S. Lambert, Numerical Modelling Division. Atmospheric Environment Service, Downsview, Ont. M3H 5T4

A TWO-LEVEL BAROCLINIC FINITE-ELEMENT MODEL T. Goos, 12843-89 St, Edmonton, Alta T5E 3J9

A COMPARISON BETWEEN CMC OPERATIONAL ANALYSIS STATISTICS AND CLIMATOLOGY

L. Lefaivre, Numerical Modelling Division, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

> Air Pollution Meteorology Group -Business Meeting

Wed. 1000-1200 Room 103

Wed. 1300-1450

Room 107

Lunch (1200-1300)

# Wednesday Afternoon, May 27, 1981

SESSION 2A Drought

Chairman: J. Maybank

CANADIAN PLAINS DROUGHT

G.A. McKay, Canadian Climate Centre, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

AN OBJECTIVE ANALYSIS OF HISTORICAL DROUGHTS IN THE CANADIAN PRAIRIES R.B. Street and B.F. Findlay, Application and Impact Division, Canadian Climate Centre, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

NEWSPAPER COVERAGE OF THE 1980 DROUGHT

L. McKerness, Water Planning and Management Branch, Inland Waters Directorate, Regina, Sask. S4P 3R4

WATER SUPPLY SIMULATIONS FOR REGIONAL DROUGHT STUDIES OF THE CANADIAN PRAIRIES

B.T. Abrahamson, Hydrology Division, Prairie Farm Rehabilitation Administration, Regional and Economic Expansion, Regina, Sask. S4P0R5

REDUCING DROUGHT EFFECTS ON CROP LANDS ON THE PRAIRIES W. Nicholaichuk, Research Station, Research Branch, Agriculture Canada, Swift Current, Sask. S9H 3X2

Wed. 1300-1450 SESSION 2B Forecasting C. McLeod Room 165 Chairman: AN EXPERIMENT IN AUTOMATED FORECAST PRODUCTION. THE WEATHER ELEMENT DIGITAL GUIDANCE EVALUATION SYSTEM I.B. Findleton, Canadian Meteorological Centre, Trans-Canada Highway, Dorval, (Québec) H9P 113 VERIFICATION OF LOW CENTRES ON SPECTRAL AND SUBJECTIVE SURFACE PROGS A. Gladstone, Canadian Meteorological Centre, Trans-Canada Highway, Dorval, (Québec) H9P 1J3 A COMPARISON OF THE SMALL AREA MODEL AND AN EKMAN PARAMETERIZATION METHOD FOR DIAGNOSIS OF MESO-SCALE SURFACE WINDS M. Loiselle and L.J. Wilson, Forecast Research Division, Atmospheric Environment Service, Downsview, Ont. M3H 5T4 THE SYNOPTIC (INSTABILITY) INDEX: 1979-80 TESTS AND NEW VERSIONS G.S. Strong and W.D. Wilson, Atmospheric Sciences Department, Alberta Research Council, Red Deer, Alta T4N 5Y5 REGIONAL WEATHER FORECASTING WITH THE CANADIAN FINITE-ELEMENT MODEL R. Benoit, Recherche en prévision numérique, Service de l'environnement atmosphérique, Dorval (Ouébec) H9P 1J3 AN IMPACT TEST OF THE LOSS OF "SHIP PAPA" DATA D.W. Shantz, Recherche en prévision numérique, Service de l'environnement atmosphérique, Dorval (Ouébec) H9P 1J3 E. Hopkins, Canadian Meteorological Centre, Trans-Canada Highway, Dorval, (Québec) H9P 1J3 SESSION 2C Entrainment, Mixing and Upwelling Wed. 1300-1450 Chairman: P.C. Smith Room 103 AN EXAMPLE OF ENTRAINMENT INTO THE HYPOLIMNION OF CENTRAL LAKE ERIE G.N. Ivey and F.M. Boyce, National Water Research Institute, Canada Centre for Inland Waters, Burlington, Ont. L7R 4A6 CONVECTION NEAR THE TEMPERATURE OF MAXIMUM DENSITY DUE TO HORIZONTAL HEATING P.F. Hamblin, National Water Research Institute, Canada Centre for Inland Waters, Burlington, Ont. L7R 4A6 THE SUMMER THERMAL STRUCTURE OF LAKE ONTARIO OFF TORONTO: COOLING THE BIG CITY F.M. Boyce, D.G. Robertson and G.N. Ivey, National Water Research Institute, Canada Centre for Inland Waters, Burlington, Ont. L7R 4A6 R.T. Tamblyn, Engineering Interface Ltd, Willowdale, Ont. OBSERVATIONS AND MODELLING OF UPWELLING OFF CAPE SABLE, NOVA SCOTIA D. Lefaivre, K.-T. Tee and P.C. Smith, Bedford Institute of Oceanography, Dartmouth, N.S. **B2Y 4A2** MIXING AND THE INTERNAL TIDE AT THE SCOTIAN SHELF EDGE J.A. Elliott and H. Sandstrom, Atlantic Oceanographic Laboratory, Bedford Institute of Oceanography, Dartmouth, N.S. B2Y 4A2

Coffee (1450-1520)

SESSION 3A	ι.
Chairman:	

Hydrometeorology II

D.J. Bauer

Room 107

PRECIPITATION MEASUREMENT WITH C-BAND WEATHER RADAR IN SOUTHERN ONTARIO

W.G. Richards and C.L. Crozier, Cloud Physics Research Division, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

WEATHER RADAR ESTIMATES OF AREAL RAINFALL IN ALBERTA M. Antonio, Fundação Educacional de Bauru, Brazil

A REAL-TIME DATA ACQUISITION SYSTEM FOR STREAMFLOW FORECASTING R. Catalfamo, Goodwood Data Systems, P.O. Box 210, Carleton Place, Ont. K7C 3P4

PROBABILISTIC FLOOD FORECASTING ON THE RED RIVER

A. Warkentin, Water Resources Branch, Manitoba Dep. of Natural Resources, Winnipeg, Man. R3E 3J5

PROBABLE MAXIMUM PRECIPITATION STUDIES IN THE LOWER MAINLAND OF BRITISH COLUMBIA

D.G. Schaefer, Scientific Services Division, Atmospheric Environment Service, Vancouver, B.C. V6P 6H9

STOCHASTIC RAINFALL INFLOW FORECASTING FOR SHELLMOUTH RESERVOIR A. Warkentin, Water Resources Branch, Manitoba Dep. of Natural Resources, Winnipeg, Man. R3E 3J5

SESSION 3B	Boundary Layer	Wed. 1520-1700
Chairman:	K.D. Hage	Room 165

BOUNDARY-LAYER FLOW OVER LOW HILLS – THEORY AND COMPUTER MODELS P.A. Taylor, J.L. Walmsley and J.R. Salmon, Boundary-Layer Research Division, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

BOUNDARY-LAYER FLOW OVER LOW HILLS - A FIELD STUDY

R.E. Mickle, P.A. Taylor and H.W. Teunissen, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

LOW-LEVEL GRAVITY WAVES OBSERVED IN CALGARY WITH AN ACOUSTIC SOUNDER

S.K. Aggarwal, S.A. Leelananda and T. Mathews, Dep. of Physics, The University of Calgary, Calgary, Alta T2N 1N4

ACOUSTIC SOUNDER OBSERVATIONS OF THE ONSET OF A CHINOOK T. Mathews, S.A. Leelananda, R.B. Hicks and P.J. Irwin, Dep. of Physics, The University of Calgary, Calgary, Alta T2N 1N4

BOUNDARY-LAYER MODIFICATION DURING FRONTAL PASSAGES AT OWS P G.A. McBean, Atmospheric Environment Service, Sidney, B.C. V8L 4B2 R.E. Mickle, Boundary-Layer Research Division, Atmospheric Environment Service, Downsview,

Ont. M3H 5T4

SESSION 3C	Estuarine Circulation and Coastal Currents	Wed. 1520-1700
Chairman:	L.A. Mysak	Room 103
A TWO DIMENSI	ONAL NUMERICAL MODEL OF ESTUARINE CL	RCULATION USING A

VERTICAL COORDINATE TRANSFORMATION

R.A. Kahawita, École Polytechnique de Montréal, Montréal (Québec)

T.T. Quach, Division Études spéciales et recherches, Hydro-Québec, Montréal (Québec)

VARIABILITY OF THE NEAR-SURFACE RESIDUAL CURRENT IN THE LOWER ST LAWRENCE ESTUARY

H.-J. Lie and M.I. El-Sabh, Département d'Océanographie, Université du Québec à Rimouski, Rimouski (Québec) G5L 3A1

ÉTUDE PRÉLIMINAIRE DES MÉCANISMES DE CIRCULATION DE LA BAIE DE SEPT-ILES M. Gagnon, INRS-Océanologie, Université du Québec à Rimouski, Rimouski (Québec) G5L 3A1

THE LOW-FREQUENCY CIRCULATION OFF CAPE SABLE, NOVA SCOTIA P.C. Smith, Bedford Institute of Oceanography, Dartmouth, N.S. B2Y 4A2

OBSERVATIONS OF AN INTRUSIVE CURRENT IN EASTERN LANCASTER SOUND D.D. Lemon, J.R. Birch and D.B. Fissel, Arctic Sciences Ltd, Sidney, B.C. V8L 4C1

DYNAMICS OF CTD SYSTEM

R. Reiniger and R.A. Clarke, Bedford Institute of Oceanography, Dartmouth, N.S. B2Y 4A2

	Annual General Meeting of CMOS	Wed. 1900-2200 Room 103
Thursday Mornin	g, May 28, 1981	
SPECIAL SESSION 4A	Air Pollution	Thurs. 0830-0945
Chairman:	J.D. Reid	Room 107
A REVIEW OF THE TRANSPORT OF POL F.B. Smith, British	EUROPEAN EMEP PROGRAMME ON TH LUTION, AND IDEAS ON HOW TO TRE Meteorological Office, Bracknell, Berkshire, U	E LONG-RANGE EAT WET DEPOSITION .K. RG12 2SZ
SESSION 4B	Agrometeorology	Thurs. 0830-1000
Chairman:	E.A. Ripley	Room 103
THE FUTURE ROLE A POSITION PAPER H.R. Davidson, Res A GROWING SEASO D.L. Spittlehouse, C British Columbia, V	OF AGROMETEOROLOGY IN OUR CHA earch Station, Agriculture Canada, Swift Curre N WATER BALANCE MODEL FOR AGR C.H.Wallis, O. Hertzman and T.A. Black, Dep ancouver, B.C. V6T 2A2	NGING SOCIETY – nt, Sask. S9H 3X2 ICULTURE AND FORESTRY of Soil Science, The University o
POTENTIAL APPLIC. N.N. Barthakur, De University, Ste-Ann	ATIONS OF THE β-GAUGE TO FIELD Cl p. of Agricultural Chemistry and Physics, Maco e-de-Bellevue (Québec) H9X 1C0	ROPS lonald Campus of McGill
REPORT OF AN INT H.R. Davidson, Res	ERNATIONAL WHEAT/WEATHER EXPE earch Station, Agriculture Canada, Swift Curre	RIMENT ent, Sask . S9H 3X2
CARBON DIOXIDE F R.L. Desjardins, La P. Alvo and P.H.Scl E. Brach, Engineeri	LUX MEASUREMENTS FROM AIRCRAI nd Resource Research Institute, Agriculture Ca huepp, Macdonald Campus of McGill Universit ng and Statistical Research Institute, Agricultur	PT-MOUNTED SENSORS nada ly e Canada
Session 4C	Low-Frequency Waves and Surges	Thurs. 0830-1000
Chairman:	P.F. Hamblin	Room 165
STORM SURGES T.S. Murty, Institut	e of Ocean Sciences, Dep. of Fisheries and Ocea	ns, Sidney, B.C. V8L 4B2
AN OPERATIONAL	STORM SURGE MODEL FOR THE BAY	OF FUNDY BON 1B0

BAROCLINIC INSTABILITY IN A DOWNSTREAM VARYING CHANNEL: SHELIKOF STRAIT, ALASKA

L.A. Mysak, Departments of Mathematics and Oceanography, University of British Columbia, Vancouver, B.C. V6T 1W5

CIRCULATION ON FLEMISH CAP

C.K. Ross, Bedford Institute of Oceanography, Dartmouth, N.S. B2Y 4A2

LOW-FREQUENCY BAROCLINIC WAVES NEAR THE EDGE OF THE SCOTIAN SHELF P.C. Smith, Bedford Institute of Oceanography, Dartmouth, N.S. B2Y 4A2

Coffee (1000-1030)

SESSION SA

Air Pollution Field Studies – Planned and Inadvertent

D.G. Steyn

Thurs. 1030-1150

Chairman:

Room 107

TETROON FLIGHTS ACROSS A RIDGE

R.D. Rowe, S.F. Benjamin and K.P. Chung, Dep. of Chemical and Petroleum Engineering, The University of Calgary, Calgary, Alta T2N 1N4

ESTIMATION OF THE RATE OF GASEOUS MASS TRANSFER FROM A SURFACE SOURCE PLOT TO THE ATMOSPHERE

J.D. Wilson, Boundary-Layer Research Division, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

G.W. Thurtell, Dep. of Land Resource Science, University of Guelph, Guelph, Ont. N1G 2W1

SHORT-RANGE ATMOSPHERIC TRANSPORT AND DIFFUSION OVER THE PRECAMBRIAN SHIELD

P.A. Davis and A. Reimer, Whiteshell Nuclear Research Establishment, Pinawa, Man. ROE 1L0 S.K. Sakiyama and P.R. Slawson, University of Waterloo, Waterloo, Ont. N2L 3G1

THE MACGREGOR VINYL CHLORIDE SPILL: A PRACTICAL EXERCISE IN DISPERSION H.M. Fraser, Atmospheric Environment Service, Winnipeg, Man. R3C 3V4

SESSION 5B	Energy and Water Balance	Thurs. 1030-1200
Chairman:	R.F. Hopkinson	Room 103

LABORATORY STUDIES ON MOISTURE TRANSFER FROM SOIL AND PLANTS IN NON-STEADY AIRFLOW

P.H. Schuepp, Dep. of Agricultural Chemistry and Physics, Macdonald Campus of McGill University, Ste-Anne-de-Bellevue (Québec) H9X 1C0

ANTHROPOGENIC INFLUENCES ON THE SURFACE ENERGY AND WATER BALANCES OF CITIES

T.R. Oke, Dep. of Geography, The University of British Columbia, Vancouver, B.C. V6T 1W5

IMPROVING MASS TRANSFER EQUATIONS OF LAKE EVAPORATION

P.J. Barry, Environmental Res. Branch, Atomic Energy of Canada Ltd, Chalk River, Ont. K0J 1J0

THE SPATIAL DISTRIBUTION OF SURFACE TEMPERATURES OF OKANAGAN LAKE N.B.A. Trivett, Hydrometeorology Division, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

S.E. Waterman, MacDonald, Dettwiler and Associates Ltd, 3751 Shell Road, Richmond, B.C. V6X 2Z9

RESEARCH AND METEOROLOGICAL DATA REQUIREMENTS FOR IMPROVED MODELLING OF LAKE ENERGY BALANCES

P.J. Barry and E. Robertson, Environmental Research Branch, Atomic Energy of Canada Ltd, Chalk River, Ont. K0J 1J0

Lunch (1200-1300)

# Thursday Afternoon, May 28, 1981

### POSTER SESSION

Thurs. 1300-1400 Rooms 112, 115

# Poster 1

A GEOSTROPHIC WIND CLIMATOLOGY FOR CANADIAN OFFSHORE AREAS V.R. Swail, Hydrometeorology Division, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

#### Poster 2

A BRIEF HISTORY OF CANADIAN MARINE WEATHER OBSERVATIONS R.G. Stark, Ontario Region, Atmospheric Environment Service, Toronto, Ont. M4T 1M2

### Poster 3

LANDSAT IMAGE PROCESSING AT PRINCE ALBERT SATELLITE STATION D. Epp, SED Systems Inc., PASS, P.O. Box 2500, Prince Albert, Sask. S6V 7G3

#### Poster 4

REMOTE SENSING OF THE LAST DAY OF SNOWMELT

G.A. Fuller and R.D. Hofer, Faculty of Engineering, University of Regina, Regina, Sask. S4S 0A2

# Poster 5

DOWN-TO-EARTH USES OF SATELLITE ORBIT DETERMINATION AND PREDICTION T. McPherson, SED Systems Inc., P.O. Box 1464, Saskatoon, Sask. S7K 3P7

### Poster 6

A LAKE ENERGY MODEL TO ESTIMATE EVAPORATION

P.J. Barry and E. Robertson, Health Sciences Division, Atomic Energy of Canada Ltd, Chalk River, Ont. K0J 1J0

# Poster 7

A SUMMARY OF THE HYDROLOGIC AND HYDROMETEOROLOGICAL OBSERVATIONS OVER AN ELEVEN-YEAR PERIOD AT PERCH LAKE

E. Robertson and D.P. Wildsmith, Health Sciences Division, Atomic Energy of Canada Ltd, Chalk River, Ont. K0J 1J0

#### Poster 8

NIPHER-TYPE SHIELD FOR RECORDING PRECIPITATION GAUGES: FIELD TRIALS B.E. Goodison and J.R. Metcalfe, Hydrometeorology Division, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

#### Poster 9

HOW, WHAT, WHY OF DROUGHT: A BRIEF HISTORY AND IMPORTANCE OF DROUGHT MITIGATION

L. McKerness, Water Planning and Management Branch, Inland Waters Directorate, Regina, Sask. S4P 3R4

# Poster 10

INTERMITTENT TORNADO DAMAGE

K.D. Hage, Dep. of Geography, The University of Alberta, Edmonton, Alta T6G 2H4

### Poster 11

RADAR ECHO CLIMATOLOGY FOR THE WOODBRIDGE C-BAND WEATHER RADAR W.G. Richards, Cloud Physics Research Division, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

# Poster 12

VERIFICATION OF OPERATIONAL PROBABILITY OF PRECIPITATION AMOUNT FORECASTS

L.J. Wilson, Atmospheric Research Directorate, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

# Poster 13

A LONG-RANGE CLIMATOLOGICAL DISPERSON MODEL

C.S. Matthias and A.K. Lo, Air Quality and Inter-Environmental Research Branch, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

Environment Se	rvice, Downsview, Ont. Mon 514	
Poster 14 TRAJECTORY AI M.P. Olson and	ND CONCENTRATION FORECASTS FOR K.K. Oikawa, Atmospheric Environment Serv	THE PEPE PROJECT ice, Downsview, Ont. M3H 5T4
Poster 15 RESULTS OF TH R.V. Portelli, A	E NANTICOKE SHORELINE DIFFUSION tmospheric Environment Service, Downsview,	EXPERIMENT: JUNE 1978 Ont. M3H 5T4
Poster 16 MOVEMENT OF G.B. Atkinson,	MOUNT ST HELENS ASH CLOUD OVER Atmospheric Environment Service, Winnipeg,	WESTERN CANADA Man. R3C 3V4
SESSION 6A	Acidification in Western Canada	Thurs. 1400-1540
Chairman:	A.S. Mann	Room 107
THE EXTENT OF CANADA S.R. Shewchuk	ACIDIC DEPOSITION IN A REGIONAL , Physics Division, Saskatchewan Research Con	CONTEXT OF WESTERN
METEOROLOGIC WESTERN CANA R.F. Hopkinsor Sask. S4P 3N5	CAL CONTROLS ON AIR POLLUTANTS I IDA 1 and J. Dublin, Atmospheric Environment Serv	N A SELECTED REGION OF ice, Airport Terminal Bldg, Regina,
SENSITIVITY OF CANADA N. Holowaychu Sask. S7N 0W0	SOILS TO ACIDIC DEPOSITION IN A Sink, G. Padbury and B. Schreiner, Agriculture Ca	ELECTED REGION OF WESTERN
POTENTIAL FOR LAKES W.K. Liaw and Renewable Rese	ACIDIFICATION OF SASKATCHEWAN' F.M. Atton, Saskatchewan Fisheries Laborator ources	S PRECAMBRIAN SHIELD y, Saskatchewan Dep. of Tourism and
POTENTIAL EFF TO NORTHERN S Z.M. Abouguer Council, Saskat	ECTS OF ACIDIC DEPOSITION ON PLAN SASKATCHEWAN AND NORTHEASTERN India and R.C. Godwin, Chemistry and Biology 1 1000n, Sask. S7N 0X1	ITS WITH SPECIAL REFERENCE ALBERTA Division, Saskatchewan Research
SESSION 6B	Polynya I	Thurs. 1400-1530
Chairman:	S.D. Smith	Room 165
THE DUNDAS IS D.R. Topham, I	LAND POLYNYA EXPERIMENT - AN IN Institute of Ocean Sciences, Sidney, B.C. V8L	TRODUCTION 4B2
TEMPERATURE G. den Hartog a Downsview, Or	AND WIND PROFILES NEAR THE DUNI nd R.E. Mickle, Boundary-Layer Division, Atr nt. M3H 5T4	DAS ISLAND POLYNYA nospheric Environment Service,

D.R. Topham and R.G. Perkin, Institute of Ocean Sciences, Sidney, B.C. V8L4B2

TURBULENT HEAT FLUX MEASUREMENTS OVER AN ARCTIC POLYNYA R.J. Anderson and S.D. Smith, Bedford Institute of Oceanography, Dartmouth, N.S. B2Y 4A2

A NUMERICAL MODEL OF FLOW OVER THE DUNDAS ISLAND POLYNYA A.K. Lo, Boundary-Layer Division, Atmospheric Environment Service, Downsview, Ont. M3H 5T4

SESSION 6C	General Meteorology	Thurs. 1400-1540
Chairman:	J.B. Gregory	Room 103
THE INTERNATIO EXPERIMENT M. Bantle, E.J. University of Sa W.F.J. Evans, E M3H 5T4	DNAL OZONE ROCKET INTERCOMPARISON: Llewellyn, B. Solheim and J. Yuen, Institute of Space skatchewan, Saskatoon, Sask. S7N 0W0 Experimental Studies Division, Atmospheric Environm	THE CANADIAN and Atmospheric Studies, nent Service, Downsview, Ont.
THE OWS "PAPA THE DEVELOPM R.E. Vockeroth	" ALTERNATIVE DATA SYSTEM ENT OF AN AUTOMATED MARINE METEORO , Atmospheric Environment Service, Downsview, One	DLOGICAL DATA SYSTEM 1. M3H 5T4
AEROLOGICAL I K. Krukewich,S	DATA REDUCTION SYSTEMS (ADRES) ED Systems Inc., P.O. Box 1464, Saskatoon, Sask. S	7K 3P7
AN INTERACTIV Y. Durocher, Ca M3H 5T4	E ARCHIVE DATA ANALYSIS SYSTEM anadian Climate Centre, Atmospheric Environment Se	rvice, Downsview, Ont.
A QUANTITATIV WINTER STORM S. Bhartendu, Sc Toronto, Ont. M	E STUDY OF THE SOCIAL AND ECONOMIC I S cientific Services Division, Ontario Region, Atmosphe 14T 1M2	MPACTS OF SEVERE
	Coffee (1530-1600)	
SESSION 7A	Alberta Oil Sands Environmental Studies	Thurs. 1610-1710
Chairman:	R.P. Angle	Room 107
A USER-ORIENT SANDS D.S. Davison, E P.O. Box 5487	ED CLIMATOLOGICAL DISPERSION MODEL F S.D. Leavitt, R. McKenna and R. Rudolph, Intera Envi Station A. Calgary, Alta T2H 1X9	FOR THE ALBERTA OIL
AN ANALYSIS O NORTHERN ALB R.R. Peters, W. T5K 2J6	F PRECIPITATION CHEMISTRY IN THE OIL S ERTA D. Hume and H.S. Sandhu, Alberta Environment, Ox	ANDS AREA OF bridge Place, Edmonton, Alta
ION AND METAL W. Murray, Pro	CONTENT OF THE SNOW COVER OF THE A met Environmental Group Ltd, 2021 - 41 Ave N.E., C	AOSERP STUDY AREA Calgary, Alta T2E 6P2
SESSION 7B	Polynya II	Thurs. 1600-1700
Chairman:	D.R. Topham	Room 165
SURFACE HEAT R.G. Perkin and S.D. Smith and G. den Hartog,	EXCHANGE AT THE DUNDAS ISLAND POLY ID.R. Topham, Institute of Ocean Sciences, Sidney, B R. J. Anderson, Bedford Institute of Oceanography, D Atmospheric Environment Service, Downsview, Ont.	NYA S.C. V8L4B2 Partmouth, N.S. B2Y4A2 M3H 5T4
OCEANOGRAPH D.R. Topham a	Y IN THE AREA OF THE DUNDAS ISLAND PC nd R.G. Perkin, Institute of Ocean Sciences, Sidney, E	DLYNYA B.C. V8L4B2
STRUCTURE OF OVER THE DUN S.D. Smith and D.R. Topham a G. den Hartog,	THERMAL TURBULENCE IN THE ATMOSPHE DAS ISLAND POLYNYA R.J. Anderson, Bedford Institute of Oceanography, D nd R.G. Perkin, Institute of Ocean Sciences, Sidney, E Atmospheric Environment Service, Downsview, Ont.	ERIC BOUNDARY LAYER artmouth N.S. B2Y 4A2 B.C. V8L 4B2 M3H 5T4

ESSION 7C	Hydrometeorology III	Thurs. 1600-1720
Chairman:	D. Male	Room 103
N THE USE OF N OPERATIONAL U. Sporns and J. Mountain, Vance	PRECIPITATION OBSERVATIONS FROM CLIM , HYDROLOGY AT B.C. HYDRO Gordon, Hydrology Section, B.C. Power and Hydro ouver, B.C. V6Z 1Y3	MATOLOGICAL STATIONS Authority, Burnaby
SOME INDEX PRO R. Perla, Enviror	OPERTIES OF THE MOUNTAIN SNOWPACK ment Canada, P.O. Box 313, Canmore, Alta TOL ON	10
A COMPARISON J. Dublin and R.I Sask. S4P 3N5	OF VARIOUS STORAGE SNOW GAUGES ON F. Hopkinson, Atmospheric Environment Service, Ai	THE CANADIAN PRAIRIE rport Terminal Bldg, Regina,
SNOWMELT INFI R.J. Granger and S7N 0W0	LTRATION IG.E. Dyck, Division of Hydrology, University of Sa	skatchewan, Saskatoon, Sask.
	Cocktails	Thurs. 1830-1900
		Marquis Hall
	Awards Banquet	Thurs. 1900-
USER CONSIDER R.P. Angle, Albo A MIXED LAYER	ATIONS IN AIR QUALITY MODELLING erta Environment, Oxbridge Place, Edmonton, Alta T STATISTICS DISPERSION MODEL tmospheric Environment Service, Downsview, Ont	'5J 2J6 M3H 5T4
CROSSWIND DISI STATISTICAL TH D.G. Steyn, Dep	ERSION FUNCTIONS FROM TURBULENT EN EORY OF DIFFUSION 0. of Geography, The University of British Columbia,	M3H 514 NERGY SPECTRA VIA THI Vancouver, B.C. V6T 1W5
THE APPROPRIAT CONCENTRATION J.D. Reid, Boun M3H 5T4	TE CHOICE OF σ <sub>z</sub> AND ū FOR PREDICTING S N USING THE GAUSSIAN MODEL dary-Layer Research Division, Atmospheric Environ	URFACE ment Service, Downsview, Or
A MODEL FOR U K.D. Hage and F	RBAN AREA SOURCE CO CONCENTRATION P. Hopps, Dep. of Geography, The University of Albe	S rta, Edmonton, Alta T6G 2H4
SESSION 8B	Precipitation and Severe Storms	Fri. 0830-1000
Chairman:	E.P. Lozowski	Room 103
SEVERE ALBERT G.S. Strong, All	A THUNDERSTORMS: A POST-COLD-FRONT berta Research Council, Red Deer, Alta T4N 5Y5	ТҮРЕ
AN APPLICATION	N OF THE MARKOV CHAIN TO THE OCCURI	RENCE OF PRECIPITATION
N.J. JOHNSTORE	JIU-JJIY KIVELOGIU KU, JAHRANIKIN, PERA LUKU	

THUNDERSTORM STUDY FROM UNOFFICIAL SOURCES: SOUTHERN SASKATCHEWAN A.H. Paul, Dep. of Geography, University of Regina, Regina, Sask. S4A 0A2

SYNOPTIC ASPECTS OF WEATHER MODIFICATION EVALUATION

E.R. Reinelt, Dep. of Geography, The University of Alberta, Edmonton, Alta T6G 2H4 A.G. Eddy, Amos Eddy, Inc.

Coffee (1000-1030)

SESSION 9A	Air Pollution Modelling and Assessment; Feedback Discussion	Fri. 1030-1210
Chairmen:	R.V. Portelli and J.D. Reid	Room 107
ON THE COMPA SHORT-TERM CO S.G. Djurfors, S	TIBILITY BETWEEN MODEL PREDICTIONS A ONCENTRATIONS Syncrude Canada Ltd, 1030–107 Street, Edmonton, A	ND MEASURED Ita T5J 3E5
IMPROVED TRE. POLLUTION USI C. Lelièvre, Ser	ATMENT OF PRECIPITATION IN A STATISTIC NG A DOUBLE MARKOV CHAIN rvice de la Météorologie, 194 ave St-Sacrement (Québe	CAL MODEL OF AIR
A MODEL FOR I BOUNDARY LAY R. Verreault, L G7H 2B1	ESTIMATING STATIC STABILITY IN THE SUR YERS FROM STANDARD HOURLY TEMPERAT . Pérelman and D. Bégin, Université du Québec à Chic	FACE AND PLANETARY 'URE DATA outimi, Chicoutimi (Québec)
SESSION 9B	Climate	Fri. 1030-1210
Chairman:	J.M. Powell	Room 103
SOME ASPECTS B.W. Boville,	OF CLIMATIC CHANGE 135 Antibes Dr., Willowdale, Ont. M2R 2Z1	
SEASONAL CLIN G.J. Boer and M	ATIC VARIABILITY K. Higuchi, Canadian Climate Centre, Downsview, On	n. M3H 5T4
PALEOCLIMATE W.M. Last and R3T 2N2	AND PALEOHYDROLOGY OF THE LAKE MA J.T. Teller, Dep. of Earth Sciences, The University of	ANITOBA BASIN Manitoba, Winnipeg, Man.
SEASONAL OCE T.J. Simons, N L7R 4A6	AN-ATMOSPHERE INTERACTION ational Water Research Institute, Canada Centre for In	land Waters, Burlington, Ont
EFFECT OF SEA	ICE ON AIR-SEA CO2 FLUXES	

# Theme Session Hydrometeorology

# HYDROMETEOROLOGY IN CANADA

J.P. Bruce

The availability and versatility of water have had a profound impact on Canada's economy and historical development and will continue to do so. Intelligent use and management of this resource in the many climates of Canada's regions pose challenging problems to the hydrological sciences. The solution to these problems has depended upon and will continue to require knowledge from the atmospheric sciences. This has nurtured a healthy development of hydrometeorology in Canada.

This paper reviews some of the historical and traditional problems and practices of hydrometeorology in Canada. These problems deal mainly with the design of single-purpose water resource systems and have been concerned especially with the extreme events associated with floods and droughts. The problems have not diminished but have given rise to new concerns. Increasing and more concentrated populations and industrial development have created greater demands on energy, water resources, and other related resources, our lands and forests. Increased consumption and exploitation of these resources have had an impact on water quality and balance of the entire hydrological cycle. Many water resource developments are now large in scale and their design and management must be efficient and multi-purpose. These developments represent huge capital investments intended for economic and physical lifetimes of 50 to 100 years. Design criteria should reflect not only climatic variability but also possible changes or trends in the climatic "normals." How to cope realistically with climatic change is one of the most critical technical problems facing water resource managers and hydrometeorologists. Emphasis will be on these newer concerns and the research needed to solve them.

# Session 1A Hydrometeorology I

Wed. 1000-1200

HYDROMETEOROLOGICAL SENSORS FOR DATA COLLECTION PLATFORMS (DCP) J.M. Whiting

In response to comments made at the DCP Workshop at Québec in September, 1980, the Water Resources Working Group (of the Canadian Advisory Committee on Remote Sensing at the Canadian Centre for Remote Sensing) has compiled a list of hydrometeorological sensors in use across Canada.

The Saskatchewan Research Council has compiled a list of the characteristics of these sensors. The method of interfacing these various sensors has also been tabulated. Tables present types, accuracies, and time responses of the sensors by themselves, and in actual field operation when combined with specific data re-transmission systems. The choice of the sensors is shown to have dramatic effects on the quality of the data and on how representative the data are of the actual micro-climate.

# RECEPTION AND DISTRIBUTION OF ENVIRONMENTAL DATA FROM DATA COLLECTION PLATFORMS

B. Ford

Reception and distribution of DCP data via PASS is described. Technical and economic trade-offs are reviewed in light of user requirements.

# THE AES AUTOMATIC ARCHIVING SYSTEM USING THE CAPABILITIES OF THE NEW CSD COMPUTER (AS/6)

# Y. Durocher and T. Won

AES is developing a system to collect and quality-control on a near real-time basis all the meteorological and climatological observations transmitted on AES telecommunication circuits. Details of the system and its components will be described.

# RAPPORTS HEBDOMADAIRES DE GESTION DES RESSOURCES HYDRAULIQUES ISSUS D'UN SYSTÈME D'INFORMATION HYDROMÉTÉOROLOGIQUE R.M. Thompstone, R. Bergeron, J. Girard, G. Perron et L. Salesse

Un système d'information hydrométéorologique (SIH) a été développé afin de supporter la gestion opérationnelle du système hydro-électrique à réservoirs multiples construit et opéré par la Société d'électrolyse et de chimie Alcan Ltée dans la région du Saguenay Lac St-Jean. Une des composantes importantes du SIH est le système de génération de rapport de gestion qui tentent de fournir aux personnes concernées des rapports contenant des informations hydrométéorologiques qui pourront être utilisées efficacement dans la gestion opérationnelle du système hydro-électrique. Cet article examine un de ces rapports: le rapport hebdomadaire de gestion des ressources hydrauliques.

L'article décrit d'abord le système hydro-électrique à réservoirs multiples ainsi que les cinq bassins versants qui couvrent une superficie totale de 73,100 km<sup>2</sup> et qui alimentent en apports non contrôlés (naturels) les différents réservoirs du système. Il décrit ensuite, globalement, l'organisation du SIH et discute des tableaux et graphiques présentés dans le rapport hebdomadaire de gestion des ressources hydrauliques. Ce rapport est fourni chaque lundi; l'information porte sur la semaine précédente (lundi-dimanche) et sur la présente "période de planification." Les informations concernant cette dernière sont données en cumulant ou en faisant la moyenne des données disponibles à partir du début de la période. L'information présentée comprend: (1) les élévations et volumes journaliers des réservoirs, (2) les apports non contrôlés journaliers, hebdomadaires et cumulatifs, (3) les débits journaliers, hebdomadaires et cumulatifs des turbines et des vannes, (4) la moyenne des températures journalières estimées par bassin versant pour une semaine et cumulées à partir du début de la période et (5) la génération d'énergie journalière, hebdomadaire et cumulative pour chaque centrale. L'information est située dans une perspective historique plus significative en utilisant les statistiques à long terme (moyennes et extrêmes). L'article souligne l'aspect complet sous lequel l'information est présentée pour la gestion opérationnelle et décrit brièvement la base des calculs et la programmation pour la préparation du rapport hebdomadaire de gestion des ressources hydrauliques.

# VARIATION SAISONNIÈRE DE L'HOMOGÉNÉITÉ SPATIALE ET DES FONCTIONS DE STRUCTURE RÉGIONALES DE LA PLUIE AU QUÉBEC

J.-P. Fortin, G. Morin, L. Dupont et G. Jacques

Par suite de la grandeur du Québec et des variations physiographiques qui y sont rencontrées, les données recueillies par le réseau pluviométrique québécois ne sont pas homogènes spatialement. Il est toutefois possible de définir des régions à l'intérieur desquelles les stations sont homogènes par rapport à celles qui sont situées à l'extérieur de ces régions. La comparaison des limites de ces régions, telles qui définies au printemps, en été et en automne, démontre, par ailleurs, que ces dernières varient d'une saison à l'autre. Quant aux fonctions de structure, elles varient en fonction des régions et des saisons. En d'autres termes, pour une saison donnée, elles varient de région en région en fonction des caractéristiques de la variation spatiale de la pluie propres à chacune des régions. Par ailleurs, pour une "région" donnée, en considérant les modifications saisonnières des limites de cette "région", les fonctions de structure varient de saison en saison, étant plus élevées en été qu'au printemps ou en automne.

# ON ESTIMATING CATEGORICAL MONTHLY PRECIPITATION LEVELS BY CONTINGENCY METHOD

# L.O. Mapanao

As an aid to monitoring the emergence and persistence of drought conditions, an autoprediction scheme based on a  $3 \times 3$  contingency matrix was used to indicate whether the precipitation totals of a predictand month would likely fall in the above or below normal range. Normal was arbitrarily taken to be within half a standard deviation of the long-term mean.

Joint probabilities for each class combination between the predictand month and antecendent month are developed for fifty Canadian stations. The net effect of twelve predictor months was maximized by taking the product of their corresponding joint probabilities over each class of the predictand month. The largest product was considered an indicator of the most likely class of the predictand.

Results were verified against monthly precipitation departures from normal. Correlations were found to be weak and the slope and F statistic tests showed lack of significance at the 95% confidence level. The implications of these results on the feasibility of using statistical techniques for drought prediction are discussed.

# Session 1B Atmospheric Dynamics

Wed. 1000-1200

EVIDENCE FOR SOLAR CYCLE MODULATION OF CIRCULATION IN THE RANGE 30-110 KM

J.B Gregory, A.H. Manson and C.E. Meek

Analysis of data on winds at 60-110 km, obtained at Saskatoon from 1974 to date has revealed a major modulation of zonal and meridional flow and tides on the scale of a solar cycle. The data will be presented and compared with longer data sequences obtained by German and Russian workers, and with stratospheric and tropospheric data. The possibilities that this physical situation offers for solar influences on the lower atmosphere, e.g. through Hines's mechanism of modification of planetary wave transmission, will be examined.

# ON THE INTERACTION OF LONG BAROCLINIC WAVES WITH TOPOGRAPHY T. Warn and A. Patoine

It is found that the zonal structure of long baroclinic forced waves of small amplitude satisfy an inhomogeneous Korteweg-de-Vries (KdV) equation.

Numerical and analytical studies indicate that for localized topography the steady state may be either localized or involve an infinite lee wave train. In some cases, multiple equilibria states are shown to exist. The stabilities of these are tested numerically.

A series of experiments involving the interaction of solitary waves with localized topography are also carried out. It is found that, depending on the parameters of the problem, the interaction sometimes resembles a solitary wave's interaction in the sense that there is preservation of both the solitary wave and the steady state. In other cases, the solitary wave will split into a series of solitary waves.

In spite of the simplicity of the model used, it is believed that these results may provide insight into the behaviour of large-scale atmospheric waves.

# THE EFFECTS OF THE 1980/81 STRATWARM UPON MESOSPHERIC WINDS, TIDES AND TURBULENCE AT SASKATOON (52°N, 107°W, L = 4.3)

A.H. Manson, J.B. Gregory and C.E. Meek

A medium-frequency radar (2.2 MHz) is in use to obtain wind profiles (60-110 km) at 5-min intervals, on a continuous basis. The change in daily mean wind during the STRATWARM is followed up through the mesosphere. Harmonic and spectral analyses are used to document changes in amplitude and phase of the atmospheric tides.

# A GLOBAL AVAILABLE POTENTIAL ENERGY—KINETIC ENERGY BUDGET IN TERMS OF ZONAL WAVENUMBER FOR JANUARY 1979

S. Lambert

A global spectral energy budget computed from FGGE Level III-b data is presented, and is compared to a similar budget computed from FGGE Level III-a data and to previous energetics studies for January.

### A TWO-LEVEL BAROCLINIC FINITE-ELEMENT MODEL T. Goos

A finite-element method (using the Galerkin formulation) and a truncated spectral method are applied to find numerical solutions to the three non-linear partial differential equations describing a two-level quasi-geostrophic model atmosphere on a  $\beta$ -plane. This work was undertaken to provide a vehicle with which the author could study the finite-element method and its application to problems of meteorological interest. A relatively simple meteorological problem was chosen to allow concentration on the method and its application rather than on complex physical interactions.

With the finite-element method, bi-linear basis functions defined on a variable resolution grid are used while with the spectral method sinusoidal basis functions are used. The domain of the problem is a channel of length  $2.8 \times 10^7$  m and width  $4.4 \times 10^6$  m with a free-slip wall boundary condition applied at the north and south boundaries and periodicity assumed in the x-direction. The grid consists of a central area with uniformly high resolution and an exterior area with a uniformly changing resolution outward from the central sub-domain. A second-order Adams-Bashforth time integration scheme is used with both numerical techniques.

Parallel integrations of up to 48-h duration for a set of four cases are presented and compared, using the spectral solution as a highly accurate standard. In the uniform resolution sub-domain, the finite-element solution achieves a maximum S1 score of under 25 for both height and thickness fields in three of the cases. Values lower than 30 are generally considered to be near-perfect forecasts in operational weather forecasting. However, it is to be noted that in this study, a highly simplified model is used and integrations are made from initial conditions with no inherent error. In the fourth case, numerical instability occurred owing to the rapid growth of spurious short-wavelength waves generated near the boundaries. Investigations revealed that these waves were being produced by the inaccurate evaluation of normal derivatives near and on the boundaries. A possible method for overcoming this problem is discussed.

# A COMPARISON BETWEEN CMC OPERATIONAL ANALYSIS STATISTICS AND CLIMATOLOGY

# L. Lefaivre

In order to understand the large-scale physical balances of the atmosphere, CMC hemispheric analyses are being analysed by the Numerical Modelling Division of the Canadian Climate Centre. Several months of twice-daily last run operational analyses have been collected. Since these analyses are motivated by demands for weather forecasting rather than for climate research, the first step in the process is to compare them with climatology.

The data from CMC include five measured parameters (geopotential height, temperature, humidity, and zonal and meridional winds), and one predicted parameter (12-h forecast of vertical motion). These six parameters are available on Gaussian grids at eleven pressure levels and are analysed by the same diagnostic package developed for the General Circulation Model. The statistics obtained are the standard ones: monthly means, standing and transient eddy variances, meridional and vertical transports.

Comparisons have been made between the CMC statistics and those reported in the literature, namely by Oort and Rasmusson (1971) and Newell et al. (1972, 1974). The differences and similarities between the climatological and analysed data are presented for the 1980–1981 winter season.

# Session 2A Drought

### CANADIAN PLAINS DROUGHT G.A. McKay

Drought is endemic to the Plains. Plains ecology, land form and industry all attest to its semi-arid character. High variability in rainfall is a major trait of a more arid climate. Coping with moisture shortages has been a perennial challenge, but the real test comes in the more externe events. Societal changes in the intervening periods creates new vulnerabilities. For example, urbanization, industrialization and dependence on new technology has created drought impacts that far exceed the concerns of the 1930s. Drought-proofing demands an understanding of the dimensions of future moisture deficiences. Both weather and climate prediction have great potential in drought decisions, particularly in determining emergency responses. Tactical decisions and design concerns can also benefit substantially from risk statistics and transformations which, in effect, are a form of forecasting. The bottom line is to act appropriately on available knowledge. A monitoring and information referral system is one way of promoting an appropriate response in drought-prone areas.

## AN OBJECTIVE ANALYSIS OF HISTORICAL DROUGHTS IN THE CANADIAN PRAIRIES R.B. Street and B.F. Findlay

Droughts can occur in many parts of Canada, but the interior Prairie Provinces are particularly susceptible. Despite improved technology the impact of drought on the region and the country has probably increased, affecting not only food production and water resources but many intrinsically-related industries and services. Following the winter drought of 1976–77 increased research was started by a number of agencies, including the Atmospheric Environment Service, as part of a departmental programme designed to accurately recognize in future those significant droughts and to assist in monitoring and managing drought effects.

An early stage of the AES programme has been a time and space frequency/duration/intensity study of historical drought in the Prairies Provinces for which a water budgeting procedure has been designed to assess the soil moisture status on a continuous basis over the extensive area bounded by the 92nd and 120th meridians, the Canada/U.S.A. border, and the 60th parallel of latitude. This area was subdivided into broad vegetatively homogeneous zones thereby permitting differences in response to processes affecting soil moisture to be taken into consideration.

The study encompasses data from over 180 meteorological stations operating continuously since 1925. To overcome difficulties associated with broken records and the unequal distribution of stations, data are projected onto an equal area (10,000 km<sup>2</sup>) spatial grid by means of a polynomial objective analysis technique. The various components of the soil moisture budget (potential evapotranspiration, snow budgeting, etc.) have been selected by assessing the ability of different published models to synthesize the corresponding processes in the different environments of the area being examined. The resulting soil moisture budget is also verified by assessing its ability as a whole to model the temporal variations of the soil moisture at various locations throughout the study area.

Work is underway to assess the relationships of the climatological droughts defined by this study to crop yields, streamflow and other quantitative indicators of drought including forest fires in order to project hierarchies of drought events. These are required for design purposes and development of monitoring strategies.

# NEWSPAPER COVERAGE OF THE 1980 DROUGHT

### L. McKerness

Our perception of environmental events is influenced not only by the "objective reality" of these events and our past experience with similar events, but also by our subjective perception of the events as influenced by the media. The purpose of this study is to undertake an analysis of the Western Canada newspapers' coverage of the 1980 drought. Approximately 8–10 newspapers were selected for analysis based on total spatial coverage offered collectively by these newspapers, frequency of publication, and availability of issues from April to September 1980. Each newspaper was examined for drought articles using a master check list approach, detailing such items as amount of coverage; assigning point scores for headlines, photographs, etc.; noting the principal content of the drought article – agriculture, water supplies, etc. – and the occasional references to particularly relevant or interesting items.

# WATER SUPPLY SIMULATIONS FOR REGIONAL DROUGHT STUDIES OF THE CANADIAN PRAIRIES

# B.T. Abrahamson

The Hydrology Division of the Prairie Farm Rehabilitation Administration (PFRA), Canada Department of Regional Economic Expansion, is currently studying the drought resistance capability of the surface water supply system in the agricultural regions of Manitoba and Saskatchewan. The results will serve as the hydrology contribution to a larger multidisciplinary Drought Proofing Study of this region which is being undertaken by PFRA in cooperation with the provinces. The hydrology study will be accomplished by simulating the operation of existing and proposed reservoirs and diversions under design drought conditions.

The design drought periods are the 1935-37 and the 1959-61 agricultural drought years, as selected on the basis of low wheat yields induced by the severest weather. Artificial design droughts were considered during the initial phases of this study, but were rejected a being too severe. Moderate and physically-realistic modifications to the historic droughts will be assessed and employed if and as required.

The water supply simulation procedures vary in accordance with the size and importance of the basin. The larger river systems, generally those having gross drainage areas greater than 10,000 km<sup>2</sup>, are simulated using PFRA's version of the SNBB (Saskatchewan Nelson Basin Board) High Speed Model. The High Speed Model is an efficient simulator of monthly streamflows under associated reservoir regulation. Smaller basins are analysed by a simple water balancing procedure that adjusts natural flow arrays to present or future use conditions.

Study outputs in the form of monthly mean flows and monthly reservoir storages are presented according to administrative units, census divisions in Saskatchewan and crop districts in Manitoba, so as to conform to the input requirements of related socio-economic studies. This is accomplished by transferring basin specific flow series to the administrative boundaries by effective drainage area ratios.

# REDUCING DROUGHT EFFECTS ON CROP LANDS ON THE PRAIRIES W. Nicholaichuk

Recent droughts, such as those experienced in 1977 and 1980, call our attention to improving the management of our limited resources in all segments in our society. Water conservation concepts and practices for use on dry crop land are given for the Prairies. Strategies are discussed for improvements in: water intake efficiency; farming systems to prevent soil degradation; snow management; reduction of runoff water; and irrigation. Additional strategies are presented for improving water use by crops through optimum fertilizer practices, matching forage-crop plant population with water supply, minor land forming to conserve water, and better irrigation scheduling.

Wind and water erosion as a result of prolonged drought is briefly oulined along with their methods of control. There is a need to improve and maintain organic matter status for drought-proofing. Research progress has been made on many facets of water management. As a result of energy and economic pressures, there will be a rapid transfer of new water conservation concepts and practices for crop land that will reduce the effects of future drought.

# Session 2B Forecasting

# AN EXPERIMENT IN AUTOMATED FORECAST PRODUCTION, THE WEATHER ELEMENT DIGITAL GUIDANCE EVALUATION SYSTEM

I.B. Findleton

The Centre météorologique canadien has developed and implemented a system for the automated production and distribution of forecast surface conditions using an hourly weather report format. This system is being used to evaluate the ability of numerical weather prediction models to produce detailed forecasts of local meteorological conditions. Currently forecasts are produced twice daily for 780 locations in North America, and are being made available in real time to AES regional centres for operational evaluation.

# VERIFICATION OF LOW CENTRES ON SPECTRAL AND SUBJECTIVE SURFACE PROGS A. Gladstone

During a period of two years beginning in December 1978, the Canadian Meteorological Centre, Montréal, verified forecast low centres on both CMC spectral and subjective surface progs in the ranges 36, 48 and 60 h. Errors in central pressure, latitude, longitude and total displacement were recorded.

Results were divided into eight geographical regions covering the subjective prog area and tabulated by seasons of three months. Some observations are made concerning regional and seasonal differences. There were also some unexpected disparities between the results for the same seasons of different years. The period December 1978 to November 1980 represents the first two years of the CMC Version Eight 29-wave spectral model. Since there were no substantial changes in the model during this period, changes in results are attributed mainly to large-scale climatic differences between the two years.

# A COMPARISON OF THE SMALL AREA MODEL AND AN EKMAN PARAMETERIZATION METHOD FOR DIAGNOSIS OF MESO-SCALE SURFACE WINDS

L. Loiselle and L.J. Wilson

The Small Area Model (SAM) is a diagnostic, one-level, primitive equation model for computing detailed surface winds over a small area, as they are affected by topography, friction and heating effects (M.B. Danard, 1977, *Mon. Weather Rev.* 105:512–581.). The model is driven by large-scale data from synoptic or prognostic charts and is intended to simulate phenomena such as orographic channelling, land- and sea-breezes and effects resulting from changes in atmospheric stability. The model is initialized with an Ekman parameterization that computes the friction using the height of the momentum boundary layer.

An experiment was conducted in which SAM was run with a 10-km grid spacing on 5 separate domains of 150 km × 150 km centred on five Ontario observing stations. These stations were chosen for the availability of the data and for the variety of their geographic locations (proximity to a lake, hilly country, small or big city, etc.). Twenty-five dates from the summer of 1977 and winter 1977–1978 were chosen to represent different wind regimes, including land- and lake-breeze situations, strong gradients associated with synoptic storms, and weak gradient situations.

The surface winds produced by SAM as well as those generated by the Ekman parameterization method alone were verified with observed surface winds at the five stations. Verification statistics are presented for the two techniques and their merits are discussed in tems of their accuracy, their response to different synoptic situations and their efficiency.

### THE SYNOPTIC (INSTABILITY) INDEX: 1979–1980 TESTS AND NEW VERSIONS G.S. Strong and W.D. Wilson

The Synoptic Index of Convection  $(S_c)$  combines parcel instability theory methods and synoptic variables to forecast all ranges of convection. The result is an objective forecast tool of consistent reliability, even after parcel theory fails because of unrepresentative soundings or rapid changes in environmental thermodynamics.

The  $S_c$ , which forecasts the Convective Day Category (CDC) in nine discrete classifications, has now been tested on 269 operational days of the Alberta Hail Project, 1978–80. Unmodified, the  $S_c$  forecasts the CDC to within one category on 71% of the days, 6% better than subjective techniques of the previous four years, 1974–77. Enough experience was gained during the three years of its use to allow forecasters to subjectively modify the  $S_c$  under "certain" circumstances, raising the overall forecast CDC accuracy to 78% and to 84% during 1980. The  $S_c$ , however, is best left unmodified for forecasting hail days alone, where it was correct over 81% of the time, compared to only 61% for the 1974–77 subjective forecasts. Subjective modifications to HAIL/NO HAIL decisions actually reduced accuracy. The diagnostic index verified only marginally better than the forecast  $S_c$  in the three years, although linear correlations with CDC were slightly better (0.76) for the total 269-day period.

The technique and test results will be discussed, along with new versions of the index that finally make it amenable to automatic computer-produced forecasts at more than one point. Thus, the  $S_c$  can now be used to forecast the variability of convective intensity over large areas.

# REGIONAL WEATHER FORECASTING WITH THE CANADIAN FINITE-ELEMENT MODEL R. Benoit

This new model (first run in 1977) is multilevel and solves the primitive equations using a variable resolution finite-element discretization in all three space dimensions. The horizontal domain is a rectangle on a polar stereographic projection that approximately covers the Northern Hemisphere; the vertical extent of the model is from the surface to a finite top located at about 100 mb. The boundary conditions are chosen such that the flow is contained within the domain both in the horizontal and in the vertical. The grid is specified to be of Cartesian product format with arbitrary non-uniform spacing. By choosing the mesh size to be uniformly small over an area of interest and increasing smoothly away from this area, it is possible to use the model to produce a regional weather forecast for a limited period of time. The model is currently undergoing a pre-implementation test period at the Canadian Meteorological Centre and results for forecast periods of up to 48 h will be presented to illustrate its performance.

# AN IMPACT TEST OF THE LOSS OF "SHIP PAPA" DATA

D.W. Shantz and E. Hopkins

The estimated errors of analysis, calculated routinely by the Canadian Meteorological Centre objective analysis programme are used to assess the impact of the loss of "SHIP PAPA." The test was run during the STREX experiment when surface data coverage was greater than normal. Analysis errors resulting from one operational run using all the data were compared with those from another with "SHIP PAPA" deleted.

# Session 2C Entrainment, Mixing and Upwelling Wed. 1300–1450

# AN EXAMPLE OF ENTRAINMENT INTO THE HYPOLIMNION OF CENTRAL LAKE ERIE G.N. Ivey and F.M. Boyce

The depletion of dissolved oxygen in the bottom waters of the Central Basin of Lake Erie over the summer stratified period has been the object of concern for many years. The thickness of the hypolimnion and the interaction of the hypolimnion with the overlying fluid are thought to be important factors governing the oxygen concentration. Previous studies, based on lake-wide budgets of heat and dissolved oxygen, have suggested that the thickness of the hypolimnion increases during certain periods because of the erosion of the thermocline from below. In 1979, measurements of currents and temperatures were made in the Central Basin that appear to contain a direct example of this "downward entrainment" phenomenon. It appears that the thicknesing of the hypolimnion occurs as a consequence of relatively strong bottom currents in the thin hypolimnion, in combination with a partial insulation of the main thermocline from direct surface forcing by the creation of a secondary thermocline above the main thermocline. The secondary thermocline is generated by short-term storm events (lasting about one day). Despite their short durations, these events exert an influence on the thermal structure, and the hypolimnion in particular, for as much as a month afterwards.

# CONVECTION NEAR THE TEMPERATURE OF MAXIMUM DENSITY DUE TO HORIZONTAL HEATING

#### P.F. Hamblin

Investigation of the convective motion driven by temperature differences at two vertical walls that are maintained symmetrically about the temperature of maximum density was motivated by field observations of thermal fronts in lakes associated with the 4°C isotherm. The analysis reveals a tendency for increased thermal gradients at second order in the aspect ratio, A, in the limit of small A and that the thermal front has a thickness of  $Gr^{-1/4}h$  in the limit of high aspect ratio of the motion, Gr being the Grashof number and h, the depth. Physically the effect of the density extremum is to cut off heat transfer by convection at the 4°C isotherm with the result that heat transfer takes place solely by conduction.

In the limit of small A the vertical sinking rate is of the order of Gr  $A\nu/\ell$  where  $\nu$  is the viscosity and  $\ell$  is the distance from shore, while the longshore flow is of the order  $\epsilon\nu$ Gr/ $\ell$  where  $\epsilon$  is the vertical Ekman number. At the opposite extreme where convection is dominated by inertial forces rather than viscous-diffusive forces the sinking rate is of the order  $\nu A$  Gr<sup>-1/4</sup>/h. The solutions demonstrate a qualitative agreement with field observations of thermal discharges during winter, and with coastal temperature distributions during the heating and cooling periods in lakes.

# THE SUMMER THERMAL STRUCTURE OF LAKE ONTARIO OFF TORONTO: COOLING THE BIG CITY

#### F.M. Boyce, D.G. Robertson, G.N. Ivey and R.T. Tamblyn

It has been proposed that large savings in electrical energy are possible if cool, deep water form Lake Ontario is used, as an alternative to electrically operated chillers, to provide the cooling requirements of large buildings in downtown Toronto. Preliminary engineering and economic studies indicate that the project is technically feasible and, although the capital costs are substantial, the longer term economic picture appears favourable, particularly in view of the rising costs of electrical energy. In order to estimate the capital expenditure, it is necessary to determine how deep (and how far offshore) the cold water intake must be placed in order to obtain a reliable supply of cool water throughout the air-conditioning season. Temperature profile data, collected during ship surveys over the past twenty years in Lake Ontario off Toronto, plus time series data from a 21-level thermistor array installed on the 100-m contour near the site of the proposed intake through the summer of 1980, have been used to answer this specific question. More generally, the two data sets are examined to determine the relative importance of thermal variability for inter-annual, seasonal, and shorter time scales. Intake design turns out to be an important consideration for the air-conditioning scheme. Unless azimuthal swirling velocities are restrained at the intake, drawdown of warmer thermocline water into the intake may occur.

# OBSERVATIONS AND MODELLING OF UPWELLING OFF CAPE SABLE, NOVA SCOTIA D. Lefaivre, K.-T. Tee and P.C. Smith

Two out of an array of six moorings of current meters, were instrumented in the bottom boundary layer. They provide the data base to compare with various models. The centrifugal upwelling hypothesis is tested by comparing the complex demodulation of the major axis of the tidal ellipse to the low-frequency onshore current in the bottom boundary layer. During the winter season, periods of onshore flow (upwelling) alternate with periods of strong flow into the Gulf of Maine, which penetrate through the boundary layer to the bottom. A three-dimensional model that gives the value of the tidal current and of the tidally induced residual current is applied to the area. Some results of the computed tidal and residual currents are presented.

# MIXING AND THE INTERNAL TIDE AT THE SCOTIAN SHELF EDGE

# J.A. Elliott and H. Sandstrom

Data from a field programme at the edge of the Scotian Shelf are analysed to show details in the generation process of the internal tide at the site and to indicate the presence of mixing caused by non-linearities in the tidal flow. The data include information from moorings, CTD cycling, microstructure and current-meter profiles and acoustic back scattering. The internal tide is observed to be strongly non-linear within the critical ray span of the shelf edge. There is an indication of significant mixing occurring along rays and at the base of the surface mixed layer.

# Session 3A Hydrometeorology II

Wed. 1520-1700

PRECIPITATION MEASUREMENT WITH C-BAND WEATHER RADAR IN SOUTHERN ONTARIO

W.G. Richards and C.L. Crozier

Three years of seasonal radar and raindrop distrometer data have been correlated to determine a Z - R relationship for Southern Ontario storms during rain periods. Providing corrections are applied to account for systematic biases, instantaneous rainfall rates can be estimated from radar reflectivity factor measurements using the relation  $Z = 295 R^{1.43}$  with a standard deviation of 0.288 in the logarithm of R. This relation closely resembles that derived from the drop distribution data alone. Sources of error and bias have been closely examined.

# WEATHER RADAR ESTIMATES OF AREAL RAINFALL IN ALBERTA M. Antonio

Weather radars together with conventional rain gauges as adjustment sites are used for the measurement of precipitation. This paper shows comparisons of areal rainfall amounts, measured by a dense network of rain gauges, with radar-derived rainfall amounts. The radar was only calibrated electronically, and the relation  $Z = 200R^{1.6}$  was used to relate rainfall rate to the weather radar mesurements. The rain gauge data were obtained from two networks, one operated by the Alberta Hail Project and the other by the Alberta Hail and Crop Insurance Corporation. The radar data were obtained from the Alberta Hail Project's S- and C-band weather radars. It is concluded that in 70% of the cases studied a radar only calibrated electronically, without rain gauge adjustment, can be used to determine rainfall amounts over areas comparable in size to many river sub-basins, with a precision at least equal to that of conventional gauge systems.

# A REAL-TIME DATA ACQUISITION SYSTEM FOR STREAMFLOW FORECASTING R. Catalfamo

This paper describes the implementation of a turn-key, real-time streamflow prediction system. The system operates on an Eclipse S/140 minicomputer and runs both the Stanford and Sacramento Watershed models. The run-time execution from data-base retrieval to output hydrograph is performed in less than one minute.

Data are acquired on-line from several sources. These include precipitation amounts from weather radar CAPPI maps every 8 to 12 min, data collection platform data every 3 h, automatic data-logger reports every hour, the Atmospheric Environment Service data from teletype circuit line 278, and remote terminal manual reports.

These data are gathered and blocked into six-hour intervals, which correspond to the basic time-step of the hydrological models. FORTRAN modules preprocess these data into the format required by the hydrological models. The modules calculate mean areal temperature, precipitation and evapotranspiration, and convert stream stage readings to discharge. Provision is also made in real time for missing data through various approximation algorithms. A redundant precipitation measurement system utilizes either radar or hydrometeorological station data. The system is conceived to run automatically and perform streamflow simulation/forecasting in a continuous mode without human intervention.

The virtue of this turn-key system is its ability to produce real-time flood forecasts for specific watersheds. This dedicated minicomputer solution to hydrological modelling makes it attractive to regional conservation authorities and environmental impact groups for various purposes. Among these are flood prediction, reservoir management, urban drainage, land-use studies, etc.

Each remote user of the system can request a model run for his particular area of responsibility. This de-centralized approach is applicable to very specific needs and requirements in a totally dedicated environment.

### PROBABILISTIC FLOOD FORECASTING ON THE RED RIVER A. Warkentin

The Red River flows northward from the United States into Manitoba where it is joined by the Assiniboine River in the City of Winnipeg. The Red River has a history of devestating spring floods, which have been caused by various combinations of meteorological conditions. Peak stage forecasts are required well in advance of spring breakup in order that decisions may be made regarding the implementation of costly flood-fighting procedures. Advance forecasts of peak stage are highly dependent on future hydrometeorological conditions and are, therefore, probabilistic. In this paper the probabilities of such unknowns as future precipitation and snowmelt rate, as well as uncertainties or errors in observed data, forecast equations and stage-discharge relationships, are quantified for a desired joint probability of occurrence. Using this information, peak-stage forecasts for a given probability are then prepared by substituting the appropriate unknowns into flood forecasting equations.

The probabilities of occurrence of future unknowns have been computed from data for a 50-year period for the 40,000-mi<sup>2</sup> basin of the Red River upstream of Emerson. Duration curves have been plotted for each unknown parameter using the Hazen Method. The joint effect of these parameters on the spring peak flow has been evaluated for each of the 50 years, and a duration curve of the joint effects has been plotted. A graph relating the percentiles of the joint effects to the percentiles of individual variables has been constructed. Using this graph and the duration curves of the individual unknowns, values of future precipitation, melt rate, forecast equation errors, etc. corresponding in their joint effect to any specified joint percentile may be obtained. These values, together with known hydrometeorological parameters up to the forecast date, are then entered into a forecasting relationship to obtain the peak stage forecast for the specified joint percentile. The probabilistic forecasting procedure is illustrated with an example.

# PROBABLE MAXIMUM PRECIPITATION STUDIES IN THE LOWER MAINLAND OF BRITISH COLUMBIA

D.G. Schaefer

B.C. Hydro and Power Authority operate a number of small (by today's standards) hydroelectric power generation projects whose drainage basins lie in the mountainous terrain immediately to the northeast and east of the city of Vancouver. These projects were constructed in the early decades of this century and a study is currently under way related to dam safety and operating criteria. As a part of the overall investigation it was necessary to produce estimates of the meteorological conditions that would be expected to lead to a probable maximum flood (PMF) on the watersheds involved, including estimates of probable maximum pecipitation (PMP).

Over southwestern British Columbia probable maximum precipitation is attributed to intense frontal weather disturbances that cross the coast with greatest vigour and frequency during the months from October to February. The scenario involves a strong, warm, moist southwesterly air flow impinging on the marked orographic barrier of the Coast Mountains and producing heavy precipitation resulting from convergence and orographic influences.

Historical storms of record from the Lower Mainland are maximized using ratios of storm to extreme moisture availability for the time of year. Orographic effects are estimated by means of the limited records available from higher elevation stations and through application of a multiple layer laminar flow wind model. Results are compared to statistical estimates based on recorded extremes from longer term climatological station records from the area.

# STOCHASTIC RAINFALL INFLOW FORECASTING FOR SHELLMOUTH RESERVOIR A. Warkentin

The Shellmouth Reservoir, which traverses the Manitoba-Saskatchewan border on the upper Assiniboine River, has a capacity of 387,000 acre-feet at the spillway level. A reliable inflow forecast is one of the requirements for the optimum operation of the control structure on this multipurpose reservoir. Forecasts of inflow from rainfall are particularly important for flood control purposes when the reservoir is near its spillway level. Since the concentration time of the basin draining into the reservoir is only two weeks, inflow forecasts based on observed rainfall leave little time to effect significant changes in reservoir storage through changes in the controlled outflow. Operation of the control structure is, therefore, based not only on forecasts of inflow from observed snowmelt and rainfall, but also on probable inflows from future rainfall.

Diagrams showing probable inflows from future rainfall are produced by first generating 200 years of daily rainfall sequences using a Monte Carlo random number generator and the statistical properties of daily basin rainfall obtained from 38 years of observed rainfall data. The rainfall generation is done separately for each month from April to October in order to take cognizance of temporal changes in climatic characteristics of the region. The rainfall sequences are then input to a rainfall/runoff model to generate daily values of basin runoff. For each semi-monthly period, 200 years of daily runoff sequences are generated for each of 16 different combinations of starting values of soil moisture and antecedent precipitation index, which are important parameters in the runoff forecasting equations. A modified Thomthwaite daily water balance computer programme is used to compute daily values of soil moisture and API after the starting date. The 200 total runoff relationships are plotted for easy use, and include families of curves representing various initial basin conditions.

# Session 3B Boundary Layer

Wed. 1520-1700

BOUNDARY-LAYER FLOW OVER LOW HILLS - THEORY AND COMPUTER MODELS P.A. Taylor, J.L. Walmsley and J.R. Salmon

Our application of the Jackson-Hunt-Mason-Sykes approximate theory of neutrally stratified boundary-layer flow over low hills will be reviewed. Modifications to the theory were found to be necessary for applications to real topography since the original formulation led to an exaggeration of the effects of high wavenumber terrain features. Some smoothing of the input terrain was also found to be helpful. Applications of the original and modified theories to both ideal and real three-dimensional topographic features will be presented. In addition, some comparisons will be made with finite-difference solutions for flow over ideal two-dimensional terrain. Implications of this work for siting of wind energy systems and calculations of wind loading will be discussed.

### BOUNDARY-LAYER FLOW OVER LOW HILLS – A FIELD STUDY R.E. Mickle, P.A. Taylor and H.W. Teunissen

Detailed measurements of the perturbations to mean flow and turbulence in the boundary layer over a low hill have been made at a site near Pincher Creek, ALTA in February 1981, following a preliminary study the previous year. The hill is fairly isolated and rises to about 100 m above the relatively flat surrounding terrain. It has a typical slope of about 0.1; the ground cover is low grass, stubble and snow. Instruments were mounted on ten 10-m towers, eight of which were placed in a line over the top of the hill parallel to the prevailing wind. An additional ten 3-m towers were deployed in a number of different configurations. Tethersonde flights were made both upwind of the hill and at the summit.

Preliminary results from the experiment will be presented and compared to wind-tunnel and numerical model simulations.

# LOW-LEVEL GRAVITY WAVES OBSERVED IN CALGARY WITH AN ACOUSTIC SOUNDER

S.K. Aggarwal, S.A. Leelananda and T. Mathews

Facsimile records of monostatic acoustic sounders reveal the occurrence of waves in the boundary layer when elevated inversion layers are present. Records from an acoustic sounder operated in Calgary over a two-year period from March 1976 to February 1978 were examined to study the characteristics of these waves. The most probable period of the waves was 6 min with the distribution extending to a period of 20 min. The most probable amplitude was  $75 \pm 25$  m, occasionally reaching 200 m or more. Waves were present 18% of the time, and showed diurnal and seasonal variations.

### ACOUSTIC SOUNDER OBSERVATIONS OF THE ONSET OF A CHINOOK T. Mathews, S.A. Leelananda, R.B. Hicks and P.J. Irwin

During the onset of the remarkable Chinook of 8–10 December 1980, we were able to obtain wind and turbulence profiles using a Doppler acoustic sounder. Other relevant data from ground-level instruments and minisondes were also available. These data are presented and discussed.

Ground-level temperature showed two types of changes – one of gradual increase and one of rapid changes. Gradual increase in temperature was observed before the warm Chinook air reached ground level, and the minisonde data indicated a strong inversion (18°C in less than 100 m). The rapid changes were associated with oscillation of the arctic front that was located close to Calgary. The wind profile showed remarkable wave-like behaviour, with periods of several hours.

# BOUNDARY-LAYER MODIFICATION DURING FRONTAL PASSAGES AT OWS P G.A. McBean and R.E. Mickle

During the Storm Transfer and Response Experiment (STREX) a special observation programme was conducted at OWS P. Radiosondes were launched at three-hourly intervals and

pressure-temperature-humidity sondes at hourly intervals during selected storm periods. This paper will examine the variation in boundary-layer structure during the passage of storms and, in particular, during cold-front passages. On November 17, 1980 a cold front associated with a deep low pressure centre passed through OWS P. The temperature profile in the boundary layer, above the surface layer, showed a marked change in a period of one hour. The near-surface layer exhibited little immediate change owing to the thermal influence of the ocean and its inertia. The surface wind and pressure did change quickly with the frontal passage. The details of these changes are examined through use of the continuous data-recording system that had been put on the CCGS *Vancouver* for STREX. These studies are aimed at understanding and eventually modelling the evolution of storms at sea.

Session 3C

# Estuarine Circulation and Coastal Currents

Wed. 1520-1700

# A TWO-DIMENSIONAL NUMERICAL MODEL OF ESTUARINE CIRCULATION USING A VERTICAL COORDINATE TRANSFORMATION

R.A. Kahawita and T.T. Quach

A procedure to study and predict the dynamics and kinematics of partially mixed estuaries is important from both physical and ecological viewpoints. Such estuaries exhibit upstream flow in their lower layers owing to longitudinal density variations, and have freshwater seaward flow in their surface layers. This "density induced circulation" as it is called considerably modifies the longitudinal mixing and transport processes in the estuary.

The purpose of this paper is to present a real-time numerical simulation model that describes the longitudinal and vertical distributions of velocities and salinities as well as tidal amplitudes for partially mixed estuaries. The model includes the continuity, salt, energy and momentum balance equations coupled

by an equation of state. The flow is assumed to be laterally homogeneous in the development of the governing equations. A transformation technique on the vertical coordinate is applied such that the computational grid is adjusted automatically to the estuarine bathymetry. The external inputs to the model are the salinity and tidal amplitude as a function of time at the ocean boundary, and the water surface elevation at the upstream (river) boundary which may be adjusted to give the correct net freshwater discharge.

The numerical technique employed for the solution of the governing equations is a second-order accurate space- and time-staggered semi-implicit finite-difference scheme. Eddy viscosity and dispersion effects are studied using semi-empirical models of diffusivity based on profiles of Richardson Number. Since the vertical diffusion terms are treated implicitly, the only restriction on the time-step is the Courant condition.

The model has been applied to the rivière Grande Baleine (Great Whale River) in the James Bay Development Region.

# VARIABILITY OF THE NEAR-SURFACE RESIDUAL CURRENT IN THE LOWER ST LAWRENCE ESTUARY

# H.-J. Lie and M.I. El-Sabh

Current records of one- and four-month durations from May 1979 at ten stations located between the two cross-sections at Point-des-Monts and at Point-au-Père in the Lower St Lawrence Estuary were subject to time series analysis. We find that the spectral energy density of the near-surface current in the subinertial frequency range is comparable to the energy concentrated in the semi-diurnal frequency band. The strong residual current decreases rapidly with depth while the tidal current is more or less uniform from surface to bottom.

A cross-spectral analysis showed that the longshore current at a station near the south shore was negatively correlated with the current at a north-shore station with high coherence in the period range greater than seven days. Some evidence was found for the existence of a cross-channel current at stations in the centre of the channel. The near-surface circulation system in the area may be classified into three types of pattern: (a) one anticyclonic eddy centred between the estuary-gulf boundary and the Baie Comeau cross-section (region I) accompanied by a cyclonic eddy located to the landward between the two cross-sections at Baie Comeau and Pointe-au-Père (region II); (b) a cyclonic eddy in region I with an anticyclonic eddy in region II; and (c) the transition phase between phases (a) and (b).

# ÉTUDE PRÉLIMINAIRE DES MÉCANISMES DE CIRCULATION DE LA BAIE DE SEPT-ILES M. Gagnon

Des études de dérive effectuées dans la baie de Sept-Iles en juin 1980 nous ont permis d'expérimenter un nouveau type de flotteur de surface ainsi qu'une méthodologie permettant de positionner un grand nombre de flotteurs (15) simultanément pendant une durée de 12 h.

L'analyse des trajectoires, des mesures ponctuelles de courant, de salinité de température et des mesures météorologiques nous a permis d'identifier les principaux mécanismes qui contrôlent la circulation de la baie. Nos résultats indiquent que le vent influence la circulation de la couche superficielle (les premiers mètres) alors que la bathymétrie modifie considérablement les caractéristiques des courants de marée.

# THE LOW-FREQUENCY CIRCULATION OFF CAPE SABLE, NOVA SCOTIA P.C. Smith

The records from one year's moorings (April 1978 – March 1979) off Cape Sable, Nova Scotia, reveal a consistent pattern for the seasonal circulation (summer vs winter). Nearshore, within the 110-m isobath, the strong winter flow (8-10 cm/s) is directed into the Gulf of Maine at the surface (15 m) and mid-depth. The near-bottom flow has a strong onshore component. Up the shell off Shelburne, the flow is slightly

weaker and similarly directed except for an offshore component near the bottom. The summer circulation shows most of the same features except for a significant offshore flow near the surface in deep water.

Another prominent feature of the seasonal circulation is an (upshelf/downshelf) flow along the (inshore/offshore) edge of Brown's Bank. This observation, along with some near-surface Lagrangian measurements, suggests a permanent clockwise gyre around the Bank.

Temperature and salinity records and monthly mean currents suggest the arrival from the Scotian Shelf and passage of several pulses of cold, fresh water at Cape Sable during the winter months. These effects are found to penetrate to the bottom on the 110-m isobath.

Transports through the Cape Sable section are estimated from current and hydrographic data.

# OBSERVATIONS OF AN INTRUSIVE CURRENT IN EASTERN LANCASTER SOUND D.D. Lemon, J.R. Birch and D.B. Fissel

As part of the Petro-Canada/EAMES studies, an intensive physical oceanographic field programme including subsurface current-meter moorings, satellite-tracked drifters and CTD profiling was carried out in 1978 and 1979 in northwestern Baffin Bay and Lancaster Sound. The results show that the summer circulation of eastern Lancaster Sound is dominated by a cyclonic intrusion of the southward flowing current of western Baffin Bay. The intrusive current is characterized by typical near-surface velocities of 75 cm/s, a width of up to 30 km and penetrations of 35 to 75 km into the Sound. Two distinct modes have been identified on the basis of the 1979 results: Upon crossing the middle of the Sound, the first mode turns southeastward while the second mode continues to the southwest reaching the south shore before exiting the Sound. Associated with the intrusive current, is a frontal zone identified by horizontal gradients in both temperature and salinity.

Over-winter current-meter measurements near the entrance of Lancaster Sound suggest that the regional circulation weakens following ice formation.

#### DYNAMICS OF CTD SYSTEM

R. Reiniger and R.A. Clarke

Conductivity/Temperature/Pressure system forms one of the basic tools used in Physical Oceanography. An extensive amount of work has been done, developing the electronics and calibrating the sensors; however, very little attention has been given to the remainder of the system which include winches, wire and rosette.

The presentation will describe some of the work that has been done at BIO to better understand the dynamic behaviour of the CTD/rosette package. This will include measurements of the tension, pitch and roll of the package, as well as pitch and roll of the ship. Details will be given about an incident when a lack of understanding about this type of system results in the breakage of a cable and loss of equipment.

# Session 4A Air Pollution

Thurs. 0830-0945

A REVIEW OF THE EUROPEAN EMEP PROGRAMME ON THE LONG-RANGE TRANSPORT OF POLLUTION, AND IDEAS ON HOW TO TREAT WET DEPOSITION F.B. Smith

The EMEP Programme, started in January 1978, has just completed its First Phase. The objectives of this Phase have been to establish an adequate network of monitoring stations across Europe measuring air concentrations and wet depositions of substances relevant to the "acid-rain" problem. In this phase emphasis has been primarily on sulphur compounds, although many stations have sampled other components as well. The monitoring programme has been directed by the Chemical Coordinating Centre in Norway.

At the same time two Meteorological Synthesising Centres were established - one in Oslo, the other in Moscow - to develop and run trajectory models carrying sulphur dioxide and sulphates. Plans are well advanced for a more ambitious Second Phase. Results and problems will be discussed. One of the primary areas of uncertainty is the representation of wet deposition by the models. Current models generate smoothed rainfall fields and this tends to reduce transport to distant receptors. Recent research based on studies of weather-radar rainfall-distribution sequences and stochastic concepts offer hope that even if individual wet-deposition distributions cannot be reliably predicted by the models, at least long-term distributions will be satisfactory. The effect of topography on dry and wet despositions and the important contribution of background concentrations to deposition in western Europe will be discussed.

# Session 4B Agrometeorology

Thurs. 0830-1000

THE FUTURE ROLE OF AGROMETEOROLOGY IN OUR CHANGING SOCIETY – A POSITION PAPER

# H.R. Davidson

Since 1973 energy costs have increased dramatically. This has already resulted in some fundamental changes in the economic and social structures of the western industrialized countries. There is every reason to believe that this trend will continue for some time to come. For Canadians this is particularly important because we are situated in the colder northern region of the hemisphere where our energy needs are particularly subject to climatic influences. As professionals working in the field of meteorology and related areas we have a responsibility to recognize this need for change and to respond accordingly.

As we move from what can be broadly described as the petroleum era into one with a more diversified energy base where conservation and renewable energy sources play a more important role, climate must be thought of more as a resource. Our climate resource will require proper management and careful planning just like any other.

This position paper will examine some of the more obvious areas in which we as meteorologists should review our priorities in order to provide the agricultural industry with the services they will need. For example, the heating and cooling degree-day index presently being used as a management tool for allocating energy resources will quickly become outdated as energy conservation techniques are adopted. What is a more appropriate index and how should it be used? Solar and wind energy are rapidly developing energy sources with considerable promise and varied applications for agriculture. What radiation and wind data are required, how should they be analysed and how can funds be appropriated to upgrade our reporting network at a time when financial resources are scarce?

Only by being aware of the changes coming in our society can we as meteorologists be prepared to meet future needs and develop strong arguments for the additional funding that will be required.

# A GROWING SEASON WATER BALANCE MODEL FOR AGRICULTURE AND FORESTRY D.L. Spittlehouse, C.H. Wallis, O. Hertzman and T.A. Black

A model is presented that calculates the growing season water balance of a vegetated surface from estimates of the daily stand evapotranspiration, rainfall interception and drainage from the root zone. The site characteristics required are the solar radiation reflection coefficient, root zone depth, soil water retention and drainage characteristics, and the leaf area index. Input variables are daily solar or net radiation, maximum and minimum air temperature, rainfall and the root zone soil water content at the start of the growing season. Evapotranspiration (E) is calculated as a function of the equilibrium evapotranspiration rate ( $E_{eq}$ ) and the fraction of extractable water in the root zone ( $\theta_e$ ) as follows: E equals the lesser of an energy limited rate ( $\alpha E_{eq}$ ) and a supply limited rate ( $b\theta_e$ ), where  $\alpha$  and b are constants. Net radiation, measured or calculated from the solar radiation and the mean air temperature, is used to calculate  $E_{eq}$ , while  $\theta_e$  is obtained from the water balance of the root zone treated as a single layer. Drainage is calculated as a function of the root zone water content. Water deficits and average root zone matrix potentials are used to indicate periods of vegetation water stress. The model is tested on a thinned and an unthinned Douglas-fir stand on the east coast of Vancouver Island, near Courtenay, and a tame, upland pasture in the Peace River region of British Columbia. The model well simulated the course of the growing season root zone water content and demonstrated the large water deficits and low soil water potentials that can be experienced by the vegetation during the summer. Applications of the model to forest water balance and pasture growth studies are presented.

# POTENTIAL APPLICATIONS OF THE $\beta$ -GAUGE TO FIELD CROPS N.N. Barthakur

The concept of a critical count rate (CCR) to investigate an objective criterion for the optimum timing of crop irrigation has been studied regarding its feasibility of use in the field. The CCR could be measured by a  $\beta$ -gauge; in applications for a crop this might lead to water conservation in a semi-arid region or in areas elsewhere during times of drought.

The  $\beta$ -gauge was found to act as an accurate dew meter, particularly at times of initiation and termination of dew formation. Duration of leaf wetness is a useful parameter for plant pathologists and can be measured more definitively by a  $\beta$ -gauge than by a conventional dew meter. The range of applicability of the  $\beta$ -gauge can be further extended to monitor agricultural sprays while continuously recording count rates in the field to determine the optimum timing of crop irrigation.

# REPORT OF AN INTERNATIONAL WHEAT/WEATHER EXPERIMENT H.R. Davidson

From 1974 to 1978 an international experiment for the acquisition of wheat/weather data was conducted under the direction of the Commission for Agricultural Meteorology (CAgM) of the World Meteorological Organization. The experiment was conducted at 11 experimental sites involving eight countries: Argentina, Brazil, Canada (2 sites), the Federal Republic of Germany, Israel, Italy (2 sites), Norway and the USSR (2 sites).

The experiment was simple in design but broad in scope. It was a very efficient way of collecting data on crop/weather relationships under a variety of meteorological conditions with a minimum of expense to the individual countries. A common variety of spring wheat, Sieta Cerros, was grown at the 11 experimental locations. There were two planting dates each year, 15–30 days apart, with two rates of fertilizer application at each planting. Records were kept of phenological stages, crop cover, number of tillers, number of mature heads, final yields and average grain weight. Detailed meteorological observations of radiation, wind, ambient air temperature and soil temperature were taken hourly. Daily precipitation and weekly soil moisture were also recorded. At the end of the experiment the data were tabulated and sent to the chairman of a WMO Working Group; they were then put on computer magnetic tape and sent to each participant. The two planting dates and two fertility levels yielded 176 experiments for analysis.

This paper describes some of the more significant relationships between wheat growth and climatic parameters that were found in this experiment. The data are unique because it is the first time that a number of countries with a variety of climates have successfully compiled so comprehensive a set of observations. The spirit of cooperation shown by the members of the Working Group and their success in performing a task of considerable difficulty can be judged as a major achievement in itself.

# CARBON DIOXIDE FLUX MEASUREMENTS FROM AIRCRAFT-MOUNTED SENSORS R.L. Desjardins, P. Alvo, E. Brach and P.H. Schuepp

The past few years have shown the need for large-scale assessment of  $CO_2$  fluxes over different types of vegetation. Such flux measurements could serve as primary predictors for biomass production and as input into more precise crop models. Through quantification and localization of  $CO_2$  source and sink distributions they would also enable long-range predictions about the global  $CO_2$  balance to be made on a more rational basis.

During the summer of 1980 a first series of test flights were made over various ecosystems, using sensors mounted on a Twin Otter aircraft. Fluxes were determined by the eddy-correlation technique. Vertical wind was measured with a gust probe package and a pitot tube for the high-frequency fluctuations and a doppler radar for the lower frequencies. Two open-path analysers, based on the principle of differential absorption of infrared radiation in the 4 to 5  $\mu$  range, were tested. With sensor response of 10 Hz and a flying speed of 50 m/s at altitudes between 15 and 50 m the smallest detectable eddies are of the order of 5 m. Analysis of the spectra of CO<sub>2</sub>, temperature, and vertical and horizontal wind shows that this is sufficient to cover the dominant frequency range.

The relative merits of the two instruments for airborne sampling will be discussed and data will be presented to show that the absolute magnitudes of the fluxes obtained are reasonable when compared with spot measurements from ground-based systems. The sensitivity of the airborne system is such as to make it a very promising tool for the rapid, large-scale monitoring of  $CO_2$  fluxes. Cospectra between vertical wind and  $CO_2$  and between vertical wind and temperature will also be presented and potential applications of the technique will be discussed.

# Low-Frequency Waves and Surges

Thurs. 0830-1000

#### STORM SURGES

Session 4C

#### T.S. Murty

Storm surges are water-level oscillations in an inland or a coastal water body resulting from pressure gradients and wind stress associated with travelling atmospheric disturbances. The periodicities in storm surge records range from a few hours to a few days; storm surges are included in the general category of long waves, along with tides and tsunamis. Storm surges are mainly a shallow water phenomenon, unlike tides and tsunamis, and their behaviour on the coast is quite different from that of the short-period wind waves. Storm surges predominantly occur on the east coast of North America and in the Gulf of Mexico and Hudson Bay; but they rarely occur on the west coast. Other areas where they frequently occur are the North Sea, the Mediterranean Sea, the Bay of Bengal, the Arabian Sea, the coasts of Japan, and the South China Sea.

A distinction is made between storm surges that are due to extra-tropical cyclones and those due to hurricanes; the meteorological forcing terms are somewhat different in these two systems. The role of resonance and edge waves, the interaction between storm surges and astronomical tides, the interaction between storm surges and wind waves, the role of bottom friction, the influence of ice cover and stratification are all important in developing prediction schemes for storm surges. The various techniques used to study storm surges are: numerical, analytical, empirical, graphical, statistical, electric analog and hydraulic modelling. The most common is numerical modelling and distinction is made between finite-difference and finite-element methods. In the finite-difference methods, uniform grids, telescopic grids and irregular grids have been used as well as one-, two- and three-dimensional models (with two-dimensional models being the most common).

# AN OPERATIONAL STORM SURGE MODEL FOR THE BAY OF FUNDY E.W. Brandon

Storm Surge calculations for Halifax and Yarmouth based upon a regression technique involving pressure data at a selected set of points are already being performed at the Maritimes Weather Office. This technique explains about 80% of the variance in the data for Halifax, about 60% for Yarmouth, but barely 50% for Saint John, New Brunswick. An alternative method is thus indicated for Saint John.

A linear shallow water long-wave model including a tide-generating function has been applied to the Bay of Fundy. Tidal amplitudes are based upon those indicated by the appropriate tide tables. The usual assumptions are made: (1) The amplitude of the surge is assumed small compared to water depth; and (2) The horizontal scale of the surge is assumed large compared to water depth. Atmospheric pressure, Coriolis force and surface and bottom friction forces are included. Much of the detail at the eastern end of the Bay of Fundy is lost in the model. Compensation for this is attempted by allowing water to penetrate the eastern boundary with a velocity proportional to the estimated surge height; otherwise, the Nova Scotia and New Brunswick shorelines are closed boundaries. The left-hand boundary of the model is open, with surge

heights kept at zero. Pressure gradients, wind speeds and directions, averages over the Bay, along with time intervals during which the conditions prevail, are input successively for the projected duration of the storm. The maximum run time is around 15 min. Thus all requirements for an operational model are met.

Results obtained thus far indicate that, notwithstanding a conservative trend, the model will prove operationally useful in forecasting storm surges in the Bay of Fundy.

# BAROCLINIC INSTABILITY IN A DOWNSTREAM VARYING CHANNEL: SHELIKOF STRAIT, ALASKA

L.A. Mysak

Moored current-meter observations obtained from upstream and downstream locations in Shelikof Strait, between the Alaskan mainland and Kodiak Island, show a considerable amount of low-frequency variability superimposed upon the mean southwestward along-channel flow. Moreover, the spectral properties of these current fluctuations varied seasonally and according to channel location. For example, during fall 1976, the variance spectra of the along-channel current fluctuations at the upstream end of the Strait were sharply peaked at 2.86 days. At the downstream end, on the other hand, the variance spectrum of the cross-channel fluctuations at 100 m were peaked at 6.15 days. However, the upstream 2.86-day signal was coherent with the 2.86-day fluctuations downstream, and the phase relationship between the two locations implied the presence of a downstream-travelling wave with a wave-length of 74 km and a phase speed of 26 km/day.

The stability of a two-layer geostrophic flow through a channel with a sloping bottom is considered in an attempt to explain the observed fluctuations. It will be shown that for representative seasonal values of the mean current shear, density stratification and bottom slope at each end of the Strait, the mean flow can be baroclinically unstable with respect to downstream-travelling, quasi-geostrophic waves. In particular, in an application of the model to the fall 1976 data, it is found that a 2.86-day period wave at the upstream end is unstable and propagates downstream with a wavelength of 92 km and a phase speed of 32 km/day, in good agreement with the observations (74 km and 26 km/day). However, at the downstream end of the Strait such a 2.86-day wave becomes stable owing to the reversal in bottom slope along the channel. Moreover, at the downstream end, only very long period waves are unstable (periods > 5 days). Thus the observed downstream spectral peak at 6.15 days is probably due to locally generated instabilities.

#### CIRCULATION ON FLEMISH CAP C.K. Ross

The Northwest Atlantic Fisheries Organization is presently sponsoring an international investigation of the cause of fluctuations in the year class strength of cod on Flemish Cap. The physical environment is considered important for understanding these fluctuations. A programme of direct current measurements used moored current meters and satellite-tracked, drogued drifting buoys to determine the circulation on the Cap. The drifting buoys indicate a sluggish anticyclonic circulation in the surface layer. The moored instruments show a weak mean current in the same sense. Apart from the tidal energy, the most pronounced source of variability is of 4-5 days period. The source of this variability has not yet been identified.

# LOW-FREOUENCY BAROCLINIC WAVES NEAR THE EDGE OF THE SCOTIAN SHELF P.C. Smith

Low-frequency measurements of current, temperature and salinity on the continental slope and rise south of Halifax reveal various features of baroclinic topographic Rossby waves that are associated with the presence of offshore Gulf Stream eddies. In the range of periods from 12 to 25 days, two particularly persistent observations of vertical structure in the longshore current field are:

1) a single phase reversal at the shelf break (250-m isobath);

2) a bottom node on the continental slope at the 700-m isobath.

To explain the features, a recent model (Ou and Beardsley, 1981, J. Phys. Oceanogr. 10: 1323-1339) for the evolution of a single topographic Rossby wave in uniformly stratified medium is used to simulate the
effects of the observed waves impinging on the continental margin. Both effects are reproduced in the numerical results for realistic topography. The phase reversal occurs consistently over the entire range of incident wave characteristics, whereas the position of the bottom node is somewhat sensitive to both frequency and wavenumber. An interpretation of the baroclinic structure is given in terms of quasigeostrophic modes representing incident, reflected and "fringe" (horizontally-trapped) waves.

# Session 5A Air Pollution Field Studies– Planned and Inadvertent

Thurs. 1030-1150

#### TETROON FLIGHTS ACROSS A RIDGE R.D. Rowe, S.F. Benjamin and K.P. Chung

A field programme is being conducted around a sour gas processing plant to determine the extent to which a ridge, situated close by, affects the air quality and the air flow. As one part of this programme, two series of tetroon flights were performed during the summers of 1977 and 1978. All of the tetroons were ballasted to float at an equilibrium level of 100 m above the ground. The data obtained from these flights are compared with those derived from theoretical and laboratory investigations published in the recent literature. Some implications for pollutant dispersion calculations in areas of complex terrain are discussed.

The first series of tetroons was released in the day-time. Large instabilities were observed during windy neutral atmospheric conditions as well as on days with strong thermal convection. The instabilities extended up to several hundred metres above the ground, and were an order of magnitude greater than the height variations of the underlying terrain. Under more stable conditions the air flow was observed to reflect the structure of the terrain more closely.

The second series of tetroons was released on clear nights with prevailing stable atmospheric conditions. A flashing light device was attached to each tetroon so that it could be tracked with two theodolites located on top of the ridge. The natural air wavelengths during all of these 13 flights were approximately the same as the total base width of the ridge.

# ESTIMATION OF THE RATE OF GASEOUS MASS TRANSFER FROM A SURFACE SOURCE PLOT TO THE ATMOSPHERE

J.D. Wilson and G.W. Thurtell

A method is given by which the rate of gaseous mass transfer from ground to atmosphere by a small (radius R < 100 m) disc-shaped source plot may be calculated from measurements of mean wind speed  $\bar{u}$  and mean concentration  $\bar{c}$  at a single height ZINST. The method is based on the fact that for a given roughness length  $z_0$ , and radius R there exists a height (ZINST) at which the sensitivity of the normalised horizontal flux  $\bar{u}\bar{c}/Q$  (where Q is the source strength) to changes in the Monin-Obukhov length L is a minimum. Using a trajectory-simulation model of turbulent dispersion, which has been shown to be in good agreement with observation, profiles of  $\bar{u}\bar{c}/Q$  were generated. It will be shown that at the height (ZINST) where the profiles for L = +500 and -500 cm intersect, all the values of  $\bar{u}\bar{c}/Q$  for |L| > 500 cm differ from the value for  $L = \infty$  (neutral stratification) by only a small ( $\leq 10$ ) percentage. For R = 50 m, curves of ZINST and  $\bar{u}$  (ZINST)  $\cdot \bar{c}$  (ZINST)/Q (neutral and  $L = \pm 500$  cm) versus  $z_0$  will be presented.

Having determined  $z_0$  and chosen ZINST from the given curve, the experimentalist could estimate source strength by measuring  $\tilde{u}$  (ZINST),  $\hat{c}$  (ZINST) and evaluating

 $Q = (\bar{u}\bar{c})^{\text{measured}}/(\bar{u}\bar{c}/Q)^{\text{model}}$ .

This is a very simple alternative to the use of a large ( $\sim$ 300-m fetch) plot and eddy-correlation or profile measurements to determine Q.

# SHORT-RANGE ATMOSPHERIC TRANSPORT AND DIFFUSION OVER THE PRECAMBRIAN SHIELD

P.A. Davis, A. Reimer, S.K. Sakiyama and P.R. Slawson

A series of 60 atmospheric diffusion trials has been conducted over the past 2 years at the Whiteshell Nuclear Research Establishment under conditions of climate and topography representative of the Precambrian Shield. Each trial involved the release of tracer gas, sulphur hexafluoride, from a 45-m stack and the collection of downwind samples by pumping air into polyethylene bags. One or two horizontal cross-sections of the plume were obtained during each trial, at distances ranging from 750 m to 15 km from the source. Vertical profiles were also obtained in a limited number of cases by suspending samplers from a tethered balloon. Trials were conducted in both winter and summer under a variety of stability conditions. The procedure employed in the trials, and the data set assembled, will be described briefly

The data have been analysed primarily in the framework of the Gaussian plume theory of dispersion. Horizontal cross-sections of the plume appear to be Gaussian in shape. The horizontal dispersion parameter  $\sigma_y$  was calculated from the observed ground-level trace concentrations by a new regression technique that minimizes the problems associated with sampling strings that either are not perpendicular to the plume or do not span its entire width. The measured  $\sigma_y$  values are well correlated with the standard deviation in horizontal wind direction. The vertical dispersion parameter  $\sigma_z$  was calculated directly from the observed vertical sample concentrations where these were available, and otherwise from conservation principles. The  $\sigma_z$  values showed considerable scatter, and were generally somewhat larger than previously published values. These results are discussed in the light of the forest cover which surrounds the experimental site.

A site-tuned Gaussian plume model is able to predict the observed centre-line concentrations to within a factor of two for steady-state conditions.

# THE MACGREGOR VINYL CHLORIDE SPILL: A PRACTICAL EXERCISE IN DISPERSION H.M. Fraser

On March 10, 1980 a train derailment near MacGregor, Manitoba resulted in a spill of some 70,000 L of vinyl chloride monomer. Relatively flat terrain and the lack of plume rise simplified the application of a ground-based Gaussian dispersion model, but there were large unknowns regarding source strength. Not only was the rate of discharge of liquid vinyl chloride undefined, but the initial release was into an atmosphere about 5°C below the boiling point of vinyl chloride and into snow underlaid by earth some 15°C above the boiling point.

Estimates are made of the rate of leakage, free surface evaporation and the effect of the earth and the snow to arrive at a dispersion scenario for the 36 h following the accident. These estimates and the modelled atmospheric concentrations are in broad agreement with the very limited observations and monitoring available. The concentrations 2 km downwind are estimated to have been of the order of 1 to 5 parts per million during the first 30 h.

The practical difficulties of providing effective warning to nearby residents in similar situations are also noted.

# Session 5B Energy and Water Balance

Thurs. 1030-1200

LABORATORY STUDIES ON MOISTURE TRANSFER FROM SOIL AND PLANTS IN NON-STEADY AIRFLOW

P.H. Schuepp

The effect of wind speed on evaporation from soil and evapotranspiration from plants has been given considerable attention but almost exclusively for conditions of steady-state wind. It is usually assumed implicitly that moisture transfer in non-steady (intermittent) wind can be accounted for adequately by the time-averaged wind speed.

This paper discusses laboratory experiments on evaporation from flat surfaces, evaporation of water drops from leaves and evapotranspiration from plants under steady-state and intermittent wind conditions under different regimes of irradiation. Available results indicate that the use of steady-state models with time-averaged (intermittent) wind speeds substituted for steady-state speeds is justified only for the evaporation of liquid water from leaves, provided that irradiation is small and the speed is measured locally (i.e. amidst the vegetation rather than outside it at a reference point). In all other cases the use of models derived for the steady state may lead to considerable error in predicting water loss. Possible implications for water balance studies and water conservation efforts will be discussed.

# ANTHROPOGENIC INFLUENCES ON THE SURFACE ENERGY AND WATER BALANCES OF CITIES

# T.R. Oke

The modification of local climates by urbanization is largely wrought by disruption of the pre-urban surface energy and water balances. The nature of these urban balances are just beginning to emerge as the result of carefully conducted field measurements in a few cities. The paper reviews, and where possible suggests, generalizations based on these studies. In particular, results are presented from experiments in Vancouver, where energy balances have been evaluated above the city during several summers, covering a range of weather and surface moisture conditions. The data clearly demonstrate the importance of evapotranspiration in the energy partitioning by this city. Further they indicate significant anthropogenic influence upon the availability of surface water. The transferability of these findings to other cities is discussed.

# IMPROVING MASS TRANSFER EQUATIONS OF LAKE EVAPORATION P.J. Barry

It has been shown that an important source of uncertainty in models of the energy balance of lakes is in the mass transfer evaporation equation. Widely used equations, applied to a given surface water temperature, give evaporation rates differing by more than a factor of 2 or 3 depending on the wind speed. The same equations used in an evolutionary energy balance model give rates differing by more than 50%. However, this apparent improvement arises because of compensatory changes in computed surface water temperatures, but still represents an unacceptable level of uncertainty for many applications.

Apart from their use for estimating lake evaporation when surface temperature measurements are not available these models have an important application for predicting the vertical fluxes of dissolved nutrients and pollutants in lakes. While such applications may not be of direct meteorological interest they do nevertheless depend upon a knowledge of meteorological processes and upon meteorological data. Since the latent energy flux at the surface of a lake is so large a component of the energy balance, errors in its estimation can lead to significant errors in estimating other fluxes in a lake.

The present unsatisfactory state-of-the-art is the more surprising because the physical process of surface mass exchange is, on relatively small time and space scales, well understood. What seems to be an important weakness in current work is the integration, for the most part implicit, of the fluxes over large lake areas and over relatively long times. The evidence analysed in this paper strongly suggests that lake evaporation must be approached as a two-dimensional rather than, as at present, a one-dimensional problem.

# THE SPATIAL DISTRIBUTION OF SURFACE TEMPERATURES OF OKANAGAN LAKE N.B.A. Trivett and S.E. Waterman

The spatial variations of surface water temperatures are obtained from three thermal imaging scanner flights over Okanagan Lake analysed to obtain areally weighted mean surface temperatures, which are compared to more conventional estimates of lake temperature. The influence of the spatial variability of surface water temperature on mass-transfer estimates of lake evaporation is also discussed.

# RESEARCH AND METEOROLOGICAL DATA REQUIREMENTS FOR IMPROVED MODELLING OF LAKE ENERGY BALANCES

#### P.J. Barry and E. Robertson

The reliability of estimates of lake evaporation obtained from an energy budget model such as we have described in another Congress paper (cf. Poster 6) is limited by sources of uncertainty arising from:

- (a) errors in the equations used to describe the energy fluxes, and in the values assigned to the parameters;
- (b) the quality of the meteorological and limnological data available as inputs to the model.

An analysis of the sensitivity of model predictions to these potential sources of uncertainty helps identify where research and observational network changes would be most effective in improving lake evaporation estimates. The results of such an analysis, reported in this paper, have identified two principal areas in need of further research. These are, firstly to improve the parameterization of the mass transfer equation describing the evaporation flux, and secondly, to find ways of estimating wind speeds over lakes from observations at land-based network stations.

More than a dozen mass transfer equations that have either been used or recommended for use as operational tools were included in the analysis. Depending on the equation selected, differences of up to 30% for annual (open-season) and up to 50% for individual monthly estimates of evaporation were obtained.

The model is also sensitive to the wind speeds used. The paper includes an analysis of the wind speeds observed over three small lakes in the Chalk River area as well as those speeds reported from the nearby Petawawa "A" network station. The analysis suggests that the magnitudes of the possible errors arising from this source of variation could be significant.

It was also found that the model predictions were sensitive to lake morphometry. The uncertainties that can arise from the absence of information about this are at least as important as those that arise from the other two causes.

# **Poster Session**

Thurs. 1300-1400

# Poster 1

# A GEOSTROPHIC WIND CLIMATOLOGY FOR CANADIAN OFFSHORE AREAS V.R. Swail

This paper deals with the synthesis of wind data for overwater areas off Canada's coasts, and the statistics derived from the data.

The wind data are created from gridded surface pressure data at 6-h intervals obtained from the U.S. Navy Fleet Numerical Oceanographic Center (FNOC) analyses. The "u" and "v" components of the pressure gradient are computed at the centre of each grid area (381-km grid) from the values at the four corners. The geostrophic wind is calculated by standard methods with appropriate corrections for latitude and map factor. Wind values have been created for a 33-year period (1946–1978) for 100 grid points in the Atlantic Ocean, Davis Strait, Baffin Bay, the Arctic Islands, Hudson Bay, the Beaufort Sea and the northeast Pacific.

Statistical routines have been run on the time series at each grid point to produce matrices of wind speed versus direction for each month, extreme value analyses (Gumbel) with confidence limits, duration statistics above and below various thresholds, and Gumbel return-period statistics on the duration lengths. A preliminary study has shown reasonable agreement between the computed geostrophic wind and observed surface winds. However, a more comprehensive comparison is planned.

Further studies are planned to consider such ageostrophic factors as stability, isobaric curvature and isallobaric fields so as to represent the true overwater surface wind more precisely.

#### Poster 2

# A BRIEF HISTORY OF CANADIAN MARINE WEATHER OBSERVATIONS

R.G. Stark

Since the 16th century weather reports taken from ship or shore have been important to Canadian meteorology. This general review traces the progress from the seaboard observations of early explorers to the remote sensing of the space age.

Observations from oceans adjacent to Canada and from inland waters, especially the Great Lakes, are referred to with a look at Canada's share in the Volunteer Ship Programme, ocean buoys and the growth and decline of the Ocean Weather Ship Programme.

# Poster 3

LANDSAT IMAGE PROCESSING AT PRINCE ALBERT SATELLITE STATION D. Epp

Image processing by software and photographic techniques is discussed. Examples of processed images are shown.

#### Poster 4

REMOTE SENSING OF THE LAST DAY OF SNOWMELT G.A Fuller and R.D. Hofer

Earth Resources Technology Satellite (ERTS) imagery was used to study the snowmelt progression from Winnipeg, Manitoba to the Arctic Islands. Snowmelt equations were also used to estimate snow depths at climatological stations along the route and were compared with ERTS imagery. The analysis of ERTS imagery provided useful snowmelt information. Four stages of snowmelt were observed on the ERTS imagery; these were: the disappearance of snow cover along ridges, the dark appearance of small lakes due to water on and in the snow, the appearance of dark open river reaches and then the general disappearance of the snow cover. The main difficulty encountered in this study was the presence of cloud cover during the snowmelt period which reduced the number of useful photographs available. However, this should be less of a problem now that other satellites are in orbit.

# Poster 5

DOWN-TO-EARTH USES OF SATELLITE ORBIT DETERMINATION AND PREDICTION T. McPherson

Users of satellite imagery and specialized communication links frequently need to know precisely where a satellite is located at a specific time. From this they can determine the map position of images, the area within range of a satellite, the probability of receiving a message, the locations of buoys, etc. Models of satellite motion and their uses are presented.

# Poster 6

#### A LAKE ENERGY MODEL TO ESTIMATE EVAPORATION

P.J. Barry and E. Robertson

To obtain short-term estimates of lake evaporation using standard meteorological data alone requires an evolutionary model of surface-atmosphere energy exchanges so that surface water temperatures and energy storage changes in the lake can be calculated. Such a model is described in this paper. It differs from others of similar type in allowing the areal sizes of different lakes to be input as a continuous rather than discontinuous variable. Inputs to the model are air temperature, relative humidity, wind speed and the total radiation incident upon the surface. The initial vertical temperature distribution is also required, but this may conveniently be taken as 4°C when the lake is isothermal. In addition to area, lake morphometry has also to be specified.

The model has been run with monthly average climatological data for several small lakes (50–200 ha) and Lake Ontario ( $\sim 10^6$  ha). Throughout this range it successfully simulates the long-term mean monthly thermal properties; the monthly mean evaporation rates obtained agree well with those obtained by other methods. The model has also been run with real-time data on the small lakes ( $10^4$  to  $10^6$  ha) at Chalk River; the resulting seven-day average evaporation rates agree well with those measured using the energy budget method. The limitation on the time scale depends on lake size; the minimum averaging time would be longer for larger lakes.

The model has so far been used as a research tool. It is limited for use as an operational tool by the reliability of its intrinsic functions, particularly the aerodynamic or mass transfer evaporation models, and by the suitability of the meteorological data available from network stations for use at specific locations. These limitations will be discussed in more detail in another Congress paper (cf. Session 5B).

#### Poster 7

# A SUMMARY OF THE HYDROLOGIC AND HYDROMETEOROLOGICAL OBSERVATIONS OVER AN ELEVEN-YEAR PERIOD AT PERCH LAKE

E. Robertson and D.P. Wildsmith

Meteorological and limnological measurements required for evaporation estimates by the energy budget method have been made almost continuously since 1970 during the open-water season at Perch Lake, a small (0.45 km<sup>2</sup>), shallow (mean depth 2 m) lake on the Canadian Shield. In 1976 the study was extended to include three other small lakes situated within a 5-km radius of each other and Perch Lake. These lakes range from 0.11 to 1.7 km<sup>2</sup> in area and have mean depths from 3.8 to 6.8 m.

Results are summarized as long-term averages along with the range of variation observed during the eleven-year period. Differences in the energy budget regimes of the four lakes are related to differences in their morphometry and exposure. Long-term mean values of meteorological parameters have been used to verify the lake energy budget model described in another Congress paper. (cf. Poster 6).

Measurements required for water budget calculations have also been made continuously since 1970 for Perch Lake. Since the groundwater input to the lake has been found to be significant, energy budget estimates of evaporation are used in the water budget equation. A summary of eleven years of data is presented.

#### Poster 8

# NIPHER-TYPE SHIELD FOR RECORDING PRECIPITATION GAUGES: FIELD TRIALS B.E. Goodison and J.R. Metcalfe

Previous experiments have indicated that the MSC Nipher shield design provided superior shielding for snow gauges. Trace amounts and retention in the non-recording MSC Nipher snow gauge and under-measurement by Alter-shield recording gauges result in inaccurate snow precipitation measurements. As one method of rectifying this problem, prototype Nipher-type shields have been constructed for use on 20-cm orifice recording precipitation gauges, particularly the Fischer and Porter and Universal Belfort. Testing began in 1978. Gauges with this shield configuration were operated at eight stations across Canada during the 1980–81 winter season. Preliminary results of the shield's performance are presented.

### Poster 9

HOW, WHAT, WHY OF DROUGHT: A BRIEF HISTORY AND IMPORTANCE OF DROUGHT MITIGATION

L. McKerness

This poster will illustrate some of the physical indicators of drought and its impact in the Canadian Prairies. A brief history about some of the past and current programmes for drought mitigation and their importance in alleviating drought impacts will also be presented.

# Poster 10

INTERMITTENT TORNADO DAMAGE K.D. Hage

A survey of tornadoes with path lengths in excess of a few hundred metres in Alberta and Saskatchewan shows that most produce spotty or intermittent surface damage. According to meagre photographic evidence and eyewitness reports such damage can be attributed occasionally to multiple funnels or to funnels that "rise and fall." However, in most cases the events cannot be reconstructed in detail with available data.

On July 5, 1973 a tornado touched down just west of Kelvington, Saskatchewan and moved off to the northeast. Because of favourable lighting conditions and the slow translatory motion of the funnel a large number of photographs were taken. A selection of photographs taken from three locations along a 16-km path, together with data about the damage, is used to show that four sequential funnels formed and dissipated causing intermittent damage along a single path.

### Poster 11

RADAR ECHO CLIMATOLOGY FOR THE WOODBRIDGE C-BAND WEATHER RADAR W.G. Richards

Approximately 10,000 Constant Altitude Plan Position Indicator (CAPPI) maps for altitude 1.5 km have been processed to determine an areal frequency distribution of radar echoes within 75 nautical miles of the Woodbridge radar for the fall and summer seasons. The resulting patterns are interpreted in terms of the existence of permanent (terrain) echoes, beam blocking and shading, anomalous propagation and seasonally preferred areas of echo occurrence.

# Poster 12

VERIFICATION OF OPERATIONAL PROBABILITY OF PRECIPITATION AMOUNT FORECASTS

L.J. Wilson

Probability of Precipitation Amount guidance forecasts are issued twice daily on a real-time basis by the Canadian Meteorological Centre. The forecasts are valid for 74 Canadian Stations, and give the probability of 12-h precipitation accumulation in four ranges – trace or no precipitation, 0.2 to 2 mm, 2 to 10 mm, and greater than 10 mm. Forecasts are made for 5 consecutive periods extending from 0 to 60 h into the future.

The prediction equations were developed using two statistical procedures, Regression Estimation of Event Probabilities (REEP) and Multiple Discriminant Analysis (MDA). The "perfect prog" formulation was applied, whereby historical analysis data are used in development of the equations, and corresponding prognostic data are used in the application of the equations. For the operational forecasts, the Canadian Spectral P.E. model supplies the prognostic predictor values.

Characteristics of the forecasts are described in terms of recent verification statistics for selected stations in all regions of Canada. Regional and local differences in the forecasts are discussed and case studies are used to illustrate the behaviour of the probabilities.

### Poster 13

# A LONG-RANGE CLIMATOLOGICAL DISPERSION MODEL

C.S. Matthias and A.K. Lo

The model, originally developed by Fay and Rosenzweig, is an analytical solution to the diffusion equation. The process of pollutant transport across the continent over a period of a year or more is considered to be analogous to a dispersion problem on a very large scale. The model describes the concentrations of primary and secondary pollutants from a point source and includes the processes of chemical transformation, and dry and wet deposition.

The presentation will examine the sensitivity of model results to errors in the input parameters. Also, using a large source inventory for Canada and the United States, results are compared with measured data and with results from other models.

#### Poster 14

# TRAJECTORY AND CONCENTRATION FORECASTS FOR THE PEPE PROJECT M.P. Olson and K.K. Oikawa

A study to investigate the formation, movement and development of persistent elevated pollution episodes (PEPEs) was undertaken during July and August 1980 by the Canadian Atmospheric Environment Service in close cooperation with the Environmental Protection Agency in the United States. The Canadian Long-Range Transport of Air Pollutants (LRTAP) trajectory and concentration models were modified to produce two-day real-time trajectory forecasts and sulphur dioxide and sulphate concentration forecasts to assist in field study planning and to serve as an experimental air quality forecast procedure.

Through the use of the CMC spectral model wind forecasts, the forecast trajectory model predicted air parcel motions for points on a 127-km forecast grid; the forecast trajectories seemed to be consistent with the flow patterns on the verifying synoptic maps. The concentration forecasts predicted regional plume-like patterns emanating from the high emissions regions and were elongated along the flow directions.

Several potential pollution episodes were forecast to occur in southern Ontario and the U.S. border states. Model validation awaits the compilation of all the measured data.

## Poster 15

# RESULTS OF THE NANTICOKE SHORELINE DIFFUSION EXPERIMENT: JUNE 1978 R.V. Portelli

Shoreline environments are quite often favoured locations for industrial development, however, as has been recognized, the dispersion of pollutants can be adversely affected in such environments. A major concern is "continuous fumigation" of elevated coastal plumes which can occur during onshore flows in the warm season – plumes travelling inland in stable air intersect the unstable internal boundary layer several kilometres from the shoreline causing intense downward mixing of pollutants and hence high ground-level concentrations.

This paper will discuss the experimental procedure and results of an intensive field investigation of continuous fumigation of pollutants (primarily  $SO_2$ ) from the two 200-m stacks of the Nanticoke Generating Station – one of the largest fossil fuel power plants in the world with a generating capacity of 4,000 MW. This plant along with a steel mill and oil refinery constitute the Nanticoke industrial complex, which is located on the north shore of Lake Erie.

Observations of the vertical structure of onshore flow and boundary-layer development were obtained by deploying various observational systems at 8 sites from the shoreline inland to about 20 km: tethersonde systems – winds, temperature, humidity and turbulence to 500 m; minisonde (pibal) systems – winds and temperature to 2 km; acoustic sounder systems – thermal turbulence structure to 1 km; sonic anemometer system – surface heat fluxes; tower system – winds and temperature to 85 m.

Ground-based plume observations were made using a mobile LIDAR system (for particulate plume rise and dispersion), three mobile COSPECS/SIGN-X units (for integrated overhead SO<sub>2</sub> burden/ground-level ambient SO<sub>2</sub> concentrations), and two mobile air monitoring laboratories (for ground-level concentrations of various gaseous and particulate pollutants).

Airborne plume observations were obtained by helicopter (for profiles of  $SO_2$ ) while various gaseous and pollutant measurements were obtained by a fixed-wing aircraft upwind and downwind of the plant to determine the quality of air masses entering and leaving the area.

The experiments were very successful. On 8 of the 15 in-field days, gradient/lake-breeze onshore flows transported the power plant plume inland and fumigation observations were made. In general, it was found that the onset of fumigation occurred at 1100–1300 h and could persist through to about 1800 h with the fumigation zones beginning 7 to 20 km inland from the plant. These zones were observed to move in or out from the plant as a result of boundary-layer build-up or decay, and to rotate with wind shifts. However, on one day, fumigation persisted from about 1100 to 1700 h with the fumigation zone remaining almost fixed in space for the entire period owing to the relatively constant plume height, bearing and boundary-layer depth.

It is considered that a rather comprehensive data set has been acquired which should be of considerable value for modelling diffusion from elevated coastal sources.

# Poster 16

# MOVEMENT OF MOUNT ST HELENS ASH CLOUD OVER WESTERN CANADA G.B. Atkinson

The relationship between the movements of the Mount St Helens ash cloud and the reported and forecast wind fields is examined.

# Session 6A Acidification in Western Canada Thurs. 1400–1540

THE EXTENT OF ACIDIC DEPOSITION IN A REGIONAL CONTEXT OF WESTERN CANADA

S.R. Shewchuk

Present and future acidic deposition rates will be assessed within a selected region of western Canada.

The CANSAP network provides present deposition estimates for sulphate, nitrate and other major ions within precipitation of the project area. The project area includes northeastern Alberta and northern Saskatchewan. Current depositions within this area were compared with national values, e.g. the deposition rates for eastern Canada are many times higher. Most locations within the region have values of sulphur deposition (as sulphate) of less than 2 kg ha<sup>-1</sup> yr<sup>-1</sup>, a value considered to be near global background.

Backgrounds for nitrate deposition have not been established; however, for comparison, levels of nitrate deposition from across Canada show that the project area has levels that are among the lowest recorded.

Chemical fractionation of the rain into its major ion constituents shows that cation buffering capacity is extremely variable across the region. The eastern portion has a marked absence of buffering cations, while the western portion has an abundance of them.

Since emissions of both sulphur and nitrogen compounds are forecast to increase greatly within the project area for at least the next twenty years, increases in the anion component of the rain through anthropogenic activities is expected to have little impact on the major ion balance of the precipitation in the western portion of the region, but will have a large impact (acidity) in the eastern portion.

# METEOROLOGICAL CONTROLS ON AIR POLLUTANTS IN A SELECTED REGION OF WESTERN CANADA

R.F. Hopkinson and J. Dublin

A study was made of the meteorological parameters that influence dispersion, transport, transformation

and deposition of air pollutants over northern Saskatchewan and northeastern Alberta. This involved the investigation of storm tracks and the character of precipitation on a seasonal basis, the construction of precipitation/wind roses, the review of solar radiation and sunshine in the area, and the determination of snow depths and the date of major snowmelt across this region. Annually, the mean transport in the boundary layer is eastward, particularly near the top of the layer. Seasonal variations are more evident at the earth's surface, but the wind roses tend to be dominated by directions with an eastward component.

# SENSITIVITY OF SOILS TO ACIDIC DEPOSITION IN A SELECTED REGION OF WESTERN CANADA

N. Holowaychuk, G. Padbury and B. Schreiner

The relative sensitivity of acidic deposition of the soils of northern Saskatchewan and northeastern Alberta was evaluated. Three categories of relative sensitivity were established based on the buffering capacity of the soils as interpreted from their cation exchange capacity and reaction, and where pertinent, from other soil attributes.

Approximately 40 to 50% of the soils in the study area were found to be in the most sensitive category, about 17% in the intermediate sensitive category, and about 15% in the least sensitive category. The remaining part of the study area comprises lakes and rock outcrops.

The bulk of the soils in the most sensitive category is classified in the Podzolic and Brunisolic areas and occurs on coarse textured sandy and gravelly sediments of the Canadian Shield. Large tracts of relatively sensitive organic soils also occur in the northern regions of Alberta.

# POTENTIAL FOR ACIDIFICATION OF SASKATCHEWAN'S PRECAMBRIAN SHIELD LAKES W.K. Liaw and F.M. Atton

Old and new data for total alkalinity, calcium, magnesium and pH from some 300 freshwater bodies in Saskatchewan's Shield and fringe-Shield regions were analysed to assess the sensitivity of these lakes to potential acid precipitation. Concentrations of alkalinity in these lakes varied from 0.5 to 87 mg/L CaCO<sub>3</sub> with a mean of 18 mg/L. Forty-four percent of the lakes surveyed had alkalinity concentrations of 10 mg/L or less, while 27% had between 10 and 20 mg/L. These two groups of lakes are considered to be highly to moderately sensitive to acid precipitation.

Measurements of pH (ranging from 5.56 to 8.2) indicate that at present Saskatchewan's Shield lakes are neither very acidic nor very alkaline. Lakes with pH levels between 6.5 and 7.5 accounted for nearly 80% of the lakes investigated.

Concentrations of calcium ranged from 0.33 to 31.60 mg/L with an average of 5.71 mg/L. About 54% of the lakes surveyed had calcium concentrations of 4 mg/L or less, while 25% had between 4 and 8 mg/L. Concentrations of magnesium varied from 0 to 10.7 mg/L with a mean of 1.99 mg/L. Approximately 65% of the lakes measured had magnesium concentrations of 2 mg/L or less, whereas 32% had between 2 and 3 mg/L. Concentrations of either calcium alone or calcium plus magnesium are highly correlated to concentrations of alkalinity. The regression equations are as follows (all units in µeq/L):

Alkalinity =	22.24 + 1.28 (Ca)	(n = 282, r = 0.93)
Alkalinity = $-18.20 + 0.92$ (Ca + Mg)		(n = 281, r = 0.97)

A plot of calcium concentrations versus pH for these Shield lakes in relation to Henricksen's empirical curve (1979) suggests that none of Saskatchewan's Shield lakes are being affected by acid precipitation. The data presented describe the uncontaminated condition of Saskatchewan's Shield waters against which future changes may be evaluated.

A nomograph was constructed to depict expected rate of acidification (to the pH of 5.5), given the mean depth and alkalinity of the lake and an assumed sulfur deposition rate of 0.4 g m<sup>-2</sup> yr<sup>-1</sup>. It is suggested that in the event of acid rain those shallow and poorly-buffered Shield lakes in northern Saskatchewan may be acidified in a matter of a few decades.

# POTENTIAL EFFECTS OF ACIDIC DEPOSITION ON PLANTS WITH SPECIAL REFERENCE TO NORTHERN SASKATCHEWAN AND NORTHEASTERN ALBERTA

#### Z.M. Abouguendia and R.C. Godwin

The present levels of acidic deposition in northern Saskatchewan and northeastern Alberta are generally low and considered to represent the natural background levels. However, the projected annual sulphur emissions in the area will double by the year 2006.

This paper considers the potential ecological significance of the projected emissions and deposition rates in light of the available literature about the effects of acid deposition on vegetation. A tentative relative sensitivity mapping of the natural ecosystems of the area is presented and further research and monitoring needs are outlined and discussed.

# Session 6B

Thurs. 1400-1530

# THE DUNDAS ISLAND POLYNYA EXPERIMENT – AN INTRODUCTION D.R. Topham

**Polvnva** I

The role of open water and thin ice is briefly discussed in the context of the Arctic Ocean heat budget and as the motivation for an extensive study of an Arctic polynya.

The overall experimental strategy is described together with the local geographical and meteorological setting.

# TEMPERATURE AND WIND PROFILES NEAR THE DUNDAS ISLAND POLYNYA G. den Hartog, D.R. Topham, R.G. Perkin and R.E. Mickle

Temperature and wind profiles upwind and downwind of open water with large sea-air temperature differences are presented. Surface to 6-m profiles are obtained from fixed towers. A tethersonde was flown to measure the wind speed and temperature to approximately 100 m. Surface heat fluxes are calculated from the bulk transfer formulation for heat transfer using air-sea temperature differences, and from the atmospheric heat balance using upwind and downwind temperature and wind profiles.

# TURBULENT HEAT FLUX MEASUREMENTS OVER AN ARCTIC POLYNYA R.J. Anderson and S.D. Smith

A sonic anemometer thermometer was used to measure turbulent heat flux in the air surface layer over the Dundas Island, NWT polynya during March-April, 1980, as part of a joint heat budget experiment. Water/air temperature differences during the experimental period were from 20 to 34°C with a wind speed range of 2–10 m/s. The data set consists of 25 runs over the polynya and three runs over the surrounding ice surface for comparison.

Heat exchanges, exceeding 500 W/m<sup>2</sup> when the air temperature was  $-34^{\circ}$ C, were twice as large as those observed elsewhere, but the heat flux coefficient  $C_T$  agrees with that obtained by Smith (1980) over the open ocean for unstable conditions.

# A NUMERICAL MODEL OF FLOW OVER THE DUNDAS ISLAND POLYNYA A.K. Lo

A numerical model for predicting boundary-layer parameters for flow over a polynya is presented. As the flow encounters a polynya, it experiences a sudden change from a cold, dry, rough snow-covered ice surface to a warmer, wetter and smoother open-water surface. The model includes equations for the heat balance and vapour conservation, in addition to the usual equations for mass continuity, x-momentum, and turbulent energy. To close the system the model uses the Glushko-rype mixing length relationship. During the numerical calculations, a fully implicit finite-difference method was used, and stable numerical solutions were obtained for a fetch of over 1 km.

# Session 6C

**General Meteorology** 

# THE INTERNATIONAL OZONE ROCKET INTERCOMPARISON: THE CANADIAN EXPERIMENT

M. Bantle, E.J. Llewellyn, B. Solheim, J. Yuen and W.F.J. Evans

During 1979 an international experiment designed to intercompare different rocket-borne ozonesondes was undertaken with a series of rocket launches from Wallops Island, Virginia. A brief description of the Canadian instrument, a Toi photometer, is given and some of the results are presented. These results are also compared with those obtained from other techniques and illustrate the obvious extension, in altitude range, that is possible if the Toi photometer is included in presently flown rocket-sondes.

#### THE OWS "PAPA" ALTERNATIVE DATA SYSTEM

#### R.E. Vockeroth

Rising operating costs led the Canadian Goverment in 1978 to decide to terminate the weather ship observation programme at Ocean Weather Station "Papa" and to develop and implement an alternative Pacific Area Data System (PADS) for obtaining meteorological observations from the northeast Pacific Ocean. The interim alternative system, using geostationary and polar orbiting satellites, drifting data buoys and coastal automatic stations, and possible further developments, are described. The operating costs of the two systems are compared.

# THE DEVELOPMENT OF AN AUTOMATED MARINE METEOROLOGICAL DATA SYSTEM R.E. Vockeroth

This paper describes the development of a real-time meteorological data buoy system using FGGE-type drifting buoys and an ARGOS Local User Terminal, and the planned expansion of the system to include anemometer buoys and shipboard automatic platforms. Projected operating costs are given.

# AEROLOGICAL DATA REDUCTION SYSTEMS (ADRES)

K. Krukewich

The Atmospheric Environment Service is currently installing ADRES equipment at each Canadian aerological station. The WMO-compatible software and hardware is described. Results of automating the radiosonde data analyses and reports are presented.

# AN INTERACTIVE ARCHIVE DATA ANALYSIS SYSTEM Y. Durocher

Using the APL language, an interactive programme has been developed to provide a facility for instantaneous analysis of data in the AES archives. The programme will be described and examples of a variety of analyses will be shown.

# A QUANTITATIVE STUDY OF THE SOCIAL AND ECONOMIC IMPACTS OF SEVERE WINTER STORMS

# S. Bhartendu

Data on the socio-economic impact of twelve winter storms on transportation, services and utilities, industry, entertainment, and property and life sectors of metropolitan Toronto were obtained from two sources: (i) newspaper reports, and (ii) a survey questionnaire. A "content" analysis was carried out on the newspaper articles. The survey results were analysed separately for social and economic impacts. Suitable indices were designed to evaluate the meteorological severity and the social and economic impacts. The relationships between meteorological severity and the social and economic impacts. It

was found that, in general, these impacts increased as the meteorological severity increased. Significant correlation coefficients were found for meteorological severity—total economic impact and meteorological severity—total social impact. The problems and limitations of the study are discussed and two methodologies are compared.

# Session 7A Alberta Oil Sands Environmental Thurs. 1610–1710 Studies

# A USER-ORIENTED CLIMATOLOGICAL DISPERSION MODEL FOR THE ALBERTA OIL SANDS

D.S. Davison, E.D. Leavitt, R. McKenna and R. Rudolph

A re-structured Climatological Dispersion Model has been developed for Alberta Environment in response to the expressed needs for a variety of users. One of the major structural changes in this CDM readily permits a user to weight the importance of a computed ground-level concentration (glc) by using other meteorological parameters occurring at the time of the glc. For example, if a biologist was most concerned with glc values during warm daylight hours, then the values could be weighted more heavily. This feature is accomplished by having two separate programmes. The first programme generates arrays of glc values depending on the wind and other dispersion parameters for each source-receptor pair. A Gaussian formulation is used with sigmas calculated according to statistical dispersion theory. These arrays of glc values are stored in an efficient manner on a random access file. The second programme is a user-oriented programme for frequency distributions and other statistical analyses. This frequency distribution programme accesses a time series file of routine meteorological parameters and calculates a dispersion index which identifies the correct glc values in the random access file. In this way a time series of glc values is generated according to the particular run parameters entered. Frequency distributions and other time series analyses can then be made. Because the source strengths are defined in the second programme, the effects of various source strengths and different chemical species can be studied quickly and efficiently without having to repeat any dispersion calculations. The model has been applied to the Alberta Oil Sands region utilizing wind and mixing height data prepared by Western Research and Development Ltd.

# AN ANALYSIS OF PRECIPITATION CHEMISTRY IN THE OIL SANDS AREA OF NORTHERN ALBERTA

R.R. Peters, W.D. Hume and H.S. Sandhu

Rain samples were collected on an event basis during the months of May to October for the period 1976–1979. Based on analysis of the prevailing weather conditions, the samples were stratified into two rainfall categories: convective and synoptic-scale. Statistical analysis including the parameters measured  $(SO_4^-, NO_3^-, Cl^-, Ca^{++}, Mg^{++}, K^+, Na^+, PO_4^-, NH_4^+, pH, alkalinity, and conductivity) for both categories revealed distribution patterns relative to the existing anthropogenic sources. Meteorological data were used to assess the contribution of local emission sources to the observed patterns. The paper reviews the sample collection and statistical analysis procedures, the limitations of the chemical analysis techniques, and the confidence placed on the derived deposition rates. Recommendations are made for quality control procedures in the event sample collection network and for additional data. Limitations in the knowledge of atmospheric circulation on the fine scale in northern Alberta are discussed.$ 

# ION AND METAL CONTENT OF THE SNOW COVER OF THE AOSERP STUDY AREA W. Muitby

Samples of snow were collected at about 60 sites around the Syncrude and Suncor Oil Sands extraction plants in the Athabaska Oil Sands region of Alberta. Two surveys were performed six weeks apart in mid-January and late February 1981. At each site, the snowpack depth was measured to evaluate the variability of accumulation at each site and over the entire area. Two different sampling methods were used. First, in each survey snow cores were collected at each of the 60 sites. In addition, snow sample collectors were set out at six of the sites in mid-January, and removed for analysis in late February. Quantitative chemical analysis of the core and collector samples was carried out by a commercial laboratory. Additional cores were collected at nine of the sites and were analysed by a second laboratory to provide an independent cross-check. The results are compared with the deposition patterns reported in two studies that were carried out in the same area before the Syncrude plant came onstream.

# Session 7B Polynya II

Thurs. 1600-1700

# SURFACE HEAT EXCHANGE AT THE DUNDAS ISLAND POLYNYA R.G. Perkin, G. den Hartog, S.D. Smith, R.J. Anderson and D.R. Topham

Sensible heat fluxes from profile and eddy correlation measurements are compared with total heat fluxes derived from the rate of freezing of water in "heat flux trays."

Latent heat and net radiation fluxes are estimated, and are combined with sensible heat fluxes calculated from wind and temperature data using a bulk coefficient. The total heat flux and its components are given for the duration of the experiment, March 12 – April 1, 1981.

# OCEANOGRAPHY IN THE AREA OF THE DUNDAS ISLAND POLYNYA D.R. Topham and R.G. Perkin

This paper describes the oceanography of the Dundas Island area and demonstrates a close relationship between the overall size of the polynya and local weather and tidal flow conditions. A significant feature of the oceanographic records is a strong modulation of ocean temperature at tidal frequencies involving temperature differences as great as 0.16°C within a single tidal cycle. Thus there are substantial quantitites of sensible heat available in the water column for maintaining the open water.

# STRUCTURE OF THERMAL TURBULENCE IN THE ATMOSPHERIC BOUNDARY LAYER OVER THE DUNDAS ISLAND POLYNYA

S.D. Smith, D.R. Topham, G. den Hartog, R.G. Perkin and R.J. Anderson

The turbulence over a polynya, in the presence of a very large sea-air temperature difference, is characterized by rising plumes of relatively warm air, made visible by a "sea smoke" of ice crystals in the air. This structure is illustrated by movies of smoke from a flare at the upstream edge, and of plumes of ice fog.

At a fixed tower these plumes are observed as ramps of linearly rising temperature, each followed by a rapid drop to ambient temperature. The temperature distributions are highly skewed, with a sharp cut-off at low temperature. At higher levels the ramps are fewer in number, interspersed by relatively long, quiet periods at ambient temperature. The ramps are displaced downwind at higher levels, appearing first at higher levels on a mast.

# Session 7C Hydrometeorology III

Thurs. 1600-1720

ON THE USE OF PRECIPITATION OBSERVATIONS FROM CLIMATOLOGICAL STATIONS IN OPERATIONAL HYDROLOGY AT B.C. HYDRO

U. Sporns and J. Gordon

Point precipitation varies greatly in time and space, particularly in the mountainous drainages of British Columbia. Daily precipitation amounts are available from climatological stations, but the network density is deficient. These stations in British Columbia are located mainly in valleys and are concentrated in the populated areas.

B.C. Hydro's operational runoff forecasting procedures demonstrate, however, that it is possible to obtain both seasonal and short-term runoff predictions from a limited network, if care is taken in applying proper weights to the observed parameters.

# SOME INDEX PROPERTIES OF THE MOUNTAIN SNOWPACK R. Perla

Spatial and temporal variations of some index properties of the mountain snowpack were studied at a level plot located within the Sunshine Ski Area, Banff National Park. The study began with the formation of the snowpack in October and concluded when the snowpack finally ablated in July. The indices investigated were: crystal morphology, density, strength, and temperature.

Snow crystal morphology was determined from analysis of color photomicrographs obtained with polarized light. The samples were assigned into the following morphological categories depending on the shape of the majority of crystals in the sample: newly-fallen crystals, initially metamorphosed crystals, rounded crystals, faceted crystals, melt-refrozen crystal clusters, crust crystals, and surface hoar. It was possible to further stratify rounded and faceted crystals according to the projected area of the largest crystal. in the sample. The size categories in millimetres were: 1/8, 1/4, 1/2, 1, 2, 4, and 8. It was generally not possible to assign a size to the remaining 5 categories of crystal shape. Snow density was measured using thin oval tubes that provided repeatable readings to within 1% accuracy as determined by adjacent sample pairs extracted at the same stratigraphic level in the pack. Snow density varied from 20 kg/m3 (layers of newly-fallen crystals) to over 500 kg/m3 (metamorphosed snow and crusts). Shear frames were used to index relative snow strengths. The index is sensitive to rate of pull, size of shear frame, mass of shear frame, number of vanes, normal pressure on shear surface, and other factors. The repeatability of shear frame measurements averages to -10% for a frame area of 0 025 m<sup>2</sup>. The shear frame index varied from < 10<sup>2</sup> N/m<sup>2</sup> for newly-fallen crystals to >10<sup>4</sup> N/m<sup>2</sup> for high-density rounded and faceted crystals. A comparison of shear frame indices versus density indices shows a very large scatter that is improved substantially if the samples are stratified according to crystal shape and size. Temperatures were measured with dial thermometers. Maximum gradients were ~ 10°C/m, and decreased to near isothermal values in April, when melting and re-freezing processes began to dominate within the snowpack.

# A COMPARISON OF VARIOUS STORAGE SNOW GAUGES ON THE CANADIAN PRAIRIES J. Dublin and R.F. Hopkinson

An experiment to compare storage snow gauges has been conducted for five consecutive winters at a well-exposed site on the airport at Regina, Saskatchewan. Two Sacramento storage gauges were installed in 1976, each equipped with an Alter shield, but in addition one gauge was positioned inside a Wyoming Shield. In 1979 two more gauges were installed: a standard AES Nipher, and a Fischer and Porter equipped with a scaled-up Nipher Shield. In 1980, a fifth gauge was acquired, a stand-pipe gauge fitted with an Alter shield. The Wyoming-shielded Sacramento has consistently caught more snow than the Alter-shielded Sacramento. The highest catch recorded was for the standard AES Nipher gauge, followed closely by the Nipher-shielded Fischer and Porter gauge.

# SNOWMELT INFILTRATION

R.J. Granger and G.E. Dyck

Infiltration of snow water is important to flood forecasting when it represents a loss to surface runoff, and to agriculture when it represents a gain to soil water reserves that are used by crops. It is shown that in uncracked Prairie clay soils that infiltration is inversely related to the frozen soil water content at the time of melt, and the depth that melt water penetrates during the melt period is approximately 20 cm. Following melt, the vertical movement is closely related to the downward movement of the 0°C isotherm.

It is also shown that the soil moisture content at the time of melt, and consequently the infiltration potential, are greatly affected by the over-water changes in soil moisture in the upper layers of the soil profile brought about by the thermal gradients resulting from the freezing process. Under certain conditions overwinter gains in moisture may exceed the snowmelt infiltration amounts.

The findings from the study have application to hydrological and agricultural forecasting: (a) they demonstrate the indirect role of fall soil moisture in the surface runoff process; (b) they show that premelt snowcover depth and water equivalent may be poor indices of soil moisture recharge in the spring; and (c) the time and occurrence of snowcover in the fall, because of the insulating effect of the snowcover, may significantly affect the snowmelt infiltration potential.

#### Session 8A Air Pollution Modelling and Assessment

Fri. 0830-1000

# USER CONSIDERATIONS IN AIR QUALITY MODELLING R.P. Angle

The achievement of satisfactory air quality entails the adoption of one or more air pollution control strategies. Of the four basic strategies available, only air resource management requires the use of air quality models. Atmospheric dispersion models are a subset which can be employed either for fundamental research or for practical decision-making. The characteristics of user oriented atmospheric dispersion models are simplicity, clarity, reliability, appropriateness, and practicality, Model performance is determined with reference to accuracy, skill, sensitivity, consistency, generality, integrity, and mechanism. For the successful application of air quality models to the decision process, there must be close cooperation between modellers and users.

### A MIXED LAYER STATISTICS DISPERSION MODEL C.S. Matthias

This model calculates the range of hourly-averaged ground-level concentrations at a point beneath the plume centre-line for each season of the year. The results are presented as seasonal and annual cumulative frequency distributions for a given downwind distance. They can be used to estimate the probability of exceeding a given concentration within an arbitrary time period within a specific compass sector, or to estimate the highest, second highest, etc. hourly concentrations. Climatological mixed layer data are the input information that describes wind speeds and miximum mixing heights. Incorporated in the model are sub-models describing the diurnal variation of surface heat flux, surface shear stress, mixing heights, turbulence intensity, and stability class. The surface albedo and surface roughness data are used to determine the turbulence intensity which, in turn, is used to determine the dispersion width of the plume.

# CROSSWIND DISPERSION FUNCTIONS FROM TURBULENT ENERGY SPECTRA VIA THE STATISTICAL THEORY OF DIFFUSION

D.G. Stevn

Within the framework of the statistical theory of diffusion, a convenient way of expressing the crosswind spread of a tracer or pollutant in a turbulent flow is through a non-dimensional dispersion function

$$S_{y}(t^{\circ}) = \sigma_{y}/\sigma_{y}t$$

t<sup>\*</sup> being a non-dimensional travel time. The form of this dispersion function can be determined by the integration over all energy-carrying frequencies of the transformed Eulerian spectral function multiplied by an appropriately scaled sampling function. The transformation and scaling arise out of the Hay-Pasquill form for the Eulerian-Lagrangian transform and the use of a non-dimensional spectral frequency. This formulation gives rise to a travel time non-dimensionalized by  $t_s = z/\sigma_{\mu}$ , which is simply related to the Lagrangian integral time scale. Applying this analysis to turbulent energy spectra measured over flat featureless terrain in a range of unstable atmospheric conditions results in the following form for the crosswind dispersion function:

$$S_{y}(t^{*}) = (1.0 + \alpha(t^{*})^{-1})^{-1}$$

The parameters  $\alpha$  and  $\beta$  are both functions of z/L and  $z_i/L$ , the atmospheric state variables, and in the range of conditions represented by:

0.1 < -z/L < 10.0 and  $31.6 < -z_i/L < 316.0$ 

have the range:

$$0.02 < \alpha < 0.63; 0.34 < \beta < 0.77.$$

Empirical functions for the determination of  $\alpha$  and  $\beta$  from z/L and  $z_1/L$  are provided.

# THE APPROPRIATE CHOICE OF $\sigma_r$ and $\vec{u}$ for predicting surface concentration using the Gaussian model

J.D. Reid

Predictions of surface concentration resulting from surface and elevated pollution sources obtained with a Monte Carlo dispersion model, incorporating best knowledge of planetary boundary-layer structure, are interpreted in terms of the Gaussian dispersion model parameters  $\sigma_z$  and u. Detailed results for neutral stratification are presented showing that, if  $\sigma_z$  is regarded as a fitting parameter and not equated to the second moment of the vertical concentration distribution, then it can be made reasonably independent of source height. To achieve this, the mean wind speed is chosen to be a function of downwind distance, approximately the wind at 0.6  $\sigma_z$  or 0.6 source height, whichever is greater. Comparisons with the Brookhaven and TVA experimental data and Briggs curves are given. The question of extension to non-neutral conditions is discussed.

# A MODEL FOR URBAN AREA SOURCE CO CONCENTRATIONS K.D. Hage and P. Hopps

High surface concentrations of motor vehicle pollutants in urban areas occur in periods of stagnant air flow when wind speeds often drop below the threshold of standard 10-m anemometers. When such stagnation occurs in a transition period between weather systems, concentrations are increased sometimes by curved trajectories that further lengthen the residence time of air over the city. In order to assess the relative importance of wind speed, vertical dispersion, and curved airflow trajectories a numerical model is formulated for carbon monoxide concentrations near city centre. Surface-layer profile equations from the Kansas and Minnesota experiments, as modified recently by Wieringa, are used to calculate the parameters of Roberts's solution to the diffusion equation for a surface line source. Contributions form line sources at some distance from the receptor are obtained by summation with allowance for time changes in source strength, wind speed, and wind direction. The model requires temperature observations at two levels and wind observations at a single level on an urban tower. Computed and observed carbon monoxide concentrations.

# Session 8B Precipitation and Severe Storms

Fri. 0830-1000

# SEVERE ALBERTA THUNDERSTORMS: A POST-COLD-FRONT TYPE G.S. Strong

A study of a severe post-cold-front thunderstorm system over central Alberta on 21 July 1976 challenges the popular routine of categorizing storms as simply cold-front or air-mass type. A comparison with cold-front thunderstorms occurring over Saskatchewan on this day illustrates the synoptic differences.

Post-cold-front thunderstorms are discussed as a relatively common yet distinct phenomenon, which is thought to include many of Alberta's more severe storms. These occur well behind the surface cold-front passage, but ahead of the associated upper (500-mb) short wave, thus eliminating their classification as a simple air-mass type. The complex influences exerted by the Rocky Mountains create the required pre-storm unstable environment for such storms, while the short wave plays a major role in the initiation,

propagation, motion, and lifetime of the thunderstorm system. This particular case study and similar ones, suggest that severe post-cold-front thunderstorms may be somewhat unique to locations in the immediate lee of large mountain barriers.

# AN APPLICATION OF THE MARKOV CHAIN TO THE OCCURRENCE OF PRECIPITATION IN ALBERTA

# K.J. Johnstone

Two Markov chain models, proposed by Katz and by Gabriel, were applied to data from Beaverlodge, Edmonton, and Medicine Hat. Model parameters were estimated from a development sample. The maximum likelihood estimates for the monthly Markov-chain parameters were used in Gabriel's model; Fourier series estimates for the daily parameters were used in Katz's model. The calculated distributions were compared with those from independent samples. The monthly distributions calculated by each model are similar, and representative of the precipitation occurrence process. Differences between the calculated distributions can be traced to differences in the model parameters.

Assumptions that the Markov chain transition probabilities are stationary within a month, and that the occurrence of precipitation is a first-order Markov chain were examined. A maximum likelihood test was used to determine the statistical significance of the observed variation in the transition probabilities. Akaike's Information Criterion (AIC), and the Schwartz Bayesian Criterion (SBC) were used to determine the appropriate chain order. For the Beaverlodge case only, the transition probabilities are significantly non-stationary. The first-order Markov chain is appropriate for each case considered, according to both the AIC and the SBC.

An unexpected result is the large sampling fluctuation exhibited by the number of wet days during a month.

# ON OBJECTIVE ANALYSIS AND FORECASTING OF SEVERE STORMS POTENTIAL A. Maarouf and L.J. Wilson

A computerized technique is being developed to provide an early objective guidance for the diagnosis and short-range forcasting of severe convective storms. The method is primarily diagnostic and combines objective analyses of various kinematic and thermodynamic parameters considered to be important discriminators for severe summer storms. At present, only upper-air data are utilized in the analysis and calculation of the severe storms potential. A simple advection scheme is applied to determine the motion of threat areas within 12 h. The method was designed and tuned on data from 1979 as a dependent sample, then tested on a daily basis during 1980. Results of the independent test are presented and case studies for Saskatchewan, Manitoba and Ontario are shown.

# THUNDERSTORM STUDY FROM UNOFFICIAL SOURCES: SOUTHERN SASKATCHEWAN A.H. Paul

Meteorologists concerned with southern Saskatchewan face a number of problems, not least of which is the problem of summertime forecasting of thunderstorm outbreaks. It is now well known that our appreciation of the severity and areal extent of such outbreaks has been limited by the availability of meteorological data in the region. Thus a number of researchers in recent years have been attempting to extend our data base by utilizing information drawn from unofficial sources. This paper critically reviews the sources available, illustrates their potential by means of a number of case studies of thunderstorm outbreaks, and suggests ways in which such information could be made available in a more systematic way in the future. Special emphasis is given to outstanding precipitation events and to damage from thunderstorm winds, including tornadoes.

# SYNOPTIC ASPECTS OF WEATHER MODIFICATION EVALUATION E.R. Reinelt and A.G. Eddy

Successful evaluation of surface rainfall enhancement ascribed to cloud seeding requires the removal of natural variability from the rainfall data sample. This problem can be approached through the analysis of covariance technique. The statistical model is designed to identify non-stationarities (i.e. trends) in time and space, synoptic covariates on a particular day, seeding treatments and noise.

This paper deals with the preliminary screening of covariates such as wind direction, precipitable water, atmospheric stability, and output from a one-dimensional convective model that integrates objectively several variables available from standard rawinsondes. Examples are drawn from a comprehensive data set which has been compiled by the North Dakota Weather Modification Board over many years. This set forms the basis for the objective analysis and thorough evaluation of the operational weather modification programme in North Dakota.

# Session 9A Air Pollution Modelling and Assessment; Feedback Discussion

Fri. 1030-1210

ON THE COMPATIBILITY BETWEEN MODEL PREDICTIONS AND MEASURED SHORT-TERM CONCENTRATIONS

S.G. Djurfors

Atmospheric dispersion models are able to predict average concentrations only for time periods greater than those given by the short term (½-h and 1-h) air quality standards. Because government and industry are both committed to the use of such models, an air quality standard consistent with model ability must be adopted. The shortest compatible "modelling standard" appears to be a 3-h standard. However, the adoption of such a standard must be accomplished without loss of regulatory stringency. A 3-h sulfur dioxide standard has been developed which resulted in a 3-h value of 0.12 ppm, equivalent to the Alberta 1-h base value of 0.17 ppm. It is also demonstrated that the 24-h base standard is the most stringent of the short-term air quality standards.

# IMPROVED TREATMENT OF PRECIPITATION IN A STATISTICAL MODEL OF AIR POLLUTION USING A DOUBLE MARKOV CHAIN

#### C. Lelièvre

When we use a statistical model of long-range transportation of air pollutant (LRTAP) we must treat statistically the effect of alternating dry and wet periods. Usually average dry and wet cycles are computed and used in the calculation of the probability of transition from one type of weather to another. However, it is generally difficult to find an average wet-dry cycle which adequately represents both continuous and intermittent rain. A statistical method, involving the computation of the sum of two Markov chains, has been developed in order to improve the treatment of rain in such models.

As a first step we compute the distribution of sequences of dry and wet periods. Next we subdivide each of these distributions into two parts, one containing the short sequences and the other the long ones. We then compute the number of sequences and the average length of the sequences in each section. From the information we compute the parameters of a sum of two Markov chains. When we combine the distributions for dry and wet cycles we obtain 4 distributions that represent continuous rain, intermittent rain and transitions from one type to another.

This model of a double Markov chain has been applied with considerable success to the hourly precipitation data observed at Québec: it decreased the error of estimate by a factor of 3 to 4 compared with that of a simple Markov chain. It can also be applied to daily precipitation when there are two phenomena acting on different time scales.

## A MODEL FOR ESTIMATING STATIC STABILITY IN THE SURFACE AND PLANETARY BOUNDARY LAYERS FROM STANDARD HOURLY TEMPERATURE DATA R. Verreault, L. Pérelman and D. Bégin

By considering simultaneously the boundary-layer heat-transfer differential equation and Fourier analysis of the screen-temperature time series, one ends up with a formalism that yields the static stability at standard screen height without having to solve the differential equation. Regressions between stabilities at different levels are then used to obtain static stability aloft from ground temperature data alone. The model is tested with the boundary-layer data from the O'Neill, Kansas and Wangara experiments and from a four-year field programme in the Valin Mountains near Chicoutimi. It turns out to provide an efficient alternative method of determining the Pasquill-Turner stability classes for environmental studies, since the screen-temperature time series already includes the integrated effects of both the radiative and the turbulent heat-exchange mechanisms.

# Session 9B Climate

Fri. 1030-1210

# SOME ASPECTS OF CLIMATIC CHANGE B.W. Boville

One still hears the questions. Is the climate changing (Are we heading for an ice age?) or is the variability of climate increasing (Are there more droughts than 50 years ago?). Probably the most suitable answer to these questions is – yes, climatic factors are changing but not very fast and not very much. A related question is, how much is or will climate change as a consequence of human activities – will there be cooling from industrial dust loading, heating from increasing CO<sub>2</sub> or increased UV-B from decreasing total ozone?

These questions will be reviewed in the light of recent scientific findings and the results of the Technical Conference on Climate held last December in China.

# SEASONAL CLIMATIC VARIABILITY

G.J. Boer and K. Higuchi

An analysis of variance of the 1000-500 mb thickness field is performed to investigate seasonal climatic variability for the period 1949 to 1975. This study is an outgrowth of previous work (Boer and Higuchi, 1980), which did not, however, include a seasonal analysis.

Analysis of mean thickness and of three measures of climatic variability are carried out for the four seasons and the annually averaged case. An overall decreasing trend in mean thickness (temperature) is again found; no overall change in variability is found but there is evidence, perhaps surprisingly, for an increase in variability during the summer season.

# PALEOCLIMATE AND PALEOHYDROLOGY OF THE LAKE MANITOBA BASIN W.M. Last and J.T. Teller

The results of stratigraphic, sedimentologic, and palynologic investigations of the postglacial record of Lake Manitoba can be used to document climatic and hydrologic changes that have occurred in the region during the past 12,000 years. Lake Manitoba, presently a large shallow prairie lake located in south-central Manitoba, originated at the end of the last glacial episode as part of a much larger lake, Lake Agassiz. The relatively cool and wet climate during the initial (Lake Agassiz) phase gave rise to a spruce dominated boreal forest surrounding the lake. Major inflowing streams such as the Assiniboine River helped maintain high sedimentation rates in the basin by draining the newly deglaciated Prairies to the west. By about 11,000 years B.P. continued retreat of the ice sheet in response to the moderating climate opened new and lower outlets to the east, and much of Lake Agassiz, including the Lake Manitoba basin, drained. Water levels rose at about 9,900 B.P. owing to a minor readvance of the ice, but by 9,200 B.P. the south basin of Lake Manitoba was nearly dry,

For the next 4,700 years water levels in the south basin of Lake Manitoba fluctuated in response to the interaction between a warmer and drier climate that tended to create dry-lake conditions and differential crustal rebound, which caused a progressive southward displacement of water from the relatively deeper north end of the lake. At times, the lake level fell enough to allow soil development to occur on the floor of the basin. The warmer and drier climate during this period also resulted in the development of a non-arboreal, prairie type of vegetation in the region.

About 4,500 B.P. this episode of relatively dry conditions came to an end when the Assiniboine River was diverted into the basin. In addition to establishing a positive hydrologic budget for the lake, this major influx of water created a sandy delta at the mouth of the river. Although the Assiniboine River was diverted out of the Lake Manitoba watershed about 2,200 B.P., water levels in the basin have remained relatively constant over the past 3,500 years mainly because of a gradual shift toward a cooler and wetter climate, and possibly because of continued crustal rebound.

# SEASONAL OCEAN-ATMOSPHERE INTERACTION

#### T.J. Simons

As part of the Canadian Climate Program, an effort has been made to couple an oceanic upper-layer model with the atmospheric GCM in Toronto. The study is based on the hypothesis that seasonal variations of sea-surface temperature are primarily determined by local fluxes of heat and momentum at the sea surface, and that large-scale horizontal and vertical advective effects may be simulated by highly simplified models. In order to test this hypothesis, a diagnostic study was carried out for the Northern Hemisphere oceans, utilizing observed seasonal variations of oceanic heat storage, surface heat balance, wind stress, and large-scale circulation patterns. A seasonal stratification model was designed and verified by recourse to extensive temperature observations on the Great Lakes; it was modified to include Ekman pumping and large-scale heat advection. This model appears to yield satisfactory simulations of observed oceanic temperatures and is now being run in conjunction with a three-layer atmospheric model.

## EFFECTS OF SEA ICE ON AIR-SEA CO2 FLUXES

E.P. Jones and A.R. Coote

Sea ice forms a physical barrier that inhibits gas exchange between the ocean and atmosphere. Thus one would expect almost no  $CO_2$  flux into the ocean in polar regions or in other regions that are ice-covered during the winter season. We propose a process in which sea ice aids in the transfer of  $CO_2$  into the ocean. As sea ice forms, salts precipitate preferentially from brines in the ice, starting with calcium carbonate at a temperature just below the freezing point of seawater. As calcium carbonate precipitates, the brines in the ice become supersaturated in  $CO_2$  with respect to the atmosphere. Because of the ice barrier, this  $CO_2$  cannot easily escape to the atmosphere and therefore will be transported into the ocean with the brines as they drain from the ice. This process can explain the  $CO_2$  supersaturation observed in arctic waters and could result in a  $CO_2$  flux into the ocean that is not negligible compared to fluxes that one would expect in cold, but ice-free regions.

# FIFTEENTH ANNUAL GENERAL MEETING CANADIAN METEOROLOGICAL AND OCEANOGRAPHIC SOCIETY

# Saskatoon 27 May 1981

# AGENDA

- 1. Adoption of the Agenda
- 2. Minutes of Annual General Meeting, 22 May 1980
- 3. Annual Reports from the Executive
  - a) President's Report
  - b) Treasurer's Report
  - c) Corresponding Secretary's Report
- 4. Annual Reports from the Committees, Editors and Archivist
  - a) Editorial Committee
  - b) CMOS Newsletter Editor
  - c) Scientific Committee
  - d) Standing Committee on Public Information
  - e) Membership Committee
  - f) Financial Development Committee
  - g) Committee on Professionalism
  - h) Awards Committee
  - i) Citations Committee
  - j) Society Archivist

5. Annuals Reports from Local Centres and Chapters

- 6. Annual Reports from Special Interest Groups
- 7. Budget for 1981 and projected budget for 1982
- 8. Motions from Council
  - a) Membership and Subscription Fees for 1982
  - b) Amendments to By-Laws
  - c) Others
- 9. Locations of Future Congresses
- 10. Other Business
- 11. Report of Nominating Committee
- 12. Installation of Officers for 1981-82

# QUINZIÈME ASSEMBLÉE GÉNÉRALE ANNUELLE DE LA SOCIÉTÉ CANADIENNE DE MÉTÉOROLOGIE ET D'OCÉANOGRAPHIE

# Saskatoon Le 27 mai 1981

# ORDRE DU JOUR

- 1. Adoption de l'ordre du jour
- 2. Procès-verbal de l'assemblée générale annuelle, le 22 mai 1981
- 3. Rapports du bureau d'administration
  - a) Rapport du président
  - b) Rapport du trésorier
  - c) Rapport du sécretaire-correspondant
- 4. Rapports annuels des comités, des rédacteurs et de l'archiviste
  - a) Comité de rédaction
  - b) Rédacteur du Bulletin de nouvelles de la SCMO
  - c) Comité scientifique
  - d) Comité permanent d'information publique
  - e) Comité d'éligibilité des membres
  - f) Comité de développement financier
  - g) Comité sur le professionalisme
  - h) Comité des récompenses
  - i) Comité des citations
  - j) Archiviste de la Société
- 5. Rapports annuels des centres locaux et des sections
- 6. Rapports annuels des groupes d'étude de sujets particuliers
- 7. Budget pour 1981, budget projeté pour 1982
- 8. Propositions du Conseil d'administration
  - a) Cotisations pour 1982
  - b) Amendements aux règlements
  - c) Divers
- 9. Lieux ou se tiendront les congrès à venir
- 10. Divers
- 11. Rapports du comité de mise en candidature
- 12. Investiture des membres de bureau d'administration pour 1981-82

# MINUTES OF THE FOURTEENTH ANNUAL GENERAL MEETING HELD ON MAY 22, 1980 AT 2000 h, PIER TWO AND THREE HARBOUR CASTLE HILTON HOTEL, TORONTO, ONTARIO

J.M. Powell, President, called the meeting to order with about 40 members present.

#### 1. Adoption of Agenda

The agenda was adopted as published on pages 26-27 of the Fourteenth Annual Congress Issue of ATMOSPHERE-OCEAN with the following additions:

Under item 3 – Auditor's Report Under item 4 – Society Archivist Under item 8 – Location of Future Executive

## 2. Minutes of the 13th Annual General Meeting, 30 May, 1979

H. Leighton moved, seconded by N. Cutler, that the minutes be adopted as published in the Fourteenth Congress Issue (pp. 28-39). MOTION PASSED.

The President commented on the following items from the minutes: publishing of minutes in the Congress Issue; *Chinook* magazine and Special Interest Groups, both subjects of motions from Council (see Agenda item 7); Honourary Memberships; appointing of new Editor.

### 3. Annual Reports from the Executive

#### a) President's Report: J.M. Powell

Events of the year are summarized in the President's Report in the Congress Issue (pp. 40-47) with two minor amendments: p. 41 para. 3, line 1, change "head" to "read"; p. 43 para. 1, line 16, change "and" to "are".

The President also noted that the NSERC grant was received and a grant from AES was promised and that the Society had co-sponsored a number of meetings. The President offered congratulations to Dr W. Godson, recently elected President of IAMAP; Dr A. Robert on receipt of the AMS Second Half Century Award; and Dr A.E. Collin on his appointment as Associate Deputy Minister for Energy, Mines, and Resources. J. Powell moved, seconded by P. LeBlond, that the President's Report be adopted. MOTION PASSED.

#### b) Treasurer's and Auditor's Reports: R. Angle

R. Angle moved, seconded by J. Whiting that the Treasurer's and Auditor's Reports be accepted as published in the Fourteenth Congress Issue (pp. 48-53). MOTION PASSED.

The treasurer commented that 1979 was the third year in a row with a budget deficit but the 1980 year was looking much better due largely to the introduction of page charges.

#### 4. Annual Reports from Committees and Editors

## a) Editorial Committee

It was moved by P. LeBlond, seconded by R. Burling, that the Editorial Committee Report be adopted as published in the Congress Issue (pp. 54-56). MOTION PASSED.

P. LeBlond commented on highlights of the year noting the steady growth of

ATMOSPHERE-OCEAN, but the current manuscript flow was low. He welcomed H. Leighton as the new editor.

H. Leighton offered congratulations to T. Oke on the progress made by ATMOSPHERE-OCEAN and reported the new Book Review Editor would be E. Reinelt. E. Lozowski requested a round of applause for T. Oke and H. Leighton.

## b) CMOS Newsletter Editor

R. Angle moved, seconded by D. Bauer that the Newsletter Editor's Report as published in the Congress Issue (p. 57), be adopted. MOTION PASSED.

It was recommended that the deadline for each issue of the Newsletter be published in the preceding issue.

# c) Scientific Committee

It was moved by K. Hage, seconded by S. Orvig, that the Report of the Scientific Committee be adopted as published in the Congress issue (pp. 57–58). MOTION PASSED.

J. Powell reported that four new members had been appointed to the committee; Dr H.-R. Cho, J.-G. Cantin, Dr S. Pond, and Dr P. Smith.

# d) Standing Committee on Public Information

It was moved by N. Cutler, seconded by D. Fraser, that the report be adopted as published in the Congress Issue (pp. 59-60). MOTION PASSED.

N. Cutler elaborated on the committee's report and the May 21st meeting. She reported the committee will be listing relevant films for public bodies and schools and looking at training courses, particularly non-meteorologist courses outside AES.

#### e) Membership Committee

Moved by C. McLeod, seconded by D. Fraser, that the Membership Committee Report be adopted as published in the Congress Issue (pp. 60-61). MOTION PASSED.

In addition C. McLeod reported that the Committee held its first meeting on May 21, and identified a number of concerns regarding membership classes, membership of special interest groups, and why the Society is losing members.

### f) Financial Development Committee

R. Angle moved, seconded by L. O'Quinn that the Report of the Financial Development Committee be adopted as published in the Congress Issue (pp. 61–62). MOTION PASSED.

J. Powell commented on the need for new members.

#### g) Committee on Professionalism

R. Angle moved, seconded by R. Jones, that the committee's report be adopted as published in the Congress issue (pp. 62-63). MOTION PASSED.

R. Angle reported the Committee is now active, recently meeting once per month and has drafted a code of ethics to appear in a future issue of the *Newsletter* seeking comments. He also noted they are preparing a Directory of Atmospheric Consultants and attempting to define a "meteorologist."

# h&i) Awards and Citations Committees

N. Cutler moved, seconded by P. LeBlond, that the reports be adopted as published in the Congress Issue (p. 63). MOTION PASSED.

#### j) Society Archivist

J. Powell reported on behalf of M.K. Thomas that he is seeking information on past activities of the Society and attempting to get all existing material together.

#### 5. Annual Reports from Local Centres and Chapters

R. Burling moved adoption of the Reports from Local Centres and Chapters as published in the Congress Issue (pp. 64–77). After several Centres and Chapters provided an update of their activities, D. Bauer seconded the motion. MOTION PASSED.

Some discussion regarding subvention funding for Centres and Chapters followed but it was noted this was the responsibility of the 1980–81 Executive.

#### 6. Budget for 1980 and Projected Budget for 1981

Following discussion and elaboration on budget details, R. Angle moved, seconded by R. Burling, adoption of the 1980 budget and projected budget for 1981 as shown in the Congress Issue (p. 52). MOTION PASSED.

## 7. Motions from Council

# a) Membership and Subscription Fees for 1981

R. Angle moved, seconded by P. Merilees, that the fee structure for 1981 would be: Members, no change, \$30.00; Students, no change, \$10.00; Institutions, increased to \$40.00; Sustaining Members, increased to \$75.00. MOTION PASSED.

J. Powell commented that the Institutional fee increase was recommended by U of T Press and NSERC because of the multi-reader aspect of institutional membership, but this increase was only a first step due to the recent advertising campaign to attract new institutional members.

# b) Amendments to By-Laws

After discussion, J. Whiting moved that the By-Law amendments (Appendix 1) be adopted, with French and English to convey the same meaning, seconded by L. O'Quinn. MOTION PASSED.

### c) Code of Ethics for Professional Members

R. Burling moved, seconded by J. McBride, that the proposed Code of Ethics be distributed for discussion. MOTION PASSED.

#### d) Establishment of Special Interest Groups

J. Powell outlined the background for Special Interest Groups, noting that Council recommended the proposed guidelines (Appendix 2) be adopted on a two-year trial basis.

It was moved by J. McBride, seconded by W. Evans, that the idea of Special Interest Groups using these guidelines be adopted for a two-year period. MOTION PASSED.

#### e) Chinook Magazine for Interested Members

J.Powell reported on the response to the *Newsletter* questionnaire regarding *Chinook* magazine noting that most responses indicated they would like the magazine as part of the package or as an optional extra. Council considered the optional arrangement best. J. Whiting moved, seconded by E. Hamilton, that the Society undertake the optional arrangement provided 100 subscriptions were obtained. MOTION PASSED.

#### f) Proposed Rewording of Terms of Reference for CMOS Awards and Prizes

J. Maybank moved, seconded by D. Bauer, the rewording of the terms of reference for the awarding of CMOS awards and prizes (Appendix 3). MOTION PASSED.

### 8: a) Locations of Future Congresses

#### 1981 Congress

After outlining proposed plans for the 1981 Congress at the University of Saskatchewan Campus in Saskatoon, J. Whiting moved, seconded by D. Bauer, that the 1981 Congress be held on the University of Saskatchewan Campus in Saskatoon. MOTION PASSED.

#### 1982 Congress

E. Hamilton, on behalf of the Ottawa Centre invited the CMOS to hold the 1982 Congress at the University of Ottawa with the Learned Societies. J. McBride moved, seconded by P. Merilees, that the 1982 Congress be held in Ottawa. MOTION PASSED.

## 1983 Congress

Invitations were received to host the 1983 Congress from the Halifax Centre and the Alberta Centre. No decision was made.

#### b) Location of Future Executive

Following discussion it was noted the choice for location of the future Executive was either Halifax or Toronto.

# 9. Other Business

## a) Canada Wide Science Fair, 1980

Winners of the CMOS Award at the Canada Wide Science Fair in Thompson, Manitoba were Aileen and Tom Hayden of Saskatoon for their "Clouds" exhibit.

#### b) AES/CMOS 1980-81 Speaker's Tour

AES will continue to support the Speaker's Tour and consideration is being given to separating the Tour into Eastern and Western halves with two speakers.

#### c) CNC/SCOPE Report

J. Powell reported on behalf of of J. McTaggart-Cowan, who represented CMOS (observer status) at the May 20 CNC/SCOPE meeting. He reported CMOS can make a worthwhile contribution and some key areas are now being looked at.

#### 10. Report of Nominating Committee

D. Bauer read the report of the Nominating Committee published in the Congress Issue (p. 78) and moved nominations as given in the report; seconded by R. Burling. MOTION PASSED.

J. Powell offered his congratulations to the new Executive and extended thanks to the past Executive, Council, Editors, the various committee chairmen and members, and programme and congress committees for their work throughout the year.

#### 11. Installation of Officers for 1980-81

The new executive officers were introduced and installed. J. Maybank took the chair and thanked the outgoing executive members and welcomed the new executive members. D. Bauer moved a vote of thanks to the outgoing executive.

E. Hamilton moved adjournment of the meeting at 2330 h with 23 members in attendence.

J. Renick Recording Secretary

# Appendix 1

# **BY-LAW AMENDMENTS**

#### By-Law 6 (c) to read:

A Membership Committee shall be established. The Committee shall consist of a Chairman appointed by Council, and one member appointed by each Centre and optionally by each Chapter. The Corresponding Secretary shall be an ex-officio member of this committee. The Comittee shall prepare an annual report of its activities for Council.

By-Law 12, additional item (h) to read:

Local Centres shall name representatives to certain committees of the Society, as required.

By-Law 13(e) to read:

Chapters shall normally be affiliated with the nearest relevant Centre from which they may receive a portion of the Society funds allocated to that Centre for support of their functions. The funding available shall be roughly in proportion to the Centre/Chapter membership numbers. Jurisdictional and financial disputes shall be resolved by Council in consultation with the Centres and/or Chapters involved.

#### By-Law 13, additional item (f) to read:

The Correspondent of a Chapter shall report to Council through the Local Centre on the activities of the Chapter during the previous year.

## By-Law 13, additional item (g) to read:

A Chapter may name a representative to certain Committees of the Society, if they so desire.

### **GUIDELINES FOR SPECIAL INTEREST GROUPS**

At previous meetings of the Council and Executive, there seemed to be general support for the idea of Special Interest Groups or Study Groups within the Society. The idea was promoted in the June 1979 *Newsletter*, and all Local Centres, Chapters and Society members were asked to consider it and come forward with suggestions. The Executive have not been overwhelmed with suggestions, but the only negative response was received from the Montréal Centre who stated they did not see a need for specialist groups; however, others do see a role for such groups to play within the Society.

The following points are offered as a basis for formulating a set of guidelines for the operation of such groups under the auspices of the Society:

- The Council is anxious to encourage the activities of Special Interest Groups, where a need has been
  expressed, in view of the contribution such groups may make to the profession as a whole and the
  Society in particular, for example, in the organization of workshops, special sessions at Congresses,
  a group news sheet and in the submission of material to the CMOS Newsletter or journal.
- Special Interest Groups with an actual or potential membership of 15 or more CMOS members may communicate with Council and request recognition by the Society.
- 3) Such groups will serve the Society in fostering interest in their special fields in the scientific and public communities, through the organizing of scientific meetings; by providing liaison between the Society and other national and international organizations concerned with their fields; and by advising Council in formulating statements and positions on matters in their fields of interest.
- 4) The Groups will be run by a Steering Committee (to be approved by Council) which will have a Chairman and Secretary. Such Groups and their chairmen will be listed in the Newsletter and all members will be given the opportunity of indicating their interest in a particular Group(s). The Groups will report to Council through the Recording Secretary.
- 5) Membership of the Groups will be open to members and non-members of the Society, which will encourage greater participation from individuals working or having an interest in the fringe areas of the atmospheric and oceanic sciences.
- 6) At all times CMOS Members should form a majority in a particular group and the executive of the Steering Committee shall be CMOS Members. The Groups will be broadly financially self-supporting. The Society is prepared to provide an initial grant to each group duly recognized as a Special Interest Group.
- Reports about the activities of the Group(s) will be required for the Annual Congress Report of the Society; other reports on the activities of the Group will be required to be filed for archival purposes.
- Each Group will have its own terms of reference, approved by Council, by which it operates fairly independently under the general umbrella of the Society.
- Jurisdictional disputes concerning discipline or interest fields of Groups shall be resolved by Council in consultation with the Special Interest Groups involved.

# TERMS OF REFERENCE FOR CMOS AWARDS AND PRIZES\*

### a) President's Prize

A President's prize may be awarded for each calendar year to a member (or members) of the Society for an outstanding publication in the field of meteorology and/or oceanography. Only papers presented at national, local centre or chapter meetings of the Society, and subsequently published in a recognized journal, shall be eligible for the prize, and only in the year of publication.

#### b) The Dr Andrew Thomson Prize in Applied Meteorology

A prize in applied meteorology may be awarded for each calendar year to a member (or members) of the Society for an outstanding publication in the field of applied meteorology.

#### c) Graduate Student Prizes:

When **publications or theses** of special merit in meteorology and/or oceanography by graduate students come to the notice of the Awards Committee, special graduate student prizes may be awarded.

#### d) The Rube Hornstein Prize in Operational Meteorology

A prize known as the Rube Hornstein Prize in Operational Meteorology may be awarded for each calendar year to an individual for providing outstanding operational meteorological service in its broadest sense, but excluding the publication of research papers as a factor, unless that research is already incorporated as an aid in the day-to-day performance of operational duties. The work for which the prize is granted may be cumulative over a period of years or may be a single notable achievement.

\*Changes in wording are indicated by bold type.

# PROCÈS-VERBAL DE LA QUATORZIÈME ASSEMBLÉE GÉNÉRALE ANNUELLE TENUE LE 22 MAI 1980, 2000 h, JETÉE 2 ET 3, HÔTEL HILTON HARBOUR CASTLE, TORONTO, ONTARIO

Le président, J.M. Powell, appelle à l'ordre les 40 membres présents.

1. Adoption de l'ordre du jour

L'ordre du jour été accepté tel que publié aux pages 26-27 du numéro du quatorzième congrès annuel d'ATMOSPHERE-OCEAN avec les ajouts suivants:

à l'article 3 - rapport de l'auditeur

à l'article 4 - archiviste de la Société

à l'article 8 - siège du prochain Bureau d'administration

2. Procès-verbal de la treizième assemblée générale annuelle, 30 mai 1979

H. Leighton proposa, secondé par N. Cutler, l'adoption du procès-verbal tel que publié dans le numéro du congrès (pp. 28–29). MOTION ADOPTÉE.

Le président a fait des commentaires sur les articles suivants qui figurent au procès-verbal: la publication du procès-verbal dans le numéro du congrès; la revue *Chinook* et les groupes d'études de sujets particuliers, qui ont fait l'objet de motion de la part du conseil (voir l'ordre du jour article 7); la question des membres honoraires; la nomination d'un nouveau rédacteur en chef.

# 3. Rapports annuels du Bureau d'administration

#### a) Rapport du président: J.M. Powell

Les événements de l'année sont résumés dans le rapport du président, inclus dans le numéro du congrès (pp. 40-47). On doit y apporter deux amendements mineurs: p. 41, paragraphe 3, ligne 1, changer "head" par "read"; p. 43, paragraphe 1, ligne 16, changer "and" par "are."

Le président fit remarquer qu'une subvention du CRSNG fut reçue, que le SEA en promettait une et que la Société avait conjointement parrainé quelques rencontres. Le président félicita M. W. Godson pour son élection comme directeur de l'AIMPA; M. A. Robert pour le prix "Second Half Century Award" qui lui a été décerné par la Société météorologique américaine et M. A.E. Collin pour sa nomination comme sous-ministre associé, (Énergie, Mines et Ressources). J.M. Powell proposa, secondé par P. LeBlond, l'adoption du rapport du président. MOTION ADOPTÉE.

#### b) Rapports du trésorier et du vérificateur: R. Angle

R. Angle proposa, secondé par J. Whiting l'adoption des rapports du trésorier et du vérificateur tel que publié dans le numéro du congrès (pp. 48–53). MOTION ADOPTÉE.

Le trésorier a fait remarquer que 1979 fut la troisième année consécutive à connaître un déficit budgétaire mais que 1980 s'annonçait mieux, surtout grâce à l'introduction de la participation aux frais de publication.

#### 4. Rapports annuels des comités et des rédacteurs

#### a) Comité de rédaction

P. LeBlond proposa, secondé par R. Burling, l'adoption du rapport du comité de rédaction tel que publié dans le numéro du congrès d'ATMOSPHERE-OCEAN (pp. 54-56). MOTION ADOPTÉE.

P. LeBlond fit des commentaires sur les principaux événements de l'année tout en notant la croissance régulière d'ATMOSPHERE-OCEAN et le faible roulement de manuscrits. Il souhaita la bienvenue à H. Leighton en tant que rédacteur.

H. Leighton félicita T. Oke pour les progrès accomplis par ATMOSPHERE-OCEAN et annonça que le nouveau rédacteur de la section "Book Review" serait E. Reinelt. E. Lozowski demanda que l'on applaudisse T. Oke et H. Leighton.

## b) Rédacteur du Bulletin de nouvelles

R. Angle proposa, secondé par D. Bauer, l'adoption du rapport du rédacteur du Bulletin de nouvelles tel que publié dans le numéro du congrès (p. 57). MOTION ADOPTÉE.

On recommenda que dans chaque bulletin, on indique la prochaine date de parution.

#### c) Comité scientifique

S. Orvig seconda K. Hage lorsque celui-ci proposa l'adoption du rapport du comité scientifique tel que publié dans le numéro du congrès (pp. 57–58). MOTION ADOPTÉE.

J. Powell annonça la nomination de quatre nouveaux membres: MM. H.-R. Cho, J.-G. Cantin, S. Pond et P. Smith.

#### d) Comité permanent d'information publique

N. Cutler proposa, secondée par D. Fraser, l'adoption du rapport du comité permanent d'information publique tel que publié dans le numéro du congrès (pp. 56-60). MOTION ADOPTÉE.

N. Cutler discuta le rapport du comité et de la réunion du 21 mai. Elle annonça que le comité établira une liste de films à conseiller, destinée aux organismes publics, aux écoles et qu'il s'intéressera à la question de cours de formation principalement ceux visant des non-météorologistes à l'extérieur de SEA.

#### e) Comité d'éligibilité des membres

C. McLeod proposa, secondé par D. Fraser, l'adoption du rapport du comité d'éligibilité des membres tel que publié dans le numéro du congrès (pp. 60-61) MOTION ADOPTÉE.

C. McLeod indiqua que le comité tint sa première réunion le 21 mai et qu'il examina un certain nombre de questions concernant les types de membres, le recrutement pour les groupes d'études de sujets particuliers et la raison pour laquelle la Société perd des membres.

#### f) Comité de développement financier

R. Angle proposa, secondé par L. O'Quinn, l'adoption du comité de développement financier tel que publié dans le numéro du congrès (pp. 61-62). MOTION ADOPTÉE.

J. Powell commenta les besoins en nouveaux membres.

## g) Comité sur le professionnalisme

R. Angle proposa, secondé par R. Jones, l'adoption du rapport du comité sur le professionnalisme tel que publié dans le numéro du congrès (pp. 62-63). MOTION ADOPTÉE.

R. Angle indiqua que le comité était maintenant actif, qu'il tient une réunion tous les mois et qu'il a élaboré un code d'éthique qui sera publié, pour commentaires, dans un prochain numéro du Bulletin de nouvelles. Il nota que le comité préparait un annuaire de consultants en sciences de l'atmosphère et que ce dernier tente de cerner la définition de météorologiste.

#### h) & i) Comités des récompenses et des citations

N. Cutler proposa, secondée par P. LeBlond, l'adoption du rapport tel que publié dans le numéro du congrès (pp. 63). MOTION ADOPTÉE.

#### j) Archiviste de la Société

J. Powell rapporta, au nom de M.K. Thomas, que ce dernier cherchait à accumuler et à rassembler de l'information sur les activités passées de la Société.

#### 5. Rapports annuels des Centres locaux et des Sections

R. Burling proposa l'adoption des rapports des centres et des sections tels que publiés dans le numéro du congrès (pp. 64–77). Après que plusieurs centres et sections aient fait une mise à jour de leurs acivités, D. Bauer seconda la proposition. MOTION ADOPTÉE.

Quelques discussions eurent lieu concernant le financement par subvention des centres et sections mais on nota que ceci était du ressort du Bureau d'administration de 1980-81.

#### 6. Budget de 1980 et budget projeté de 1981

Après discussions et explications sur des détails du budget, R. Angle proposa, secondé par R. Burling, l'adoption du budget de 1980 et du budget projeté de 1981 tel que publié dans le numéro du congrès (p. 52). MOTION ADOPTÉE.

#### 7. Propositions du Conseil

## a) Cotisations et frais d'abonnement pour 1981

R. Angle proposa, secondé par P. Merilees, les nouveaux taux pour 1981: membres, aucun changement, \$30; étudiants, aucun changement, \$10; institution, augmenté à \$40; membre de soutien, augmenté à \$75. MOTION ADOPTÉE.

J. Powell remarqua que l'augmentation pour les institutions fut recommandée par les Presses de l'université de Toronto et le CRSNG en raison du nombre de lecteurs dans ces institutions; cette augmentation n'est qu'un premier pas puisque la récente campagne publicitaire tentait d'attirer ce genre de nouveaux membres.

#### b) Amendements aux règlements

Après discussion, J. Whiting proposa, secondé par L. O'Quinn, l'adoption en français et en anglais des amendments aux règlements (Appendice 1). MOTION ADOPTÉE.

### c) Code d'éthique pour membres professionnels

R. Burling proposa, secondé par J. McBride, la distribution, pour discussion, du code d'éthique envisagé. MOTION ADOPTÉE.

# d) Création des groupes d'étude de sujets particuliers

J. Powell décrivit le bien fondé des groupes d'étude de sujets particuliers et nota que le Conseil recommanda l'adoption de la procédure sur une base d'essai de deux ans (Appendice 2). J. McBride proposa, secondé par W. Evans, que soit adopté l'idée des groupes d'étude de sujets particuliers et de la procédure pour une période de deux ans. MOTION ADOPTÉE.

#### e) Revue Chinook pour les membres intéressés

J. Powell donna les résultats du questionnaire concernant la revue Chinook dans le Bulletin de nouvelles et il nota que la plupart des réponses indiquaient une préférence, soit comme partie intégrante de la cotisation, soit comme supplément facultatif. Le conseil considère qu'un arrangement sur une base optionnelle est préférable. J. Whiting proposa, secondé par E. Hamilton, que la Société s'occupe de l'arrangement facultatif à condition que 100 abonnements soient reçus. MOTION ADOPTÉE.

## Proposition de changement dans les termes de référence pour les prix et récompenses de la SCMO

J. Maybank proposa, secondé par D. Bauer, la reformulation des termes de référence pour l'octroi de prix et récompenses de la SCMO (Appendice 3). MOTION ADOPTÉE.

### 8. a) Localisation des futurs congrès

#### Congrès de 1981

Après avoir présenté un projet de congrès à l'université de la Saskatchewan, campus de Saskatoon J. Whiting proposa, secondé par D. Bauer, que le congrès 1981 ait lieu à l'université de la Saskatchewan, campus de Saskatoon. MOTION ADOPTÉE.

#### Congrès de 1982

Au nom du Centre d'Ottawa, E. Hamilton invite la SCMO à ce que son congrès de 1982 ait lieu à l'université d'Ottawa, de concert avec les Sociétés Savantes. J. McBride proposa, secondé par P. Merilees, la tenue du congrès de 1982 à Ottawa. MOTION ADOPTÉE.

#### Congrès de 1983

Des invitations ont été reçues de la part du Centre d'Halifax et de l'Alberta. Aucune décision n'a été prise à cet effet.

# b) Siège du prochain bureau d'administration

Après discussion, on retient le choix de Toronto ou d'Halifax comme siège du prochain bureau d'administration.

#### 9. Autres

#### a) Exposition canadienne de la science, 1980

Les gagnants du prix de la SCMO à l'exposition canadienne de la science à Thomson, Manitoba, sont Aileen et Tom Havden, de Saskatoon, pour leur montage relatif aux les nuages.

#### b) Conférencier SCMO/SEA pour 1980-81

Le SEA continuera à soutenir les conférenciers itinérants: on considère la possibilité de séparer en partie est et partie ouest la tournée de conférences.

#### c) Rapport de CNC/SCOPE

J. Powell, s'adressant au nom de J. McTaggart-Cowan, représentant de la SCMO (observateur) à la réunion du 20 mai du SCOPE remarqua que la SCMO peut apporter une contribution de valeur; certains secteurs importants sont examinés.

# 10. Rapport du Comité de mise en candidature

D. Bauer lu le rapport du comité de mise en candidature publié dans le numéro du congrès (p. 78) et proposa son adoption, secondé par R. Burling. MOTION ADOPTÉE.

J. Powell félicita le nouveau bureau d'administration et remercia le bureau sortant, le conseil, les rédacteurs, les différents comités, présidents et membres et les comités de programme et du congrès pour leurs travaux durant l'année.

#### 11. Intronisation des officiels pour 1980-81

Le nouveau bureau fut présenté et ses membres intronisés. J. Maybank remercia le bureau d'administration sortant et souhaita la bienvenue aux membres du nouveau bureau. D. Bauer proposa une résolution de remerciements pour le bureau sortant.

À 23:30, avec 23 membres présents, E. Hamilton proposa l'ajournement de l'assemblée.

J. Renick Secrétaire d'assemblée

# **Appendice 1**

# AMENDEMENTS AUX RÈGLEMENTS

# RÈGLEMENT 6 (c) se lira désormais:

Un comité d'éligibilité des membres devra être formé. Le comité se composera d'un président nommé par le Conseil, et d'un membre nommé par chaque centre ou le cas échéant par chaque section. Le secrétaire-correspondant sera un membre ex-officio de ce comité. Le comité devra préparer un rapport annuel de ses activités pour le Conseil.

#### RÉGLEMENT 12, article additionnel (h):

Les centres locaux devront nommer des représentants à certains comités de la Société, tel que nécessaire.

# RÈGLEMENT 13 (e) se lira désormais:

Les sections devront normalement être affiliées au plus proche centre pertinent, dont elles peuvent recevoir une partie des fonds de la Société alloués à ce centre pour assurer leur fonctionnement. Les fonds disponibles devront être approximativement proportionnels au rapport du nombre de membres au centre et à celui de la section. Les conflits de juridiction ou de finance devront être tranchés par le conseil en consultation avec les centres et ou sections en question.

### RÈGLEMENT 13, article additionnel (f):

Le correspondant de chaque section devra faire rapport au Conseil, par l'intermédiaire du centre local, des activités de la section durant l'année précédante.

# RÈGLEMENT 13, article additionnel (g):

Une section peut nommer un représentant à certains comités de la Société si elle le désire.

# PROCÉDURE POUR LES GROUPES D'ÉTUDE DE SUJETS PARTICULIERS

Lors de rencontres précédentes du Conseil et du Bureau d'administration, il semblait y avoir un accord général quant à l'idée de l'existence de groupes d'étude de sujets particuliers à intérieur de la Société. Cette idée a été mise de l'avant dans le *Bulletin de nouvelles* de juin 1979 et on demanda à tous les centres, sections et membres de la Société d'examiner la question et de faire des suggestions. Le Conseil n'a pas été submergé de suggestions, la seule réponse négative fut celle du Centre de Montréal qui ne voyait pas l'utilité de tels groupes de spécialistes; cependant, d'autres entrevoient un rôle pour ces groupes à l'intérieur de la Société.

Les points suivants sont présentés comme base de marche à suivre générale pour le fonctionnement de tels groupes, sous les auspices de la Société.

- Le Conseil désire encourager les activités des groupes, là où le besoin en est exprimé, dans la perspective de la contribution qu'ils peuvent apporter à la profession en général et à la Société en particulier, par exemple, en organisant des groupes de travail, des sessions spéciales au congrès, ou en publiant une feuille de nouvelles ou encore par l'envoi de manuscrits au Bulletin de nouvelles ou à ATMOSPHERE-OCEAN.
- Les groupes avec un nombre actuel ou potentiel de 15 intéressés, membres de la SCMO, peuvent communiquer avec la SCMO et demander d'être accrédités.
- 3) De tels groupes serviront la Société en stimulant l'intérêt de la communauté scientifique et du publique, pour leur domaine respectif, en organisant des rencontres scientifiques; en agissant comme lien entre la Société et d'autres organisations nationales ou internationales intéressées à leurs domaines et en avisant le Conseil lors de prise de position sur des sujets relatifs à leurs domaines d'intérêt.
- 4) Les groupes seront animés par un comité directeur (qui devra être approuvé par le Conseil) composé d'un président et d'un secrétaire. De tels groupes seront listés dans le Bulletin de nouvelles et chaque membre aura l'occasion d'indiquer l'intérêt qu'il porte à un (des) groupe(s) particulier(s). Les groupes feront rapport au Conseil par le biais du secrétaire.
- 5) La participation aux groupes sera ouverte aux membres et aux non-membres de la Société, cette dernière encourageant une plus grande participation d'individus oeuvrant ou ayant un intérêt dans les domaines moins fondamentaux des sciences atmosphériques et océanographiques.
- 6) En tout temps, les membres de la SCMO doivent former la majorité dans un groupe particulier et ceux du comité directeur doivent être membres de la SCMO. Les groupes seront financièrement indépendants. La Société est prête à donner une subvention initiale à chaque groupe effectivement reconnu.
- Un rapport sur les activités du groupe est exigé pour le rapport annuel (congrès) de la Société; d'autres rapports sur les activités du groupe seront demandés pour archivage.
- Chaque groupe aura son propre champ d'activité, sous approbation du Conseil, de sorte que l'ensemble de ceux-ci opèreront indépendamment tout en étant chapautés par la SCMO.
- Les conflits de juridiction concernant les disciplines ou domaines d'intérêt de groupes seront tranchés par le Conseil en consultation avec les groupes impliqués.

Procès-verbal de l'AGA, le 22 mai 1980 / 68

# PRIX ET RÉCOMPENSES DE LA SOCIÉTÉ CANADIENNE DE MÉTÉOROLOGIE ET D'OCÉANOGRAPHIE\*

# a) Prix du président

Le prix du président peut être décerné chaque année civile à un membre (ou des membres) de la Société, pour une publication exceptionnelle en météorologie ou en océanographie. Seules les communications présentées aux assemblées nationales ou aux réunions des centres locaux ou des sections de la Société et publiées subséquemment dans une revue scientifique reconnue rendent leurs auteurs éligibles à ce prix et cela seulement dans l'année même de leur publication.

## b) Prix du Dr Andrew Thomson en météorologie appliquée

Le prix de météorologie appliquée peut être décerné chaque année civile à un membre (ou des membres) de la Société pour une publication exceptionnelle dans le domaine de la météorologie appliquée.

## c) Prix pour étudiant diplômé

Un prix spécial pour étudiant diplômé peut être décerné lorsqu' une publication ou une thèse spécialement méritoire en météorologie et/ou en océanographie et portée à l'attention du Comité des récompenses.

#### d) Prix de météorologie opérationnelle Rube Hornstein

Le prix de météorologie opérationnelle Rube Hornstein peut être décerné chaque année civile à un individu pour un travail exceptionnel dans l'exploitation des services météorologiques, au sens large du terme, en excluant cependant comme critère d'évaluation les publications scientifiques, à moins que les résultats de ces recherches ne soient déjà utilisés pour améliorer la performance au jour le jour des services d'exploitation. Le travail pour lequel le prix est donné peut avoir été effectué durant plusieurs années précédant l'année en cours ou encore, pour un accomplissement exceptionnel.

\*Les changements dans la formulation sont indiqués en lettres grosses.

### 1 Introduction

Briefly, the CMOS enjoyed a stable, relatively prosperous year. Membership has been increasing slowly and now stands at just over 800, approximately 20% of whom are oceanographers, and the rest meteorologists by profession. Financial constraints have been eased somewhat, with the receipt at the start of the year of a \$5,500 NSERC grant to aid in journal publication. Membership dues continue to be the major source of funds at roughly \$24,000, followed by the \$16,000 subvention from the AES. An important new development for the society in 1980 has been the embryonic establishment of a permanent office address in Ottawa.

### 2 National Executive and Council

The National Executive consists of President, Vice-President, Treasurer, Corresponding Secretary and Recording Secretary. Effective operation requires that these five officers be co-located or at least in reasonable proximity to each other; at the present time the executive is concentrated in Edmonton. Past experience has shown, too, the value of having the *Newletter* editor and the chairman of the Public Information Committee from the same area as the National Executive.

The 1979–80 executive, under President John Powell, steered the CMOS through the first months of 1980, leading up to the year's Congress in May. Activities during this period centred on report preparation for the Annual General Meeting, preparations for Congress and the regular review of upcoming finances. With notification that we had received a special publications grant from NSERC for \$5,500 some of the pressure was removed from the annual budget-balancing problem.

Following Congress, the new executive took office as scheduled. The newly-elected Vice-President was Dr E. Lozowski, and the Corresponding Secretary P. Kociuba. R.P. Angle and J. Renick continued in office as Treasurer and Recording Secretary, respectively. A well-established "cycle of activities" calendar ensured that the routine operational activities of the Society were undertaken as required.

For other than routine matters, the governing body of CMOS is its Council, consisting of the National Executive, the Chairmen of Local Centres, and the Past President, plus three Councillors-at-Large. It customarily meets three times a year. Significant new activities for CMOS in the past year included establishment of our first Special Interest Group and the successful conclusion of negotiations with the Canadian Association of Physicists to obtain some permanent office services from them. Both are discussed in greater detail in subsequent sections of this report.

#### **3** National Committees

Many CMOS activities are carried out by committees that have been established for particular purposes by Council. Some of these are more-or-less permanent and on-going, while others are set up to perform a specific task and then disband. Only a few of the more significant committee actions during the past year are reported on here.

One of the major concerns of the Scientific Committee has been the organization within NSERC of the granting committees for meteorological and oceanographic research fund support. There is no single committee for either science, nor for them jointly. Rather, some meteorology applications get considered by the Space and Astronomy Committee, others by the Earth Sciences Committee, through an apparently arbitrary decision process. Applications in physical and chemical oceanography go to the latter committee on which there is presently no oceanographer. The CMOS Scientific Committee has on several occasions recommended to NSERC that a single review committee be set up for both sciences together. At their fall meeting, the present situation was reviewed, and it was again decided to press NSERC to modify their granting structure. A detailed proposal is to be made to them in 1981, following input from the various universities presently active in meteorological and oceanographic research.

Closely related to the above topic is the matter of university teaching of meteorology now that AES has withdrawn from professional training. The apparent discrepancy between present demand for qualified meteorologists and the relatively small number of students entering meteorological courses is the major concern. On the basis of the Scientific Committee's recommendation, a special task force is to be set up in 1981 to address this problem and to suggest ways of ameliorating it. The recently announced AES
scholarship program is obviously one such way, and news of it was received with appreciation by the Scientific Committee at their November meeting.

The Scientific Committee reviewed the imminent demise of Ocean Station P. While deeply regretting the loss of this observation platform for both meteorological and oceanographic activities, the committee members did not feel that they could recommend its continued operation, considering the severe financial constraints facing AES. If such a high cost item were to be kept, other important activities would have to be curtailed severely, including most research on developing alternatives to the ocean station. The Committee did direct the CMOS to write the Minister of Environment Canada, expressing our concerns and asking for increased attention to be focussed on use of satellite observations to replace "Papa."

The Scientific Committee undertook a study of computer facilities available in Canada for meteorological and oceanographic purposes and considered them to be inadequate to meet present needs. They also reviewed the principle of CMOS producing occasional "Position Papers" on controversial topics, such as acid rain, for news media use (one had been produced in 1978 on weather modification). While concluding that such brief, balanced statements as envisaged would be a valuable service to the public, it was felt that "Acid Rain" was not presently amenable to such treatment. Following next spring's meetings in Albany and the CMOS Congress, the proposal would be reviewed again, as would the possibility of producing a position paper on private forecast services.

The Public Information Committee has representatives from each CMOS Centre plus two members who provide liaison with AES and OAS. It is designed to provide information to the general public, or to specific groups on matters of concern to the Society. Encouragement of a better understanding of the sciences of meteorology and oceanography, including the production of news releases to correct misleading news media reports, falls within its purview.

When, in the latter half of 1980, Environment Canada distributed a draft document on Public Information Access, requesting comments and criticisms, the Public Information Committee prepared the CMOS reply. It was presented at the Environment Canada public hearing in Edmonton in early December.

The Membership Committee is directed to monitor the general state of health of CMOS from the standpoint of its membership numbers and distribution across the country. It is further required to review from time to time the membership category structure to determine whether it could be improved.

One important recommendation made by this committee in 1980 was that a category of "Associate Member" be established. It would provide most of the benefits of full membership, for a reduced annual fee; the principal difference between the two categories would be that associate members would not receive *ATMOSPHERE-OCEAN*. The recommendation would hopefully result in a larger number of non-professional meteorologists and oceanographers joining the CMOS. In addition, professionals in related disciplines might more readily join, to affiliate themselves with our Special Interest Groups as they become established. The danger would be that paid circulation of *ATMOSPHERE-OCEAN* might drop badly if many present full members transferred over to associate status. Clearly, CMOS Council will move very cautiously on this recommendation.

The Professionalism Committee is presently composed entirely of meteorologists, drawn from the various employment areas (i.e. Federal Government, Provincial Government, University, Corporation and Private Consulting). Its role has been firstly to determine what qualifications might be appropriate to being considered a "professional meteorologist," and secondly to recommend codes for professional conduct and ethics.

It was considered important for CMOS to address such matters because, despite the increasing numbers of meteorologists engaged in consulting work, environmental assessments and reviews were frequently being produced such that the meteorological component had been undertaken by someone from another scientific discipline, usually an engineer. A code of ethics is in its final drafting stages and is being distributed for discussion and comment by the Society members.

At the end of 1980, the Professionalism Committee also produced a Directory of Consultants in Meteorology and Oceanography. It consists of unedited submissions from some 27 firms and individuals, most of them one-page statements about their staff, capabilities and facilities. This constitutes about 30% of the organizations that had been invited to submit. It is expected that a second edition may become necessary in a year or so.

#### 4 Organizational Structure

As in the past, the Society's operations are focussed regionally through our Centres and Chapters. The implementation in 1980 of two new structural arrangements will, it is hoped, further broaden and strengthen our overall organization.

There are presently 11 CMOS Centres in existence plus two of the smaller Chapter units, with at least one centre or chapter in every province except Prince Edward Island. Their activities consist of meetings, monthly in nearly every case, at which local or visiting scientists speak, plus extension work in the region including support of school science fairs and the like. A highlight of each winter's programme is the visit of the AES Tour Speaker; in 1980 this was Dr Michael Glantz who happened to be on leave of absence from NCAR at the time.

Financial support for the Centres is provided through subventions from the CMOS national funds, and is based on the total centre membership in such a way as to favour those with fewest members. Amounts awarded in 1980 varied from about \$115 to over \$450. Chapters receive their funds through the Centres with which they are affiliated; the two presently in existence are in New Brunswick and Newfoundland, and hence are included with the Halifax Centre for subvention purposes. As in the past most of these funds are for notices and communication costs and defray speaker expenses at their meetings.

The formation of Special Interest Groups was approved at the 1980 Annual General Meeting on a two-year trial basis. Briefly, they provide for affiliations within CMOS according to scientific discipline, in addition to the geographic affiliations that Centres and Chapters provide. It was expected that these groups would most likely be formed in subject areas that were peripheral to so-called "mainstream" meteorology and oceanography, and might therefore have members who did not belong to CMOS. In this way it is hoped to broaden the Society's outlook and to increase other scientists' awareness of meteorology and oceanography. Thus agriculturalists, engineers, hydrologists and marine biologists might become affiliated with CMOS (if not actually become members) through the establishment of appropriate Special Interest Groups. It was agreed that a minimum of 15 CMOS members should be a requirement for starting such a group, and that a majority of its members should belong to the Society.

At the Council meeting in October, the first petition to establish a Special Interest Group was received and approved. It is in Air Pollution Meteorology, and as would be expected, several engineers and medical doctors working in the field of air pollution research have been attracted to this group. Its first major undertaking will be the organizing of several special sessions on air pollution at the 1981 CMOS Congress.

In addition, as the year ended, discussions have taken place about the potential for establishing Special Interest Groups in such areas as hydrology, marine biology, agrometeorology (including forest meteorology) and climatology, but no formal petitions have been submitted. As with the formation of new Centres, the National Executive feels that although they should be encouraged, their healthy growth and continued existence is more likely to be assured if the primary push comes up from the members themselves, and not downward from the Society's officials.

It has been a frequent complaint from our members that, while they might know who the particular executive member is that they wish to reach, they do not know his address. With the inevitable changes each year in office-holders, such things as applications for membership frequently are directed to the Corresponding Secretary of several years ago. More serious are the problems caused by the fact that CMOS does not send out its dues renewal notices and hence lacks ready access to its own membership list. As these notices and the incoming payments are handled on our behalf by the U of T Press (for a sizable fee) as an adjunct to the printing of ATMOSPHERE-OCEAN, and as from their point of view there is no need to distinguish between CMOS members and journal subscribers (not always institutions), our membership list when we do get one consists of an amalgam of both. The Society is also constrained, by not controlling the renewal notice process, from offering additional publications for a fee, from requesting Centre or Special Interest Group affiliation, and from getting address label subsets of its members for particular purposes.

It has been felt for some time that while a permanent office with a full-time staff would be nice to have, it was too expensive a luxury for a society as small as CMOS. However, in late 1979 negotiations were commenced with the Canadian Association of Physicists to see whether we could obtain some office services from them under a contractual arrangement. The CAP has roughly twice the membership of CMOS, and as it does not have to support a scientific journal (the *Canadian Journal of Physics*, produced by NRC, serves this role), it has considerably greater financial resources available for other uses. For some years, therefore, the CAP has maintained an office in Ottawa, which presently has a full-time staff of three.

A small computer console was purchased in 1980 capable of maintaining and sorting membership information from which lists and address labels can be quickly printed out for a variety of purposes.

The negotiations reached fruition towards the end of 1980, with the CAP formally agreeing to the use of its office as a mailing address for the CMOS, and the services of the staff to handle and forward the mail. Also included in the agreement was the printing and sending out of dues and renewal notices, the handling of the incoming payments, plus the distribution of the *Newsletter* and other CMOS notices to its members. Naturally, we would be charged for these services according to the work involved. At the CMOS Council Meeting in October the agreement was formally ratified for a two-year trial period. Accordingly, the official address of the Society is now: Suite 903, 151 Slater Street, Ottawa, Ont. K1P 5H3 (phone: 613/237-3392).

It is expected to be several months at least before this arrangement will become significant. Firstly, new CMOS stationery will have to be printed and distributed. Secondly, our present membership list will have to be organized in the appropriate format to be entered into the CAP computer. Thirdly, a new dues notice will have to be designed compatible with that computer's capabilities. A special committee was set up at the Council meeting to effect these last two items through close cooperation with the CAP's Executive Secretary.

#### **5** National Congresses

The 1980 conference was primarily a meeting of the American Geophysical Union, with the CMOS being merely one of several minor cosponsors. As such, it was, simultaneously, one of the easiest and most frustrating Congresses to plan for and organize that we have ever had. Aside from the huge total attendance of several thousand (compared to 300 or so that CMOS Congresses generally attract) and the correspondingly large numbers of papers and concurrent sessions, there were several other significant departures from custom. In the first place the Congress lasted six days extending over a weekend, which made it difficult and expensive for CMOS members to attend the entire affair. There was no unifying theme for the Congress, papers were solicited and accepted on any topic, and a fee was charged for submission. Neither the Local Arrangements Committee nor the CMOS Programme Committee had much control over the organization of functions and the scheduling of the scientific sessions. Finally, it was not possible to identify specific CMOS contributions to the programme, and the abstracts were not available for inclusion in *ATMOSPHERE-OCEAN*'s Congress issue.

There were compensations, however, particularly for the oceanographers in the Society. A total of 350 or so presentations were officially scheduled in the two disciplines, compared to the usual 70–100 at previous CMOS Congresses. The vast majority were in oceanographic fields; for comparison, 22 sessions were officially listed as being Oceanography, and only 6 as being Meteorology. However, most climatological research was presented under the former field, so the relative discrepancy was not as large as first appeared. In addition, there were sessions in hydrology and planetary atmospheres that were of considerable interest to at least some CMOS members. Indeed, the major advantage of such a large meeting was the ability of attendees to broaden their interests by being exposed to research under way in related geophysical sciences beyond the confines of meteorology and oceanography.

As 1980 drew to a close, plans for the 1981 Congress in Saskatoon were well under way. For 1982, the tentative Congress location is Ottawa; this was approved at the 1980 Annual General Meeting, but is normally subject to confirmation at the time of the immediately preceding Congress. For 1983, possible locations have been suggested by the Halifax and Alberta Centres.

#### **6** CMOS Publications

As in the past few years, the prestige of the Society rests to a great degree on the scientific reputation of ATMOSPHERE-OCEAN. The quality of the research papers being submitted for publication remains high, and includes a sizable number of foreign presentations, signifying that the international community accepts ATMOSPHERE-OCEAN as a suitable place to publish their research. The quantity of submissions remains somewhat below a desirable level, however, and there is a noticeable paucity of papers coming from the AES. In 1980, the number of articles published was 24, and the total volume of four quarterly issues amounted to 336 pages. In addition, there was the Annual Congress Issue, coming out in early May, which at 80 pages was somewhat thinner than usual; as mentioned earlier this was because abstracts of the papers being presented at the Congress were not available from the AGU for inclusion in it. During 1980 the editorship changed hands. Dr T.R. Oke, having completed a three-year stint as Editor, relinquished the position at the time of the Congress. He was replaced by Dr H.G. Leighton of McGill University. The transfer was effected smoothly, thanks largely to the continuity provided by the editorial committee and the continuation in office of the Deputy Editor (responsible for the oceanographic component) Dr P.H. LeBlond of UBC, and of the Technical Editor, E.J. Truhlar of AES.

The CMOS Newsletter has become the chief source of Society news for, and about, our members and has gradually increased in size to some 24-30 pages an issue. Customarily bimonthly, the pressures of publication caused us to combine the two mid-year issues into one in September. Its scope is becoming increasingly broad and now includes book reviews, employment opportunities and announcements for conferences of potential interest to our members. By having the Editor co-located with the National Executive, the Newsletter can be used to disseminate information and items of interest as they arise during Executive and Council meetings. In 1981 it is hoped to have the Newsletter printed locally as well, thereby expediting its delivery to our members.

#### 7 Other Society Activities

The appearance a couple of years ago of *Chinook*, a Canadian magazine devoted to popularizing meteorology, was of considerable interest to the CMOS. The Society had several meetings with its editor about ways in which we could help each other. The first result of such negotiations was that during 1980, CMOS members were canvassed, via the *Newsletter*, about whether they would like to receive *Chinook* as an optional extra. Sufficient interest was shown that a special subscription price was offered. By the end of the year, the necessary minimum of one hundred requests had been received, and the arrangement was finalized. For the future it is expected that this will become a regular option, available via our membership renewal notice.

The CMOS continues as a sponsoring organization for the Youth Science Foundation, making a regular annual grant to it of \$75.00. In addition most Local Centres award prizes to local science fairs for various school levels.

Increasingly, the CMOS is being called on to name meteorologists and oceanographers to various national committees. In some cases we are merely asked to suggest the names of appropriate scientists, while in others the persons so recommended are intended to serve as CMOS representatives. Only for the latter does the Society consider CMOS membership to be a requirement; for the former we try to select the best qualified or most appropriate individuals regardless of affiliation.

For the recently etablished Canadian National Committee for the World Climate Research Program (CNC/WCRP), the CMOS, jointly with AES and OAS, provides NRC with the names of potential members for this committee. In addition, the president of CMOS is an ex-officio member.

For the Canadian National Committee for the International Union of Geodesy and Geophysics (CNC/IUGG) CMOS continues to recommend four members, two to represent each of our scientific disciplines. This is the committee that annually produces the *Canadian Geophysical Bulletin*, with the editors for the meteorology and oceanography sections being appointed by the CMOS Scientific Committee.

Other national committee involvement includes the following: (i) a CMOS representative on the Climate Advisory Committee for the Canadian Climate Program; (ii) a CMOS observer on the Canadian Committee on Oceanography; and (iii) a CMOS nominee on the newly reconstituted NRC Commitee for International Scientific and Technological Affiliations (CISTA).

Finally, through the Centres, the Society is represented on a number of provincial committees. The nature of these varies from agricultural meteorology to air pollution and environmental advisory councils. In most cases the body is multidisciplinary, and thus affords CMOS the opportunity of broadening its impact at the local or regional level.

#### 8 Acknowledgements

As outgoing President, I wish to express my appreciation for the great efforts expended by other members of the National Executive in keeping the Society operating smoothly. I would also like to acknowledge the endeavours of chairmen and members of our various committees and of Local Centre and Chapter executive officers. The health of a small Society such as ours is very dependent upon the unstinting commitment of volunteers for these various functions. We have been fortunate in securing their enthusiasm for the CMOS and I hope we shall continue to be successful in obtaining the widespread involvement of our members. Thank you very much

J. Maybank President

# RAPPORT DU PRÉSIDENT

#### **1** Introduction

En bref, la dernière année s'est avérée stable et relativement prospère pour la SCMO. Le nombre de membres a sensiblement augmenté et on compte aujourd'hui en peu plus de 800 membres parmi lesquels on retrouve à peu près 20% d'océanographes, le reste étant des météorologistes. Les contraintes financières ont été sensiblement amoindries par une subvention de \$5,500 du CRSNG au début de l'année, pour supporter notre revue. Toutefois, la principale source de revenus de la Société demeure la contribution des membres avec un apport de près de \$24,000, suivi par une subvention de \$16,000 du SEA. En 1980, un fait nouveau marquant pour la Société a été l'installation bien qu'au stade embryonnaire d'une permanence à Ottawa.

## 2 Le Conseil et le Bureau national d'administration

Le Bureau national d'administration est composé d'un président, un vice-président, un trésorier, un secrétaire-correspondant et un secrétaire d'assemblée. Il est nécessaire, pour le bon fonctionnement de la Société, que ces cinq membres soient regroupés en un même endroit ou, tout au moins, non loin l'un de l'autre; pour le moment, le Bureau d'administration de la Société se trouve à Edmonton. Les expériences passées ont aussi démontré l'importance de regrouper dans le Bureau d'administration le rédacteur du Bulletin de nouvelles et le président du Comité d'information publique de la même région.

Le Bureau d'administration de l'année 1979–80, sous la direction du président John Powell, à dirigé la SCMO, des premiers mois de l'année 1980 au congrès annuel de la Société en mai. Pendant cette période, les activités ont été centrées sur la préparation d'un rapport pour l'assemblée générale annuelle, sur l'organisation du Congrès et l'étude des questions financières. Toutefois, avec l'annonce de la subvention de \$5,500 du CRSNG pour notre revue, le problème de l'équilibre du budget de l'année s'est trouvé considérablement allégé.

Après la tenue du Congrès, le nouveau bureau d'administration est entré en fonction tel que prévue avec pour nouveau vice-président le M. E. Lozowski et le secrétaire-correspondant était P. Kociuba. MM. R.P. Angle et J. Renick ont continué à occuper leur poste respectif de trésorier et de secrétaire d'assemblée. Un calendrier bien établi du travail courant à été créé afin que toutes les activités nécessaires au fonctionnement efficace de la Société soient entreprises.

Le Conseil est en quelque sorte le moteur de la SCMO pour les activités autres qu'administratives. Il est composé des membres du Bureau national d'administration, des présidents des centres locaux, du président sortant et de trois conseillers généraux. Le Conseil se réunit généralement trois fois par année. Parmi les plus importantes réalisations de la SCMO pendant l'année 1980, on retrouve la mise sur pied de notre premier groupe d'étude de sujets particuliers et un accord plus que satisfaisant avec l'Association canadienne des physiciens en vue d'obtenir des services administratifs permanents. D'ailleurs, ces deux réalisations feront l'objet d'un exposé plus détaillé dans l'une des parties suivantes de ce rapport.

## 3 Les comités nationaux

Des comités ont été chargés par le Conseil de réaliser certaines tâches de la SCMO. Certains de ces comités sont plus ou moins permanents et suivent les progressions d'un projet; d'autres, qu'on pourrait appeler "ad hoc" sont créés pour réaliser certaines tâches bien précises puis sont dissous une fois l'objectif atteint. Je n'énumérerai ici que quelques unes des plus importantes réalisations de ces comités durant l'année qui vient de se terminer. L'une des principales tâches du Comité scientifique a été la mise sur pied, à l'intérieur du CRSNG de comités chargés de l'octroi de subventions destinées à la recherche en météorologie et en océanographie. Aucun comité ne se rapporte spécifiquement à l'une ou aux deux sciences ci-mentionnées. On considérera plutôt, par un processus de décision qui peut sembler arbitraire, que certaines demandes d'aide d'une branche donnée de la météorologie puissent plus particulièrement intéresser le comité d'astronomie et d'études spatiales, ou que tel autre domaine donné relève plus du comité des sciences naturelles. Les requêtes déposées par les comités de recherche de chimie et de physique océanographique seront par le fait même, elles-aussi acheminées vers le comité chargé des sciences naturelles ou on ne retrouve d'ailleurs aucun océanographe. A plusieurs reprises, le Comité scientifique de la SCMO a recommandé au CRSNG la création d'un seul comité d'étude pour les deux domaines scientifiques. Ainsi, l'automne dernier, lors de leur rencontre, les membres de la SCMO ont ré-étudié la situation qui prévaut dans le domaine des subventions et ont décidé, encore une fois, d'exercer des pressions sur le CRSNG afin qu'il modifie son système de subventions. C'est en 1981 que l'on formulera une proposition détaillée pour faire suite à une requête de diverses universités qui sont impliquées dans la recherche en météorologie et en océanographie.

Une question connexe est l'enseignement universitaire en météorologie suite au retrait du SEA du secteur de la formation professionnelle. Le principal problème est l'écart évident entre le nombre requis de météorologistes qualifiés et le contingent relativement faible d'étudiants inscrits aux cours de météorologie. Suite aux de récommandations du Comité scientifique un groupe d'étude doit être créé en 1981 pour cerner le problème et émettre des suggestions pour y remédier. D'ailleurs, le programme d'octroi de subventions d'études du SEA récemment dévoilé s'inscrit clairement dans cette ligne et a été reçu avec satisfaction par le Comité scientifique lors de sa réunion en novembre dernier.

Le Comité scientifique a aussi considéré l'arrêt prochain des activités de la plate-forme d'observation "Ocean Station P." Malgré le regret profond des membres du Comité pour cette perte autant dans le domaine météorologique qu'océanographique, ils n'ont pas jugé essentiel de recommander la poursuite du programme, à la lumière des sérieuses difficultés financières auxquelles le SEA a à faire face; afin de poursuivre ce programme, on aurait dû sacrifier d'autres projets importants incluant l'étude des solutions de remplacement pour une station océanographique. C'est pourquoi le Comité a suggéré à la SCMO d'écrire au Ministre d'Environnement-Canada afin d'exprimer ses craintes et d'attirer une attention particulière sur l'utilité d'observations par satellite pour remplacer la station "PAPA."

Le Comité scientifique a aussi effectué une étude sur les installations d'ordinateurs pour les recherches météorologiques et océanographiques au Canada et a souligné qu'elles ne répondaient plus aux besoins actuels. Le comité s'est aussi penché sur la question de publier à l'occasion des "Communiqués de prise de position" à l'usage des média d'information sur des sujets d'actualité controversés, tels les pluies acides, et comme celui émis en 1978 sur les changements climatologiques; on a convenu de l'utilité publique, de ce genre de communiqués brefs et pondérés tels qu'on les conçoit; toutefois, on n'a pas cru à propos, pour l'instant, de soulever le problème des "pluies acides." On reconsidérera tout de même cette suggestion après les rencontres du printemps prochain à Albany et le congrès de la SCMO. On étudiera aussi, probablement, la possibilité de présenter des communiqués de prise de position relatifs aux services de prévisions atmosphériques privés.

Le Comité d'information publique est formé de réprésentants de chaque centre de la SCMO et de deux membres qui font le lien entre la Société, le SEA et SOA. Il a pour objectif d'informer le public ou encore des groupes particuliers sur des sujets qui intéressent la Société. Il lui appartient aussi, d'encourager une meilleure compréhension des buts des sciences de la météorologie et de l'océanographie ainsi que d'émettre des communiqués pour corriger certains bulletins de nouvelles des média qui induisent le public en erreur.

Lorsque, pendant le deuxième semestre de 1980, Environnement-Canada a fait circuler l'ébauche d'un document sur le libre accès du public à l'information, dans le but d'obtenir commentaires et critiques constructives, le Comité d'information publique a préparé la réponse de la SCMO. Elle a été présentée lors de l'audience publique tenue par Environnement-Canada à Edmonton, au début du mois de décembre.

Le Comité d'éligibilité des membres doit s'assurer de l'état de santé de la Société en se basant sur la quantité de membres et leur répartition à travers le pays. Il est par le fait même nécessaire de réviser périodiquement le système de catégorisation des membres afin de déterminer s'il y a lieu de l'améliorer.

Le Comité a fait une importante recommandation, en 1980, suggérant la création d'une catégorie de "Membres-Associés." Ces membres-associés bénéficieraient de la plupart des avantages d'un membre à part entière à un coût d'inscription annuel réduit; la principale différence entre les deux catégories résiderait dans le fait que les membres-associés ne recevraient pas la revue ATMOSPHERE-OCEAN. Cette initiative aurait pour but d'augmenter le nombre de météorologistes et d'océanographes non-professionels au sein de la SCMO. De plus, il est probable que des professionnels de spécialités connexes se joindraient plus spontanément à la Société pour s'affilier à des groupes d'étude de sujets particuliers au fur et à mesure de leur création. Toutefois, il est à considérer comme probable que le tirage payant de la revue ATMOSPHERE-OCEAN baisserait particulièrement si plusieurs de nos membres à part entière déjà inscrits décidaient d'opter pour le statut d'associé. Il est donc évident que le Conseil de la SCMO étudiera cette recommandation avec circonspection.

Le Comité sur le professionnalisme est, pour l'instant, composé uniquement de météorologistes de différents secteurs (i.e. gouvernement fédéral, gouvernement provincial, universitaire, société commerciale et experts-conseils privés). Son rôle est de déterminer quelles sont les qualités requises pour être considéré "météorologiste professionnel" et, ensuite, de suggérer un code d'éthique pour les pratiquants professionnels.

La SCMO, a jugé important de s'attaquer à cette tâche parce que, bien qu'on retrouve une quantité grandissante de météorologistes impliqués dans le travail de consultation, des études sur l'environnement sont souvent faites par des spécialistes d'autres disciplines scientifiques, plus souvent qu'autrement par des ingénieurs, même lorsque des facteurs météorologiques entrent en ligne de compte. On s'applique présentement à la rédaction de ce code d'éthique pour le distribuer aux membres de la Société afin d'engager des discussions et de recevoir des commentaires.

À la fin de 1980, le Comité sur le professionnalisme a, de plus, préparé un annuaire des experts-conseils en météorologie et en océanographie. Cet annuaire regroupe les soumissions de 27 firmes et spécialistes qui, pour la plupart sur une page, présentent l'inventaire de leurs effectifs, de leurs ressources et de leur équipement. On y retrouve à peu près 30% des organisations contactées. Par le fait même, il est donc probable qu'un second annuaire soit mis en circulation d'ici à peu près un an.

#### 4 Structure de l'organisation

Comme par le passé, les activités de la Société grâce à ses centres locaux et à ses sections sont surtout régionales. Il est à souhaiter que l'année 1981 verra s'élargir et se renforcer notre organisation dans son ensemble grâce à deux nouvelles structures mises sur pied en 1980.

On retrouve présentement onze centres locaux de la SCMO et deux sections plus petites répartis partout à travers le Canada, sauf à l'Ile du Prince Édouard. Dans la majeure partie des centres, des conférences où l'on invite des scientifiques, sont organisées mensuellement. De plus, le travail régional de ces centres s'étend aussi au support d'expositions scientifiques dans le milieu scolaire et autres organisations du genre. Un des principaux points d'intérêt du programme hivernal annuel est la visite d'un conférencier délégué du SEA; en 1980, M. Michael Glantz était ce délégué, puisqu'il bénéficiait d'un congé du National Center for Atmospheric Research.

L'aide financière accordée aux centres locaux est tirée des fonds nationaux de la SCMO et les montants alloués le sont en fonction du nombre de membres affiliés au centre de façon à favoriser les centres où l'on retrouve le moins de membres. Les montants distribués en tant qu'aide financière en 1980 variaient entre \$115 et \$450. Les sections reçoivent une aide du centre auquel elles sont affiliées. Les deux sections pour le Nouveau-Brunswick et Terre-Neuve sont donc affiliées au Centre d'Halifax pour ce qui est des subventions. Comme par le passé, ces subventions servent à défrayer les frais de communication et d'avis qui sont distribués ainsi que les coûts afférents à la participation d'un conférencier à leurs réunions.

La formation de groupes d'étude de sujets particuliers à été approuvée lors de l'assemblée générale annuelle de 1980 à titre d'essai sur deux ans. En bref, ils justifient leur affiliation à la SCMO par leurs caractéristiques scientifiques dans des disciplines précises, et correspondent sur le plan géographique avec les centres et les sections. On s'attend à ce que ces groupes soient formés à partir de points d'intérêt relevant d'une définition générale des objectifs de l'océanographie et de la météorologie; ainsi, les membres de ces groupes ne seraient pas nécessairement membres de la SCMO. On espère ainsi élargir les perspectives de la Société et augmenter l'intérêt porté par d'autres scientifiques à la météorologie et à l'océanographie. Peut-être qu'ainsi, des agronomes, des ingénieurs, des hydrologues et des biologistes en sciences marines viendraient s'affilier à la SCMO par l'entremise d'un de ces groupes d'études de sujets particuliers (s'ils ne sont déjà membres). Il a été convenu qu'un minimum de 15 membres de la SCMO était nécessaire à la formation d'un tel groupe et qu'une majorité des membres de ce groupe doit préalablement être membre de la Société.

C'est à la réunion du Conseil en octobre que la première requête pour la formation d'un groupe d'étude de sujets particuliers a été reçue et accordée. Ce groupe traite sur le plan météorologique de la "pollution de l'air" et, tel que nous le prévoyions, il est formé de plusieurs ingénieurs et docteurs en médecine impliqués dans la recherche sur la pollution de l'air. Son premier objectif est d'organiser une série de groupes de travail sur la pollution de l'air au Congrès de la SCMO en 1981.

De plus, à la fin de l'année, des discussions ont été entreprises afin d'étudier l'éventualité de la formation de groupes d'étude de sujets particuliers dans des domaines comme l'hydrologie, la biologie marine, l'agrométéorologie (incluant la météorologie forestière) et la climatologie, sans que l'on ait toutefois reçu de requête. Le bureau national d'administration est d'avis que tout comme la formation de nouveaux centres qui doit être encouragée, la formation des groupes d'étude de sujets particuliers ne reposera sur une base solide que si elle résulte d'un besoin exprimé par les membres plutôt que par le Bureau lui-même.

Des membres se sont plaints fréquemment que, même s'ils connaissent le nom d'un membre du Bureau d'administration qu'ils doivent rejoindre, il n'ont pas, par contre, son adresse. En raison de changements annuels, certaines demandes d'adhésion à la Société, par exemple, sont adressées au secrétaire-correspondant qui était en poste quelques années auparavant. Des problèmes plus sérieux sont occasionnés par le fait que la SCMO n'envoie pas elle-même les formules de ré-inscription à ses membres et n'a pas un accès rapide à sa liste de membres. Comme ces envois d'avis et le paiement des comptes ont été confiés aux Presses de l'université de Toronto, à un coût important en plus des coûts d'impression de la revue ATMOSPHERE-OCEAN et comme, pour les Presses de l'université nul n'est besoin de faire une différence entre les membres de la SCMO et les abonnés à notre revue, notre liste de membres lorsque nous en avons une, est faite d'un amalgame des deux listes. Dès lors, en ne contrôlant pas le processus des renouvellements, la Société ne peut pas facilement vendre des exemplaires supplémentaires, demander la liste des membres de certains centres ou groupes d'étude de sujets particuliers et elle ne peut non plus demander les étiquettes pré-adressées d'un sous-groupe de ses membres.

On a senti, à un moment donné, toute la nécessité d'une permanence avec des employés réguliers mais une société aussi petite que la SCMO ne peut se prévaloir d'un luxe aussi onéreux. On a tout de même entrepris, à la fin de 1979, des négociations avec l'Association canadienne des physiciens pour étudier la possibilité d'obtenir d'eux une aide pour le travail de bureau en signant un accord contractuel. L'ACP a presque le double des effectifs de la SCMO et, n'ayant pas à défrayer le coût d'une revue scientifique (puisque le Journal canadien de physique publié par le CRSNG joue ce rôle), elle a de plus grandes ressources financières disponibles à d'autres fins. Ainsi, depuis déjà quelques années, l'ACP possède son propre bureau administratif, à Ottawa avec trois employés à plein temps. Ils ont de plus contracté l'achat d'un petit ordinateur qui garde en mémoire une liste des membres et qui peut l'imprimer rapidement pour une variété d'usages comme des étiquettes d'addresse.

C'est vers la fin de 1980 que nous sommes arrivés à un accord avec l'ACP qui permet aujourd'hui au courrier destiné à la SCMO d'être acheminé par les bureaux de l'ACP et c'est le personnel en place qui reçoit et expédie notre courrier. L'accord stipule aussi que l'ACP s'engage à imprimer et à expédier les comptes, les avis de ré-inscription, à faire circuler nos comptes à recevoir en plus de s'occuper de la distribution du *Bulletin de nouvelles* et autres avis de la SCMO à ses membres. Il est évident que les frais encourus pour ces services seront portés à notre compte. On a donc ratifié cet accord à l'assemblée du Conseil de la SCMO en octobre pour essai sur deux ans. Ainsi, la Société a maintenant une adresse officielle qui est:

151 rue Slater, Suite 903 Ottawa (Ontario) K1P 5H3 Tél: (613) 237-3392

Toutefois, il faudra encore plusieurs mois avant que les effets de cet accord ne se concrétisent vraiment. En premier lieu, la nouvelle adresse des locaux de la SCMO doit être imprimée et distribuée. Puis la liste de nos membres devra être reformulée d'une façon bien précise pour permettre qu'elle soit enregistrée par l'ordinateur de l'ACP. Finalement, les avis de paiement devront être, eux aussi, reformulés pour permettre la programmation de l'ordinateur. Un comité spécial a d'ailleurs été formé à l'assemblée du Conseil, comité qui aura pour tâche de s'occuper des deux derniers points en travaillant en étroite collaboration avec le secrétaire-administratif de l'ACP.

#### 5 Les congrès nationaux

La conférence de 1980 s'est déroulée lors de la réunion de l'American Geophysical Union (AGU) où la SCMO se bornait au simple rôle de co-participant. Pour nous, ce fut, un des congrès les plus frustrants mais, d'autre part, un des plus faciles à préparer et à organiser. En plus de l'énorme assistance de plusieurs milliers de participants (comparée aux quelques 300 participants aux congrès de la SCMO), en plus des nombreuses communications et des groupes d'étude simultanés, on a dérogé plus d'une fois à la tradition. Pour commencer, le congrès a duré six jour, y compris une fin de semaine, ce qui a rendu difficile et onéreuse la tâche des membres de la SCMO de participer à toutes les activités. Il n'y avait pas de thème central et les communications étaient sollicitées et acceptés sans qu'on tienne compte du sujet; on devait aussi payer un certain montant pour les soumettre.

En fait, ni le Comité local d'organisation ni le Comité du programme de la SCMO n'avait vraiment de contrôle sur le fonctionnement et sur l'horaire des groupes d'étude scientifiques. Enfin, il a été impossible d'identifier les contributions faites au congrès par la SCMO sans compter qu'il nous a été impossible d'obtenir le résumé des communications pour les publier dans le numéro spéciale du congrès de la revue ATMOSPHERE-OCEAN.

Certains y trouvèrent tout de même des compensations, plus particulièrement les océanographes de la Société. Au total, quelques 350 conférenciers étaient officiellement inscrits à l'ordre du jour dans les deux disciplines, comparativement aux 70 ou 100 des précédents congrès de la SCMO. La grande majorité de ces conférenciers réprésentaient le domaine de l'océanographie; en guise d'exemple, 22 groupes d'étude étaient officiellement inscrits en océanographie, alors que seulement six l'étaient en météorologie. Mais l'écart n'était pas aussi grand qu'il semble puisque bon nombre de recherches climatologiques étaient présentées en océanographie. Il est à noter, aussi, que certains groupes d'études sur l'hydrologie et sur l'atmosphère terrestre n'ont sûrement pas manqué d'intérêt pour certains de nos membres. En fait, le principal avantage d'une aussi grande assemblée est la possibilité qu'elle donne aux participants d'élargir leur champ d'intérêts alors qu'il leur est fait part de recherches géophysiques à l'intérieur des domaines de la météorologie et de l'océanographie.

Vers la fin de 1980, les travaux de préparation du congrès de Saskatoon en 1981 étaient déjà entrepris. La ville d'Ottawa a été suggérée pour le Congrès de 1982; on a approuvé ce choix mais la confirmation officielle se fait habituellement au congrès précédent. Les centres d'Halifax et de l'Alberta se sont offerts pour recevoir les participants au congrès de 1983.

#### 6 Les publications de la SCMO

Comme par les années passées, le prestige de la Société repose en grande partie sur la réputation dans les milieux scientifiques de la revue ATMOSPHERE-OCEAN. La qualité des exposés scientifiques soumis pour publication, demeurant très élevée et incluant une quantité respectable de travaux de l'étranger, représente bien la confiance accordée par la communauté scientifique internationale à la revue ATMOSPHERE-OCEAN. Malgré cela, la quantité de soumissions demeure tout de même en dessous de ce que l'on considère être un niveau désirable; de plus, la quantité d'articles soumis par le SEA est relativement faible. En 1980, nous avons publié 24 articles et le volume total des 4 parutions trimestrielles était de 336 pages. En complément, il y a eu le numéro du congrès annuel au début de mai qui, avec ses 80 pages, était tout de même moins volumineux qu'à l'habituel; comme il l'a été mentionné plus tôt, cet état de chose est dû à l'impossibilité d'obtenir de l'AGU le résumé des études présentées au congrès.

C'est aussi en 1980 que le post de rédacteur en chef a changé de titulaire. M. T.R. Oke, après avoir occupé, sans relâche, pendant trois ans ce poste, a démissionné au moment du congrès. Il a été remplacé par M. H.G. Leighton de l'Université McGill. Le transfert des pouvoirs s'est effectué sans anicroches et c'est au Comité de rédaction qui a assuré la continuité, au rédacteur adjoint P.H. LeBlond de l'UBC et au rédacteur technique E.J. Truhlar de SEA qui sont tous deux demeurés en poste, qu'en revient le mérite.

Le Bulletin de nouvelles de la SCMO est devenu la principale source d'information de la Société sur les sujets impliquant ses membres et son volume a graduellement augmenté pour atteindre entre 24 et 30 pages par parution. Il demeure bi-mensuel mais en raison d'un manque de temps pour la publication nous avons dû combiner les deux éditions mi-annuelles en une seule, mise en circulation en septembre. Son champ d'intérêt augmente sans cesse et comporte maintenant des articles sur des livres, des offres d'emploi et l'annonce de conférences qui peuvent intéresser nos membres. Le rédacteur et le Bureau d'administration national se trouvant non loin l'un de l'autre, le Bulletin est utilisé plus efficacement pour faire circuler les informations et fait connaître les événements d'intérêt général dès qu'ils se présentent lors des réunions du Conseil et du Bureau d'administration. Nous espérons, en 1981, être capable d'imprimer le Bulletin de nouvelles localement pour pouvoir en faire la distribution immédiate à nos membres.

#### 7 Activités diverses de la Société

La SCMO s'est considérablement interessée, depuis quelques années déjà, à la revue Chinook, une revue canadienne qui tente de populariser la météorologie. Le rédacteur en chef du magazine ainsi que des membres de la Société se sont rencontrés à quelques reprises afin de déterminer en quels sens nous pourrions nous aider mutuellement. Le premier résultat concret de ces discussions a été, en 1980, la consultation des membres de la SCMO, par le biais du *Bulletin de nouvelles*, pour savoir s'ils étaient interessés à recevoir *Chinook* en guise de supplément facultatif. Suite à l'intérêt manifesté par plusieurs membres, on a fixé un prix spécial d'abonnement. À la fin de l'année, le minimum nécessaire de 100 abonnements a été atteint et on a conclu l'entente avec la direction de *Chinook*. Nous prévoyons maintenant offrir cet abonnement (toujours facultativement) à tous les membres qui désirent se ré-inscrire.

La SCMO continue de parrainer la Fondation des jeunesses scientifiques en faisant une subvention annuelle de \$75. De plus, la majeure partie des centres locaux offrent des récompenses lors des expositions régionales sur les sciences, aux étudiants de différents niveaux.

De plus en plus, la Société est appelée à désigner des météorologistes et des océanographes pour siéger dans certains comités nationaux. En certaines occasions, on nous demande de suggérer les noms de scientifiques alors qu'en d'autres situations, ces personnes recommandées sont désignées pour servir de représentants de la Société; la personne doit alors nécessairement être membre de la SCMO; pour les autres, la Société s'applique plutôt à désigner la personne la plus compétente en la matière sans tenir compte de son affiliation à la Société.

La SCMO, aidée du SEA et SOA, fournit au Comité national canadien pour le programme mondial de recherches sur le climat (CNC/PMRC) nouvellement établi, une liste de personnes qui pourraient éventuellement devenir membre du dit comité. Le président de la SCMO est membre d'office du comité.

La SCMO délègue toujours quatre de ses membres pour siéger dans le Comité national canadien de l'Union géodesique et géophysique internationale (CNC/UGGI), soit deux représentants pour chacune des deux disciplines. C'est ce comité qui publie annuellement le *Bulletin canadien de géophysique* en coopération avec des rédacteurs des sections "météorologie" et "océanographie" designés par le Comité scientifique de la SCMO.

La Société s'implique dans d'autres comité nationaux:

- Un délégué de la SCMO fait partie du Comité consultatif en climatologie du Programme climatologique canadien;
- 2) Un observateur de la SCMO fait partie du Comité canadien d'océanographie;
- Un représentant de la SCMO siége au comité du CNR nouvellement reconstitué, le Comité sur les affiliations scientifiques et techniques internationales (CASTI).

Enfin, c'est par l'intermédiaire de ses centres que la Société est représentée dans plusieurs comités provinciaux. Ces comités touchent à des domaines comme l'agrométéorologie, la pollution de l'air ou encore à la consultation sur l'environnement. Généralement, ce sont des groupes pluri-disciplinaires, ce qui permet à la SCMO d'augmenter son impact aux niveaux régional et local.

#### 8 Remerciements

En tant que président sortant, je désire exprimer ici ma reconnaissance aux autres membres du Bureau national d'administration pour les efforts qu'ils ont fournis, efforts qui ont permis à la Société de fonctionner de façon souple et constante. Je voudrais aussi souligner les efforts déployés par les présidents et les membres des différents comités et les administrateurs des centres locaux et des sections. Le bon fonctionnement d'une petite Société comme la nôtre dépend du dévouement désintéressé et du bénévolat des membres. C'est un privilège pour nous d'avoir bénéficié de leur enthousiasme inébranlable envers la SCMO et je crois que nous pourrons, dorénavant, continuer à compter sur leur participation unanime. Merci de votre attention.

> J. Maybank Président

## **TREASURER'S REPORT**

Our financial situation improved markedly in 1980 with the year-end balance showing a net gain of nearly \$8,000. This was the combined result of higher than anticipated income and lower than anticipated expenses.

The income from dues and subscriptions rose sharply from that in 1979 largely because of the 20% increase in rates. Membership has grown much more quickly than in previous years, perhaps reflecting the impact of the journal promotion by the University of Toronto Press. This promotion also accounts for the unusually large sales of back issues of ATMOSPHERE-OCEAN. Our application to the Natural Sciences and Engineering Research Council for journal support was successful, but continued support in the future is unlikely. Voluntary page charges amounted to much more than expected, thanks to the generosity of our authors and their institutions. ATMOSPHERE-OCEAN had no advertisers in 1980, a bit of a disappointment in view of the policy change and expected revenue. Our low 1979 equity is responsible for low interest income. The Congress held jointly with the American Geophysical Union Spring Meeting in Toronto produced no income whatsoever.

The cost of ATMOSPHERE-OCEAN was down slightly, while commissions paid to the University of Toronto Press for handling subscriptions and dues collection were up. Newsletter costs were also up, reflecting the growth and importance of this organ to the Society. Operating costs of the Executive and Council were extremely low, a direct result of the substantial support provided by the employers of our Society officers.

The net gain on the year's transactions raises our equity to slightly over \$14,000, more than double that of the previous year. This comes only \$2,500 short of restoring the equity situation achieved in 1978. However, the American Society of Association Executives recommends that a society such as ours should have reserves equal to at least 50% of its annual budget. This means that our Society should have double its present equity. This is a goal that the Financial Development Committee will work towards.

The account numbers and names shown in the Appendix are somewhat different from those of previous years. As before, the 100s represent income; the 200s, expenses; the 300s, assets; and the 400s liabilities. Some old accounts have been combined and a number of new ones have been introduced to facilitate a separation of the various activities of the Society, especially the journal and different types of committees.

The budget for 1981 and the projected budget for 1982 are prepared on a break-even basis. A grant from NSERC is expected in 1981, but the likelihood in 1982 is not known. Page charges maintain their present level and advertising in the journal produces some revenue. Each Congress generates the target profit and there is modest growth in membership and subscriptions. The *Newsletter* undergoes expansion in 1981, and the Executive/Council Operations increase with steps toward the relocation of the Executive to the Ottawa area. Other expenses also have a modest increase. In 1982, however, our financial situation will be tight unless a grant from NSERC or OAS can be secured. In order to balance the budget without such revenue, restraints and cutbacks will be necessary.

R.P. Angle Treasurer

## RAPPORT DU TRÉSORIER

Notre situation financière s'est grandement améliorée en 1980 alors que le solde finale indiquait un gain net de près \$8,000, résultat de revenus plus élevés et de dépenses plus faibles que prévu.

En raison d'une augmentation de 20% des cotisations et des abonnements le revenu de cette source augmenta sensiblement par rapport à celui de 1979. Le nombre de membres a connu une croissance plus rapide que par les années passées, résultat probable de la publicité faite par les Presses de l'université de Toronto, ce qui favorisa aussi la vente, inhabituelle, d'un grand nombre d'anciens numéros d'*ATMOSPHERE-OCEAN*. La demande de subvention, pour le journal, auprès du CRSNG a été couronnée de succès mais dans le futur, on ne s'attend pas à ce que cette aide continue. Les frais de publication volontaires furent une source de revenus plus importante que ce à quoi on s'attendait grâce à la générosité des auteurs et de leurs employeurs. Aucune publicité ne fut insérée dans *ATMOSPHERE-OCEAN* en 1980, ce qui désappointe un peu puisqu'on s'attendait à tirer des revenus de ce changement de politique. Notre faible réserve sous forme d'actions ordinaires ne nous procura que de faibles revenus d'intérêts. Le Congrès, tenu conjointement avec la rencontre du printemps de l'AGU, ne nous apporta aucun revenu de quelque nature que ce soit.

Les coûts pour ATMOSPHERE-OCEAN ont légèrement diminués alors que la redevance payée aux Presses de l'université de Toronto pour s'occuper des abonnements et des cotisations était à la hausse. Les coûts pour le Bulletin de nouvelles étaient aussi à la hausse, reflet de la croissance et de l'importance de ce médium pour la Société. Les coûts de fonctionnement pour le Bureau d'administration et le Conseil étaient extrêmement bas, résultat direct du soutien substantiel fourni par les employeurs des officiels de la Société.

Le gain net sur nos transactions augmenta notre avoir à un peu plus de \$14,000, soit plus de double de l'année dernière, ce qui, n'est qu'à \$2,500 près du montant accumulé en 1978. Malgré tout, l'American Society of Association Executives recommande qu'une société telle que la nôtre ait avoir une réserve au moins égale à la moitié de son budget annuel. Ce qui signifie que l'avoir de notre Société devrait être le double de ce qu'il est; le Comité pour le développement financier fait de cette constatation un de ses objectifs.

Les numéros de comptes et les noms donnés à l'appendice sont quelque peu différents de ceux des années passées. Comme auparavant, 100 indiquent une source de revenus; 200 dépenses; 300, les sommes au fonds de roulement; et 400, des engagements. Quelques anciens comptes ont été combinés et un certain nombre de nouveaux ont été créés pour faciliter le partage entre les différentes activités de la Société, principalement la revue et les différents comités.

Le budget de 1981 et celui anticipé pour 1982 visent à joindre les deux bouts. On s'attend à une subvention du CRSNG en 1981 mais c'est incertain pour 1982. Les frais de publication seront au même niveau qu'actuellement et on s'attend à des revenus provenant de la publicité publiée dans la revue. Chaque congrès génère les profits désirés et bien que modeste, il y a croissance du nombre de membres et des abonnements. Le *Bulletin de nouvelles* prend de l'ampleur en 1981 et les coûts de fonctionnement pour le Bureau d'administration et le Conseil augmentent, en raison de la relocalisation du Bureau à Ottawa. Les autres dépenses augmentent légèrement. Malgré tout, financièrement nous serons à l'étroit en 1982, à moins qu'une subvention du CRSNG ou des SOA ne vienne nous aider. Sans ces revenus, de façon à équilibrer le budget, des restrictions et des coupures seront nécessaires.

> R.P. Angle Trésorier

## CANADIAN METEOROLOGICAL AND OCEANOGRAPHIC SOCIETY/ LA SOCIÉTÉ CANADIENNE DE MÉTÉOROLOGIE ET D'OCÉANOGRAPHIE

## INCOME AND EXPENSE STATEMENT/ÉTAT DU REVENU ET DES DÉPENSES

INCOME/REVENU	1980	1979
Dues and Subscriptions/Cotisations et abonnements	\$32,655.66	\$24,694.59
AES Grant/Subvention SEA	16,000,00	16,000,00
NSERC Grant/Subvention CRSNG	5,500.00	0.00
Page Charges/Frais de publication	3,879.05	0.00
Advertising/Annonces	75.00	25.00
Interest/Intérêts	1,534.54	1,687.53
Congress/Congrès	0.00	5,000.00
Others/Divers	1,626.95	2,448.78
	\$61,271.20	\$49,855.90
EXPENDITURES/DÉPENSES		
ATMOSPHERE-OCEAN	\$31,937.64	\$33,222.41
Newsletter/Bulletin de nouvelles	4,101.44	3,289.67
Commissions	4,182.91	3,273.75
Centres	2,888.50	1,886.50
Executive and Council Operations/Fonctionnement		
du Bureau d'administration et du Conseil	1,626.00	5,395.94
Scientific Committee/Comité scientifique	2,304.50	1,250.25
Other committees/Autres comités	5.70	61.80
Prizes/Prix	980.32	1,861.43
Congress/Congrès	5,159.78*	5,386.09
Other/Divers	105.00	10.58
	\$53,291.79	\$55,638.42
NET GAIN/REVENUNET	\$ 7,979.41	(\$5,782.52)

"Includes \$1,000 advance to Saskatchewan Centre to host 1981 Congress/Comprend une avance de \$1,000 à notre Centre de la Saskatchewan où se tiendra le congrès de 1981.

## STATEMENT OF FINANCIAL POSITION/BILAN

Cash/Coises (Bouel Beak/Banous Bouels)	\$ 5 238 50	
Cash/Caisse (Royal Bank/Banque Royale)	\$ 5,450.55	\$ 5,174.32
Short-Term Deposit/Dépôt à court terme	0.00	0.00
Development Fund/Fonds de développement	4,433.87	4,433.87
Development Fund Interest/Intérêt du fonds de développement	2,675.08	1,919.17
Hornstein Fund/Fonds Hornstein	1,000.00	1,000.00
Hornstein Fund Interest/Intérêt du fonds Hornstein	277.15	256.47
Bell Canda Shares/Parts de Bell Canada	720.00	738 00
Accounts Receivable/Comptes à recevoir	320.00	320.00
	\$14,664.69	\$13,841.83
LIABILITIES/PASSIF		
Accounts Payable/Comptes à payer	439.45	7,578.00
	\$14,225.24	\$ 6,263.83
SOCIETY'S EQUITY/AVOIR DE LA SOCIÉTÉ		
Equity at end of previous year/Avoir à la fin		A.B. Paula
de l'année précedente	6,263.83	12,089.85
Increase from operations/Augmentation des opérations	7,979.41	(5,782.52)
Increase from Bell Canada Shares/Augmentation		
des parts de Bell Canada	(18.00)	(43.50)
Equity at end of year/Avoir à la fin de l'année	\$14,225.24	\$ 6,263.83

## APPENDIX/APPENDICE

## BALANCE OF EACH ACCOUNT/SOLDE DE CHAQUE COMPTE

No.II	N° Account Name/Nom de compte	
101	Dues and Subscriptions/Cotisations et abonnements	\$31,865.66
102	Sustaining Members/Membres de soutien	790.00
103	Grants/Subventions	16,000.00
104	Congress revenue/Revenus du Congrès	0.00
105	Interest/Intérêts	1,475.50
106	Dividends/Dividendes	59.04
107	Newsletter advertising/Annonces, dans le Bulletin de nouvelles	75.00
108	Other/Divers	563.60
152	Page Charges/Frais de publication (A-O)*	3,879.05
153	Advertising/Annonces (A-O)	0.00
154	Grants/Subventions (A-O)	5,500.00
155	Other/Divers (A-O)	1,063.35
202	Newsletter Production/Publication du Bulletin	2,275.00
203	Newsletter Distribution/Distribution du Bulletin de nouvelles	1,826.44
205	Collections/Commissions	4,182.91
208	Scientific Committee/Comité scientifique	2,304.50
209	Congress/Congrès	5,159.78
210	Centres/Centres	2,888.50
211	Executive and Council/Bureau d'administration et Conseil	1,626.00
212	Prizes and Citations/Prix et citations	980.32
219	Translations/Traductions	30.00
220	Standing Committees/Comités permanents	5.70
222	Ad hoc Committees/Comités ad hoc	0.00
224	Other/Divers	75.00
251	Printing/Impression (A-O)	27,762.44
252	Distribution/Distribution (A-O)	1,852.69
253	Technical Editing/Rédaction technique (A-O)	1,374.80
254	Translation/Traduction (A-O)	0.00
255	Overhead/Frais du fonctionnement (A-O)	947.71
301	Cash/Caisse	5,238.59
302	Short-Term Deposits/Dépôt à court terme	0.00
303	Development Fund/Fonds de développement	4,433.87
304	Development Fund Interest/Intérêt du fonds de développement	2.675.08
305	Hornstein Fund/Fonds Hornstein	1,000.00
306	Hornstein Fund Interest/Intérêt du fonds Hornstein	277.15
309	Bell Canada Shares/Parts de Bell Canada	720.00
310	Accounts Receivable/Comptes à recevoir	320.00
401	Accounts Payable/Comptes à payer	439.45

\*ATMOSPHERE-OCEAN

#### BUDGET

INCOME REVENUE 1981	1704
Membership Dues/Cotisations \$22,200	\$23,300
Subscriptions/Abonnements 11,200	11,800
Sustaining Memberships/Membres de soutien 900	1,000
AES Grant/Subvention SEA 16,000	16,000
Other Grants/Autres subventions 4,2001	
Page Charges/Frais de publication 4,000	4,400
Advertising/Annonces 500	1,000
Interest/Intérêts 2,000	2,000
Congress/Congrès 1,000	1,000
Other/Divers 500	500
\$62,500	\$61,000
EXPENDITURES/DÉPENSES	
ATMOSPHERE-OCEAN \$35,500	\$35,000
Newsletter/Bulletin de nouvelles 5,500	5,000
Commissions 4,500	4,0002
Centres 3,000	3,000
Executive and Council operations/Fonctionnement	
du Bureau d'administration et du Conseil 3,500	3,500
Scientific Committee/Comité scientifique 3,500	3,500
Other committees/Autres comités 1,000	1,000
Congress/Congrès 6,000	6,000
\$62,500	\$61,000

<sup>1</sup> NSERC grant expected in 1981/Subvention du CRSNG prévue pour 1981

<sup>2</sup> Costs of handling memberships and subscriptions should be reduced when the Society completes its move to the offices of the Canadian Association of Physicists in Ottawa./Les frais de bureau concernant les cotisations des membres et les abonnements devraient se trouver réduits lorsque la Societé sera installée dans les bureaux de l'Association canadienne des physiciens à Ottawa.

## AUDITOR'S REPORT

I have examined the Statement of Financial Position of the Canadian Meteorological and Oceanographic Society as of December 31, 1980 and the related Income and Expense statement for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances, except as noted in the following paragraph.

In common with many similar organizations, the Society reports amounts for dues and subscriptions revenue which are not susceptible of complete verification by audit procedures. Accordingly, my verification of dues and subscription revenue was limited to a comparison of recorded receipts with bank deposits.

In my opinion, except for the possibility of adjustments, had dues and subscriptions revenue been susceptible of complete verification, these financial statements present fairly the financial position of the Society as of December 31, 1980, and the results of its operations for the year then ended, in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Edmonton, Alberta February 16, 1981

H.B. McDonald, RIA

## RAPPORT DU VÉRIFICATEUR

J'ai examiné le bilan de la Société canadienne de météorologie et d'océanographie au 31 décembre 1980 et l'état du revenu et des dépenses pour l'année se terminant à cette date. J'ai fait mon examen en respectant les normes généralement acceptées et en utilisant les essais et les autres méthodes que je considérais nécesaires dans les circonstances, excepté comme expliqué dans le paragraphe suivant.

Comme plusieurs autres organisations semblables, la Société rapporte les montants pour les revenus provenant des cotisations et des abonnements qui ne sont pas susceptibles d'une vérification complète par les procédés d'apurement. Alors ma vérification des revenus provenant des cotisations et des abonnements fut limitée à une comparaison des recettes enregistrées avec les dépots en banque.

A mon avis, sauf pour la possibilité de corrections, si les revenus provenant des cotisations et des abonnements avaient été susceptibles d'une vérification complète, ces bilans présentent équitablement la situation financière de la Société au 31 décembre 1980 et les résultats de ses activités en 1980, conformément aux principes comptables généralement acceptés tels qu'appliqués d'une façon compatible avec celle de l'an passé.

Edmonton, Alberta le 16 février 1981

H.B. McDonald, RIA

## EDITORIAL COMMITTEE REPORT

Last year marked the end of the term of office of Tim Oke as Editor of ATMOSPHERE-OCEAN following publication of issue 18–2. It is a tribute to Tim's excellent organization of the journal operations that the transfer of the Editor's Office to Montreal was smooth and uneventful. Apart from the change in Editor, the composition of the Editorial Committee remained almost unchanged.

The past year has been a somewhat disappointing one for ATMOSPHERE-OCEAN. After a steady increase in the numbers of papers submitted in the previous two years, there was a significant decrease in 1980. We cannot emphasize strongly enough the obvious fact that the well-being of our journal is dependent upon the support given it by Canadian meteorologists and oceanographers in the form of articles submitted for publication. This is of course not unusual; a similar statement could equally well be made about several prominent national and international journals. The decline we experienced in 1980 has occurred before and we are sure that with your support this trend will be reversed.

Our circulation figures are encouraging. Total circulation is over 1,150 copies in spite of the elimination of almost all complimentary and exchange subscriptions and the AES bulk subscription. This represents a 15% increase in the total paid subscriptions and memberships over the previous year.

The financial position of the journal has also improved in the last year, partly owing to an increase in revenue from memberships and subscriptions, partly to a publication grant from the Natural Sciences and Engineering Research Council of Canada, which was gratefully received for the first time, and partly also to the continued success of the policy of inviting authors to submit voluntary page charges. Contributions ranging from 10 to \$40 per page were received from authors of one-half of the articles published in Volume 18. So far no advertisements have been submitted for publication in *ATMOSPHERE-OCEAN*, however, it is anticipated that this will become a useful source of revenue. Our legal action against the Post Office for second class mailing privileges is moving slowly through the courts. Although it seems very likely that we will be successful, there now appears to be more doubt that we will receive reimbursement for past overpayments.

The Editorial Committee has functioned relatively well considering our limited ability to meet. Many members of the committee have been most helpful in making suggestions regarding how we might alleviate some of our problems, in actively soliciting articles and in arranging for reviews. The response of the committee to questions raised by Council that could have a major impact on the journal was especially valuable.

> H.G. Leighton, Editor ATMOSPHERE-OCEAN

## RAPPORT DU COMITÉ DE RÉDACTION

C'est avec la publication du numéro 18-2, que le mandat de Tim Oke comme rédacteur d'ATMOSPHERE-OCEAN a pris fin. Le transfert sans heurts vers Montréal du bureau du rédacteur montre l'excellente organisation des opérations de la revue, ce qui est tout à l'honneur de Tim. Exception faite du rédacteur, la composition du Comité de rédaction demeure la même.

L'année dernière fut plutôt désappointante; en effet, après avoir connu une augmentation du nombre de manuscrits soumis à ATMOSPHERE-OCEAN durant les deux années précédentes, on nota une diminution substantielle. On ne peut insister assez sur le fait que la bonne santé de notre revue dépend du support que lui procure les météorologistes et océanographes canadiens, support exprimé sous forme d'articles soumis pour publication. Ceci n'est pas un phénomène isolé puisqu'on peut dire la même chose à propos de plusieurs revues prestigieuses, tant nationales qu'internationales. On a observé dans le passé des baisses analogues à celles de 1980 mais nous sommes certains qu'avec votre support, la situation se rétablira.

Le tirage est encourageant, il est à plus de 1,150 copies malgré l'élimination de la plupart des copies envoyées à titre gracieux ou sur la base d'échange et de l'abonnement en gros du SEA. Ceci représente une augmentation de 15% sur le total des abonnements et cotisations payés par rapport à l'année dernière.

La situation financière de la revue s'est améliorée l'année dernière, en partie grâce à l'augmentation du nombre de membres et d'abonnements, en partie grâce à la subvention de publication du CRSNG qu'avec gratitude nous avons reçue pour la première fois et finalement grâce au succès de la politique demandant aux auteurs une contribution volontaire (frais de publication). On a reçu, de la part des auteurs, des montants de l'ordre de 10 à \$40 et ce, pour la moité des articles publiés dans le volume 18. Jusqu'à maintenant, aucune publicité ne nous a été soumise pour publication dans *ATMOSPHERE-OCEAN*, mais on croit que dans le futur ceci s'avèrera une bonne source de revenus. Notre poursuite judiciaire contre les postes, concernant les privilèges du courrier de 2<sup>e</sup> classe progresse lentement. Même s'il semble très probable que nous ayons gain de cause, on croit de plus en plus que nous ne seront pas remboursé pour les montants payés en trop.

Le Comité de rédaction a bien fonctionné malgré le peu de possibilités de rencontres. Plusieurs membres se sont rendus très utiles par leurs suggestions quant à nos problèmes ou en encourageant la présentation d'articles et en organisant la révision. La réponse du comité aux importantes questions soulevées par le Conseil relativement à la revue a été de grande valeur.

> H.G. Leighton, Rédacteur en chef ATMOSPHERE-OCEAN

### CMOS NEWSLETTER REPORT

Publication of the CMOS Newsletter continued in the same format as established in previous years. A change in the 1980 publishing schedule resulted in combining the June and August issues.

We wish to acknowledge with thanks the support received from all members and for their contributions to the Newsletter.

Avard Mann, Editor CMOS Newsletter

## BULLETIN DE NOUVELLES DE LA SCMO

La rédaction du *Bulletin de nouvelles* de la SCMO s'est poursuivie sous le même format établi les années precédéntes. Un changement introduit sur le plan de la publication était de combiner les bulletins de juin et août.

Nous désirons remercier tous les membres pour leur contribution au Bulletin.

Avard Mann Rédacteur du Bulletin

## **REPORT OF THE SCIENTIFIC COMMITTEE**

The Scientific Committee membership in 1980-81 included:

Dr G.J. Boer (Chairman), Atmospheric Environment Service, Toronto Mr H.M. Fraser (Secretary), Atmospheric Environment Service, Winnipeg Dr C. Gauthier, Space Science and Engineering Center, Madison, Wisc. Mr P. Denison, Acres Consulting Services Ltd, Niagara Falls Dr K.D. Hage, University of Alberta, Edmonton Dr J.B. Gregory, University of Saskatchewan, Saskatoon Dr Y. Delage, Atmospheric Environment Service, Dorval

Dr J.G. Cantin, Université du Québec à Montréal, Montréal

Dr S. Pond, University of British Columbia, Vancouver

Dr P.C. Smith, Bedford Institute of Oceanography, Dartmouth

Dr H.-R. Cho, University of Toronto, Toronto

Dr J. Maybank (CMOS President), Saskatchewan Research Council, Saskatoon

The committee held two meetings in Toronto during the year, in conjunction with the CMOS Congress in May, and again on November 17.

The two subjects which continued to be most demanding of the committee's time were meteorological education and training and the availability of research funding through the Natural Sciences and Engineering Research Council.

A subcommittee drew together estimates of the future opportunities for professional meteorologists; the Scientific Committee's further investigation and discussion led to serious concern regarding the availability of meteorological graduates in the next few years. The committee saw an important role for the Society in assisting in the coordination of education and professional opportunities and recommended an active involvement to Council.

Although the committee's attempts to have a separate granting committee for Atmospheric Sciences in the NSERC structure have not been successful, considerable progress was made. The ad hoc committee on the subject has assembled impressive statistics supporting the Society's case and the matter is still being actively pursued.

Other major subjects addressed by the Scientific Committee included:

- Assessment (by an ad hoc committee) of the needs in the field of satellite research

- The ship "Papa" situation
- The need for a major Canadian computing facility
- Acid rain.

In addition, the committee received authoritative updates on GARP/ICSU; IAMAP; and the Canadian Climate Program.

> H.M. Fraser Secretary

## RAPPORT DU COMITÉ SCIENTIFIQUE

Le comité scientifique de 1980 comprend:

M. G.J. Boer (Président), Service de l'environnement atmosphérique, Toronto

M. H.M. Fraser (Secrétaire), Service de l'environnement atmosphérique, Winnipeg

M. C. Gauthier, Space Science and Engineering Center, Madison, Wisc.

M. P. Denison, Acres Consulting Services Ltd, Niagara Falls

M. K.D. Hage, Université de l'Alberta, Edmonton

M. J.B. Gregory, Université de la Saskatchewan, Saskatoon

M. Y. Delage, Service de l'environnement atmosphérique, Dorval

M. J.G. Cantin, Université du Québec à Montréal, Montréal

M. S. Pond, Université de la Colombie-Britannique, Vancouver

M. P.C. Smith, Bedford Institute of Oceanography, Dartmouth

M. H.-R. Cho, Université de Toronto, Toronto

M. J. Maybank (Président SCMO) Saskatchewan Research Council, Saskatoon

Le Comité a tenu une réunion lors du congrès, en mai 1980, et à nouveau le 17 novembre (à Toronto).

Deux sujets ont principalement retenu l'attention du Comité, soit: la formation et le perfectionnement en météorologie; la disponibilité de fonds de recherches octroyés par le Conseil de recherches en sciences naturelles et en génie.

Un sous-comité a examiné les possibilités futures d'emplois pour les météorologistes professionnels; des recherches plus poussées ont amené le Comité à s'inquièter de la disponibilité de nouveaux diplômés en météorologie d'ici les prochaines années. Le Comité entrevoit que la SCMO peut jouer un rôle important en participant à la coordination du perfectionnement et des offres d'emplois et il a recommandé au Conseil de s'impliquer fermement en ce sens.

Le Comité n'a pu obtenir du CRSNG la formation d'un comité interne distinct sur les sciences de l'atmosphère, mais des progrès considérables ont été réalisés. Le sous-comité ad-hoc chargé de ce sujet a monté un dossier impressionnant pour soutenir de la SCMO et l'on continue à s'occuper activement de cette question.

Les autres sujets d'importance touchés par le Comité comprennent entre autre:

l'évaluation (par un sous-comité ad-hoc) des besoins de recherches dans le domaine des satellites

- le bateau, "Papa"

- le besoin d'un centre canadien d'informatique

les pluies acides.

Le Comité a aussi reçu des mises à jour, de la part de source officielle, sur le GARP/CIUS, sur le programme climatique canadien et sur la AIMPA.

H M. Fraser Secrétaire

## **REPORT OF THE STANDING COMMITTEE ON PUBLIC INFORMATION**

The standing Committee consists of:

J.T. Kotylak (Chairman) Dr P. Carlson, (AES Liaison), Downsview Dr G.K. Sato, (OAS Liaison), Ottawa D.G. Schaefer, B.C. Mainland Centre Dr R.G. Humphries, Alberta Centre J. Dublin, Saskatchewan Centre N.B. Cutler, Toronto Centre Dr S. Froeschl, Montréal Centre Dr M.G. Ferland, Québec Centre A.D. Gates, Halifax Centre D.W. Boyd, Ottawa Centre L. Romaniuk, Winnipeg Centre Prof. I. Brothwick, Newfoundland Chapter

A meeting of the Standing Committe on Public Information took place just before the 1980 Congress and proved to be very valuable, since it offered the opportunity for members to meet and discuss public information concerns directly. At the meeting members agreed to work towards the preparation of a pamphlet on CMOS, to draw up a list of recommended films on meteorology and oceanography, to develop guidelines or a check-list for TV and radio weathercasting and to define the role of CMOS in relation to the content of meteorological courses given to the aviation community, power squadrons, etc.

The committee was given the responsibility of reviewing the draft policy from Environment Canada on Public Consultation and Information Availability. The review was sent to the Minister of Environment, Mr John Roberts by Dr John Maybank.

The committee re-wrote the Occupational Information Monograph on the "Meteorologist." The brochure is printed and distributed by the Guidance Centre of the University of Toronto and provides information to high school students on a career in Meteorology.

It is planned to conduct another meeting of the committee prior to Congress 1981 and to further develop the area of public information in the CMOS.

> J.T. Kotylak Chairman

#### **RAPPORT DU COMITÉ PERMANENT D'INFORMATION PUBLIQUE**

Le Comité permanent est constitué de:

J.T. Kotylak (Président) P. Carlson, (Contact SEA), Downsview G.K. Sato, (Contact SOA), Ottawa D.G. Schaefer, Centre de la C.-Britannique (intérieure) R.G. Humphries, Centre de la C.-Britannique (intérieure) R.G. Humphries, Centre de la Saskatchewan N.B. Cutler, Centre de la Saskatchewan N.B. Cutler, Centre de la Saskatchewan N.B. Cutler, Centre de Toronto S. Froeschl, Centre de Montréal M.G. Ferland, Centre de Québec A.D. Gates, Centre d'Halifax D.W. Boyd, Centre d'Ottawa

L. Romaniuk, Centre de Winnipeg Prof. I. Brothwick, Section de Terre-Neuve

Public Information Committee Report / 91

Une réunion du Comité eut lieu tout juste avant le Congrès de 1980 et s'avéra très fructueuse pusqu'elle permit aux membres de se rencontrer et de discuter ensemble des problèmes liés à l'information publique. À cette réunion, les membres ont accepté de: préparer une brochure sur la SCMO; d'établir une liste de films à conseiller sur la météorologie et l'océanographie; d'élaborer un guide ou une liste de vérifications destinée aux présentations TV ou radio; de définir le rôle de la SCMO en rapport avec le contenu de cours donnés aux écoles de pilotage, de voile, etc.

Le Comité s'est vu confier la responsabilité de réviser l'ébauche de la politique d'Environnement-Canada en matière de consultation publique et de disponibilité de l'information. M. J. Maybank a fait parvenir les remarques du Comité à M. J. Roberts, ministre de l'Environnement.

Le Comité a ré-écrit la monographie d'information au sujet du météorologiste et de sa carrière, destinée aux étudiants du secondaire. Celle-ci est publiée par le Centre d'orientation de l'Université de Toronto.

Une autre réunion du Comité devrait avoir lieu avant le congrès de 1981; l'intention est d'accroître l'information publique dans la SCMO.

> J.T. Kotylak Président

## **REPORT OF THE MEMBERSHIP COMMITTEE**

#### Members

Mr F.J. Conway (Chairman), Toronto Centre Dr W.D. Denner, Newfoundland Chapter Mr R. Leduc, Service de la Météorologie du Québec Dr G. Sato, Ottawa Centre Mr N. Bussières, Winnipeg Centre Dr S.G. Froeschl, Montréal Centre Mr J.C. McLeod, Alberta Centre

The Membership Committee only met once in 1980, that meeting taking place during the 1980 Congress.

The committee first discussed its role and then proceeded to consider other possible classes of membership. The committee recommended that the present Regular, Student and Sustaining classes of membership should be retained unchanged and that a new Corporate Membership should be created that would correspond to sustaining membership. The creation of an Associate Member class with limited privileges and not including receipt of ATMOSPHERE-OCEAN was considered to be an attractive option for many potential members and was also recommended. This will obviate the need for a Retired Member class. It was considered that the purpose of Honorary Membership could be better achieved by some other award. The concept of Special Interest Groups was considered to be very worthwhile, but it was felt that members of such a group should at least have associate membership in the Society.

The committee considered that questions of membership status should continue to be handled by the Corresponding Secretary. Promotional campaigns were discussed but the questions of funding and organizing the campaigns were left open.

> F. Conway Chairman

## RAPPORT DU COMITÉ D'ÉLIGIBILITÉ DES MEMBRES

#### Membres

M. F.J. Conway (Président), Centre de Toronto

M. W.D. Denner, Section de Terre-Neuve

M.R. Leduc, Service de la Météorologie du Québec

M. G. Sato, Centre d'Ottawa

M.N. Bussières, Centre de Winnipeg

M. S.G. Froeschl, Centre de Montréal

M. J.C. McLeod, Centre de l'Alberta

L'unique réunion du Comité en 1980 eut lieu lors du Congrès de 1980 à Toronto.

Le rôle du Comité fut discuté en général et suivi par l'examen des classes de membres proposées. If fut recommandé que soient retenues comme telles les classes de membre régulier, membre étudiant, membre de soutien, et que soit créée la classe de membre corporatif avec les mêmes prérogatives que celle de membre de soutien. Le Comité trouva la conception de membre associé très attirante: cette classe aurait des prérogatives limitées et ne comprendrait pas d'abonnement à ATMOSPHERE-OCEAN. Une telle classe permettrait d'obvier à celle de membre à la retraite.

Le Comité sentit que les besoins d'une classe de membre honoraire pourraient être servis d'une autre façon.

Le concept de groupes d'étude de sujets particuliers semble intéressant, mais le Comité considéra qu'un membre d'un tel groupe devrait être au moins membre associé de la Société.

If fut décidé que toute question sur le statut d'un membre devrait rester la responsabilité du Sécretaire-correspondant. On parla de compagnes pour attirer des membres, mais la question du financement et de la direction de telles compagnes ne fut pas résolue.

> F. Conway Président

## **REPORT OF THE FINANCIAL DEVELOPMENT COMMITTEE**

#### Members

L.T. Campbell (Chairman), Toronto P.D McTaggart-Cowan, Bracebridge W. Hitschfeld, Montréal R.P. Angle, Edmonton

#### Purpose:

To develop a comprehensive financial policy aimed at eventual self-sufficiency for CMOS. To investigate ways of increasing and diversifying income from sources such as:

- (a) dues
- (b) journal subscriptions
- (c) advertising and exhibits
- (d) government grants (AES, OAS, NSERC, MOSST, SSHRC)
- (e) publications
- (f) investments
- (g) bequests

To examine all aspects of support for ATMOSPHERE-OCEAN, including:

- (a) separation of the subscription from the membership dues
- (b) journal grant from NSERC
- (c) direct publication by NSERC
- (d) revenue from page charges, reprints, advertising, etc.

To study the feasibility of establishing permanent headquarters in cooperation with one or more other scientific societies.

To recommend appropriate uses of the Development Fund.

No meetings were held. With the extremely widespread membership of the committee, it was and will likely continue to be necessary to conduct business by correspondence. During the past year, work was commenced on a new submission to OAS for a grant similar to that received from AES. Action was also commenced to examine means of increasing CMOS revenue.

> L.T. Campbell Chairman

## **RAPPORT DU COMITÉ DE DÉVELOPPEMENT FINANCIER**

#### Membres

L.T. Campbell (Président), Toronto P.D. McTaggart-Cowan, Bracebridge

F.D. Mic Laggan-Cowan, Bracebridg

W. Hitschfeld, Montréal R.P. Angle, Edmonton

#### But:

Élaborer une politique financière complète visant à l'autosuffisance de la SCMO.

Examiner les moyens pour augmenter et diversifier les revenus provenant de sources telles que:

- (a) les cotisations
- (b) les abonnements à la revue
- (c) la publicité et les expositions
- (d) les octrois du gouvernement (SEA, SOA, CRSNG, MOSST, SSHRC)
- (e) les publications
- (f) les placements
- (g) les legs

Examiner tous les aspects d'appui pour ATMOSPHERE-OCEAN, y compris:

- (a) la séparation des frais d'abonnement des frais de cotisation
- (b) l'octroi de publication du CRSNG
- (c) la publication directe par le CRSNG
- (d) revenus provenant de la publication, de réimpressions, de la publicité, etc.

Étudier la possibilité d'établir un bureau-chef permanent en coopération avec une ou deux autres sociétés scientifiques.

Recommander les usages appropriés de la Caisse de développement.

En raison de la dispersion des membres du Comité, aucune réunion n'a eu lieu; les affaires se feront et continueront probablement de se faire par correspondance. L'année dernière, le travail a débuté par une nouvelle, requête adressée aux SOA en vue d'obtenir une subvention similaire à celle reçue du SEA. Des démarches ont été amorcées dans le but d'examiner les moyens d'augmenter les revenus de la SCMO.

> L.T. Campbell Président

## **REPORT OF THE COMMITTEE ON PROFESSIONALISM**

The CMOS Committee on Professionalism is made up of:

Robert Charlton (Chairman), University of Alberta Randy Angle, CMOS Council Robert Humphries, Alberta Research Council Douglas Leahey, Western Research and Development Ltd Neil Meadows, Atmospheric Environment Service Dennett Netterville, Syncrude Canada

The main objectives of the Committee on Professionalism are to implement the findings of the Ad Hoc Committee on Meteorological Standards in Canada which published its final report in May 1978, and those of the Review and Evaluation Committee which elaborated on those findings in May 1979 in a report entitled "Consulting and Professionalism."

The Committee on Professionalism held four meetings during 1980 during which the most easily implemented suggestions of the previous two committees were acted upon. Progress was made on the following topics: Code of Ethics for Professional Members of CMOS, a set of Definitions explaining the categories of meteorologists, and a Directory of Consultants in meteorology and oceanography. Some consideration was given to the possibility that Canadian consultants and other professional members of CMOS might become affiliated with appropriate professional societies as opposed to learned societies such as CMOS. Another approach to professionalism involves the more complex question of certification of consultants by CMOS. This topic was set aside until later.

The Code of Ethics is based on a review of similar codes from both learned and professional societies. It was published in Volume 8 Number 3 of the *Newsletter*. Definitions of Meteorologists were published in Volume 8 Number 6 of the *Newsletter*.

The Directory of Consultants is made up of "one-page" descriptions of consulting activities submitted by 27 firms and universities. Three hundred copies of this first edition have been printed and are being distributed to potential users along with a question sheet to encourage feedback. The oceanographic aspects of the Directory stress physical oceanography as does CMOS. During development of the Directory it was discovered that the Canadian Committee on Oceanography had just completed a comprehensive "Directory of Marine Scientists in Canada – 1980." It is composed of cross-references between firms, individuals and specialties. Such a study could be done for Atmospheric Scientists but it would not necessarily eliminate the need for our consultant-written directory.

R.B. Charlton Chairman

## RAPPORT DU COMITÉ SUR LE PROFESSIONNALISME

Le Comité sur le professionnalisme de la SCMO se compose de:

Robert Charlton (Président), Université de l'Alberta Randy Angle, Conseil de la SCMO Robert Humphries, Alberta Research Council Douglas Leahey, Western Research and Development Ltd Neil Meadows, Service de l'environnement atmosphérique

Dennett Netterville, Syncrude Canada

Les principaux objectifs du Comité sur le professionnalisme sont d'appliquer les recommandations du comité ad-hoc sur les normes en météorologie au Canada, dont le rapport final fut publié en mai 1978 et celles du comité de revue et d'évaluation qui a approfondi ces recommandations dans un rapport intitulé "consultation et éthique professionnelle," déposé en mai 1979.

Le Comité sur le professionalisme a tenu quatre réunions en 1980 au cours desquelles on se concerta sur

les suggestions les plus facilement applicables, amenées par les deux comités mentionnés ci-haut. On a réalisé des progrès sur les sujets suivants: code d'éthique pour les membres professionnels de la SCMO; un ensemble de définitions identifiant les différentes catégories de météorologistes: un annuaire de consultants en météorologie et océanographie. On a aussi considéré le fait que certains membres professionnels de la SCMO ainsi que des consultants pourraient s'unir à des groupements professionnels, plutôt qu'a des sociétés savantes comme la SCMO. Une autre facette, complexe, du code d'éthique concerne la certification de consultants par la SCMO. Ce sujet a cependant été remis à plus tard.

Le code d'éthique est semblable à d'autres codes existant dans des groupements professionnels ou des sociétés savantes. On l'a publié dans le *Bulletin de nouvelles*, volume 8, no 3 et les définitions de "météorologiste" figurent dans le volume 8 no 6.

Dans l'annuaire des consultants, on retrouve la description de leurs activités soumise par 27 firmes et universités. On en a imprimé et distribué 300 copies à des usagers probables et on a joint un questionnaire destiné à encourager le dialogue. Tout comme la SCMO, l'annuaire met l'accent sur l'océanographie physique. En cours d'élaboration, on s'est aperçu que le Comité canadien d'océanographie avait préparé un annuaire complet sur les scientifiques pour le milieu marin en 1980. On y retrouve une liste, à recoupages multiples, de firmes, individus et spécialités. Une telle réalisation pourrait être entreprise pour les sciences de l'atmosphère, ce qui n'éliminerait pas pour autant le besoin de notre annuaire de consultants.

> R.B. Charlton Président

## **REPORT OF THE AWARDS COMMITTEE/RAPPORT DU COMITÉ DES RÉCOMPENSES**

The Committee (composed of D.M. Farmer, *Chairman*; M.B. Danard; D.A. Huntley; J.R. Mathieson; G.A. Isaac and G.L. Picard) reviewed the nominations submitted and recommended awards to Council. Le comité (composé de D.M. Farmer, *Président*; M.B. Danard; D.A. Huntley; J.R. Mathieson; G.A. Isaac and G.L. Picard) a etudié les nominations qui ont été soumises et a recommandé au Conseil la présentation des récompenses.

## **REPORT OF THE CITATIONS COMMITTEE/RAPPORT DU COMITÉ DES CITATIONS**

The committee (composed of D.M. Whelpdale, *Chairman*; J.M.R. Asselin; G.A. McPherson; P.H. Schuepp; H.J. Freeland and J.D. McTaggart-Cowan) reviewed the nominations submitted and recommended awards to Council.

Le comité (composé de D.M. Whelpdale, *Président*; J.M.R. Asselin; G.A. McPherson; P.H. Schuepp; H.J. Freeland and J.D. McTaggart-Cowan) a etudié les nominations qui ont été soumises et a recommandé au Conseil la présentation des citations.

## **ARCHIVIST'S REPORT**

Pressure of other responsibilities and duties prevented the Archivist from beginning to write a history of the Society as part of a full historical report on meteorology in Canada. Society files and other historical material have been gathered together to facilitate preparation of items of current interest for possible publication in the CMOS *Newsletter* and the other periodicals as time allows.

M.K. Thomas

## **RAPPORT DE L'ARCHIVISTE**

Diverses tâches et responsabilités ont empêché l'archiviste d'amorcer l'histoire de la SCMO, celle-ci faisant partie intégrante d'une histoire, plus globale, de la météorologie au Canada. Des archives de la SCMO et d'autres documents de nature historique ont été rassemblés pour préparer des textes d'actualité destinés à être publiés, lorsque le temps le permettra, dans le *Bulletin de nouvelles* de la SCMO et dans d'autres périodiques.

M.K. Thomas

## **REPORTS FROM LOCAL CENTRES AND CHAPTERS**

### VANCOUVER ISLAND CENTRE

#### Executive 1980-81

Chairman	Richard Bennett	Air Management, B.C. Environment
Secretary	David Krauel	Royal Roads Military College
Treasurer	Richard Thomson	Institute of Ocean Sciences
Coordinators	Gail Gabel	Aanderaa Instruments Ltd
	Humfrey Melling	Institute of Ocean Sciences

## Speakers - 1980

The value of an El Niño Forecast:
A Social Perspective"
Atmospheric Forcing and Circulation in the
Strait of Juan de Fuca"
Topics on Circulation in the Northeast
Pacific Ocean"
'Climatology Aspects of Forest Management''
Satellite Based Estimates of Solar Radiation at
Earth's Surface"
Discovery Park and Some new Ideas in
Resources Chemistry"

The Vancouver Island Centre has continued to grow during its second year of existence. The membership totals approximately 50, with the majority of the members located in the Victoria region.

The Centre established a book prize to be awarded annually in the Vancouver Island Regional Science Fair for the best exhibit relating to oceanography or meteorology.

Speakers invited to future meetings include Dr D.G. Steyn (UBC), Dr G.A. McBean (AES), Dr M.B. Danard, and the AES/CMOS 1981 Tour Speaker Dr W. Emery (UBC).

### Financial Statement 1980

Bank Balance as of 1 January 1980		\$712.68
Income		
Annual subvention	\$237.50	
Interest	35.22	
	\$272.72	\$272.72
		\$985.40
Debits		
Payments to Dr Rees (Univ. of Victoria)		
carryover from 1979 Congress	\$ 14.70	
Expenses - L.A. Mysak (UBC)	50.00	
J. Holbrook (PMEL)	50.00	
H. McCaughey	25.00	
J. Hay (UBC)	25.00	
J. Knox, carryover from December 1979	42.10	
Service charges	6.55	
	\$213.35	\$213.35
Balance as of 31 December 1980		\$772.05
and a dependent of the second s		-
		R.E. Thomson Treasurer

## **B.C. MAINLAND CENTRE**

Executive 1980-81

Chairman	Doug Steyn	Dep. of Geography, UBC
Vice-Chairman	Bob Morris	AES, Vancouver
Secretary-Treasurer	Brian Hammond	AES, Vancouver
Program Coordinator	Rolf Leuck	Inst. of Oceanography, UBC
Assistant Program	Don Faulkner	AES, Vancouver
Coordinator		

As indicated by the list of meetings below, the B.C. Mainland Centre had another active year in 1980. We have enjoyed a good variety of speakers and topics.

One of the highlights of our year was the "Papa" meeting held in Robson Square in downtown

Vancouver. The meeting was open to the public and took the form of a panel discussion with the following participants:

Mr J. Bruce	Assistant Deputy Minister, AES
Dr R. Burling	Inst. of Oceanography, UBC
Mr T. Kew	Canadian Coast Guard
Capt. R. Paine	Seaman and Fisherman
Mr J. Knox	Dep. of Geography, UBC
strategy and an in social country in the second of the	

Each panel member presented a brief talk expressing their thoughts and views on the removal of Ocean Station Papa. Discussion followed. A resolution was prepared and forwarded to the Minister of the Environment:

This meeting urges the Federal Government to reconsider its decision to withdraw ocean station PAPA from service and recommends that this station remain active until an equivalent replacement system is in place, tested and proven.

Unfortunately, the resolution met with a negative response. The Minister, the Hon. John Roberts replied that he could not support our position.

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***				-	

24 Jan.	William J. Emery	"Oceanography from Space"
	Dep. of Oceanography,	
	UBC	
1 Feb.	Michael Glantz	"The Value on an El Niño Forecast: a Social
	AES/CMOS Tour Speaker	Science Perspective"
	NCAR	
27 Feb.	Owen Hertzman	"Cloud Mapping from the Earth's Surface Using Infrared
	Dep. of Soil Science	Radiance Control"
	UBC	
20 Mar.	Dave Phillips	"The Status and Future of Land and Sea Based
	AES, Vancouver	Automatic Observing Systems in the Pacific Region"
24 Apr.	Merton Horita	"Weather Operations at the Pacific Weather Centre"
	AES, Vancouver	
26 June	Peter Scholefield	"Canadian Climate Program"
	AES, Downsview	
12 Nov.		Public Meeting on Ocean Station "Papa"
27 Nov.	Alex Hay	"Acoustic Detection of Suspended Sediments"
	Dep. of Oceanography	
	UBC	
8 Dec.	L.W. Snellman	"Operation Forecasting in the 'Automated Forecasting
	NWS Western Region	Operations and Services' (AFOS) Era"
17 Dec.	Richard F. Marsden	"Synoptic Estimates of Air-Sea Fluxes"
	Seaconsult Marine	
	Research Ltd	
	Vancouver	

Financial Statement 1980		
Cash on hand, as of 1 January 1980		\$529.58
Income		
Interest	\$ 57.72	
	\$ 57.72	\$ 57.72
		\$587.30
Expenses		
Postage	\$101.83	
Meetings	11.96	
Stationery	9.97	
Printing	7.00	
	\$130.76	\$130.76
Credit balance as of 31 December 1980		\$456.54
	В	. Hammond
	Secretar	y-Treasurer

## ALBERTA CENTRE

## Executive

MrJ.C. McLeod
Mr C.H. Sackiw
MrT.G. Medlicott
Mr L. Wojtiw
Dr R.G. Humphries
Dr D.S. Davison

## Meetings

4 Feb.	Dr Michael H. Glantz	"Dealing With a Long-Term, Low Grade
(Calgary)	AES/CMOS Tour speaker NCAR	Environmental Problem: The CO <sub>2</sub> Issue"
5 Feb.	Dr Michael H. Glantz	"Societal Value of Streamflow Forecasts"
25 Mar.		A film night featuring the University of Calgary production Chinook
7 May	Dr Marianne English	"Pattern of Hailstone Embryo Types in Alberta"
25 June		A field trip to the Alberta Hail Project facilities at Penhold, Alta
22 Oct.	Roger Weldon NOAA/NESS	"Satellite Meteorology"
26 Nov.	Hennie Veldhuizen EPS/DOE	"Acid Rain"

	\$ 763.35
\$322.50	
68.53	
\$391.03	\$ 391.03
	\$1,154.38
\$140.00	
111.66	
105.20	
82.81	
27.96	
16.20	
9.19	
2.00	
\$495.02	\$ 495.02
	\$ 659.36
	\$322.50 68.53 \$391.03 \$140.00 111.66 105.20 82.81 27.96 16.20 9.19 2.00 \$495.02

#### SASKATCHEWAN CENTRE

### Executive

	1980	1981
Chairman	Jeff Whiting	Earl Ripley
Chairman-Elect	Earl Ripley	Stan Shewchuk
Secretary/Treasurer	Don Bauer	Don Bauer
Public Information	John Dublin	John Dublin
Membership	Elaine Wheaton	Elaine Wheaton

The Saskatchewan Centre held 4 meetings this year as follows: January 15, presentation of Audio/Visual-material for education institutions; February 6, AES/CMOS Tour Speaker on the "Value of Stream Flow Forecating in Times of Drought"; June 4, Congress issues; December 4, "Introduction to Acid Rain". Most of the Centre's time was spent organizing for the next Congress to be held in Saskatoon, May 27–29, 1981. Dr Maybank also helped the Saskatchewan Institute of Agrologists organize tour speakers for 6 towns in Saskatchewan. The Centre has increased its membership by 20 per cent.

#### List of Speakers and Topics - 1980

15 Jan.

Dr John Maybank, SRC Dr Ken Yoshida, SRC Jeff Whiting, SRC Don Bauer, AES Gerald Farkas, Univ. of Saskatchewan Audio/Visual material for education: "Cloud or Precipitation Modification" "Spray Drift" "Weather Satellites" "Weather Forecasting" "Methods Available and Costs"

6 Feb.	Dr Michael Glantz AES/CMOS Tour Speaker NCAR	"The Value of Stream Flow Forecasting in Times of Drought"	
4 June	Dr John Maybank	"Information from Congress"	
4 Dec.	Slide-Tape	"Introduction to Acid Rain"	
		(On loan from AES, Winnipeg)	
	Elaine Wheaton	"Across Canada Reaction to Acid Rain"	
	Dr Stan Shewchuk	"The Alberta-Saskatchewan Situation"	
Financial S	statement 1980		
Balance as	of 31 December 1979		\$ 180.00
Receipts			
Congress	sloan	\$1,000.00	
1980 Sul	ovention	135.00	
Interest		38.57	
		\$1,173.57	\$1,173.57
			\$1,353.57
Expenditur	es		
CMOS S	peaker's Tour	\$ 5.00	
Science I	Fair Prizes	41.90	
Meeting	S	15.75	
Service of	charges	0.85	
		\$ 63.50	\$ 63.50
Cash on ha	nd 31 December 1980	\$1,290.07	
Outstandin	g Congress Loan		\$1,000.00
Balance as	of 31 December 1980		\$ 290.07
			J.M. Whiting
			Past Chairman

## TORONTO CENTRE

Executive 1980-81

Chairman	HR. Cho
Secretary	D. Chan
Treasurer	G. Lesins
Programme Director	K. Higuchi

Six meetin	gs were held by the Toronto Cent	re during 1980:
24 Jan.	A.G. Davenport	"Structural Engineering and Meteorological
	University of Western Ontario	Information"
29 Feb.	M. Glantz AES/CMOS Tour Speaker NCAR	"Social Impact Assessment of a Wrong Forecast: A Case Study"

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27 Mar.	W.R. Peltier	"Ice Sheets, Oceans and the Earth's Shape: Their
	University of Toronto	Response to Climate Changes"
24 Apr.	R.E. Munn	"The Design of Environmental Monitoring Systems"
	University of Toronto	and the second se
24 Sept.	Annual Election	
	D. Pengelly	"Air Quality and Respiratory Health"
	McMaster University	Call and a same second and a
26 Nov.	D.M. Whelpdale	"Acid Rain and Long-Range Transport"
	AES	

The first five meetings were held at the AES Downsview Headquarters, and the last meeting at the University of Toronto. The Centre also hosted the Fourteenth Annual Congress during 22–27 May 1980.

The invited speakers at the meetings all gave excellent talks. In addition to their well-known professional accomplishments, they are very able speakers. Their presentations were very well received by our members.

A major change occurred at the Toronto Centre in 1980. The Centre headquarters were moved from AES to the University of Toronto in September. It is hoped that through our activities we may attract more young students to our profession.

In November, 1980, the Centre mailed letters to approximately 150 high schools in the greater Toronto area informing them of the opportunities in the field of meteorology and offering to send our members to speak to their students. About ten high schools have responded so far and four of our members (Cathy Banic, G. Lesins, K. Higuchi, and D. Chan) have already made presentations at two of the schools.

Several events are planned for the Toronto Centre early in 1981. One is the Andrew Thomson Memorial Lecture which is going to be given at the University of Toronto. Professor R. List has invited Dr Wiin-Nielsen, (Secretary-General, WMO) to give the presentation. We also hope to invite Mr Gordon McKay, Director, Applications Branch, Canadian Climate Centre to present a talk on energy and climate. Mr Mike Newark of AES has also agreed to give a presentation at one of our future meetings. He is an expert on the climatology of tornadoes in southwestern Ontario.

H.-R. Cho.

		Chairman
Financial Statement 1980		
Balance as of 1 January 1980		\$ 542.07
Income		
Wine and Cheese tickets	\$ 54.00	
Subvention	466.00	
Interest	11.96	
	\$531.96	\$ 531.96
		\$1,074.03
Expenditures		
Stamps	\$138.89	
Guest speakers	191.87	
Loan to AGU	99.50	
Wine and cheese	185.54	
	\$615.80	\$ 615.80
Balance as of 31 December 1980		\$ 458.23
		G. Lesins Treasurer

## OTTAWA CENTRE

## Executive Members (1980/1981)

Chairman	L.D. O'Quinn
Vice-Chairman	G.M. Shimizu
Secretary-Treasurer	R.L. Jones
Past Chairman	E.J.A. Hamilton

## **Program of Meetings**

30 Jan.	Dr J. B. Harrington, Jr Petawawa National Forestry Institute	"Canada's Forests as a Component of Our Energy Resource Future"
	Environment Canada Chalk River, Ont	
3 Mar.	Dr Michael H. Glantz AES/CMOS Tour Speaker	"Science, Politics and Economics of the Peruvian Fishery: Considering the Effects of El Niño"
l Apr.	Dr. R.W. Durie Corporate Planning Group Environment Canada Hull (Ouébec)	"The Ark-One Experiment in Alternative Energy Futures"
29 Apr.	Mr J. Ploeg Hydraulic Laboratory National Research Council Ottawa	"The Oceans – A Renewable Energy Resource"
9 Oct.	Mr Gerry Gainer Gulf Canada Limited Calgary, Alta	"Meteorology in Environmental Assessment"
19 Nov.	Dr R. Keith Raney Canada Centre for Remote Sensing Energy Mines and Resources Canada	"Remote Sensing of the Marine Environment"
	Ottawa	

## Financial Statement 1980

Bank balance as of 1 January 1980	\$681.05	
Petty cash on hand, 1 January 1980	4.17	
Total cash on hand	\$685.22	\$ 685.22
Income		
Interest	\$ 18.11	
CMOS subvention	295.00	
Sales of coffee, cookies, sandwiches, etc. at meetings	18.14	
	\$331.25	\$331.25
		\$1,016.47

	Secre	R.L. Jones tary-Treasurer
Total cash on hand	\$693.79	
Petty cash on hand, 31 December 1980	21.68	
Bank balance, two accounts as of 31 December 1980	\$672.11	
Difference (Income – Expenses)		\$ 693.79
	\$322.68	\$ 322.68
Bank service charges	0.40	
Engraving of trophies for YSF Winners	29.15	
Cash prizes for Youth Science Fair winners	75.00	
Dinner for visiting AES/CMOS Tour Speaker	15.25	
Other meetings	50.22	
Dinner meeting: Bartender and Guest Speaker meals	60.31	
Postage and stationery supplies	\$ 92.35	
Expenses		

### **CENTRE DE QUÉBEC**

## Membres du Conseil d'administration

Président	Richard Leduc
Vice-Président	Claude Lelièvre
Secrétaire	Fernando Shériff
Trésorier	Gaétan Soucy
Conseillers	Roger Bouffard
	Raymond Poiré
	Guy Lemelin
	JP. Fortin
	JPaul Boucher

#### Résumé des principales activités 1980

En 1980, la Société de Météorologie de Québec connut une année particulièrement active. En plus de poursuivre ses activités sur le climat urbain de Québec, une campagne de recrutement fut lancée à l'automne et ses résultats furent très encourageants; notre Société compte maintenant 108 membres.

En février 1980, une deuxième expérience sur l'ilôt de chaleur à Québec fut menée à bien. Les résultats de cette expérience, qui s'inscrivent à la suite de ceux obtenus en 1979, seront publiés dans le courant de l'année. Durant l'été et l'automne, on recueillit les données de 11 stations équipées d'un enregistreur Foxboro, dont 7 installées par la Société sur le territoire de la CUQ. Les membres participent à l'extraction de ces données et une analyse sera effectuée dans le courant de l'année.

En mai, la Société présenta une conférence dans le cadre du mois de l'environnement (Environnement-Québec) et on entend répéter cette participation cette année.

A la fin d'octobre, la Société participa, en collaboration avec le Service de la Météorologie et le bureau de Québec du SEA, à la Semaine des Sciences. Durant 3 jours, notre kiosque, installé à la Place Laurier, accueilli plus de 1,000 personnes.

Au printemps, la station mobile fut exposée au Complexe Desjardins à Montréal et durant l'été on la prêta à un camp de jeunes. Elle retourna dans la région de Montréal à l'automne pour les besoins d'une commission scolaire. Une école de la région de Québec s'en servit aussi comme moyen de sensibilisation auprès de certains de ses élèves. Au chapitre des conférences, les sujets les plus divers furent touchés, en passant par les pluies acides, les satellites et les énergies nouvelles. Au total, 7 conférences furent présentées en 1980.

Dernièrement, le vice-président assista pour la Société à la création du conseil québécois gérant les fonds recherche au Québec.

En un mot, les activités de la Société furent diversifiées et on tentera, dans l'avenir, d'obtenir le plus possible la participation des membres.

#### Liste des conférenciers - 1980

19 fév.	Claude Masse	"Quelques aspects météorologiques du transport atmosphérique polluants et leur relation avec
10	M.U. Chaste	les pluies acides"
10 mars	M.H. Glantz	Peruvian Fisheries and the Impact of El Niño"
16 avril	P.H. LeBlond	"L'énergie des océans"
28 mai	Richard Leduc	"Le climat urbain: exemple de Québec"
17 oct.	André Sévigny	"Les satellites météorologiques et leurs utilisations"
17 nov.	Claude Calvet	"Végétation et climat méditerranéen"
9 déc.	Giles Saint-Hilaire	"La météorologie et la mise en valeur des énergies nouvelles"

## Conférences projetées - hiver 1981

9 fév.	André Hufty	"Propos sur les fluctuations climatiques récentes"
mars	David Leslie	"Les maisons solaires passives"
avril	à déterminer	
mai	Claude Lelièvre	"Pluies acides"

Richard Leduc Président

### Rapport du Trésorier 1980

Actif		
Actif en caisse au début de l'exercice	\$ 818.66	
Cotisations des membres (108)	516.00	
Subvention spéciale de la Société Linnéenne		
de Québec	100.00	
Subvention de la SCMO	125.00	
Intérêts et dividendes	76.86	
Remboursement pour timbres	14.47	
Total	1,650.99	
Capital social	5.00	
Actif total	\$1,655.99	\$1,655.99
Passif		
--	------------	---------------
Frais de séjour et de déplacements des conférenciers	\$ 465.47	
Achat de timbres et matériel de bureau	219.25	
Frais de secrétariat (dactylographie)	75.00	
Frais pour assemblée générale annuelle et réunion		
spéciale d'ouverture	346.68	
Frais relatifs à la station métérologique mobile	73.02	
Frais re: a) exposition à Montréal		
b) excursion aux baleines blanches	122.00	
Total	1,301.42	
Immobilisation du capital social	5.00	
Passif total	\$1,306.42	\$1,306.42
Excédent de l'actif sur le passif		\$ 349.57
		Trésorier
	Ga	étan-D. Soucy

## HALIFAX CENTRE

## Executive

Chairman	Fraser MacNeil	
Secretary	Denis Lefaivre	
Treasurer	David Huntley	
Meetings		
16 Jan. 1980	Dr John Smith	"Environmental Aspects of the Point Lepreau Nuclear Project"
13 Feb.	Dr Rod Shaw Chief, Air Pollution Control Division EPS Atlantic Region	"Acid Precipitation in the Atlantic Provinces: Are we Participants or Onlookers?"
24 Mar.	Dr Michael Glantz AES/CMOS Tour Speaker	"Science, Politics, and Economics of Managing the Penuvian Fisheries and Impact of El Niño"
14 May	Mr Fraser MacNeil	"Highlights of the CIDA/Hydrometeorological Project in Colombia, South America"
16 June	Simon Skey	"Environmental Hazards of Offshore Exploration"
5 Nov.	Mr K.C. Curren Maritime Regional Director	"Kurdistan Operation"
	Canadian Coast Guard	
10 Dec.	R. Morgan Commander	"Sea Surface Temperature and Tropical Climate"
	Royal Navy (Retired)	
14 Jan. 1981	Ms Jackie Booth Plansearch Inc.	"Eastern Arctic Environmental Impact Study"
	(Incorporating MacLaren Marex Inc.)	

Attendance at meetings this year has been disappointing, however, the enthusiasm of those present provides some encouragement.

The Centre plans to support regional science fairs again this year by awarding prizes. We are also investigating the possibility of putting together an information package on oceanography to be made available to high schools.

We are presently preparing for our annual dinner meeting which will be held at the Dalhousie Faculty Club. The speaker will be Ms Zoe Lucas who will give a slide presentation on the restoration of the sand dunes on Sable Island.

Financial Statement 1980		
Bank balance, 31 December 1979	\$482.06	
Petty cash on hand 31 December 1979	11.63	
	\$493.69	\$ 493.69
Income		
Annual subvention	\$362.50	
Tickets: Dinner meeting, February 13	315.00	
Bank interest	13.24	
	\$690.74	690.74
Total available funds		\$1,184,43
Expenses		
Funds to Newfoundland Chapter	\$191.71	
Science Fair prizes: Cape Breton	25.00	
Halifax	21.27	
Dinner meeting expenses: February 13	325.68	
Refreshments for evening meetings	19.75	
Mailing meeting notices	29.70	
Wine and cheese meeting: May 21	60.00	
	\$673.11	673.11
Available funds over expenses		\$ 511.32
Bank balance, 31 December 1980	\$509.74	
Petty cash on hand, 31 December 1980	1.58	
	\$511.32	
		a harries
Balance as of 31 December 1980		\$ 511.32
		D.A. Huntley

Treasurer

#### NEW BRUNSWICK CHAPTER

The New Brunswick Chapter has just completed the first full year of operation. We held four regular programme meetings and co-sponsored a regional international conference in March – coinciding with World Meteorological Day. All activities during the year were at Fredericton. Professor R.B.B. Dickison, University of New Brunswick, served as Chapter Correspondent; Paul Galbraith, AES meteorologist, served as Programme Chairman.

The highlight of the Chapter's operation was the co-sponsoring of the AMS/CMOS Second Conference on the Meteorology of New England and the Maritimes, held at Keddy's Motor Inn on 21–22 March 1980. A programme of 14 scientific papers was planned (although four were not presented), plus two special speakers including CMOS/AES National Tour Speaker Dr Michael Glantz. Forty persons registered for the conference.

#### Meetings

5 Feb.	Leo M.D. Burns AES, on leave at UNB Dep. of	"Low-Level Wind Phenomena in New Brunswick"	
21 May	Prof. Verne Ireton UNB Dep. of Mech. Engineering	"Data for Solar Heating Applications – Availability and Utilization"	
20 Oct.	Paul J. Smith N.B. Dep. of Agriculture and Rural Development	"The Use of Meteorology for Agriculture"	
11 Dec.	Prof. Bob Dickison UNB Dep. of Forest Resources	"Hydrometeorological Studies in the Nashwaak Experimental Watershed Project"	
Financial	Statement 1980		
Cash on ha	nd as of 1 January 1980		\$27.40
Income			0.00
Expenses Meeting	5	\$15.20	\$15.20
Balance as	of 31 December 1980		\$12.20

#### NEWFOUNDLAND CHAPTER

Executive 19	980-81	
Chairman	Dr Colin Banfield	Department of Geography
		Memorial University of Newfoundland
Secretary	Mr John Newell	NORDCO Ltd
		St. John's, Nfld
Treasurer	Mr James Helbig	Department of Physics
		Memorial University of Newfoundland
Meetings		
31 Jan.	Mr Laurie Davidson Fenco Ltd	"Deep Water Exchanges in British Columbia Inlets"
11 Mar.	Mr John Newell	"Long-Range Forecasting of Sea Ice Clearing in
	NORDCO Ltd	Baffin Bay"
25 Mar.	Dr Michael Glantz	"The El Niño Phenomenon and the Anchovy Fishery"
	AES/CMOS Tour Speaker	
17 Apr.	Ian Borthwick	"Measurement of Ocean Diffusion and its Applicability
	Department of Biology	to Oil Spill Movement"
	Memorial University	
19 June	New executive elected	Business meeting
17 Sept.	Dr Noel Boston	"So You Want to be a Consultant"
	Beak Consultants	
16 Oct.	Dr Noel Boston	"The Global Weather Experiment"
	Beak Consultants	(Joint CMOS, MTS meeting)
11 Dec.	Mr Scott Ackenhead	"Effect of Climatic Variabilities on Marine Temperate
	Fisheries and	Fishes"
	Oceans Canada	

In addition to the regular meetings during 1980 the Society held a dinner for Dr Glantz which was attended by a large number of members.

#### Future Meetings

Jan. 1981	Mr Mike Hewson	"The Marine User of Environmental Services"
	NORDCO Ltd	

During 1980 the Newfoundland Chapter awarded the prizes for its High School Contest for the best project related to meteorology or oceanography. The first prize of \$100 was awarded to Mount Pearl Central High School. The second prize of \$50 was awarded to Holland's Memorial High School, Norris Point and the third prize, a book, was awarded to Grant Collegiate, Springdale.

John Newell Secretary

## Financial Statement 1980

Balance on hand as of 31 December 1979		\$ 39.48
Income		
Annual subvention	\$ 99.21	
Refreshments for meetings	7.75	
Donations for student prizes:		
Fenco Newfoundland	25.00	
NORDCOLtd	50.00	
Hydrospace Marine Services	50.00	
C-CORE	50.00	
Remotec Applications	50.00	
Halifax Centre	25.00	
Harvey's Offshore Services	25.00	
Seaconsult Marine Research Ltd	50.00	
Interest	20.69	
	\$452.65	\$492.13
Expenses		
Meetings	\$ 35.28	
Stationery	7.00	
Student prizes	150.00	
	\$192.28	\$192.28
		-
Balance on hand as of 31 December 1980		\$299.85
(\$175.00 reserved for future student prizes)		_
		J.A. Helbig
		Treasurer

#### **REPORT OF THE AIR POLLUTION METEOROLOGY SPECIAL INTEREST GROUP**

On October 16, 1980 CMOS Council approved the formation of a Special Interest Group in air pollution meteorology. The objectives of the group are:

- To further development of the study and application of meteorology to the emission, diffusion, transport, transformation and deposition of pollutants in the atmosphere;
- b) To encourage and enhance information exchange between scientists and engineers in these disciplines and related areas.

Council also approved a budget allocation of \$100. An interim steering comittee was appointed, consisting of J.D. Reid (Chairman), R.P. Angle (Secretary), W. Hume and R.E. Munn. Presently, group membership consists of 27 CMOS members and 11 non-CMOS members.

The major activity this year has been working toward organization of special air pollution meteorology sessions at the Saskatoon CMOS Congress. Arrangements have been made to bring in a distinguished keynote speaker for the sessions, Dr F.B. Smith from the British Meteorological Office, who will speak on "A Review of the European EMEP Programme on the Long-Range Transport of Pollution, and Ideas on How to Treat Wet Desposition." Some 20 other papers are planned for presentation. Publication of these papers is being arranged. We are fortunate to have obtained funding from Alberta Environment and the Atmospheric Environment Service, which will underwrite our Congress activities without cost to the Society.

J.D. Reid

#### REPORT OF THE NOMINATING COMMITTEE RAPPORT DU COMITÉ DE MISE EN CANDIDATURE

The Nominating Committee (D. Fraser, Chairman; M. Donelan; P.E. Merilees; S.D. Smith; J.M. Powell) is unanimous in nominating the following persons to the 1981 CMOS Executive. All nominees have expressed their willingness to serve in the indicated positions. The nominations have been made with the understanding that the CMOS Executive will shift from Edmonton to Ottawa in 1982.

C'est à l'unanimité que le comité de mise en candidature (D. Fraser, Président; M. Donelan; P.E. Merilees; S.D. Smith; J.M. Powell) soumet la liste suivante de candidats au Bureau d'administration pour 1981. Tous les candidats ont consenti à occuper le poste indiqué. Les mises en candidature ont tenu compte du déménagement prévue du Bureau d'administration de la Société d'Edmonton à Ottawa en 1982.

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Vice President/Vice-Président

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Dr J. M. R. Asselin Director of Meteorology and Oceanography National Defence Headquarters Ottawa, Ontario KIA 0K2

Mr Randy Angle Division of Pollution Control Alberta Dep. of Environment Oxford Place Building 106th Street Edmonton, Alberta T5K 2J6

Mr Peter Kociuba Atmospheric Environment Service 6325 – 103 Street Edmonton, Alberta T6H 5H6

Mr J. Carr McLeod Atmospheric Environment Service 6325 – 103 Street Edmonton, Alberta T6H 5H6

Dr Robert Benoit 12462 Toulouse Pierrefonds (Québec) H8Z 1G9

Dr E.P. Jones Bedford Institute of Oceanography P.O. Box 1006 Darmouth, Nova Scotia B2Y 4A2

Mr J.D. O'Quinn Canadian Committee on Oceanography Department of Fisheries and Oceans C.D. Howe Building, 7th Floor West 240 Sparks Street Ottawa, Ontario K1A 0E6

> D. Fraser Chairman/Président

### LIST OF PREVIOUS RECIPIENTS OF SOCIETY AWARDS/ LAURÉATS DES ANNÉES PRÉCÉDENTES

President's Prize/Prix du Président

1967	A. Robert	1974	G.A. McBean
1968	A.W. Brewer	1975	Not awarded
1969	G.T. Csanady	1976	W.F.J. Evans
1970	R.E. Munn	1977	P.E. Merilees
1971	M. Kwizak and A. Robert	1978	G. Garrett
1972	T.R. Oke	1979	Not awarded
1973	A.J. Chisholm and Marianne English		

Dr Andrew Thomson Prize in Applied Meterology/ Prix du Dr Andrew Thomson en météorologie appliquée

1967	A. Davenport	1972	P.W. Summers	
1968	D. Davies	1973	H.P. Wilson	
1969	M.K. Thomas	1974	R. Daley	
1970	N. Yacowar	1975	G. A. McKay	
1971	J.S. Marshall		State and the	

#### Graduate Student Prize Prix aux étudiants diplômés

1967	S. Woronko	1972	L. Ettinger
1968	Not awarded	1973	Y.S. Chung
1969	T. Warn	1974	G. Strong
1970	N.A. McFarlane	1975	Helen Warn
1971	R.S. Schemenauer	1976	H. Melling

Rube Hornstein Prize in Operational Meteorology/ Prix de météorologie opérationnelle Rube Hornstein

1975 W. L. Guzman 1976 S. V. A. Gordon 1977 K. Lee 1978 Bureau de prévision du Québec à Ville St-Laurent
1979 D.B. Fraser

1976 S. Orvig and E.A. Vowinckel
1977 J.I. McPherson
1978 J.D. Reid
1979 Y. Delage and C. Girard

1977 M. Beland
L.W. Diehl
1978 B. McArthur
1979 E. Friere and W.G. Large

#### Citations

1973	John A. Livingston
	Pierre Dansereau
	P.D. McTaggart-Cowan
1974	Barbara Frum, Alan Maitland, Harry Browne and Staff, CBC "As It Happens"
	Alberta Environmental Conservation Authority
	Lydia Dotto (Globe and Mail Science reporter)
1975	Tony Le Sauteur
1976	Conseil Québecois de l'environnement
	Douglas H. Pimlott
1977	Directors of the ARK, New Alchemy Institute, P.E.I.
1978	Tim Padmore

Canadian Arctic Resources Committee 1979 Kenneth C. Curren

La Société Linnéenne de Québec

#### LIST OF AES/CMOS LECTURE TOUR SPEAKERS/ CONFÉRENCIERS EN TOURNÉE, SOUS L'ÉGIDE DE LA SCMO ET DU SEA

1969 K.M. King	1973 W.R. Frisken	1977 D.A. Huntley
1970 T.R. Oke	1974 A.G. Davenport	1978 D.S. Davison
1971 F.K. Hare	1975 P.E. Merilees	1979 A. Fraser
1972 M.B. Danard	1976 J. Maybank	1980 M. Glantz

### LIST OF SUSTAINING MEMBERS OF THE SOCIETY/ MEMBRES DE SOUTIEN DE LA SOCIÉTÉ

Airflow Development Canada Ltd Alberta Agriculture Advisory Committee on Weather Modification Beak Consultants Bendix Aviation Electric Ltd Bristol Aerospace Ltd Dobrocky Seatech Ltd Geneq Inc. Hermes Electronics Ltd MacDonald Dettweiler Assoc. Ltd Nordco Ltd Ontario Hydro N. Sargent Young Atmospheric Consulting Services Ltd

#### LIST OF PRESIDENTS OF THE SOCIETY/ LES PRÉSIDENTS DE LA SOCIÉTÉ

1961 R.H. Douglas	1971 C.M. Penner	1977 K.F. Harry
1962-64 B.W. Boville	1972 G.A. McKay	1978 R.W. Burling
1964-66 R.E. Munn	1973 W.F. Hitschfeld	1979 J.M. Powell
1966-69 A.W. Brewer	1974 A. Robert	1980 J. Maybank
1969-70 M.K. Thomas	1975 P.E. Merilees	
1970 D.N. McMullen	1976 J.E. Hay	

# MEMBERSHIP APPLICATION FORM

(Please write in Block Letters)

General or Student Member	SURNAME GIVEN NAMES PERMANENT ADDRESS TITLE, RANK, DECORAT QUALIFICATIONS OCCUPATION	IONS, DEGREES OR PROFES nly; if student, indicate u	SIONAL iniversity and year	
Sustaining Member	NAME OR AGENCY BUSINESS ADDRESS			
Membership Status Required	Please enroll me as a of the Canadian Me effective January 1, 19 sued by the Society \$payable to graphic Society.	teorological and Ocear , to receive from that date. I atta the Canadian Meteorolo	mographic Society all publications is- ich a cheque for ogical and Oceano-	
		Signature of Applicant		
Mail completed application forms to: Corresponding Secretary Canadian Meteorological and Oceanographic Society Suite 903 151 Slater Street Ottawa, Ontario K1P 5H3		смоs dues for 1981: General Member Student Member Sustaining Member	\$30.00 \$10.00 \$75.00 (min.)	

# DEMANDE D'INSCRIPTION

(Lettres moulées, s.v.p.)

Membre	NOM		
Membre	PRÉNOM(S)		
étudiant	ADRESSE		
	TITRE, RANG, DÉCORATIO	NS, DIPLÔMES OU TITRE	S DE
	COMPÉTENCE PROFESSION	NELLE	
	EMPLOI (Pour dossiers seulemen université et la date où il f	t. L'étudiant doit inscr inira ses études.)	rire le nom de sor
Membre de soutien	NOM OU RAISON SOCIALE		
ue bounter.	ADRESSE		
Type de membre	J'aimerais devenir memb Société canadienne de compter du 1 <sup>er</sup> janvier 19 publications de la Socié de \$à rologie et d'océanograph	re et recevoir pa té. Vous trouverez ci l'ordre de la <i>Société can</i> ie.	de la l'océanographie à ar la suite toutes les -inclus un chèque nadienne de météo-
Type de membre	J'aimerais devenir memb Société canadienne de compter du 1 <sup>er</sup> janvier 19 publications de la Socié de \$à rologie et d'océanograph	re et recevoir pa té. Vous trouverez ci l'ordre de la <i>Société can</i> ie. Signature du c	de la l'océanographie à ar la suite toutes les -inclus un chèque nadienne de météo- andidat
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Type de membre invoyer cette Secrétaire-cu Société cana météorologi	J'aimerais devenir memb Société canadienne de compter du 1 <sup>er</sup> janvier 19 publications de la Socié de \$à rologie et d'océanograph demande d'inscription au: prrespondant idienne de e et d'océanographie	re et recevoir pa té. Vous trouverez ci l'ordre de la <i>Société can</i> <i>ie</i> . Signature du c Cotisation annuelle, p Membre Membre étudiant Membre de soutien	de la 'océanographie à ar la suite toutes les -inclus un chèque nadienne de météo- andidat pour 1981: \$30.00 \$10.00 \$75.00 (min.)
Type de membre de membre Envoyer cette Secrétaire-ce Société cana météorologi Suite nº 903 151 me Slat	J'aimerais devenir memb Société canadienne de compter du 1 <sup>er</sup> janvier 19 publications de la Socié de \$à rologie et d'océanographe demande d'inscription au: prrespondant dienne de e et d'océanographie	re et recevoir pa té. Vous trouverez ci l'ordre de la <i>Société can</i> <i>ie</i> . Signature du c Cotisation annuelle, p Membre Membre étudiant Membre de soutien	de la 'océanographie à ar la suite toutes les -inclus un chèque madienne de météo- andidat pour 1981: \$30.00 \$10.00 \$75.00 (min.)
Type de membre de membre Secrétaire-cu Société cana météorologi Suite nº 903 151 rue Slat Ottawa (Ont	J'aimerais devenir memb Société canadienne de compter du 1 <sup>er</sup> janvier 19 publications de la Socié de \$à rologie et d'océanograph demande d'inscription au: prespondant dienne de e et d'océanographie er ario)	re et recevoir parties de la Société car ie. Signature du c Cotisation annuelle, p Membre Membre étudiant Membre de soutien	de la 'océanographie à ar la suite toutes les -inclus un chèque nadienne de météo- andidat pour 1981: \$30.00 \$10.00 \$75.00 (min.)

## INFORMATION FOR AUTHORS

Editorial Policy. ATMOSPHERE-OCEAN is a medium for the publication of the results of original research, survey articles, essays, book reviews, notes and correspondence in all fields of the atmospheric and oceanographic sciences. It is published quarterly by the Society with the aid of grants from the Canadian Government and the Natural Sciences and Engineering Research Council. Articles may be in either English or French. Contributors need not be members of the Society nor need they be Canadian; foreign contributions are welcomed. All contributions will be subject to a critical review before acceptance. Because of space limitations articles should not normally exceed 16 printed pages.

Manuscripts should be submitted to: ATMOSPHERE-OCEAN, Dept. of Meteorology, McGill University, 805 Sherbrooke St. West, Montreal, p.q. H3A 2K6. Four copies should be submitted, typewritten with double spacing and wide margins. Headings and sub-headings should be clearly designated. A concise, relevant and substantial abstract in both English and French is normally required.

Tables should be prepared on separate sheets, each with concise headings.

Figures should be provided in the form of four copies of an original which should be retained by the author for later revision if required. A list of legends should be typed separately. Labelling should be made in generous size so that characters after reduction are easy to read. Line drawings should be drafted with India ink at least twice the final size on white paper or tracing cloth. Photographs (halftones) should be glossy prints at least twice the final size.

Units. The International System (si) of metric units is preferred. Units should be abbreviated only if accompanied by numerals. e.g. "10 m" but "several metres".

Footnotes to the text should be avoided.

Literature citations should be indicated in the text by author and date. The list of references should be arranged alphabetically by author, and chronologically for each author, if necessary. Page charges are not levied against the author, but excessive alterations made by the author at the proof stage will be charged. Voluntary contributions are appreciated and will entitle the author to 50 free offprints.

## **RENSEIGNEMENTS POUR LES AUTEURS**

Politique éditoriale. ATMOSPHERE-OCEAN est un organe de publication de résultats de recherche originale, d'articles sommaires, d'essais, de critiques et de courtes notes et de lettres dans tous les domaines des sciences de l'atmosphère et de l'océan. Il est publié par la Société grâce à des subventions accordées par le gouvernement canadien et le Conseil de recherches en sciences naturelles et en génie. Les articles peuvent être en anglais ou en français. Il n'est pas nécessaire que les auteurs soient membres de la Société; les contributions étrangères sont les bienvenues. A cause des limitations d'espace les articles ne doivent pas dépasser l6 pages dans le format final. Tout article sera soumis à un critique indépendant avant d'être accepté.

Les manuscrits doivent être envoyés à: ATMOSPHERE-OCEAN, Département de Météorologie, Université McGill, 805 ouest, rue Sherbrooke, Montréal (Québec) H3A 2K6. Ils doivent être soumis en quatre exemplaires dactylographiés à doubles interlignes avec de larges marges. Les titres et sous-titres doivent être clairement indiqués. Chaque article doit comporter un résumé qui soit concis, pertinent et substantiel; ce résumé sera normalement soumis sous versions françaises et anglaises.

Les tableaux doivent être préparés et présentés séparément accompagnés d'un titre concis et d'un numéro.

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### Canadian Meteorological and Oceanographic Society

#### La Société canadienne de météorologie et d'océanographie

The Canadian Meteorological and Oceanographic Society assumed its present constitution in 1977. The organization was first established in 1940 as the Canadian Branch of the Royal Meteorological Society, later becoming the Canadian Meteorological Society in 1967. The Society exists for the advancement of Meteorology and Oceanography (including Limnology) and membership is open to persons and organizations sharing these interests. There are eleven Local Centres and two Chapters of the Society which hold meetings of interest to the membership. ATMOSPHERE-OCEAN is the scientific journal of the Society and is distributed free to all members. Each spring the Society convenes a National Congress.

Correspondence regarding Society affairs and membership should be directed to the Corresponding Secretary, Canadian Meteorological and Oceanographic Society, Suite 903, 151 Slater Street, Ottawa, ONT. KIP 5H3. Telephone: (613)-237-3392.

Street, Ottawa, owr. K1P 5H3. Telephone: (613)-237-3392. There are three types of membership – Member, Student Member and Sustaining Member. For 1981 the dues are \$30.00, \$10.00 and \$75.00 (min.), respectively. The annual Institutional subscription rate for *ATMOSPHERE-OCEAN* is \$40.00.

Correspondence relating to Institutional subscriptions should be directed to the University of Toronto Press, Journals Department, 5201 Dufferin St., Downsview, Ontario, Canada, M3H 5T8. Cheques should be made payable to the University of Toronto Press.

La Société canadienne de météorologie et d'océanographie a adopté la présente constitution en 1977. La Division canadienne de la Société royale de météorologie a été fondée en 1940 et remplacée par la Société météorologique du Canada en 1967. Cette société existe pour le progrès de la météorologie et de l'océanographie (y compris la limnologie) et accueille comme membres toute personne ou organisation intéressée à ces sciences. Les onze centres et les deux sections locaux de la Société réunissent les membres pour des discussions et conférences. ATMO-SPHERE-OCEAN, la revue scientifique de la Société, est distribuée gratuitement à tous les membres. La société organise chaque printemps un Congrès national.

Toute correspondance concernant les activités de la Société et les souscriptions devrait être adressée au Secrétaire-correspondant, Société canadienne de météorologie et d'océanographie, Suite nº 903, 151 rue Slater, Ottawa (ONT.) K1P 5H3. Téléphone: (613)-237-3392.

Il y a trois types de membres: Membre, Membre étudiant, et Membre de soutien. La cotisation pour 1981 est de \$30.00, \$10.00 et \$75.00 (min.) respectivement. Les institutions peuvent souscrire à ATMOSPHERE-OCEAN au coût de \$40.00 par année.

La correspondance concernant les souscriptions des institutions doit être envoyée aux Presses de l'Université de Toronto, Département des périodiques, 5201 rue Dufferin, Downsview (Ontario) Canada, M3H 5T8. Les chèques doivent être faits à l'ordre des Presses de l'université de Toronto.

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