

Atmosphere

10^e CONGRES ANNUEL

26-28 Mai

1976

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Québec

**Canadian Meteorological Society
Société Météorologique du Canada**

ATMOSPHERE

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DIXIEME CONGRES ANNUEL

SOCIETE METEOROLOGIQUE DU CANADA

Le dixième congrès de la Société météorologique du Canada sera tenu sur le site de l'université Laval de Québec les 26, 27 et 28 mai prochains.

L'emphase de cet événement annuel sera mise sur les *réseaux d'observation*, le thème central du congrès de 1976. La première matinée a été réservée aux conférenciers invités qui présenteront l'historique des réseaux d'observation tant météorologiques qu'océanographiques au Canada et qui introduiront les réseaux d'observation récemment mis en place et/ou qui pointent dans le futur immédiat. Ces derniers réseaux sont rattachés à l'essor gigantesque imprimé par le Programme de la recherche atmosphérique globale, mieux connu sous le sigle de GARP. Deux sessions additionnelles complètes seront consacrées à des communications sur les réseaux d'observation.

La Société météorologique du Canada se réjouit de la participation au congrès d'un groupe d'océanographes canadiens et ceci pour la deuxième année consécutive. Cette participation favorise la présentation de deux sessions conjointes de Météorologie et d'Océanographie (la session-thème ainsi qu'une session sur l'interaction air-mer) et d'une série de sessions techniques simultanées. On compte de plus douze sessions en Météorologie et onze sessions en Océanographie. Les responsables des programmes scientifiques sont le Dr. Gaston Paulin, service de la Météorologie, Québec, P.Q. et le Dr. C. Mann, Institut Bedford d'Océanographie, Dartmouth, N.S.

Le Centre québécois de la Société météorologique du Canada a accepté d'agir, à titre d'hôte, au congrès annuel de 1976. M. Michel Ferland du service de la Météorologie du Québec est le responsable du comité de coordination.

SOMMAIRE DES SESSIONS

Mercredi, le 26 mai		Local
0830 – 0850	Discours d'ouverture et de bienvenue	—
0850 – 1200	Session-thème	—
1030 – 1200	1* Marées	—
1030 – 1215	2* Turbulence océanique	—
1330 – 1700	3 Réseaux d'observation	I – Rationalisation
1330 – 1500	4* Ondes océaniques	I – Ondes en surface
1530 – 1700	5* Ondes océaniques	II – Ondes longues et internes
Soirée	Réunion générale annuelle de la SMC au pavillon Pollack	—
Jeudi, le 27 mai		
0830 – 1200	6 Instruments	I – Systèmes
0830 – 1000	7 Météorologie appliquée	—
0830 – 1000	8* Limnologie physique	—
1020 – 1200	9 Météorologie dynamique	I – Modèles et simulations
1030 – 1200	10* Golfe du St-Laurent	I – Processus physiques
1330 – 1700	11 Réseaux d'observation	II – Divers
1330 – 1500	12** Interaction air-mer	—

*Session en océanographie

**Session conjointe océanographie-météorologie

1330 – 1500	13*	Golfe du St-Laurent	II – Processus chimiques	—
1530 – 1630		Réunion de la division d'Océanographie		—
Soirée		Banquet et présentation des prix de la Société. Conférencier: Dr. Marcel Lortie, Directeur général régional, Service de la gestion de l'environnement.		

Vendredi, le 28 mai 1976

0830 – 1200	14	Météorologie dynamique	II – Théorie	—
0830 – 1000	15	Téledétection		—
0830 – 1000	16*	Circulation océanique	I – Circulation au large	—
1020 – 1200	17	Instruments	II – Tests et développements	—
1030 – 1220	18*	Circulation océanique	II – Circulation côtière	—
1330 – 1500	19*	Réseaux océanographiques		—
1330 – 1500	20	Météorologie physique	I – Physique des nuages	—
1330 – 1500	12	Turbulence atmosphérique		—
1530 – 1700	22*	Mélanges verticaux dans l'océan		—
1520 – 1700	23	Météorologie physique	II – Divers	—
1520 – 1700	24	Pollution de l'air		—

*Session en océanographie

PROGRAMME

Mercredi matin, le 26 mai 1976

0830 – 0850

Discours d'ouverture et de bienvenue:

Dr. L. Kerwin,
Recteur, Université Laval

Dr. P. E. Merilees,
Président,
Société météorologique du Canada

Dr. C. Mann,
Sous-comité d'Océanographie à la SMC

M. M. Ferland,
Président,
Centre québécois de la SMC

SESSION-THÈME *Les réseaux d'observation*

Mercredi 0850 – 1200

Modérateur P. E. Merilees

Local:

OCEANOGRAPHIC OBSERVATIONAL NETWORKS: PAST, PRESENT AND FUTURE
W. B. Bailey, Headquarters Maritime Command, Halifax, N.S.

THE HISTORY OF CANADIAN OBSERVATIONAL NETWORKS
R. G. Stark, Atmospheric Environment Service, Downsview

Pause-café: 1030 – 1100

THE PROPOSED OBSERVATIONAL NETWORK ASSOCIATED WITH THE GARP FIRST
EXPERIMENT
Verner E. Suomi, Space Science and Engineering Center,
Madison, Wisconsin, U.S.A.

Déjeuner: 1200 – 1330

SESSION 1 *Les marées*

Mercredi 1030 – 1200

Modérateur: W. D. Forrester

Local:

PREDICTING CHANGES IN TIDAL REGIME – THE OPEN BOUNDARY PROBLEM
C. Garrett, Department of Oceanography, Dalhousie University, Halifax
D. Greenberg, Marine Environment Data Service, Ottawa

TIDAL ANALYSIS AT SAINT JOHN, N.B. USING THE RESPONSE METHOD
Lung-fa Ku, Department of Oceanography, Dalhousie University, Halifax
(Presently on leave from Department of Environment, Canadian Hydrographic
Service, Ottawa)

TIDE-INDUCED UPWELLING AND LONGSHORE CURRENT OFF THE SOUTH-WEST COAST OF NOVA SCOTIA

Tsai Yuan-Erh, Department of Oceanography, Dalhousie University, Halifax

NUMERICAL MODEL STUDIES OF THE M_2 TIDE IN THE BEAUFORT SEA AND AMUNDSEN GULF

R. F. Henry, Institute of Ocean Sciences, Victoria, B.C.

SESSION 2 *Turbulence océanique* Mercredi 1030 – 1215

Modérateur: M. Donelan Local:

VARIABILITY OF TEMPERATURE MICROSTRUCTURE IN THE GULF STREAM

N. S. Oakey and J. A. Elliott, Bedford Institute of Oceanography, Dartmouth

THE SPECTRUM OF SMALL-SCALE OCEANIC TEMPERATURE GRADIENTS

J. A. Elliott and N. S. Oakey, Bedford Institute of Oceanography, Dartmouth

MONIN-OBUKHOV SCALING (MOUS?) UNDER WATER AND OTHER ASPECTS OF SEDIMENT TRANSPORT

P. A. Taylor, Department of Oceanography, University of Southampton, England and Atmospheric Environment Service, Downsview

DEEP WATER RENEWAL IN HOWE SOUND

L. E. Bilodeau and T. R. Osborn, Institute of Oceanography, University of British Columbia, Vancouver

THE VARIANCE SPECTRUM OF PHYTOPLANKTON IN A TURBULENT OCEAN

K. L. Denman, Bedford Institute of Oceanography, Dartmouth, Nova Scotia

Mercredi après-midi, le 26 mai 1976

SESSION 3 *Réseaux d'observation
I – Rationalisation* Mercredi 1330 – 1700

Modérateur: A. J. Robert Local:

ON THE SPECIFICATION OF METEOROLOGICAL OBSERVING SYSTEMS OF THE FUTURE

S. F. Woronko, Atmospheric Environment Service, Downsview

INTERPOLATION ACCURACY IN DATA SPARSE REGIONS

H. Jean Thiébaux, Dept. of Mathematics, Dalhousie University

PRECIPITATION NETWORKS IN THE ATLANTIC PROVINCES – AN OBJECTIVE DESIGN CONCEPT

C. F. MacNeil, A. D. Dow and A. D. J. O'Neill,
Atmospheric Environment Service, Bedford, N.S.

Pause-café: 1500 – 1530

LE RESEAU CLIMATOLOGIQUE DU QUEBEC – ETAT ACTUEL ET NORMES
A. Fréchette, Service de la Météorologie, Québec

RATIONALIZATION OF A PRECIPITATION NETWORK
R. L. Berry, Atmospheric Environment Service, Downsview

AN OBSERVATIONAL NETWORK TEST SYSTEM (ONTES)
D. A. Bourque and W. A. Physick
Atmospheric Environment Service, Downsview

PRECISION D'UN RESEAU DE PLUVIOMETRES
I. I. Zawadzki, Université du Québec à Montréal

SESSION 4 *Ondes océaniques* Mercredi 1330 – 1500
 I-Ondes en surface

Modérateur: R. W. Burling Local:

WAVE CLIMATE ON THE NORTH ATLANTIC – 1970
H. J. A. Neu, Bedford Institute of Oceanography, Dartmouth

STORM WAVE STATISTICS IN A COASTAL AREA
P. E. Vandall, Jr., Bedford Institute of Oceanography, Dartmouth

SURF-BEAT AND EDGE WAVES
D. A. Huntley, Department of Oceanography, Dalhousie University, Halifax

LONG WAVE RADIATION FROM A POINT SOURCE ON A SHELF: A STUDY OF LATERAL GRAVITY WAVES
D. R. King and P. H. LeBlond, Institute of Oceanography, University of British Columbia, Vancouver

SESSION 5 *Ondes océaniques* Mercredi 1530 – 1700
 II-Ondes longues et internes

Modérateur: P. H. LeBlond Local:

REFLECTION AND SCATTERING OF LONG WAVES BY BOTTOM TOPOGRAPHY
A. J. Bowen, Department of Oceanography, Dalhousie University, Halifax

LOW FREQUENCY CURRENTS IN THE STRAIT OF GEORGIA
J. A. Helbig and L. A. Mysak, Institute of Oceanography, University of British Columbia, Vancouver

VARIATIONS IN THE MIXED LAYER AND MAIN THERMOCLINE AT 9°N 22°W DURING PHASE III OF GATE
R. A. Clarke, Bedford Institute of Oceanography, Dartmouth

THE ATTENUATION OF VERTICALLY PROPAGATING INTERNAL GRAVITY WAVES IN A RANDOMLY VARYING WIND/CURRENT SHEAR
R. E. Thomson, Institute of Ocean Sciences, Victoria, B.C.

Jeudi matin, le 27 mai 1976

SESSION 6 *Instruments* **Jeudi 0830 – 1200**
 I-Systèmes

Modérateur: R. E. Vockeroth **Local:**

RROMS (RADAR REMOTING OUTPUT MONITORING SYSTEM)
D. Cullen, Atmospheric Environment Service, Downsview

MAGNETIC TAPE EVENT RECORDER (MATER)
J. M. Cook, Atmospheric Environment Service, Downsview

MAPS – A NEW SYSTEM OF RUGGED BATTERY OPERATED ACQUISITION
R. Van Cauwenberghe, Atmospheric Environment Service, Downsview

SOME PROBLEMS ASSOCIATED WITH METEOROLOGICAL MEASUREMENTS OVER WATER AND THEIR SOLUTIONS
K. K. K. Wu and R. Van Cauwenberghe, Atmospheric Environment Service, Downsview

Pause-café: 1000 – 1030

AN AUTOMATIC WEATHER STATION FOR THE BEAUFORT SEA
R. J. Grauman

REAL TIME RADAR DETECTION OF MESOSCALE FLOW FEATURES IN FRONTAL CYCLONES
Harold W. Baynton and Grant R. Gray, National Center for Atmospheric Research, Boulder, Colorado,
Peter V. Hobbs and Robert A. Houze Jr., Department of Atmospheric Sciences, University of Washington

SYSTEM FOR CONSTANT ELEVATION PRECIPITATION TRANSMISSION AND RECORDING (SCEPTRE)
A. E. Aldcroft, Atmospheric Environment Service, Downsview

AEROLOGICAL DATA REDUCTION SYSTEM (ADRES)
G. Mongeau, Atmospheric Environment Service, Downsview

Déjeuner: 1200 – 1330

SESSION 7 *Météorologie appliquée* **Jeudi 0830 – 1000**

Modérateur: R. M. Gagnon **Local:**

MODELE DE PROBABILITE DE PRECIPITATIONS (PdP) EN ETE DANS LE REGION AGRICOLE DE MONTREAL
Stan Siok, Service de l'Environnement atmosphérique, Montréal

SUBJECTIVE PROBABILITY FORECASTING IN THE UNITED STATES: SOME RECENT OPERATIONAL AND EXPERIMENTAL RESULTS
Allan H. Murphy, National Center for Atmospheric Research, Boulder, Colorado

CLIMATIC FLUCTUATION IN THE 500 MB GEOPOTENTIAL AND 500-1000 MB THICKNESS FIELD

R. G. Lawford, Atmospheric Environment Service, Downsview

SERVICE FORET-METEO

Luc Pouliot, Service de l'Environnement atmosphérique, Montréal

Pause-café: 1000 - 1020

SESSION 8 *Limnologie physique* Jeudi 0830 - 1000

Modérateur: D. M. Farmer Local:

THE DYNAMICS OF RIVER-INDUCED CURRENTS IN A LAKE

P. F. Hamblin, Physical Limnology Section, Canada Centre for
Inland Waters, Burlington, Ontario

SOME FEATURES OF THE THERMAL STRUCTURE OF LAKE ONTARIO

F. M. Boyce, Physical Limnology Section, Canada Centre for
Inland Waters, Burlington, Ontario

THE PROBLEM OF SALINITY INCREASE IN LAKE QARUN (EGYPT) AND A PROPOSED SOLUTION

A. H. Meshal, Bedford Institute of Oceanography, Dartmouth

UTILITÉ DES SATELLITES LANDSAT EN LIMNOLOGIE

G. Rachon, Department of Energy, Mines and Resources, Ottawa

SESSION 9 *Météorologie dynamique* Jeudi 1020 - 12.0
 I-Modèles et simulations

Modérateur: J. M. R. Asselin Local:

PREVISION A L'AIDE D'UN MODELE AUX EQUATIONS PRIMITIVES UTILISANT LA METHODE SPECTRALE

Claude Girard et Roger Daley, Service de l'Environnement atmosphérique,
Montréal

NUMERICAL EXPERIMENTS WITH A POLAR FILTER AND ONE-DIMENSIONAL SEMI-IMPLICIT ALGORITHM

P. E. Merilees, P. Ducharme et G. Jacques,
McGill University, Montréal

A MODEL FOR COMPUTING SMALL-SCALE WIND VARIATIONS OVER A WATER SURFACE

M. Danard, University of Waterloo, Waterloo, Ontario and
S. Venkatesh, Atmospheric Environment Service, Downsview

PROGRAMME DE SIMULATION CLIMATOLOGIQUE - COMPARAISON AVEC L'EXPERIENCE

Georges Gallagher et Ludovic Perelman, Université de Québec à Chicoutimi

Déjeuner: 1200 – 1330

SESSION 10 *Golfe du St-Laurent* **Jeudi 1030 – 1200**
I-Processus physiques

Modérateur: E. R. Pounder **Local:**

THE LOWER ST. LAWRENCE ESTUARY AS A PHYSICAL OCEANOGRAPHIC SYSTEM
M. I. El-Sabh, Université du Québec à Rimouski

STRUCTURE THERMIQUE ESTIVALE DE LA REGION DE SEPT-ILES – ANTICOSTI
F. R. Boudreault, Min. Industrie et Commerce, Québec

ICE MOVEMENT AND MODIFICATION IN THE GULF OF ST. LAWRENCE
G. L. Bugden, Department of Oceanography, Dalhousie University, Halifax

EPAISSEUR DE LA GLACE DANS LES LAGUNES DES ILES-DE-LA-MADELEINE (GOLFE DU SAINT-LAURENT) EN 1973-75
F. R. Boudreault

Jeudi après-midi, le 27 mai 1976

SESSION 11 *Réseaux d'observation* **Jeudi 1330 – 1700**
II-Divers

Modérateur: R. J. Fichaud **Local:**

WORLD ENVIRONMENTAL MONITORING SYSTEMS
R. E. Munn, Atmospheric Environment Service, Downsview

A FIELD TEST OF POTENTIAL OPERATIONAL HUMIDITY SENSORS
D. J. McKay

INTEGRATION EN TEMPS REEL DU RESEAU D'OBSERVATION-MAITRE AVEC D'AUTRES RESEAUX AUXILIAIRES
J. Vanier, Service de l'Environnement atmosphérique, Montréal

UTILISATION D'OBSERVATIONS METEOROLOGIQUES A L'ECHELLE MESO DANS UN SYSTEME DE PREVISIONS A COURTE ECHEANCE
L. L. Primeau, Service de l'Environnement atmosphérique, Montréal

Pause-café: 1500 – 1530

A TEMPORARY OBSERVATIONAL NETWORK DESIGNED FOR ESTIMATING ON-FARM MINIMUM TEMPERATURES AND FREEZE PROBABILITIES
A. Bootsma, P.E.I. Department of agriculture and Forestry, Charlottetown

D. W. Buss, Atmospheric Environment Service, Downsview

Bea Taylor Alt, Ottawa

Jean-Pierre Dupouyet, Travaux Publics de l'Etat, Périgueux, France

Jean-Pierre Dupouvet, Travaux Publics de l'Etat, Périgueux, France

Jeudi 1330 – 1500

Local:

E. G. Banke, S. D. Smith and R. J. Anderson, Bedford Institute of Oceanography, Dartmouth

M. A. Donelan, Canada Centre for Inland Waters, Burlington

A. H. Meshal, Bedford Institute of Oceanography, Dartmouth

P. A. Yeats and J. M. Bowers, Bedford Institute of Oceanography, Dartmouth

Jeudi 1330 – 1500

Local:

S. A. Poulet, D. Cossa, and J. C. Marty, Université du Québec à Rimouski

J. C. Marty, S. A. Poulet, and D. Cossa, Université du Québec à Rimouski

D. Cossa, J. C. Marty, and S. A. Poulet, Université du Québec à Rimouski

SMALL SCALE VARIABILITY IN THE PRODUCTIVITY: BIOMASS RATIO FOR PHYTOPLANKTON IN THE LOWER ST. LAWRENCE ESTUARY

M. Sinclair, M. El-Sabh and J. P. Chanut, Section d'Océanographie,
Université du Québec à Rimouski

Vendredi matin, le 28 mai 1976

SESSION 14 *Météorologie dynamique* **Vendredi 0830 – 1200**
 II-Théorie

Modérateur: B. W. Boville **Local:**

ATMOSPHERIC BOUNDARY-LAYER FLOW ABOVE "GENTLE TOPOGRAPHY"
P. A. Taylor, University of Southampton, England and Atmospheric
Environment Service, Downsview

PLANETARY-WAVE INSTABILITIES IN THE PRESENCE OF DISTORTED BACKGROUND
FLOWS

John H. E. Clark, The Pennsylvania State University

THE CHINOOK OF SOUTHERN ALBERTA – A PROBLEM ASSESSMENT

Peter F. Lester, The University of Calgary

APPLICATION DE LA THEORIE DES GROUPES AUX MODELES DE PREVISIONS
ATMOSPHERIQUES

E. Yakimiw, Service de l'Environnement atmosphérique, Montréal

Pause-café: 1000 – 1020

SELF INTERACTION OF ROSSBY WAVE PACKET AND GENERATION OF MEAN FLOW

M. Shabbar, Atmospheric Environment Service, Downsview

A DIAGNOSTIC STUDY OF ATMOSPHERIC SPECTRAL KINETIC ENERGETICS

William R. Burrows, Atmospheric Environment Service, Downsview

ON THE PARAMETERIZATION OF HORIZONTAL DISSIPATION IN NUMERICAL MODELS

L. Steinberg, Atmospheric Environment Service, Downsview

UNE PARAMETRISATION DE LA COUCHE LIMITE PLANETAIRE POUR LES MODELES DE LA
CIRCULATION GENERALE

R. Benoit, Service de l'Environnement atmosphérique, Montréal

BAROCLINIC GROWTH RATES IN THE RPN SPECTRAL MODEL

Roger Daley and Helen Warn, Atmospheric Environment Service, Montréal

Déjeuner: 1200 – 1330

SESSION 15 *Téledétection* **Vendredi 0830 – 1000**

Modérateur: E. G. Morrissey **Local:**

THE DETERMINATION OF CLOUD HEIGHT IN THE CANADIAN ARCTIC

E. R. Reinelt and Y.-J. Chang, University of Alberta, Edmonton

AREAL TEMPERATURE DISTRIBUTION FROM THERMAL IMAGERY

Richard C. Bennett, Environment and Land Use Committee,
Victoria, B.C.

GEOMETRIC CORRECTION OF METEOROLOGICAL SATELLITE IMAGERY

S. Peteherych and D. Steenbergen, Atmospheric Environment Service,
Downsview

THE AES HIGH RESOLUTION SATELLITE IMAGERY SYSTEM

E. G. Morrissey, R. W. Welsh and J. D. Steenbergen,
Atmospheric Environment Service, Downsview

Pause-café: 1000 – 1020

SESSION 16

*Circulation océanique
I-Circulation au large*

Vendredi 0830 – 1030

Modérateur: C. R. Mann

Local:

LAGRANGIAN MEASUREMENTS OF OCEAN MOTION – PROGRESS AND PROBLEMS

J. F. Garrett, Ocean and Aquatic Sciences, Victoria, B.C.

QUASI-GEOSTROPHIC OSCILLATIONS ON A THERMOCLINE MODEL

G. T. Needler, Bedford Institute of Oceanography, Dartmouth

OBJECTIVE ANALYSIS OF MESO-SCALE OCEAN CIRCULATION FEATURES

H. J. Freeland, University of Rhode Island, Kingston, R.I.

A STUDY IN THE SLOPE WATER REGION SOUTH OF HALIFAX

M. Germaine Gaten, Department of Oceanography, Dalhousie University, Halifax

SESSION 17

*Instruments
II-Tests et développements*

Vendredi 1020 – 1200

Modérateur: G. A. McKay

Local:

HOW LONG FOR THE STEVENSON SCREEN?

J. D. McTaggart-Cowan and D. J. McKay,
Atmospheric Environment Service, Downsview

THE STANDARD AES MINISONDE

M. E. Still, Atmospheric Environment Service, Downsview

MICROPROCESSORS IN NETWORK INSTRUMENTATION

C. E. Robinson, Atmospheric Environment Service, Downsview

SOLAR POWER – IS IT A SOLUTION TO THE POWER REQUIREMENTS OF REMOTE METEOROLOGICAL SYSTEMS?

S. Ozog and R. Van Cauwenberghe, Atmospheric Environment Service,
Downsview

UN THERMOGRAPHE A L'EPREUVE DU GIVRE

R. Verreault et C. Tremblay, Université du Québec à Chicoutimi

Déjeuner: 1200 – 1330

SESSION 18 *Circulation océanique*
II-Circulation côtière

Vendredi 1030 – 1220

Modérateur: M. I. El-Sabh

Local:

WIND FORCING ON THE OUTER CONTINENTAL SHELF

Brian Petrie, Bedford Institute of Oceanography, Dartmouth

OCEANOGRAPHY OF THE LABRADOR COAST – A REVIEW

J. B. Matthews, Bedford Institute of Oceanography, Dartmouth

OCEANOGRAPHIC FEATURES, CURRENTS AND TRANSPORT IN CABOT STRAIT

M. I. El-Sabh, Université du Québec à Rimouski

PHYSICAL OCEANOGRAPHIC ASSESSMENT OF OCEAN DUMPING

H. C. Mouratidis, Beak Consultants Limited, Richmond, B.C.

QUASI-GEOSTROPHIC CURRENTS IN THE MAGDALEN SHALLOW

C. L. Tang, Bedford Institute of Oceanography, Dartmouth

Vendredi après-midi, le 28 mai 1976

SESSION 19 *Réseaux océanographiques*

Vendredi 1330 – 1500

Modérateur: J. A. Elliott

Local:

THE BUOY OBSERVING SYSTEM FOR THE FIRST GARP GLOBAL EXPERIMENT

J. F. Garrett, Ocean and Aquatic Sciences, Victoria, B.C.

FIRST GARP GLOBAL EXPERIMENT (FGGE) – BUOY ARRAY DEVELOPMENT PLAN

N. Boston, Beak Consultants Limited, Richmond, B.C.

RESUME OF CODS PROGRAM

A. Mclatchy, Hermes Electronics Limited, Dartmouth

SESSION 20 *Météorologie physique*
I-Physique des nuages

Vendredi 1330 – 1500

Modérateur: W. R. Hitschfeld

Local:

CUMULUS CLOUD SEEDING FOR FOREST FIRE CONTROL – PRELIMINARY SEEDING
EXPERIMENTS

G. A. Isaac, Atmospheric Environment Service, Downsview
J. I. MacPherson, National Aeronautical Establishment, and
L. B. MacHattie, Canadian Forestry Service

A NUMERICAL MODEL OF GRAUPEL INITIATION

L. Cheng and R. Charlton, University of Alberta, Edmonton

FINE SCALE STRUCTURE OF CONVECTIVE STORMS – IMPLICATIONS FOR CLOUD SEEDING
IN ALBERTA

B. L. Barge, F. Bergwall, G. G. Goyer and J. H. Renick,
Alberta Research Council, Edmonton

CUMULUS CLOUD POPULATIONS IN THE TRADE WIND REGIONS

H. R. Cho, University of Toronto, Toronto

Pause-café: 1500 – 1520

SESSION 21 *Turbulence atmosphérique* Vendredi 1330 – 1500

Modérateur: R. E. Munn Local:

ON AN AERODYNAMIC PREDICTION OF HEAT AND WATER VAPOR LOSSES FROM THE
GROUND

P. H. Schuepp, McGill University, Ste-Anne-de-Bellevue

TEMPERATURE FLUCTUATIONS IN THE SURFACE BOUNDARY LAYER

G. A. McBean, Atmospheric Environment Service, Downsview

AN ANALYTICAL-EMPIRICAL METHOD FOR DETERMINING THE ROUGHNESS-LENGTH
AND ZERO-PLANE DISPLACEMENT HEIGHT

Aloysius K. Lo, Atmospheric Environment Service, Downsview

SPECTRAL GAPS AND OPTIMUM AVERAGING TIMES IN A TROPICAL MARINE BOUNDARY
LAYER

R. E. Mickle, Atmospheric Environment Service, Downsview and
D. S. Davison, INTERA Environmental Consultants Ltd., Calgary

Pause-café: 1500 – 1520

SESSION 22 *Mélanges verticaux
dans l'océan* Vendredi 1530 – 1700

Modérateur: M. Miyake Local:

DEEP WATER EXCHANGE IN RUPERT-HOLBERG INLET

D. Stucci and D. M. Farmer, Institute of Ocean Sciences, Victoria, B.C.

DEEP WATER EXCHANGE PROCESSES IN THE SAGUENAY FJORD

S. J. Reid, R. W. Trites¹, D. J. Lawrence, R. H. Loucks², G. H. Seibert
Bedford Institute of Oceanography, Dartmouth

VERTICAL MIXING IN THE SLOPE WATER OFF NOVA SCOTIA

Edward Horne, Department of Oceanography, Dalhousie University, Halifax

VERTICAL MIXING ON THE NORTH SHORE OF LAKE ONTARIO DURING A FALL STORM

F. M. Boyce and B. K. Killins, Physical Limnology Section, Canada
Centre for Inland Waters, Burlington, Ontario

SESSION 23 *Météorologie physique*
 II-Divers

Vendredi 1520 – 1700

Modérateur: R. List

Local:

FATA MORGANA SIMULATIONS

Alistair B. Fraser, The Pennsylvania State University,
University Park, Pennsylvania

MEASUREMENTS OF CONTINENTAL THUNDERSTORM ACTIVITY FROM ONE SPHERICS
STATION

R. D. Grimes, R. G. Lawford, Bhartendu, Atmospheric Environment Service,
Downsview

STUDIES ON THE EFFECTS OF ATMOSPHERIC IONS ON PLANTS

T. M. Elkley, Bhartendu, R. L. Pelletier and N. Barthakur, McGill
University, Ste-Anne-de-Bellevue

CLIMATOLOGICALLY RELATED PROBLEMS IN DETERMINING THE POTENTIAL FOR
SOLAR ENERGY UTILIZATION IN CANADA

John E. Hay, The University of British Columbia, Vancouver

MESURE DES RAYONNEMENTS DE GRANDES LONGUEURS D'ONDE: APPLICATION AU
BILAN ENERGETIQUE D'UNE SERRE

J. J. Vonarburg et V. V. Tran, Université du Québec à Chicoutimi

SESSION 24 *Pollution de l'air*

Vendredi 1520 – 1700

Modérateur: C. East

Local:

CANADIAN PARTICIPATION IN THE WMO PROGRAMME FOR WORLD WIDE MONITORING
OF BACKGROUND CARBON DIOXIDE LEVELS

K. G. Pettit, Atmospheric Environment Service, Downsview

ON MONITORING THE ATMOSPHERIC AEROSOLS BY REMOTE SENSING SATELLITE
TECHNIQUES

T. Takashima, Atmospheric Environment Service, Downsview

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PUBLIC PERCEPTION OF AIR POLLUTION IN NEW BRUNSWICK

James W. S. Young, Department of the Environment, Fredericton

PHOTOCHEMICAL OZONE (O_3) AND REGIONAL TRANSPORT OF AIR POLLUTANTS IN THE BOUNDARY LAYER

Y. S. Chung, Atmospheric Environment Service, Downsview

CONCENTRATIONS TRIDIMENSIONNELLES DU SO_2 A MONTREAL RELIEES AUX CONDITIONS METEOROLOGIQUES

C. East et P. Zwack, Université du Québec à Montréal,

G. Desautels et G. Perrier, Service de l'Environnement atmosphérique,
Montréal

SOMMAIRES

Session 1 Les marées

PREDICTING CHANGES IN TIDAL REGIME – THE OPEN BOUNDARY PROBLEM

Christopher Garrett and David Greenberg

Attempts to predict the impact on a tidal regime of large engineering structures are generally based on the use of a numerical model which is calibrated to reproduce the natural tidal regime and then re-run with the structures in place. It is usually assumed that the 'input' tide at the open boundary is unchanged by the structures, though this is clearly wrong in principle. We show how errors in this procedure can be corrected for, or at least estimated, using output from the numerical model and estimates of the impedance of the exterior ocean.

We find that, to a reasonable approximation, the predictions made with an unchanged input at the open boundary should be multiplied by a factor $(1 + Z_0 I / V_m) / (1 + Z_0 \lambda I / V_m)$. V_m is the prescribed elevation averaged along the open boundary, I the computed mass flux across the open boundary for the natural regime, λI the mass flux for the modified regime and Z_0 the impedance of the exterior ocean. Z_0 can be expressed as an infinite series in terms of the normal modes of the exterior ocean, with some terms allowing for near-resonant enhancement of particular modes and the infinite tail of the series corresponding to a local-source type behaviour, which may be estimated independently.

Application of the techniques to the problem of predicting the impact of Fundy tidal power suggests that any predicted change may be uncertain to about $\pm 20\%$ of the change, due to uncertainties in the tidal characteristics of the world's oceans.

We also estimate that the effect on global ocean tides outside the Bay of Fundy and Gulf of Maine of a medium scale tidal power project in the Bay of Fundy would be a change of at most 0.01m in M_2 .

TIDAL ANALYSIS AT SAINT JOHN, N.B. USING THE RESPONSE METHOD

Lung-fa Ku

Three years of water level data recorded at Saint John, N.B. in the Bay of Fundy were analysed using the response method developed by Munk and Cartwright. The astronomical tidal potential is used as an input. The variance of the water levels is concentrated in the semi-diurnal frequency band, which is about $4.8 \times 10^4 \text{ cm}^2$ in comparison with 250 cm^2 in the diurnal. The largest contribution ($> 99\%$) comes from the second order spherical harmonic of the tidal potential C_2^2 , and the next from the third order nonlinear interaction $(I)^{2+2-2}$, which is a triple product of the semi-diurnal tides. It accounts for about 80 cm^2 ; however, contributions from other sources are generally about 10 cm^2 each.

The semi-diurnal tides generated by $(I)^{2+2-2}$ are out of phase with those which originated from C_2^2 , therefore the latter tidal response computed without $(I)^{2+2-2}$ will be underestimated in magnitude. This is in agreement with the polynomial expansion of $|u|/u$ representing the quadratic friction. The reduction at M_2 frequency due to $(I)^{2+2-2}$ is about 0.5 m. The tidal response will be severely distorted if $(I)^{2+2-2}$ is neglected. The distortion is largest at frequencies below N_2 because the contribution from C_2^2 is smaller than that from $(I)^{2+2-2}$ below this frequency.

The response curve indicates a resonant feature with a peak of 1.88 cycle/day and a Q of about 20. This represents the tidal response observed at Saint John of the Atlantic Ocean, Gulf of Maine and Bay of Fundy as one system. A minor peak occurs at 2.07 cycle/day, and its amplitude is 23% of the major peak.

Tsai Yuan-Erh

A theory of upwelling and longshore current generated by oscillatory tidal currents around a cape is derived, taking the effects of centrifugal force, frictional force, and Coriolis force into account. The longshore current is such that, in the Northern (Southern) hemisphere, the coast is on the right (left) hand side of an observer looking downstream. Application of the theory to the South-West coast of Nova Scotia is in quantitative agreement with the observed onshore flow near the bottom of about 0.02 m/s.

NUMERICAL MODEL STUDIES OF THE M_2 TIDE IN THE BEAUFORT SEA AND AMUNDSEN GULF

R. F. Henry

Only fragmentary cotidal charts can be drawn on the basis of tidal records presently available from the Beaufort Sea and Amundsen Gulf. A numerical model driven on its western boundary by a travelling wave and having an open northern boundary has yielded an overall M_2 cotidal chart in good accord with available data. Numerical experiments to determine whether winds or ice-cover govern the seasonal variation in tidal phase are also discussed.

Session 2 Turbulence océanique

VARIABILITY OF TEMPERATURE MICROSTRUCTURE IN THE GULF STREAM

N. S. Oakey and J. A. Elliott

Extensive measurements of the vertical temperature gradient structure have been made in a section through the Gulf Stream using a vertical profiling instrument, Octuprobe. The results of two cruises (October 1972 and March 1974) have been analyzed to examine the spatial and temporal variability of the structure as characterized by the finestructure variance (.01 cycle/m to 1 cycle/m) and microstructure (1 cycle/m to 20 cycles/m) and square of the mean gradient.

The blocks of vertical gradient record (typically 100 m) have been grouped into categories on the basis of the T - S curves for the section. Within a category there is a consistent ratio of microstructure variance to square of mean gradient. This ratio is higher for categories in the surface region than for those representative of deep ocean gradients. For all categories there is a relatively constant ratio between microstructure variance and finestructure and the generation of microstructure. On the basis of the Osborne & Cox model (1972) we calculate the vertical eddy coefficient to be 4×10^{-5} m²/s for the deep ocean gradients and larger for near surface regions.

Statistical properties of the temperature gradient signals indicate no systematic differences between the data from different regions of the section suggesting common mechanisms for generation of the structure.

THE SPECTRUM OF SMALL-SCALE OCEANIC TEMPERATURE GRADIENTS

J. A. Elliott and N. S. Oakey

The spectrum of the vertical temperature gradients that occur in the ocean is examined for a number of typical profiles and is compared to a simple model for the scale range 1 cycle/m to 100 cycles/m.

MONIN-OBUKHOV SCALING (MOUS?) UNDER WATER AND OTHER
ASPECTS OF SEDIMENT TRANSPORT

P. A. Taylor

Civil Engineers and Physical Oceanographers have been concerned for decades with the transport of sediment either as suspended matter or as bed load. One of the simplest situations that can be considered is the transport of material in suspension in deep water above an infinite plane bed. In these circumstances, there is a balance between upward turbulent mixing of sediment and downward gravitational settling. The presence of sediment in suspension produces a stable density gradient in the fluid-sediment mixture which then affects the turbulent mixing of both sediment and momentum. Experimentally, this has been interpreted as a variation in the value of the von Karman constant, κ . An application of the micrometeorological concepts of Monin-Obukhov scaling and the non-dimensional wind shear to this situation provides a nice example of a transfer of ideas from one field to another and helps to explain the observations and predict the apparent variation in κ .

Other aspects of sediment transport, in particular the flow and bed load transport above sand and gravel waves have also been studied recently by the author and some results will be briefly presented.

DEEP WATER RENEWAL IN HOWE SOUND

L. E. Bilodeau and T. R. Osborn

Howe Sound is a B.C. inlet in which a 75-m-deep sill separates a 290-m-deep inner basin from the rest of the inlet and the Strait of Georgia. In late fall, changes in the water properties indicate the occurrence of inflows from the Strait of Georgia. Such an event was observed using bottle samples, an STD and microstructure profilers. Measurements showed that the intruding water was not distributed uniformly in the inlet; samples taken along the middle of the inlet would not have adequately represented the distribution of the intruding water. Microstructure measurements showed that features smaller than 20 m were extremely variable in space and time.

The inner basin was revisited during the following January, February and March. During this period, the water below sill-depth consisted of two fairly uniform and distinct water volumes. Data collected in February with two free-falling probes were used to construct vertical profiles of the mean and rms gradients averaged over intervals of 0.4 m. The mean gradient profiles revealed features of the fine structure that can be traced over tens of meters laterally. The rms gradient profiles revealed patches of microstructure. In the inner basin the microstructure patches extended over distances of a few tens of meters while in the outer basin, they had higher intensities and apparently did not extend as far horizontally.

THE VARIANCE SPECTRUM OF PHYTOPLANKTON IN A TURBULENT OCEAN

K. L. Denman

A theoretical representation of the variance spectrum of phytoplankton is derived from dimensional arguments. Critical parameters are the rate of reproduction of phytoplankton and the rate of turbulent dissipation of the medium. Examples of spectra of that part of the variance of phytoplankton abundance not correlated with internal wave effects are presented; they are consistent with the theoretically derived spectrum.

ON THE SPECIFICATION OF METEOROLOGICAL OBSERVING SYSTEMS OF THE FUTURE
S. F. Woronko

An analysis of present and future requirements for meteorological observing systems is presented, taking into account the major applications of meteorological information as well as the natural time and space scales of atmospheric phenomena. The relevancy and adequacy of existing systems and standards is discussed. Recommendations are made regarding the direction in which instrument and network development should be headed in order to meet the needs of the future most effectively.

INTERPOLATION ACCURACY IN DATA SPARSE REGIONS
H. Jean Thiébaux

Experiments with objective analyses establish the degree of dependence of analysis accuracy on the basic geopotential correlation model. Three isotropic models are compared with a direction dependent, two-dimensional model which has been shown to be a much more accurate representation for observed correlation behavior. By varying densities of stations in the observation net contributing to the analyses, with a wide range of data coverage, measures of accuracy gains are established vis-a-vis observation network configurations.

PRECIPITATION NETWORKS IN THE ATLANTIC PROVINCES - AN OBJECTIVE DESIGN CONCEPT
C. F. MacNeil, A. D. Row and A. D. J. O'Neill

This paper reviews the history and current status of precipitation networks in the Atlantic Region. Principles underlying the design and development of these networks are discussed. Major emphasis is, however, on the presentation of results of an application of the objective methods of Gandin to the analysis of network requirements in the area.

LE RESEAU CLIMATOLOGIQUE DU QUEBEC—ETAT ACTUEL ET NORMES
André Fréchette

Présentation de l'état actuel du réseau climatologique et des programmes d'observations en vigueur. Les normes utilisées pour l'établissement des stations proviennent des recommandations du professeur L. S. Gandin, publiées dans une note technique de l'OMM. Ces recommandations ont été adaptées pour tenir compte de la topographie du territoire québécois et d'une division du territoire selon l'activité humaine.

RATIONALIZATION OF A PRECIPITATION CHEMISTRY NETWORK
R. L. Berry, Atmospheric Environment Service of Canada

The application of Gandin's method for network rationalization to the design of a precipitation chemistry network is examined in light of an 18 month field test of several precipitation collectors. The properties of the data are discussed with respect to the requirements of Gandin's method. Some conclusions are drawn about the usefulness of this method for planning a national precipitation chemistry network, with some comments regarding its application to the design of a synoptic scale surface raingauge network.

AN OBSERVATIONAL NETWORK TEST SYSTEM (ONTES)

Denis A. Bourque and William L. Physick

A numerical, dynamic procedure (ONTES) developed to test the Canadian meteorological observing systems is described. Its purpose is to provide objective information to help assess the effectiveness of a network configuration with respect to the entire forecast procedure, from large-scale prognoses to the regional-scale forecasts. It performs this task by simulating as much of the operational procedure as possible. Its major components, the 'reference atmosphere' and the 'working atmosphere' are outlined. Also included are discussions on the approach used to handle the various meteorological scales involved. Examples are taken from the preliminary studies of ONTES' first application, the Canadian West Coast system.

PRECISION D'UN RESEAU DE PLUVIOMETRES

I. I. Zawadzki

La précision de l'estimation du taux de précipitation pour un réseau de pluviomètres est étudiée comme fonction du nombre des pluviomètres, de la surface couverte et du temps d'intégration des mesures. L'étude est basée sur des paramètres statistiques de la pluie tels qu'observés dans la région de Montréal. La présence des erreurs systématiques et aléatoires dans l'estimation du taux de précipitation pour un réseau est observé et une méthode de correction est suggérée.

Session 4 Ondes océaniques I-Ondes en surface

WAVE CLIMATE OF THE NORTH ATLANTIC - 1970

H. J. A. Neu

Based on the synoptic wave charts issued twice daily by the Meteorological and Oceanographic Weather Centre, Halifax, the wave climate of the North Atlantic was established for the year 1970. The criteria and concepts for developing such a climate are critically reviewed. Representative parameters and statistical terms are used to characterize the sea-state.

The results clearly indicate that the sea-state, across the North Atlantic, varies greatly with season and location. During the winter, the wave energy was 6 to 10 times greater than during the summer and in the mid- and northeastern Atlantic 4 to 6 times that of the western Atlantic. The largest waves were found to occur near the west coast of Ireland with a height of 21 m. In the northeastern part of the ocean, there was 2 to 12 times more wave activity than in the western and southern part of the Atlantic, depending on the wave height. Long-term probability statistics based on the 1970 data, indicate that the "design" wave (100 year wave) varies along the east coast of North America from 14 to 24 m and along the coast of Europe from 28 to 34 m.

STORM WAVE STATISTICS IN A COASTAL AREA

Paul E. Vandall, Jr.

With the passage of a storm off the mouth of the Halifax Harbour, during the period February 15 and 16, 1972, wave measurements were obtained. Wave heights of up to 6.3 m were recorded at periods ranging from 8 to 10 seconds with spectral widths of the order of 0.8. Analyses of these records carried out using the wave-for-wave and spectral techniques permitted verification of the wave height and period distribution as well as an intercomparison of their various statistics. One particular 16-hour continuous wave record within the storm received particular attention. The two techniques appear to be in agreement in areas of overlap and complementary otherwise.

An increasing number of measurements of nearshore water motion are revealing the existence of significant wave motion with periods long compared to the incident wave period (i.e. tens of seconds to several minutes). Detailed analysis of one set of such measurements has indicated that at least some of this low frequency energy is contained in edge waves, waves trapped against a shoaling coastline by refraction. An interesting feature of this edge wave energy is that it occurs in several discrete narrow frequency bands, rather than forming a broad band of low frequency energy. A possible explanation of these discrete peaks is that they are edge waves at the cut-off frequencies (Ursell 1952, Ball 1967). Each mode of edge wave has a cut-off frequency, determined by the mode number and the subaqueous beach profile, below which the wave is no longer trapped to the shoreline but can radiate energy away. The observed low frequency peaks compare well in both frequency and on/offshore amplitude variation with the predicted cut-off modes, each peak corresponding to a particular mode.

The result suggests that prediction of the low frequencies expected on a beach can be made on the basis of the known beach profile along a line normal to the shoreline. The implications of this for bar and cusp formations are discussed.

LONG WAVE RADIATION FROM A POINT SOURCE ON A SHELF:

A STUDY OF LATERAL GRAVITY WAVES

David R. King and Paul H. LeBlond

An investigation is made of the wave field arising from a small cylindrical source of shallow-water surface gravity waves located on a half-space of constant depth (the shelf) separated by a depth discontinuity from a deeper homogeneous region (the deep ocean). The wave field on the shelf is analysed in terms of its components: the direct wave, the reflected wave, and the lateral wave.

The problem is examined for rotating and for non-rotating systems. Solutions are obtained in the far field by asymptotic methods.

A laboratory experiment simulating the theoretical configuration on a non-rotating plane was conducted to examine the transient response. A mechanical generator was located on the shelf and a capacitance-type sensor recorded the variations in surface elevation. The results of the experiment are compared to those of the theory.

Session 5 Ondes océaniques II—Ondes longues et internes

REFLECTION AND SCATTERING OF LONG WAVES BY BOTTOM TOPOGRAPHY

A. J. Bowen

The influence of bottom topography on long wave propagation was emphasized by the results of the Joint North Sea Wave Project in 1969. The amplitude of long swell was attenuated as it approached the German coast but the decay did not show the expected increase in frictional damping during periods of strong tidal currents; it appears that the attenuation was primarily due to reflection and scattering from the rough sea bed.

The effect of bottom topography on the wave field can be represented as a weak interaction between two waves (frequencies σ_1, σ_2 , wave numbers k_1, k_2) and bottom topography (wavenumber k_b).

Resonance occurs if

$$\sigma_1 - \sigma_2 = 0, \quad k_1 - k_2 \pm k_b = 0$$

A wave is scattered into free waves of the same frequency travelling in directions which depend on k_b . Surprisingly, considerably more attention has been paid to the higher order interactions, involving three waves and topography. Of particular interest has been the energy transfer from a wave (σ_1, k_1) to its harmonic $(2\sigma_1, k_1)$, which is not normally a true resonance. However the presence of bottom topography introduces an extra wavenumber which may enhance, or detune, the resonance, the resonance conditions now being

$$\sigma_1 + \sigma_1 - 2\sigma_1 = 0, \quad k_1 + k_1 - k_2 \pm k_b = 0$$

Examples of both types of resonance are considered for both normal surface wave and edge waves. Of particular interest is the way a wave interacts with topography (bar or cusp) that it has generated or is capable of generating.

LOW FREQUENCY CURRENTS IN THE STRAIT OF GEORGIA

J. A. Helbig and L. A. Mysak

Chang (1976) has shown that up to 46% of the horizontal kinetic energy in the Strait of Georgia (GS), B.C., is contained in current oscillations possessing periods exceeding 4 days. In an attempt to explain these findings we have studied a class of low-frequency oscillations in a model channel of GS. The Strait is modelled by an infinitely long, rectangular channel with a bottom that slopes upwards to the east; the stratification is idealized by a two-layer system. This model admits northward-travelling, topographic planetary waves with frequencies that lie in the observed range for reasonable values of the wavelength. However the model does not accurately predict the observed vertical distribution of the horizontal kinetic energy.

Reference

Chang, P.Y. K., 1976: Subsurface currents in the Strait of Georgia, west of Sturgeon Bank. M.Sc. thesis, University of British Columbia.

VARIATIONS IN THE MIXED LAYER AND MAIN THERMOCLINE AT 9°N22°W DURING PHASE III OF GATE

R. Allyn Clarke

Data collected by a moored thermistor chain sampled 6 cycles/hour and STD lowerings approximately 6 times/day from CCGS Quadra in August–September, 1974, have been analysed to give estimates of the internal wave energy present in the upper main thermocline in a series of frequency bands up to the diurnal frequency. These energy levels are compared with the wind stress as estimated by squaring Quadra's hourly surface wind data to see if there is any evidence of local generation of these waves. From these estimates of high frequency internal wave energy in the upper thermocline, estimates are made of the possible errors induced by aliasing in the calculation of the mixed layer depth from the 6 or 8 cycle/day STD observations.

THE ATTENUATION OF VERTICALLY PROPAGATING INTERNAL GRAVITY WAVES IN A RANDOMLY VARYING WIND/CURRENT SHEAR

Richard E. Thomson

With their ability to redistribute momentum and energy, internal gravity waves are an important part of the kinematics and dynamics of the atmosphere and ocean. Perturbations in the upper atmosphere wind and density structure, for example, appear to be related to internal wave-induced motions. And the generation of turbulence in stratified fluids in general is linked to regions of breaking internal waves, as well as to their absorption at critical layers and to their mutual interaction. Longshore currents

and mean winds can also be produced through the momentum fluxes released upon the breakdown of these waves.

An essential characteristic of the waves, particularly in the atmosphere, is their velocity amplification with height due to decreasing fluid density. This is offset somewhat by dissipative mechanisms such as viscous damping and thermal conduction. If such effects, in fact, are appreciable, the amount of momentum available for the generation of turbulence and mean flows is significantly reduced.

The purpose of this paper is to show that random vertical variations in the background horizontal wind or current profile provide a mechanism for dissipating the energy of vertically propagating internal gravity waves. As with other diffusive processes, this can lead to a significant modification of the upward amplification or downward attenuation normally associated with these waves. An advantage of the analysis used, however, is that it yields the effectiveness of the diffusive process explicitly in terms of the ensemble-averaged properties of the background flow field. (The randomness in the background flow may be considered as resulting from a superposition of other motions whose periods exceed that of the wave itself or alternatively as resulting from turbulence-generated fluctuations which are confined to horizontal planes by the vertical stratification.) Singular regions are avoided in the analysis since we require that the speed of the basic flow always be somewhat less than the horizontal phase speed of the internal gravity waves and that it remain stable in the presence of these waves. Under these assumptions the dispersion relation yields an expression for the vertical wavenumber which can then be used to derive the effect of the random basic flow on the wave characteristics.

First order solutions to the coherent part of the wavenumber are obtained using a perturbation method devised by Keller (1967) in which the norm of the random operator is much less than the norm of the deterministic operator. Attention is focused on the imaginary part of the wavenumber. For random mean flows having correlation lengths much shorter or much longer than the wave length, the waves are found to lose energy. Hence the random advective flows serves as an effective dissipative mechanism which scatters energy to the incoherent part of the wave field and/or to the background flow itself. Only when the correlation length is of the order of the wave length is it possible to have a transfer of energy from the mean flow to the coherent wave field.

Reference

Keller, J. B., 1967: The velocity and attenuation of waves in a random medium. In *Electromagnetic Scattering* (eds. R. L. Rowell and R. S. Stein), pp 823-834. Gordon and Breach.

Session 6 Instruments I-Systèmes

RROMS (RADAR REMOTING OUTPUT MONITORING SYSTEM)

D. Cullen

RROMS, an inexpensive radar remoting system, converts high speed radar data to low speed facsimile data and transmits this, via telephone lines, to a receiving site. The facsimile presentation is a PPI display containing four shades of grey for the precipitation signals and range rings and radial blips for areal definition. This paper discusses the system in general and its limitations.

MAGNETIC TAPE EVENT RECORDER (MATER)

J. M. Cook

MATER is a low-cost system which records raw sensor data in event form (e.g. contact

closures representing miles of wind or degree-hours, for example) onto a standard compact cassette. When an "event" occurs, its "signature" is recorded and the tape is incremented one step. A time reference event signature is recorded each minute. In addition to the clock, the system can record up to seven other signatures (i.e. seven other channels). Each cassette holds 860,000 events.

MAPS — A NEW SYSTEM OF RUGGED BATTERY OPERATED DATA ACQUISITION R. Van Cauwenberghe

MAPS, Modular Acquisition and Programming System, has been developed in conjunction with Bristol Aerospace, to meet the meteorological data acquisition requirement in remote areas. The system architecture consists of sensor interface modules, each of which are physically independent, and a programmer. The casual user can purchase, fault find, and maintain the system, without a detailed knowledge of the system or of the electronics. A review of users and their applications is also presented.

SOME PROBLEMS ASSOCIATED WITH METEOROLOGICAL MEASUREMENT OVER WATER & THEIR SOLUTIONS K. K. K. Wu and R. Van Cauwenberghe

A Bedford Tower – a taut-moored spar buoy – has been employed since 1969 for taking winds, air temperatures, water temperature and precipitation measurements over Lake Ontario. Problems have occurred associated with lightning, power, maintenance and reliability over the years. Solutions to these problems are illustrated. Also ancillary systems – orientation measurement, continuous wind, backup telemetry – developed for the additional micrometeorological requirements associated with the Olympic sailing events are discussed.

AN AUTOMATIC WEATHER STATION FOR THE BEAUFORT SEA R. J. Grauman

Design and construction details of an automatic weather station built to be installed on the pack ice of the Beaufort Sea are presented. The installation consists of a vertical-axis wind-turbine power-generating station mounted on pilings in the ice, and a meteorological station which measures wind speed and direction at ten meters, atmospheric temperature, atmospheric pressure, station heading, station position, and several diagnostic and house-keeping parameters. The data are transmitted to the GOES satellite and distributed on the AES teletype network.

REAL TIME RADAR DETECTION OF MESOSCALE FLOW FEATURES IN FRONTAL CYCLONES Harold W. Baynton, Grant R. Gray, Peter V. Hobbs and Robert A. Houze, Jr.

NCAR's portable C-band Doppler radar is designed to portray wind patterns on a color display in real time. The radar is equipped with a real-time Doppler processor that determines the radial speeds of targets. These speeds are then coded in 15 colors with a resolution of 2 m/sec. the display easily resolves the ambiguity associated with speeds greater than the maximum unambiguous velocity.

When scanning in the PPI mode at an elevation angle of several degrees, characteristic features of the colored patterns provide clear differentiation between warm and cold air advection. Jets can also be detected at a glance and complete wind profiles, more representative than, and as accurate as those determined from conventional rawins, can be deduced from the colored pattern.

Because of the crucial role played by color differentiation and the high cost of publication in color, full justice to this new analytical tool can best be done through the

spoken word and with the aid of colored slides. Colored slides are shown of typical patterns observed in the University of Washington's CYCLES (*Cyclonic Extratropical Storms*) Project carried out near Seattle in January 1975 and January 1976. Included are patterns that are characteristic of pre warm frontal and post cold frontal conditions, mid-level jets, shallow layers that seem to be uncoupled from the flow both above and below, and precipitation aloft but not at the ground. Wind profiles deduced from the colored display are also compared to concurrent rawins.

SYSTEM FOR CONSTANT ELEVATION PRECIPITATION TRANSMISSION & RECORDING (SCEPTRE)

A. E. Aldcroft

Five SCEPTRE systems will be in operation at sites across Canada by early 1978. Each system will be co-located with an unattended weather radar to provide remote users with real-time precipitation data in the form of charts produced on a facsimile recorder.

In the presence of significant precipitation, SCEPTRE will output two facsimile charts of various types, every 10 minutes. In addition to precipitation information, the charts will contain information on the operational status of the SCEPTRE system. The system will also record precipitation data on magnetic tape for later analysis.

SCEPTRE has been designed for maximum reliability and flexibility. A number of self-checking and diagnostic features are included, and a software facility will make foreseeable operational parameter changes as convenient as possible.

AEROLOGICAL DATA REDUCTION SYSTEM (ADRES)

G. Mongeau

ADRES is being developed as a computer-centered data reduction and archiving tool for the use of the upper air observer. Several aspects of the system and its development are discussed, including the guiding philosophy, hardware and software architecture and a summary of expected benefits.

Session 7 Météorologie appliquée

MODELE DE PROBABILITE DE PRECIPITATIONS (PdP) EN ETE DANS LA REGION AGRICOLE DE MONTREAL

Stan Siok

Devant les lacunes présentées par les "prévisions catégoriques de précipitations" appliquées à l'agriculture, on a pensé qu'une prévision de "probabilité de précipitations" (PdP) serait non seulement plus utile, mais aussi plus appropriée aux conditions estivales d'averses.

On montre la similitude entre les méthodes par "probabilité ponctuelle" et par "probabilité en termes de surface" (areal coverage) dans le cas des prévisions de probabilité.

On a fait appel à une technique de régression linéaire à variables multiples, en prenant comme variables explicatives (predictors) les données observées en surface et en altitude pendant l'été de 1974. Pour définir une équation générale de PdP, on a utilisé comme variable expliquée (predictand) les précipitations recueillies en un certain nombre de pluviomètres dans une région à l'entour de Montréal.

Cette équation a servi de guide pour l'émission de prévisions PdP dans la région agricole de Montréal au cours de l'été 1975. On dispose des vérifications de ces prévisions.

SUBJECTIVE PROBABILITY FORECASTING IN THE UNITED STATES: SOME RECENT OPERATIONAL AND EXPERIMENTAL RESULTS

Allan H. Murphy

Subjective probability forecasts have been made on an operational and/or experimental basis in the United States for several years. The purposes of this paper are to summarize the most significant results of these programs and to briefly discuss the implications of the results for the practice of weather forecasting.

With regard to operational programs, the National Weather Service (NWS) has routinely issued probability of precipitation (PoP) forecasts (i.e., forecasts of the probability of occurrence of measurable precipitation) to the general public on a nationwide basis since 1965. The reliability, accuracy, and skill of the PoP forecasts, as well as recent trends in these attributes of the forecasts, will be described. The role of "objective" guidance forecasts, based upon the model output statistics (MOS) procedure, in the formulation of the subjective PoP forecasts will also be discussed.

With regard to experiments, subjective probability forecasts have been formulated in connection with the synoptic laboratory programs at the Massachusetts Institute of Technology (MIT) and the State University of New York at Albany (SUNYA) since 1957 and 1969, respectively. At present, these experimental programs involve forecasts of precipitation occurrence (at MIT and SUNYA), precipitation amount (at MIT – in six categories), and minimum temperature (at MIT – in ten categories, at SUNYA – in two categories). Recently, several subjective probability forecasting experiments have been conducted in NWS forecast offices, including:

- (1) two experiments involving credible interval temperature forecasts (Denver: 1972–73, Milwaukee: 1974–75);
- (2) two experiments involving point and area precipitation probability forecasts (St. Louis: 1972–73, Rapid City: 1974); and
- (3) an experiment concerning the effect of ("objective") guidance forecasts on subjective PoP forecasts (Great Falls and Seattle: 1972–73).

The results of these experiments will be described and, when appropriate, compared. Plans for further experimentation in this area will also be briefly discussed.

CLIMATIC FLUCTUATIONS IN THE 500 MB GEOPOTENTIAL AND 500–1000 MB THICKNESS FIELDS

R. G. Lawford

The temporal and longitudinal variations in the 500 mb geopotential and the 500–1000 mb thickness fields have been summarized in the format of a Hovmöller diagram. The variations were investigated by computing 28-day means for both fields for two hemispheric latitude bands in the period from 1 January 1966 to 31 December 1973 incl. Based on this analysis the times and longitudes when the geopotential and thickness fields fall below certain critical values have been assessed. Over North America, where 26 years of data were available, the year-to-year variations in the locations of ridges and troughs have been documented for both the geopotential and thickness fields. These variations have also been related to the year-to-year fluctuations in monthly mean temperatures and precipitation amounts at ten Canadian locations.

SERVICE FORET-METEO

Luc Pouliot

La protection des forêts québécoises contre le feu requiert la coopération des agences fédérales, provinciales et privées. On décrit brièvement l'organisation du système de protection ainsi que la participation des diverses agences. L'apport météorologique du SEA se situe au niveau de la détection, du contrôle et de la lutte proprement dite.

On définit le problème forestier et les concepts de la météorologie des feux de forêt. On explique les types de combustibles, les divers indices requis ainsi que leur utilisation. On décrit le programme de prévisions météorologiques, indices, cartes et bulletins spéciaux. On termine par une évaluation des indices prévus et de l'utilité du service.

Session 8 Limnologie physique

THE DYNAMICS OF RIVER-INDUCED CURRENTS IN A LAKE

P. F. Hamblin

The trajectory of a river entering a lake may be considered to consist of three phases for the purposes of the analysis of the dynamics: an initial stage where the plume sinks along the delta face, a free stage where the incoming jet spreads out along constant density surfaces and finally a phase in which the river flow becomes bound to the shore. Simple mathematical models are developed and compared to observations in a number of lakes with particular emphasis on Kamloops Lake. In the sinking stage, entrainment of the surrounding fluid is much stronger than in the free phase. It is shown that the trajectory of the plume is a spiral due to the influence of rotation which is larger in the case of a plume of low aspect-ratio than in the instance of a circular plume. The shore-bound current on the right-hand side of the lake exists in a state of balance between horizontal density gradients and Coriolis force. It is shown that friction is relatively weak in the downstream region.

SOME FEATURES OF THE THERMAL STRUCTURE OF LAKE ONTARIO

F. M. Boyce

Lake Ontario is a large (18,500 km²) deep (85 m) lake which exhibits marked seasonal stratification. Many dynamic processes ranging from coastal upwelling to small scale vertical mixing in the presence of internal waves have their signatures in the thermal structure of the lake. A considerable body of data now exists on these features. The intent of this paper is to present examples of some of the many observed phenomena and to describe briefly the nature of the data collected so far in the hopes that other workers may be encouraged to take advantage of it.

THE PROBLEM OF SALINITY INCREASE IN LAKE QARUN (EGYPT) AND A PROPOSED SOLUTION

Admin H. Meshal

Lake Qarun, an inland closed basin, lies in the Western Desert in Middle Egypt. The water level of the lake is 44 m below sea level. The lake covers an area of 240 km² and has a volume of 1 km³. Lake Qarun ($S = 32\text{‰}$) is the remnant of a natural fresh water reservoir which was connected to River Nile from prehistoric times. That reservoir became artificially controlled to form what was known as Lake Moeris. Lake Moeris was disconnected from the Nile and evaporation caused its water level to drop below that of the Nile leaving areas of lands for cultivation. Drainage water from these cultivated lands was directed to Lake Moeris and hence its salt content began to increase slowly. Lake Qarun, which is the remnant of Lake Moeris is still used to receive drainage water from the surrounding lands. Drainage water contributes to the lake 0.4×10^9 kg of salts per year causing its salinity to increase with time. Its salt content increased from 11×10^9 kg in 1906 to 33×10^9 kg in 1970 and the salinity increased from 11‰ to 32‰ in the same period. The present rate of salinity increase is 0.4‰ per year and the salinity is expected to be 60‰ within seventy years if

nothing is done to change the present rate. This threatens the fisheries of the lake.

In order to stop the salinity increase, the salts conveyed to the lake by drainage water should be removed. This can be achieved by removing a volume of lake water ($S = 32 \text{ ‰}$) that contains the same amount of salts carried by drainage water ($S = 1 \text{ ‰}$). A proposed method is to dam over certain partly isolated regions which have narrow and shallow openings to the lake. The separated parts would then be left to evaporate until their water level dropped below that of the lake which receives continuous inflow of drainage water to compensate for its loss by evaporation. Saline water from the lake would then be allowed to flow to the separated regions to offset the salinity increase. Two proposals are discussed: by the first the salinity would increase slowly to reach an equilibrium of 41 ‰ while by the other the salinity would decrease and asymptotically approach an equilibrium value of 12.4 ‰ .

UTILITE DES SATELLITES LANDSAT EN LIMNOLOGIE

Guy Rochon

Si l'on énumère les principaux paramètres qui permettent de caractériser les nappes d'eau, ou d'évaluer leur état trophique, on constate qu'ils sont souvent reliés à des phénomènes optiques. La télédétection, et plus spécifiquement les satellites de type LANDSAT, sont donc susceptibles de nous procurer des informations sur ces paramètres puisque la réponse des capteurs dépend des caractéristiques optiques du milieu.

A partir de l'analyse d'une dizaine d'images LANDSAT, et d'un échantillon de quelques centaines de lacs du Québec, l'auteur passe en revue les différentes mesures des caractéristiques des lacs pouvant être obtenues de cette manière, et indique la précision relative de ces mesures pour chacun des aspects suivants:

- (a) le contenu des lacs: qualité de l'eau, hydrodynamique, dates de gel et de dégel
- (b) le contenant: mesures topographiques: localisation des masses d'eau, superficie, périmètre
- (c) le bassin versant: couverture du sol, couverture de neige.

La méthodologie permettant d'extraire des données LANDSAT les mesures de ces caractéristiques est également décrite succinctement, y compris les techniques de correction radiométrique nécessaires pour l'élimination des effets atmosphériques ou d'illumination.

L'Auteur montre enfin que cette méthodologie pourrait être appliquée, à peu de frais, pour suivre de façon systématique l'évolution de l'ensemble des lacs du Canada.

Session 9 Météorologie dynamique I-Modèles et simulations

PREVISION A L'AIDE D'UN MODELE AUX EQUATIONS PRIMITIVES UTILISANT LA METHODE SPECTRALE

Claude Girard et Roger Daley

Une description sommaire est faite des principales caractéristiques d'un modèle aux équations primitives à plusieurs niveaux et utilisant la méthode spectrale. Une version de ce modèle est présentement en exploitation au Centre Météorologique Canadien pour la production des prévisions numériques au Canada. La performance du modèle est établie principalement à l'aide d'exemples de prévisions incluant des comparaisons avec des modèles utilisant les différences finies. Quelques données statistiques récemment accumulées sont également présentées.

P. E. Merilees, P. Ducharme and G. Jacques

The numerical integration of the equations governing atmospheric flow using a latitude-longitude grid presents certain practical problems due to the convergence of meridians near the poles. The difficulty is that excessively small time steps are required to avoid computational instability of an explicit time stepping scheme. Space filtering in the polar regions has generally been used to alleviate this restriction but since it does not distinguish between low and high frequencies it affects the meteorological modes as well as gravitational modes and thus can lead to errors. An alternative solution may lie in the use of a semi-implicit technique in one dimension. These problems are explored and evaluated with the aid of a pseudospectral model of the primitive equations on a sphere.

A MODEL FOR COMPUTING SMALL-SCALE WIND VARIATIONS OVER A WATER SURFACE

M. Danard and S. Venkatesh

A knowledge of winds near the surface is important in computing fluxes of heat, momentum and water vapour as well as in applications such as calculating motion of ice floes and oil spills, water levels near shore, surface currents, wind-waves and thermocline depths. However, synoptic or prognostic sea-level pressure charts can depict only the large-scale features. This paper describes a simple one-level primitive equations model to compute surface winds using a grid size of 5–20 km. These small-scale variations are caused by differences in water temperature or nearby topographic features which affect the height of the atmospheric Ekman layer and the surface pressure. For example, surface pressure is high, wind speeds are light and cross-isobar angles large when the air is cooled from below (warm air over cold water). Near-shore effects such as orographic channeling, land and sea-breezes, upslope and downslope winds and the frictional discontinuity between land and water are also included. The model is verified with data over Juan de Fuca and Georgia Straits, the Beaufort Sea and Lake Ontario.

PROGRAMME DE SIMULATION CLIMATOLOGIQUE – COMPARAISON AVEC L'EXPERIENCE

Georges Gallagher et Ludovic Perelman

Nous avons pour but l'explication des modifications du climat local moyen en fonction de la variation des paramètres physiques de la région concernée. La première phase de ce projet est la réalisation d'un programme de calcul sur ordinateur qui reconstitue un climat moyen pour une année complète, avec pour données initiales la valeur des paramètres physiques et climatiques de la région concernée. Ce programme, à partir des données initiales, calcule l'évolution du climat moyen journalier et saisonnier. Le climat moyen est déterminé par la température au sol en fonction de l'heure et du jour, ainsi que par la quantité de précipitations observées ordinairement.

THE INFRA-RED FREON EFFECT IN A SIMPLE CLIMATE MODEL

G. J. Boer and A. O'Toole

Most interest in the environmental effects of freons has been focussed on the possible destruction of stratospheric ozone due to photochemical reaction with the products of freon dissociation.

Recently, however, Ramanathan has suggested that the infra-red "green house" effects of freons could have an impact on tropospheric temperatures. This suggestion is explored using a simple Sellers – Budyko type climate model.

THE LOWER ST. LAWRENCE ESTUARY AS A PHYSICAL OCEANOGRAPHIC SYSTEM

Mohammed I. El-Sabbh

Between April and November 1973 and 1974, a network of more than 150 oceanographic stations in the lower St. Lawrence Estuary have been occupied jointly with the Bedford Institute of Oceanography. These stations were distributed on 15 cross-channel sections between Pointe-de-Monts and Rivière-du-Loup; some of them were repeated over at least one tidal cycle while others were monitored on a monthly basis. Horizontal and vertical distributions of the physical properties along the estuary are presented and discussed. Freshwater run-off through the two boundaries of the Lower St. Lawrence Estuary are estimated. Utilizing all available information, a typical summer surface circulation pattern is presented. The outflow of the warm, less dense, surface water from the Saguenay River which sets southward to join the eastward surface current along the south shore of the estuary; the upwelling of the intermediate cold saline waters near the mouth of the Saguenay and the clockwise gyre between Pointe-des-Monts and Ile du Bic are the main features of the surface circulation in the Lower St. Lawrence Estuary. Comparisons with other estuaries are made and suggestions for future work are presented.

STRUCTURE THERMIQUE ESTIVALE DE LA REGION DE SEPT-ILES - ANTICOSTI

F. Robert Boudreault

La structure thermique de la région de Sept-Iles - Anticosti est décrite pour les niveaux standards, d'après un réseau de 187 stations (XBT) visité du 2 au 4 août 1974.

Cette structure appuie fortement l'hypothèse d'une circulation cyclonique avec affleurement central. L'indice d'un affleurement de pente, entre 100 et 200 m, est présent dans la partie nord-ouest du territoire étudié.

ICE MOVEMENT AND MODIFICATION IN THE GULF OF ST. LAWRENCE

G. L. Bugden

A computer model of ice movement and modification in the Gulf of St. Lawrence, incorporating terms describing mechanical and thermodynamical alteration of the ice cover, is presented. Special attention is given to the role of internal stress in determining ice motion. An elastic plastic stress model is used, with the yield curve for plastic deformation related to the way in which the ice is modified by rafting or ridging. The possibility of using such a model on an operational basis as a short term forecasting tool is investigated.

EPAISSEUR DE LA GLACE DANS LES LAGUNES DES ILES-DE-LA-MADELEINE
(GOLFE DU SAINT-LAURENT) EN 1973-75

F. Robert Boudreault

L'épaisseur de la glace dans les lagunes des Iles-de-la-Madeleine a été mesurée en mars 1973-75 à 42, 47 et 231 stations respectivement.

L'épaisseur moyenne observée en 1973 est beaucoup plus élevée que celles des années 1974-75, ces deux dernières étant identiques.

WORLD ENVIRONMENTAL MONITORING SYSTEMS

R. E. Munn

The present status of the UN programme "Global Environmental Monitoring System" (GEMS) is given, and the need for intellectual support from the scientific community is emphasized. The special rôle of the Monitoring and Research Centre (MARC) at Chelsea College, London, England is described.

A FIELD TEST OF POTENTIAL OPERATIONAL HUMIDITY SENSORS

D. J. McKay

The introduction of "representative observing sites" at major airports created the need to replace the psychrometer as the standard instrument for humidity measurements in Canada. This paper discusses a field evaluation of several humidity sensors with electrical outputs which can be read remotely. It will also be shown that the search for the optimum humidity sensor requires a re-evaluation of our standards for specifying humidity.

INTEGRATION EN TEMPS REEL DU RESEAU D'OBSERVATION MAITRE AVEC D'AUTRES RESEAUX AUXILIAIRES

J. Vanier

D'une part, dans la région du Québec du SEA, comme dans les autres Régions, une foule de programmes pour usagers spécialisés ont été mis en œuvre: Prévisions à courtes échéances, forêt-météo, agro-météorologie, prévisions de neige pour les routes, etc. En second temps, seuls les réseaux d'observations synoptiques et aéronautiques sont normalement disponibles pour nous fournir les observations requises, en temps réel. Traditionnellement; l'autre réseau d'observations officielles, celui de la climatologie, n'était pas disponible pour desservir les usagers avec problèmes immédiats. Or, la densité actuelle des stations du réseau officiel en temps réel et la fréquence des observations de ce réseau, sont nettement insuffisantes pour nous fournir les données de base afin de desservir ces usagers spécialisés. Il fallait donc, si possible, se servir du réseau climatologique en temps réel, là où c'était rentable de le faire, et aussi établir un réseau de stations officielles, pour atteindre les objectifs visés.

La création d'un, ou de plusieurs réseaux d'observations officielles, et l'utilisation intégrée des observations de ces réseaux, avec celles du réseau climatologique et de celles du réseau officiel en temps réel, afin de mener à bien des programmes pour usagers spécialisés, font l'objet de cette présentation. L'auteur souligne l'importance de l'aspect "coordination" et "cohérence" dans l'utilisation, par les spécialistes météorologiques des observations autres qu'officielles, en temps réel. La collecte centralisée de ces données de base, l'acheminement aux spécialistes météorologiques et la retransmission, lorsqu'il y a lieu, des données traitées à l'utilisateur, à l'aide d'un système adapté de communication, est également discutée. L'auteur, finalement préconise, l'élargissement de la base des données météorologiques non seulement dans la Région du Québec, mais aussi ailleurs au pays.

UTILISATION D'OBSERVATIONS METEOROLOGIQUES A L'ECHELLE MESO DANS UN SYSTEME DE PREVISIONS A COURTE ECHEANCE

L. L. Primeau

Durant la mise en marche d'un projet de prévisions à courte échéance axées sur les besoins météorologiques de certains usagers spécifiques, on s'est vite rendu compte

que les données météorologiques brutes en provenance des réseaux synoptiques et/ou aéronautiques étaient insuffisantes pour les exigences du projet. Il a donc été nécessaire de mettre sur pied un réseau complémentaire d'observations plus ou moins grossières en tant que des paramètres observés dans la zone du projet même et le secteur environnant.

Les paramètres choisis sont, en plus de la température présente, les températures maximales et minimales et la quantité de précipitation de la période qui se termine au moment de l'observation; la présence ou l'absence de nébulosité et de précipitation inclut l'intensité et l'ordre de grandeur du vent et sa direction.

Le réseau est divisé en deux parties dont le réseau éloigné qui sert de réseau d'alerte pour le réseau rapproché établi dans la zone même du projet ainsi qu'à la prévision. Le réseau rapproché sert à confirmer, et les observations du réseau d'alerte et les prévisions qui ont été préparées. En tout, les deux réseaux consistent à une quinzaine de postes d'observations qui sont pour la plupart des stations climatologiques du SMO et quelques stations officielles établies pour la durée du projet. Chaque poste observe les paramètres dans la mesure de sa capacité.

Les observations sont recueillies par le bureau météorologique d'après un horaire fixe quoique le bureau communique plus fréquemment avec un ou plusieurs postes, si les conditions météorologiques l'exigent.

Les résultats à date portent à la conclusion que les données supplémentaires disponibles à cause de la présence des deux réseaux, sont non seulement très utiles pour les fins du projet, mais jouent un rôle essentiel dans la préparation et la vérification des prévisions taillées qui sont distribuées aux usagers.

A TEMPORARY OBSERVATIONAL NETWORK DESIGNED FOR ESTIMATING ON-FARM MINIMUM TEMPERATURES AND FREEZE PROBABILITIES

A. Bootsma

On-farm minimum temperature measurements are required when local weather stations are unable to represent adequately the surrounding area due to topographical influences. A temporary network described in this paper was used to obtain these measurements in hilly terrain in Prince Edward Island, Canada, and served as the basis of a frost risk advisory service for farmers in the province.

On-farm minimum temperatures were related to the nearest synoptic weather station using multiple linear regression and correlation techniques. The equations developed were considered useful for on-farm minimum temperature forecasts. A technique is described which provides quantitative estimates of spring and fall freeze probabilities from the short term temperature measurements.

A method of estimating spring and fall freeze dates from mobile nighttime temperature surveys using network data will be presented. The progress of models which predict freeze dates from topographical features will also be discussed.

QUALITY CONTROL OF DATA FROM AES STANDARD NETWORKS

D. W. Buss

A brief look at the history of checking and processing data from the Upper Air, Solar Radiation, Surface Primary and Climatological Networks, and procedures currently carried out in Central Services Directorate. Emphasis is placed on the type of controls, particularly on the Surface observation data, to ensure that published and archived data is of the highest possible standard.

USE OF FIELD STATION DATA IN THE INVESTIGATION OF SYNOPTIC CONTROLS ON DEVON ICE CAP MASS BALANCE

Bea Taylor Alt

A synoptic circulation classification system has been developed to investigate the factors governing variations in the annual mass balance of Devon Island Ice Cap. Glaciological records of mass balance and winter accumulation are available for the Ice Cap for the period 1961-1974. Meteorological records covering the same period are available from field stations ranging from well instrumented three-hourly surface weather stations to moving glaciological field parties. These data were used as an indication of surface weather conditions over the ice cap during the development of the synoptic classification system. Holmgren's (1971) daily values of climate and surface energy balance components for the 1962 and 1963 summer seasons were utilized to investigate the mechanisms by which the synoptic types affect the Ice Cap. Having classified each day of June, July and August (1961-74) as to synoptic Type, it was then possible to relate regular and irregular field data to permanent station records and to each other in order to study elevation and areal variations of climate under specific synoptic circulation conditions.

Some results of these comparisons are presented and the availability of other field party data in the Queen Elizabeth Islands is discussed. It is concluded that field data are an important addition to permanent station records in investigations into the physical processes of climate and climatic change in the high Arctic Islands.

DIX ANS D'EXPLOITATION D'UN RESEAU DE RADIO-TELEMESURE HYDRO-METEOROLOGIQUE

Sommaire non disponible

L'APPLICATION DU RADAR METEOROLOGIQUE POUR L'ANNONCE DES CRUES DANS LES BASSINS A TEMPS DE REPONSE COURT

Sommaire non disponible

Session 12 Interaction air-mer

RECENT EXPERIMENTS IN WIND STRESS ON ARCTIC SEA ICE

E. G. Banke, S. D. Smith and R. J. Anderson

Wind stress is a driving term in the dynamics of ice movement and must be represented in any numerical model of the ice. On the hypothesis that the wind stress can be represented in terms of wind speed and surface characteristics, we have carried out a series of six experiments at various locations in the Arctic Ocean and Robeson Channel.

Areas of uniform terrain may be characterized by a parameter derived from surveys of ice elevation along lines and by a surface drag coefficient from measurements of wind turbulence using sonic and thrust anemometers.

Isolated ridges are better represented by form drag related to the sail area of the ridge, and we have measured the form drag coefficients of a small number of ridges by measuring air pressure differences across the ridges at a number of heights, in addition to wind speed.

Based on our present data, the total drag on the surface and on a distribution of ridges may be represented by $\tau = \rho C_{10}' U_{10}^2$ where

$$10^3 C_{10}' = 1.14 + 0.066\zeta + 0.5C_D H N$$

ζ = rms surface roughness at wavelengths up to the 13 m, measured along a line

H = mean height of ridges

N = frequency of occurrence of ridges along a line

C_D = form drag coefficient of ridges, typically 0.3

Continuing progress in remote sensing by laser altimeter may make it possible to

determine ζ , H and N for large areas by airborne survey, and the AIDJEX experiment is currently generating a set of data for the development of ice models.

THE DRAG COEFFICIENT VERSUS WAVE AGE

M. A. Donelan

This paper describes the analysis of a laboratory experiment and some field observations designed to test the idea that the drag coefficient is strongly dependent on wave age. The laboratory experiments were conducted in the 80-metre-long Wind-Wave flume of the Canada Centre for Inland Waters. Direct measurements of the momentum transfer were made with an "X-film" anemometer while the surface elevation was recorded at 10 metre intervals along the flume. The field observations were obtained in Lake Ontario from a bottom-mounted tower in 12 metres of water. Stress estimates were made with a 3-D film anemometer and a sonic anemometer and there were simultaneous surface elevation measurements. It is shown that the drag coefficient depends weakly on the significant wave height and much more strongly on the wave age, decreasingly rapidly as the wave age approaches unity. The rate of growth of the spectrum with increasing fetch places a lower limit on the rate of uptake of momentum by the wave field.

DRAG COEFFICIENT MEASURED DIRECTLY AND DERIVED FROM WIND PROFILE

Amin H. Meshal

Five fast-response cup anemometers with newly developed circuits were mounted on a mast erected in Bedford Basin where a fetch over water of 4–6 km was available for wind coming from N.W. Wind speeds under stable conditions (Z/L from 0.007 to 0.5) have been observed at heights between 0.5 and 7 m above water surface. Simultaneous direct measurements of wind velocity fluctuations have been taken by a sonic anemometer mounted near the top of the same mast.

The profiles were closely log-linear in the range of the stability observed.

Comparison between the directly measured drag coefficient and that derived from the profiles using Karman's constant $k = 0.4$, gave a mean percentage difference of 17.4 with standard deviation of 6.3. When $k = 0.35$ was used in the log-linear calculations the agreement improved slightly and the mean difference was 15.6% with standard deviation of 13.9. The drag coefficient did not show clear variation with either wind speed or stability. One of the directly measured drag coefficients was negative and three were very low ($< 0.3 \times 10^{-3}$) while the rest of the values were between 0.5 and 1.73×10^{-3} .

Wind speeds measured by cup and sonic anemometers at the same level were compared. It was surprising to find out that there was no overspeeding of the cup anemometers. On the contrary, the average ratio of wind speed measured by the cup and sonic anemometers was 0.98 and there was no clear effect of stability or of wind direction on this ratio.

SOURCES OF ATMOSPHERIC FLUORINE

P. A. Yeats and J. M. Bewers

Global budget calculations indicate that the majority of the fluorine, chlorine and iodine in rivers is cyclic since non-marine sources, such as weathering, volcanism and anthropogenic activity, contribute minor amounts of these elements to the freshwater portions of the hydrologic cycle. Fluorine and iodine, however, are enriched relative to chlorine by factors of about 100 in atmospheric precipitation and inland freshwater compared to seawater. Thus, unless important undiscovered non-marine sources of fluorine and iodine exist, both elements must be transported across the sea-air inter-

face considerably more efficiently than chlorine. The observed relative enrichment of iodine in marine aerosols and evidence of the gaseous escape of iodine from the sea surface support the idea that excess hydrologic iodine is marine-derived but fluorine has been found to be depleted in marine aerosols with respect to chlorine. This paper first discusses the search for additional non-marine sources of fluorine and concludes that the principal process of fluorine injection to the hydrologic cycle must be by way of gaseous escape from the oceans. The paper then shows that calculations based upon chemical thermodynamics of the halogens and present understanding of the global circulation of chlorine suggest that hydrogen fluoride gas can escape both directly from the sea surface and from fresh marine aerosols in sufficient quantities to account for the excess amounts of fluorine in the hydrologic cycle. Experiments aimed at verifying such behaviour are also discussed.

Session 13 Golfe St-Laurent II-Processus chimiques

ETUDE DU MATERIEL PARTICULAIRE EN SUSPENSION DANS L'ESTUAIRE MARITIME DU SAINT-LAURENT - I: TAILLE, CONCENTRATION ET BIOMASSE

S. A. Poulet, D. Cossa, et J. C. Marty

L'étude de la distribution spatiale du matériel particulaire en suspension a été effectuée au mois de juillet 1975 dans l'Estuaire maritime du St. Laurent à la profondeur 5 m, sur 42 stations réparties en 9 radiales comprises entre l'embouchure du Saguenay et Cap-Chat.

La taille et la concentration (en volume) des particules dans l'intervalle de taille 1,0-181 μm , ainsi que les teneurs en carbone organique particulaire, en azote particulaire, en *ATP* et en chlorophylle ont été analysées parallèlement dans deux groupes de tailles compris entre 0,8-15 μm . Les concentrations de tous les paramètres sont généralement plus fortes vers la rive sud que vers la rive nord. On observe également une augmentation des concentrations entre l'amont et l'aval de l'estuaire pour la chlorophylle, l'*ATP* et l'azote. La répartition géographique des lignes de même concentration pour chaque paramètre correspond à celle des isothermes et des isohalines.

On observe plusieurs catégories de spectres de distribution des tailles des particules, suivant les secteurs de l'estuaire. Les variations de la concentration totale en particules sont reliées à l'apport de particules de tailles différentes suivant les secteurs de l'estuaire considérés. En amont, 70% de la concentration correspond à des particules de 2 à 10 μm . Dans la partie intermédiaire de l'estuaire et vers la rive sud, les petites particules (<15 μm) constituent 40 à 60% de la concentration totale et sont associées à des particules variant de 22 à 45 μm . En aval, et dans certains secteurs de la rive sud correspondants, les particules de tailles inférieures à 15 μm ne représentent plus que 30% de la concentration totale et sont remplacées par des particules plus grosses formant un pic situé dans l'intervalle de tailles 45-90 μm .

Les concentrations en carbone, en azote, en *ATP* et en chlorophylle sont respectivement plus fortes dans la fraction particulaire de taille inférieure à 15 μm et ont en moyenne des valeurs supérieures ou égales à 60% du total mesuré dans l'intervalle 0,8-202 μm .

La composition du matériel particulaire en suspension est discutée en fonction de l'allure des spectres de distribution des tailles des particules, et en fonction de la circulation des eaux de surface dans l'estuaire.

ETUDE DU MATERIEL PARTICULAIRE EN SUSPENSION DANS L'ESTUAIRE MARITIME DU SAINT-LAURENT - II: COMPOSES ORGANIQUES

J. C. Marty, S. A. Poulet, et D. Cossa

Des prélèvements d'eau ont été réalisés à 5 m de profondeur dans l'Estuaire du

Saint-Laurent sur 42 stations situées sur 9 radiales réparties entre l'embouchure du Saguenay et Cap-Chat.

Le matériel particulaire a été recueilli par filtration immédiate de ces échantillons sur filtres en fibre de verre GELMAN type A, après filtration à 15 et 202 μm . De cette manière, le seston a été séparé en 2 classes de taille ($<15 \mu\text{m}$ et $<202 \mu\text{m}$), le tamisage à 202 μm étant destiné à éliminer la majorité du zooplancton.

Les protéines, les lipides et les hydrates de carbone totaux particuliers ont été analysés par des méthodes colorimétriques.

Dans la classe de particules $<202 \mu\text{m}$, les teneurs varient de 20 à 123 $\mu\text{g/litre}$ d'eau filtrée pour les protéines, de 34 à 79 $\mu\text{g/litre}$ pour les lipides et de 7 à 72 $\mu\text{g/litre}$ pour les hydrates de carbone. Les concentrations varient de 8 à 76 $\mu\text{g/litre}$ pour les protéines, de 31 à 73 $\mu\text{g/litre}$ pour les lipides et de 6 à 32 $\mu\text{g/litre}$ pour les hydrates de carbone dans la classe de particules $<15 \mu\text{m}$.

La distribution géographique de ces paramètres suit de très près les caractéristiques physiques de l'estuaire.

La distinction entre les deux classes de tailles de particules ($<15 \mu\text{m}$ et $<202 \mu\text{m}$) permet de constater que les protéines, les lipides et les hydrates de carbone des particules $<15 \mu\text{m}$ sont d'une importance prépondérante dans le matériel particulaire total. Ils représentent respectivement en moyenne 73% des protéines totales, 60% des hydrates de carbone et 91% des lipides totaux.

Les teneurs en substances organiques ainsi que les autres résultats obtenus sur les même échantillons (particulièrement carbone et azote organiques totaux, chlorophylle *a*, *ATP*) permettent de discuter la nature et l'origine du matériel particulaire des différentes zones de l'estuaire.

ETUDE DU MATERIEL PARTICULAIRE EN SUSPENSION DANS L'ESTUAIRE MARITIME DU SAINT-LAURENT - III: TENEURS EN METAUX TRACES

D. Cossa, J. C. Marty, et S. A. Poulet

Des prélèvements de matériel particulaire en suspension ont été effectués à une profondeur de 5 m, en 42 stations réparties en 9 radiales dans l'estuaire maritime du Saint-Laurent de l'embouchure de la rivière Saguenay à la région de Cap-Chat.

Les filtrations ont été effectuées sur membrane 0,8 μm après un tamisage à 202 μm pour éliminer la plus grande partie du zooplancton et à 15 μm séparer le seston en deux classes de tailles.

Les dosages des métaux (*Cd*, *Ag*, *Pb*, *Zn* et *Mn*) ont été réalisés sur la fraction non silicatée du seston par spectrophotométrie d'absorption atomique sans flamme. Les concentrations des métaux particuliers (taille 0,8 à 202 μm) dans l'eau varient de 0,9 à 3,5 ng L^{-1} pour le cadmium, de 0,0 à 0,8 ng L^{-1} pour l'argent, de 0,02 à 0,33 $\mu\text{g L}^{-1}$ pour le plomb, de 0,06 à 1,78 $\mu\text{g L}^{-1}$ pour le zinc et de 0,15 à 3,66 $\mu\text{g L}^{-1}$ pour le manganèse. Les concentrations pour la classe de taille 0,8 à 15 μm varient de 0,6 à 2,6 ng L^{-1} pour le cadmium, de 0,0 à 0,7 ng L^{-1} pour l'argent, de 0,01 à 0,28 $\mu\text{g L}^{-1}$ pour le plomb, de 0,02 à 1,25 $\mu\text{g L}^{-1}$ pour le zinc et de 0,10 à 3,07 $\mu\text{g L}^{-1}$ pour le manganèse.

Ces valeurs, comparées aux concentrations et à l'allure des spectres de fréquence de répartition des tailles des particules, montrent l'existence d'une relation entre la concentration en éléments traces du matériel particulaire et la taille des particules.

La répartition géographiques des métaux particuliers est discutée en fonction de la taille des particules et de leurs origines respectives.

SMALL SCALE VARIABILITY IN THE PRODUCTIVITY: BIOMASS RATIO FOR PHYTOPLANKTON IN THE LOWER ST. LAWRENCE ESTUARY

M. Sinclair, M. El-Sabh and J. P. Chanut

A fixed station within the lower St. Lawrence Estuary was occupied over a period of

four days, July 31–August 4, 1975. The structure of the phytoplankton biomass within the water moving past the ship was estimated by continuous monitoring of chlorophyll at 5 meters depth. Salinity, temperature and currents were measured every 15 minutes at the same depth. Concurrently, every two hours, a four bottle rosette sample was taken for the estimation of the productivity: biomass ratio (P/B , $\text{mgC}/\text{m}^3/\text{hr}/\text{mg Chlor } a$), measured at saturating light intensity. The sampling design permitted, by analysis of variance, the evaluation of the small scale (<1 m) variability in the P/B ratio in relation to the hourly variability. There were significant differences between rosette bottles for biomass but not for the primary production measures of the P/B ratios. However the hourly variability in the P/B ratio was marked with a range of 2.8 to 10.1. The observed fluctuations in the P/B ratio are interpreted in relation to the physical environment, as well as to the species composition.

Session 14 Météorologie dynamique II—Théorie

ATMOSPHERIC BOUNDARY-LAYER FLOW ABOVE "GENTLE TOPOGRAPHY"

P. A. Taylor

A numerical model developed by Taylor and Gent (Boundary-Layer Meteorology (1974) 7, 349–362), for two dimensional flow in the surface boundary-layer of the atmosphere has been generalised to deal with arbitrary surface topography. Mean flow separation is not permitted. The model is based on the solution of the full mean-momentum equations and avoids boundary-layer approximations for the pressure. Reynolds stresses are represented by a relatively simple eddy viscosity formulation with $K = l(z) \bar{E}^{1/2}$ where $\rho \bar{E}$ is the mean turbulent kinetic energy. Further extensions of the model, to three dimensions and to the planetary boundary layer are in hand and preliminary results should be available for presentation at the Congress. Basic situations studied are the flow, with neutral stratification, above two-dimensional hills and gentle escarpments and around isolated three-dimensional hills.

PLANETARY-WAVE INSTABILITIES IN THE PRESENCE OF DISTORTED BACKGROUND FLOWS

John H. E. Clark

The theory of baroclinic instability has played a central role in the development of our conceptual understanding of the dynamics of synoptic and planetary scale disturbances in the atmosphere. Recently the relevance of this theory has been questioned and it is sometimes fashionable to consider it too simple to be applicable to the real atmosphere mainly because non-linear effects play too important a role to be ignored as they are in baroclinic theory.

It might be premature to throw out linear baroclinic theory at such an early date. In this study I have attempted to assess the effect on baroclinic instability of distorting the background zonal flow by a finite-amplitude stationary quasi-geostrophic wave. The zonal flow, by itself, is without shear but under certain circumstances baroclinicity associated with the finite-amplitude wave renders the total flow unstable and meteorologically important growth rates ensue.

The structure of these unstable disturbances is considered in detail and implications on our understanding of the general circulation are discussed.

THE CHINOOK OF SOUTHERN ALBERTA – A PROBLEM ASSESSMENT

Peter F. Lester

The recently completed phase of chinook research at the University of Calgary may be

viewed as an intermediate step between past macroscale and future mesoscale studies. A successful effort has been made to define, as far as possible, the subsynoptic scale meteorological characteristics of the chinook on the basis of available data. In the present paper, the major results of the study are reviewed and a mesoscale research programme is outlined. It is shown that while the most dramatic chinooks may be explained primarily on the basis of simple advection, (i.e., the *macroscale component* of the chinook), that long gravity waves (the *mesoscale component*) may have an equally important long term effect, especially with respect to the atmospheric momentum budget. Eighteen months of wave cloud observations, a series of case studies and a statistical summary of soundings upwind of the mountains are utilized to describe the frequency, characteristics and environment of the waves. Recommendations for further study include a combined theoretical/observational programme which clearly falls under the realm of GARP.

APPLICATION DE LA THÉORIE DES GROUPES AUX MODÈLES DE PRÉVISIONS ATMOSPHÉRIQUES

E. Yakimiw

On démontre qu'à condition de choisir une base orthonormale complète de vecteurs harmoniques sphériques, il est possible d'exprimer les "coefficients d'interaction" du modèle spectral en termes des symboles 3-j. On discutera des avantages théoriques de la méthode et de ses possibilités d'utilisation dans les modèles de prévisions numériques.

SELF INTERACTION OF ROSSBY WAVE PACKET AND GENERATION OF MEAN FLOW

M. Shabbar

An analysis is presented for the interaction of a weakly non-linear slowly varying Rossby wave train with itself. It demonstrates that mean flows can be generated by the slow variation of the wavetrain, and that these mean flows can play a dominant role in the instability of the Rossby wave. The analysis provides a suggestive mechanism for the maintenance of zonal flow in the lower stratosphere against diabatic damping.

A DIAGNOSTIC STUDY OF ATMOSPHERIC SPECTRAL KINETIC ENERGETICS

William R. Burrows

Wind spectra are obtained from data, using expansion in spherical harmonics. Equations governing the tendencies of kinetic energy of the spectral wind components are derived. Dissipation is obtained diagnostically as a residual. Calculations are performed on a data set of two weeks' duration at 8 pressure levels for the Northern Hemisphere. As the data coverage is not global, parity assumptions are necessary for scalar data fields, and are assigned based on observation and the geostrophic wind equations. Results are scaled by the two-dimensional index n (degree of the Legendre polynomials P_n^l). Expansions are truncated at $l = n = 24$. Data accuracy may be questionable for the higher coefficients considered here.

Some of the results of calculations are:

- 1) Kinetic energy above 850 mb is maximum in scales $n = 2$ and 4 , with a secondary maximum at $n = 9$. Equipartition of u and v kinetic energy occurs at $n = 7$.
- 2) Dissipation residuals are large in every scale, suggesting large fluxes of kinetic energy between scales $n > 24$ and $n \leq 24$.
- 3) The total non-linear horizontal transfer of kinetic energy shows sources in scales $4 \leq n \leq 10$, $13 \leq n \leq 15$, $n = 18$, and $n = 23$, with scale sources at $n = 7$ and 9 . The source at $n = 18$ is isolated and strong and may be due to the ITCZ. Scales $n \leq 3$ gain

kinetic energy in the fashion of the familiar zonal flow in energetic calculations where data is expanded in Fourier series at latitude circles.

- 4) The presence of sources of kinetic energy in scales $15 \leq n \leq 24$, and the fact that slopes of kinetic energy with scale are generally not close to -3 , suggest these scales do not form an inertial sub-range.
- 5) The contributions of interactions of scales $0 \leq n \leq 6$, $7 \leq n \leq 14$, and $15 \leq n \leq 24$ to the transfers in 3) were isolated, and the method is suggested as a means of diagnosing the impact of dissipation and heating parameterizations upon all scales of motion in models of the atmosphere. Interactions involving scales $7 \leq n \leq 14$ are quite active, and those involving scales $15 \leq n \leq 24$ are surprisingly active in view of their small kinetic energy content. Self-interactions in the latter scale range transfer a great deal of kinetic energy into ultra-long scales $n \leq 3$ and out of $n \leq 4$ in the upper troposphere, while self-interactions in the former scale range (scales of baroclinic middle-latitude disturbances) transfer much of the kinetic energy out of scales $4 \leq n \leq 9$ and $n = 18$. Self-interactions in planetary scales $0 \leq n \leq 6$ are rather passive, except in a few scales $n \leq 11$, in view of the large kinetic energy content involved. Cross-interactions are active in most scales.

ON THE PARAMETERIZATION OF HORIZONTAL DISSIPATION IN NUMERICAL MODELS

L. Steinberg

Spectral Shaving is a method whereby sub-grid scale inertial effects are parameterized.

The amplitudes of the spherical harmonic components in a wavenumber subrange adjacent to the truncation limit are shaved according to an imposed rule such as

$$A(n) = A(n_0) \left(\frac{n}{n_0} \right)^b, \quad n > n_0,$$

where n_0 is a reference wavenumber on the low wavenumber side of the spectral range and b is the spectral slope which at present may be taken from observations.

Investigations using the GCM model are being undertaken. Indications are that this parameterization will be effective. Other results using a 2 level quasi-geostrophic model will be described.

UNE PARAMÉTRISATION DE LA COUCHE LIMITE PLANÉTAIRE POUR LES MODÈLES DE LA CIRCULATION GÉNÉRALE

R. Benoit

Une paramétrisation de la couche limite planétaire (CLP) a été développée pour le modèle de la circulation générale (MCG) de NCAR (National Center for Atmospheric Research, Boulder, Colorado) à six couches et à résolution de cinq degrés (en latitude et longitude).

Les variables pronostiques sont l'épaisseur de la CLP, h , et les propriétés au niveau de l'anémomètre (10m), soient le vent horizontal, V_a , la température potentielle, θ_a , et l'humidité spécifique, q_a ; pour les points au-dessus des continents, on calcule aussi les propriétés relatives à la surface, soient la température, l'humidité spécifique, la couverture neigeuse, le contenu en humidité du sol, de même que le profil de température sous la surface.

Les gradients de flux turbulents verticaux sont les termes dominants des équations pour V_a , θ_a et q_a ; on les obtient en modelant directement la forme du profil de flux vertical. On tient compte de l'entraînement à travers l'interface situé à h , des propriétés de l'atmosphère libre du MCG, causé par le "bombardement" des éléments convectifs qui se développent sous h dans la CLP instable. On inclut aussi l'effet des nuages bas, qu'il s'agisse d'un ensemble de cumulus au-dessus de h ou d'une couche de stratocumulus sous h , pourvu qu'ils recouvrent tout un carré de la grille numérique.

L'effet de ces nuages est, pour les cumulus, de maintenir une sortie de masse hors de la CLP et, pour le stratocumulus, d'accentuer la convection dans la CLP par le refroidissement radiatif du nuage.

On présentera des résultats ayant trait à la simulation de la CLP pour les régions océaniques tropicales (en référence à l'expédition ATEX), et à une intégration de dix jours du MCG de NCAR.

BAROCLINIC GROWTH RATES OF THE RPN SPECTRAL MODEL

Roger Daley and Helen Warn

In order to investigate the hydrodynamic properties of the spectral model the model was run from initial data consisting of small perturbations imposed on zonal mean fields. After a short adjustment period, modes with zonal wave numbers from 3-11 grew exponentially. The most unstable mode was generally wave number 7, which had a doubling time of approximately 2 days. The results were checked for sensitivity to such things as zonal profile, the presence or absence of a mean meridional circulation, and the presence of various forms of diffusion; generally, it was found that the model reproduced results in reasonable agreement with the classical theory of baroclinic development.

Session 15 Télédétection

THE DETERMINATION OF CLOUD HEIGHT IN THE CANADIAN ARCTIC

E. R. Reinelt and Y.-J. Chang

Satellite IR imagery is used to determine cloud height in the Canadian Arctic. The method is based on the correlation of cloud height with the difference between the actual surface temperature and the radiation temperature measured by a satellite-borne IR scanning radiometer. The height and amount of cloud can be deduced from the shape of the histogram of temperature for a given region of interest. Thick, high overcasts produce sharp peaks on the low-temperature side of the scale, while clouds at lower elevation shift the frequency peaks toward higher temperature. Flat distributions are usually indicative of multi-layered cloudiness.

AREAL TEMPERATURE DISTRIBUTION FROM THERMAL IMAGERY

Richard C. Bennett

Thermal infrared imagery was used to determine the areal temperature distribution for use in frost and frost-risk mapping. An infrared line scanner was flown at altitudes of 1 km and 3 km at sunrise following a clear calm night characteristic of the spring nights when strong radiative cooling frequently results in frost conditions. The scanner had a spectral bandwidth from $8\ \mu$ to $14\ \mu$. The resulting thermal images had a resolution of $<1\ \text{K}$ showing that the lakes, streams, roads, and hilltops were warmest while the tops of houses, barns and low lying agricultural areas were coolest. Different crop types, irrigated areas and individual fruit trees were distinguished by their thermal contrasts. Variations in emissivities notwithstanding, it has been possible to derive a map of surface temperature which shows greater detail than could be obtained using conventional ground based investigations employing vehicle-mounted temperature sensors to interpolate between point temperature stations.

Extrapolating the surface temperature distribution to give the screen-height temperature pattern is more difficult but appears to be feasible.

GEOMETRIC CORRECTION OF METEOROLOGICAL SATELLITE IMAGERY
S. Petcherych, D. Steenbergen

Satellite imagery as received by a ground station is highly distorted. These distortions must be removed and the imagery must be registered to the earth before it can be used for quantitative interpretation (e.g. temporal studies). This paper defines the various sources of error and presents analytic expressions for these distortions.

THE AES HIGH RESOLUTION SATELLITE IMAGERY SYSTEM
E. G. Morrissey, R. W. Welsh and J. D. Steenbergen

The AES is developing an advanced meteorological satellite receiving system to acquire and process high resolution imagery and profile radiometry from the NOAA and TIROS-N series of satellites. The mini-computer based system is intended to provide the flexibility necessary to deal with changing data structures and to produce output tailored to specialized applications.

The paper outlines the system design and the processing of imagery for AES ice forecasting and weather forecasting offices.

Session 16 Circulation océanique I-Circulation au large

LAGRANGIAN MEASUREMENTS OF OCEAN MOTION – PROGRESS AND PROBLEMS
J. F. Garrett

The accumulating experience with attempts to measure large scale oceanic motions with drifters of various types has led to a better understanding of the technical and fundamental problems involved. The current technical state of the art is briefly reviewed, but the discussion will concentrate on the fundamental problems arising from the space and time scales of oceanic motion.

QUASI-GEOSTROPHIC OSCILLATIONS ON A THERMOCLINE MODEL
G. T. Needler

Models of the large-scale mid-ocean density and velocity fields have been available for several years. The possible stable and unstable quasi-geostrophic modes are presented for one class of models.

OBJECTIVE ANALYSIS OF MESO-SCALE OCEAN CIRCULATION FEATURES
Howard J. Freeland

The method of objective analysis is used to compute maps of the stream function field at four depths in the "MODE region" (near 28 N 69 40' W) of the N. Atlantic Ocean. A combination of current meter and neutrally buoyant float data is used. The maps at 500 m and 1500 m serve to show the sense of rotation and direction of propagation throughout the mapping period, and the shapes of eddies resolved for a substantial period of time. At the two lower levels, 3000 m and 4000 m, the shapes of eddies are not defined. The phase speed of eddies is 5 cm/sec below the thermocline and 2 cm/sec above the thermocline. The flow patterns are coherent between the subthermocline levels, but there is no coherence evident across the thermocline.

A STUDY IN THE SLOPE WATER REGION SOUTH OF HALIFAX
M. Germaine Gatién

Based on a re-analysis of the data from the Gulf Stream 60 survey it is proposed that the

Slope Water is comprised of two distinct zones. The first, warm Slope Water is a well-mixed zone found between 0 and 400 meters depth close to the Gulf Stream; the flow is primarily eastward. The second zone, Labrador-Slope Water, is deeper, clinging to the continental slope below 100 meters and at its broadest near $\sigma_t = 27.5$; it is poorly mixed and the flow is westward. The boundary between the two zones varies in shape and intensity in response to changes in the Gulf Stream and the Labrador Current. Observations made in the Slope Water Region south of Halifax in November 1973 are discussed in terms of the two Slope Water zones. In particular, movements of the boundary between the two zones is examined.

Session 17 Instruments II-Tests et développements

HOW LONG FOR THE STEVENSON SCREEN?

J. D. McTaggart-Cowan and D. J. McKay

An evaluation of 17 different types of radiation shields has been conducted for the past 8 months at AES-HQ in Toronto. This paper presents the results to date with emphasis on the late summer and mid winter conditions. The future of the Stevenson screen as the standard radiation shield is discussed.

THE STANDARD AES MINISONDE

M. E. Still

A commercially available minisonde has now been developed for environmental studies. The minisonde when carried aloft by a standard pilot balloon can be employed for temperature profiles up to 3 kilometres. This paper will place emphasis on the accuracy of the complete package in regards to absolute and differential temperatures. The choice of sensor will be discussed in relation to its accuracy, tracking ability through the specified temperature range and repeatability of each sensor relative to the others. A brief outline of the complete system and an indication of the costs involved will also be given.

MICROPROCESSORS IN NETWORK INSTRUMENTATION

C. E. Robinson

One of the fastest growing segments of the semiconductor industry today is the Microprocessor. Microprocessor devices are invading the technological domains of Computers, Data Acquisition, Instrumentation, Communication and Process Control Equipment. The main reasons for this popularity are discussed with particular emphasis on the benefits and pitfalls related to their use in network equipment. A specific implementation of Microprocessors in Runway Visual Range (RVR) Airport equipment is examined.

SOLAR POWER - IS IT A SOLUTION TO THE POWER REQUIREMENTS OF REMOTE METEOROLOGICAL SYSTEMS?

S. Ozog and R. Van Cauwenberghe

While solar power has been used for years, very little is known of its characteristics and potential for use in remote meteorological measurement situations. This paper presents several successful applications of solar power as a dependable source. A discussion is included on the correlation of the basic radiation measurement - total incoming radiation RFI - with solar cell output as a function of time. This permits a prediction of the possible capturable power for any region in Canada. Battery storage

requirements are also discussed with emphasis being given to the type found to be most acceptable.

UN THERMOGRAPHE A L'EPREUVE DU GIVRE

Verreault R. et Tremblay C.

Sur le plateau du Moyen-Nord québécois aux altitudes supérieures à 600 m, le givre hivernal fréquent diminue drastiquement la fiabilité des données des stations climatiques. Le thermographe antigivre que nous avons développé fait appel:

1. à un cycle de conditionnement automatique,
 2. à la télétransmission des données à un centre d'enregistrement habité plutôt qu'à l'enregistrement mécanique en brousse,
 3. à la miniaturisation des senseurs pour fins d'économie énergétique et d'équilibre rapide avec l'air ambiant avant qu'une recontamination appréciable n'ait lieu.
- Lors d'un cycle de conditionnement typique, le senseur chauffé jusqu'au-delà de 100 °C se libère de son eau en moins d'une minute et revient à l'équilibre avec un temps de relaxation moyen, sans vent, de 22 secondes.

Session 18 Circulation océanique II-Circulation côtière

WIND FORCING ON THE OUTER CONTINENTAL SHELF

Brian Petrie

Current meter data taken on the outer portion of the Continental Shelf off Nova Scotia have been examined for the effects of wind forcing. The wind stress was calculated from data taken on Sable Island. The suitability of this data for representing winds over the shelf is discussed. Wind forcing is most prominent in the fall and winter exciting a large response in the ocean at periods of two to six days as well as at inertial periods. Daily mean currents of up to 25 cm/sec at mid-depth appear to be driven by the wind stress. The response of the ocean on the outer shelf to the wind forcing is nearly barotropic with high correlations between like components of current in the vertical. The alongshore stress generally is larger than the onshore stress. The correlation between the alongshore components of wind stress and current near the bottom is high. Correlations between alongshore stress and other components are lower. The relationship of wind stress and intrusions of warm salty "slope" water onto the shelf is discussed.

OCEANOGRAPHY OF THE LABRADOR COAST - A REVIEW

J. B. Matthews

Relatively little has been written on the coastal oceanography of Labrador. This review brings together data from scattered journals in light of imminent potential development along the coast. The rocky, irregular coastline studded with islands and fjord inlets stretches some 1100 km from Belle Isle Strait (52 °N) to Hudson Strait (60 °N). The Labrador Continental Shelf is incised by the Labrador Marginal trough parallel to the coast 80 km wide and 300-800 m deep. Offshore from the trough are banks which have minimum depths of 84-200 m and lie from 110-270 km from the coast. The climate of the coastal region in winter is controlled by the Icelandic low and continental high which produces a predominately northwesterly flow and low temperatures. In summer a weak low pressure system appears over Hudson Strait and Baffin Island which leads to a prevailing westerly airflow and coastal fog. On the shelf the Labrador current, formed of a mixture of cold Hudson Bay water, polar Canadian

current water from Baffin Bay and relatively warm water from the West Greenland current, flows southeastward with surface velocities of 10-50 cm/sec. The core of the current is along the shelf edge at 200 m depth with branches through the coastal saddles and along the marginal trough. Maximum surface temperatures are less than 4-6 °C compared with central Labrador Sea maxima of 9-10 °C, in winter surface temperatures are less than 0 °C. At 100 m, temperatures are 0 to -1°C throughout the year. Salinities are in the range 32 to 33‰. Temperatures in the inlets are typically below zero at depths greater than 50 m with appreciable summer freshening. Pack ice is present over the shelf from November to June. Icebergs are present year round with a peak from May to August. The southern region particularly is very productive and is a breeding ground for both marine birds and fish. It supports an important fishing and sealing industry.

OCEANOGRAPHIC FEATURES, CURRENTS AND TRANSPORT IN CABOT STRAIT

Mohammed I. El-Sabih

Eighty-nine oceanographic sections across Cabot Strait, taken at various times of the year between 1950 and 1974, were utilized to describe the average oceanographic features, currents, and volume transport patterns as well as their variations with depth and time. The water mass structure in Cabot Strait is two-layered structure with an upper layer, 50-75 m thick, having a net outward flow above a lower layer with a net inward flow. The more variable of these two layers is the upper one; its characteristics are strongly influenced by land drainage and surface exchange with the atmosphere. Surface temperatures vary between -1.6 °C in February and 17 °C in August with salinities ranging between 28 and 32‰. The deep warm layer does not vary seasonally; the maximum temperature within it oscillates between 5 and 6 °C associated with a constant salinity of 34.5‰. The vertical variations of the physical properties in the mean monthly sections of Cabot Strait are described.

Outflow through Cabot Strait, except in March, is shown to be concentrated in the upper layer off the Cape Breton side and is mostly balanced by inflow at intermediate depths on the Newfoundland side and in the deep portions of the section. In March, the flow in the upper layer is reversed and the outflow from the Gulf takes place along the Newfoundland side. The maximum and minimum transports, both inflow and outflow, occur in August and March respectively. Contrary to what has been previously thought, the net volume transport through Cabot Strait cross-section is not always outward. It varies from a mean value of $2.9 \times 10^3 \text{ m}^3/\text{s}$ inward in March to a mean value of $20.9 \times 10^3 \text{ m}^3/\text{s}$ outward in August. The maximum transport occurs at times of minimum salinity. Horizontal advective transport of salt is found to be more important than horizontal diffusive transport. Recommendations for future studies in Cabot Strait are presented.

PHYSICAL OCEANOGRAPHIC ASSESSMENT OF OCEAN DUMPING

H. C. Mouratidis

In December 1975, Canada and 16 other nations joined in legislating control measures for dumping waste material into the sea. Environment Canada set up three committees to deal with applications covering the Pacific, Arctic and Atlantic seaboard. In order to determine appropriate disposal grounds and develop regulations for processing applications, it is necessary to assess the present sites and dumping methods.

This paper reviews ocean dumping technology, considers the nature of waste material dumped from barges and presents dispersion models which may be applied in various marine environments. Specific examples are given for B.C. coastal waters.

Numerous factors determine the fate of dumped material. The degree of turbulence,

density, gradients, currents and "hindered settling" impose limitations on models. Fluff zones can be created at the sediment-water interface which require examining the mechanics of bottom encounter. Biological impacts result from bottom encounter, heavy metals, hydrocarbons and other man-made substances contained in the carrying material.

QUASI-GEOSTROPHIC CURRENTS IN THE MAGDALEN SHALLOW

C. L. Tang

Current meter data taken from ten stations along the edge of and in the interior of the Magdalen Shallow in October and November of 1970 are analyzed by using low pass filters. The results show that: (1) The current structure is basically a two-layer motion. The currents in the upper layer are greater than those in the lower layer by a factor of about 3. The directions in the two layers do not seem to be directly correlated. (2) Currents near the Gaspé Peninsula reflect the characteristics of the strong Gaspé Current, the core of which is shifting between the shore and the mid-Channel. (3) Mass transports in the central part of the Magdalen Shallow are strongly influenced by the curl of the wind stress. The maximum transport occurred when a low pressure center passed the Gulf of St. Lawrence on November 6.

A linear model with constant horizontal eddy coefficient and bottom friction coefficient is used to correlate the data from different stations. Wind stresses are calculated from geostrophic wind velocity, which can be deduced from pressure data taken at weather stations around the Gulf of St. Lawrence.

Session 19 Réseaux océanographiques

THE BUOY OBSERVING SYSTEM FOR THE FIRST GARP GLOBAL EXPERIMENT

J. F. Garrett

The need for surface meteorological observations in the southern hemisphere during the FGGE has led to a Canadian program to produce expendable drifting buoys for this purpose. This brief discussion will describe the requirement, the approach being taken, progress to date and possible future use of such a system.

FIRST GARP GLOBAL EXPERIMENT (FGGE) - BUOY ARRAY DEPLOYMENT PLAN

Noël Boston

The FGGE Buoy Array Deployment plan is reviewed. This program calls for the deployment of buoys at approximately 1000 km. intervals throughout the southern oceans between latitudes 20°S and 65°S. The experiment is to take place in 1979. The buoy systems are required to measure atmospheric pressure to within ± 1 mb absolute (minimum resolution ± 0.5 mb) and sea surface (immersion) temperature to within ± 1 C° (minimum resolution of ± 0.2 C°). Additional measurements may be added as system design progresses. Data retrieval and position determination is to be by means of a polar-orbiting satellite. Deployment of the buoys will be by means of research, commercial and military vessels. Additional buoys will be deployed from island stations.

Initial buoy array schemes and array drifts are examined in the light of present knowledge of the general circulation of the southern oceans. The effect of buoy failure and rate of replacement on the integrity of the array are discussed.

The initial phase of the CODS (Canadian Ocean Data System) Program may be divided into two main sections

- Study

- Production, deployment and operation of "development test model" buoys

The study part of the program is designed to gather together all the data required to make decisions establishing the optimum Canadian Ocean Data System. The test buoys and their associated development is an input to the study program.

In establishing the sensors and data processing we have accepted the recommendations of the known authorities on sensors, i.e., AES, BIO, CCIW, NOAA, with special regard to the opportunity offered by the CODS Program to conduct controlled comparison of various buoys and sensors. The design of the data handling equipment allows wide bandwidth data to be brought back from the buoys for direct scientific comparison.

The above station includes a computer and data storage facilities. Programs will be established to compare effects of buoy motion and other environmental effects on the sensor data. As a program control, independent data is gathered from wave height measuring equipment located in the buoy deployment area.

The sensor site selection for the test buoys and their expected measurement accuracy and data usage will be discussed.

Session 20 Météorologie physique I-Physique des nuages

CUMULUS CLOUD SEEDING FOR FOREST FIRE CONTROL - PRELIMINARY SEEDING EXPERIMENTS

G. A. Isaac, J. I. MacPherson and L. B. MacHattie

During 1975, a two-week field experiment to study the possibility of initiating precipitation formation in cumulus clouds passing over forest fires was conducted in Yellowknife, N.W.T. Equipment and personnel from the Atmospheric Environment Service, the National Aeronautical Establishment and the Canadian Forestry Service were involved in the project. Measurements in seeded and unseeded clouds were made with two aircraft: a Twin Otter and a T-33. The instrumented Twin Otter made cloud microphysical measurements while the T-33 monitored turbulence levels and seeded clouds with *AgI*. The equipment and logistics used during the experiment and the preliminary results will be described.

A NUMERICAL MODEL OF GRAUPEL INITIATION

L. Cheng and R. Charlton

The initiation of graupel growth could be said to occur when a planar ice crystal begins to accrete rime. This study simulates that process through a numerical model. The hexagonal ice crystal is represented by an oblate spheroid of axis ratio 0.05 and Reynolds number 10 or 20 which implies that the major dimension of the ice crystal is about 0.6 or 0.8 millimeters. The supercooled cloud droplets being accreted by the spheroid have Reynolds numbers between 0.003 and 0.1 which give droplet diameters of 12 and 40 micrometers.

The flow field of air around the oblate spheroid was calculated by solving the steady-state Navier-Stokes equation. The flow field around the spherical droplets was found using analytical solutions for the smaller droplets and by solving the Navier-Stokes equation for the largest example. The hydrodynamic interaction between the

spheroid and the approaching sphere was simulated by using a superposition of their combined flow fields. From this interaction, the trajectories of the water drops as they approached the spheroids were calculated.

The drop trajectories gave new insight into the spatial variation of accretion on ice crystals. The maximum angle at which the droplets could accrete on the outer edge of the ice crystal was calculated so that the direction in which growth by accretion initiates could be estimated. The results indicate that the angles at the pointed end of conical graupel can be initiated by accretion on an ice crystal.

FINE SCALE STRUCTURE OF CONVECTIVE STORMS—IMPLICATIONS FOR CLOUD SEEDING IN ALBERTA

B. L. Barge, F. Bergwall, G. G. Goyer and J. H. Renick

Recent research at the Alberta Research Council revealed the existence of fine scale radar reflectivity patterns. These patterns are found within hailstorms and have characteristic dimensions of about 4 km; new patterns form at a rate of about one every two minutes. The patterns are therefore smaller and form more frequently than previously observed cells within multicellular storms. These time-dependent fine scale patterns are also found within storms often classed as supercells. It is hypothesized that the fine scale radar reflectivity patterns are associated with hail growth, and furthermore suggested that the patterns provide a common basis for cloud seeding regardless of storm type.

These new results have prompted amendments to cloud seeding procedures based on multicellular storm models. It is suggested that a physical basis now exists for more frequent and extensive cloud seeding, where the intent is to promote beneficial competition among hail embryos and thereby to reduce hail. To seed hail generation regions as early as possible, the cloud seeding reagent is to be placed at freezing temperatures into the shelf cloud, an extensive region of cloud on the edges of storms assumed to contain natural hail embryos. These results stress the need for cloud seeding aircraft to drop seeding reagent (produced by pyrotechnic flares) into cloud at temperatures between 0 and -7°C . Seeding at cloud base where updrafts are weak is also proposed as an alternate to seeding the strongest cloud base updrafts associated with storms.

CUMULUS CLOUD POPULATIONS IN THE TRADE WIND REGIONS

H. R. Cho

A new formulation of the cloud-environment interaction equations is applied to a typical trade wind weather situation observed during phase 3 of the BOMEX to determine the cumulus cloud populations. The formulation includes the cloud life-cycle effects by introducing a cloud distribution function which describes the cloud fractional coverage distribution in terms of cloud top height as well as cloud age. The total cloud mass flux, the fractional cloud coverage distribution, as well as the mean lifetime of the shallow cumulus population are determined. It is found that cumulus clouds covered about two percent of the total observational area. The mean life span of the cloud population is of the order of ten minutes. The atmospheric air near the cloud base level was recycled about three times a day by cumulus clouds. This recycling rate decreases rapidly with height. The recycling rate is about 0.3 per day at the bottom of the trade inversion, and decreases to zero near the top of the inversion layer.

Session 21 Turbulence atmosphérique

ON AN AERODYNAMIC PREDICTION OF HEAT AND WATER VAPOR LOSSES FROM THE GROUND

P. H. Schuepp

Studies of the relationship between plant growth and climate point out the need for reliable prediction of energy and water vapor fluxes between soil and air in terms of parameters that can be easily measured.

A simple model of turbulent fluxes near the ground was developed which is based on the approximate proportionality between eddy diffusivity (or friction velocity) near a surface and the heat or mass transfer coefficient at that surface.

The model was tested by comparing heat transfer coefficients measured from ground-based electrically heated plates in open terrain, grass, corn and behind all kinds of natural and artificial barriers in the field and laboratory with those predicted on the basis of the model from velocity profiles at the plate. The standard deviation between observed and predicted values was 13%; the correlation coefficient between observed and predicted values was 0.8.

TEMPERATURE FLUCTUATIONS IN THE SURFACE BOUNDARY LAYER

G. A. McBean

Temperature fluctuations are of critical importance to the dynamics of an unstable surface boundary layer and also have other effects such as the distortion or scattering of electromagnetic and sound waves. Data from two experimental sites are examined in a variety of ways. The spectrum and budget of the fluctuations are presented. The Corrsin-Kolmogoroff constant was evaluated both directly and indirectly and the differences will be discussed. The results have implications on the existence of local isotropy.

AN ANALYTICAL-EMPIRICAL METHOD FOR DETERMINING THE ROUGHNESS-LENGTH AND ZERO-PLANE DISPLACEMENT HEIGHT

Aloysius K. Lo

It has been well understood that measurements over both natural and man-made roughness elements have indicated that wind and temperature profiles begin to obey the similarity hypothesis of Monin and Obukhov only at some finite distance above the top of the surface structure.

A method based on the principle of the Method of Weighted Residuals for calculating the roughness-length (z_0) and zero-plane displacement height (d) is presented. This method not only can minimize errors involved during the evaluating process but can also smooth it out and re-distribute the already minimized error in a most favourable manner via using appropriate weighting functions. With the inclusion of d in addition to z_0 , formula for wind and temperature profiles in the surface layer are represented by:

$$U = \frac{u_*}{k} \left[\ln \left(\frac{z-d}{z_0} \right) + \phi \right]$$
$$\text{and } \theta - \theta_0 = \theta_* \left[\ln \left(\frac{z-d}{z_0} \right) + \phi_T \right]$$

where ϕ and ϕ_T are the "integrated diabatic influence functions" for velocity and temperature profiles respectively.

Analytical expressions for both ϕ and ϕ_T as functions of wind shear or, implicitly in terms of the Richardson's numbers have been derived.

Typical values of z_0 and d determined by the present method using experimental data measured over the Petawawa Experimental Forest, Ontario, are included.

SPECTRAL GAPS AND OPTIMUM AVERAGING TIMES IN A TROPICAL MARINE BOUNDARY LAYER

R. E. Mickle and D. S. Davison

Data gathered by the Canadian tethersonde system at the GARP Atlantic Tropical Experiment (GATE) were spectrally analyzed to determine the existence and size of spectral gaps between turbulent and larger scales. The existence of a spectral gap permitted the development of optimum averaging times for profiling operations. The technique, which can be applied to any profiling system, minimizes the area of uncertainty associated with a data point and thus maximizes the amount of information obtainable from the profile. The shapes of the curves of areas of uncertainty as functions of averaging time indicate how critical is proper selection of averaging times. This optimization technique was applied to a series of profiles measured from before dawn until midday to demonstrate the effects of spatial and temporal variability on the reliability of details within profiles.

Session 22 Mélanges verticaux dans l'océan

DEEP WATER EXCHANGE IN RUPERT-HOLBERG INLET

D. Stucci and D. M. Farmer

Temperature, salinity and current velocity measurements made directly in front of the sill in Rupert-Holberg Inlet provide observational evidence of deep water exchange. During each flood tide, strong bottom currents (154 cm/sec maximum) of denser water are observed. Furthermore, the density of the entire water column continually increases during the 17 day data period. Examination of the seasonal temperature and salinity data reveals that deep water exchange occurs in the spring and summer months. In the fall and winter months, a different exchange process is at work – one which is able to extract salt from the entire water column.

Simple models of the deep water exchange and the salt extraction process have been developed. These exchange processes are controlled by tidal mixing and the density of the inflowing Quatsino Sound water. The first set of temperature and salinity data from our long term moorings in Quatsino Sound and Holberg Inlet has been used to test and refine the exchange models. The long term data has been successfully interpreted in terms of the exchange models.

DEEP WATER EXCHANGE PROCESSES IN THE SAGUENAY FJORD

S. J. Reid, R. W. Trites, D. J. Lawrence, R. H. Loucks, G. H. Seibert

Saguenay Fjord is connected to the St. Lawrence Estuary at a sill over which the water is only about 20 m. deep. The surface layer, which sometimes is only a few metres deep, has a low salinity and is separated from the deep saline waters by an intense pycnocline. Nevertheless, oxygen levels in the deep layers are remarkably high, suggesting a vigorous exchange process with water near the surface. Observations indicate intrusions of St. Lawrence water across the sill into the deep layers on the flood tides and extrusions from these layers on the ebb. The intrusions appear to take the form of density currents, occasionally penetrating to the bottom of the fjord and regularly producing sufficient mixing near the mouth to entrain large volumes of

surface water into the deep layers. The variation in the levels of the isohalines and the isotherms during a tidal cycle is consistent with the generation of large amplitude internal waves at the sills. The dissipation of the waves at bends in the fjord maintains a level of mixing in the deep layers. In addition, the waves tend to bring deep waters to the surface which flow across the sill with the tide. Especially pronounced internal waves in the St. Lawrence Estuary at the mouth of the Saguenay are probably responsible for the cold saline water which enters the Saguenay carrying with it high concentrations of nutrients and oxygen. The subsequent modification, and discharge of this water near the surface, probably contributes to the upwelling thought to exist in this region.

VERTICAL MIXING IN THE SLOPE WATER OFF NOVA SCOTIA

Edward Horne

It has been known for some time that a boundary zone exists in the slope water between the Gulf Stream and the Shelf Break where temperature jumps from 7°C to 12°C and salinity from 34.8‰ to 35.5‰. Data taken in this area with closely spaced STD stations was analyzed and shows that at the boundary zone the two water masses interleave with a vertical scale on the order of 10 m. and these layers are coherent for several kilometers in the horizontal. By using Turner's formulae for double diffusive heat and salt fluxes through the interfaces of these layers it has been shown that this could be an area of strong vertical mixing even though the boundary zone itself is a convergence. This mixing could bring nutrients from the oxygen minimum layer (400 m) to the surface to help support its unusually high productivity which has puzzled biologists for some time.

VERTICAL MIXING ON THE NORTH SHORE OF LAKE ONTARIO DURING A FALL STORM

F. M. Boyce and B. K. Killins

Measurements of thermal structure made with electronic and mechanical bathythermographs and a towed thermistor array, in a 100 km² zone on the north shore of Lake Ontario show a striking transition from a two layered thermal stratification to one comprising a uniform mean temperature gradient with abundant microstructure following an October storm. During this same interval, the two layered structure was retained in the open lake. This event is described and discussed in terms of possible mechanisms giving rise to the intensified inshore vertical mixing.

Session 23 Météorologie physique II-Divers

FATA MORGANA SIMULATIONS

Alistair B. Fraser

The Fata Morgana is a strange form of mirage which is capable of creating images of recognizable features, such as mountains, where no mountains exist. Most mirages produce images which are simple transformations of distant objects; a car appears double, a boat gets magnified or a building becomes squashed, but the Fata Morgana creates apparitions of objects that are not there. The basic theory of how the atmosphere does this was presented last year at Vancouver. This year computer simulations of the apparitions will be shown along with the requisite temperature structure. Because the Fata Morgana also depends on the aperture of the viewing instrument (naked eye, telescope) two people viewing the same scene can see (or photograph) two different things. Simulations will be presented of phantom snow-capped mountains (such as those that blocked Ross's 1818 exploration of the North-West Passage),

phantom sailing ships (such as that of the Flying Dutchman), and phantom castles and aqueducts (such as those that legend ascribes to the Fairy Morgan herself).

MEASUREMENTS OF CONTINENTAL THUNDERSTORM ACTIVITY FROM ONE SPHERICS STATION

R. D. Grimes, R. G. Lawford, and Bhartendu

Spherics measurements made from a VLF analyzer for 1975 at the AES Station for Atmospheric Experiments, Toronto, are reported. Spherics data have been analyzed for diurnal and seasonal variations. These variations have been compared with the usual meteorological measure of thunderstorm activity (number of days thunder heard). Large correlation coefficients have been observed between these two quantities.

STUDIES ON THE EFFECTS OF ATMOSPHERIC IONS ON PLANTS

T. M. Elkiey, Bhartendu, R. L. Pelletier and N. Barthakur

Experiments were performed to determine possible effects of atmospheric ions on diseases and germination of plants. Exposure of barley plants, infected with net blotch disease, to an atmosphere of small positive ions (2.5×10^4 ions/cm³) increased the incubation period (time between inoculation and first symptoms of disease appearance) by three days. Negative small ions had no detectable effect on net blotch disease of barley. Plant length and dry weight of barley were stimulated slightly (after 15 days of continuous exposure to unipolarly ionized atmospheres of either charge of concentrations 2.5×10^4 ions/cm³) but significantly.

Preliminary experiments were then carried out to investigate whether ions act on the pathogens (spore germination, penetration, etc.) or on the host plants. Spores of *Helminthosporium teres* were germinated in a standard culture medium. After 18 hours of exposure to negative small ions (2.5×10^4 ions/cm³), no difference in behaviour between ion-treated and control spores were observed. However, growth inhibition of spore germination was observed when exposed to small positive ions. A time-delay of 6 hours was observed in germination between the treated (with positive small ions) and the control. Abnormal structural growth of the germ tube was observed for an initial period of about 1 hour which, however, continued to grow normally later. This phenomenon was observed under both positive and negative ion exposures. Similar results were obtained when experiments were performed on the leaf surfaces instead of the culture medium.

CLIMATOLOGICALLY RELATED PROBLEMS IN DETERMINING THE POTENTIAL FOR SOLAR ENERGY UTILIZATION IN CANADA

John E. Hay

There have been numerous studies of the distribution of solar energy over Canada but the surface considered has been horizontal and thus the results are inappropriate for the present purpose – namely to assess the amount of solar energy potentially available for conversion into economically more useful forms of energy.

Reasons for the currently inappropriate analyses are that few measurements of solar radiation on non-horizontal surfaces are available and that there are presently only four Canadian stations which routinely report on measurements of diffuse shortwave radiation. Kondratyev's model for the calculation of the shortwave radiation incident on a non-horizontal surface requires data on both the direct and diffuse components of shortwave radiation incident on a horizontal surface. This paper presents a technique which makes this subdivision of the total shortwave flux possible and shows that the relevant equation is both spatially and temporarily conservative. Kondratyev's model

is then used to provide data on the amount of solar energy falling on slopes of a given angle and aspect. The analyses are performed for seven Canadian stations distributed zonally from coast to coast and latitudinally between 43 and 54 degrees north.

The slope orientation which optimizes the daily solar energy receipt is shown to be determined primarily by latitude, time of year and the distribution of solar energy through the day though the ratio of the direct to diffuse shortwave radiation also influences the optimum orientation. The sensitivity of the energy flux to deviations of the surface away from the optimum orientation (both for fixed and "tracking" collectors) is also investigated.

Finally the paper concentrates on the difficulties associated with determining whether calculated solar energy totals represent economically viable quantities of energy. Data on Canadian domestic heat consumption are used in an attempt to overcome this problem and the results are encouraging, both for the viability of the technique and for the potential for solar energy in southern Canada.

MESURE DES RAYONNEMENTS DE GRANDES LONGUEURS D'ONDE: APPLICATION AU BILAN ENERGETIQUE D'UNE SERRE

J. J. Vonarburg et V. V. Tran

Le bilan énergétique d'une serre nécessite une parfaite connaissance de tous les paramètres climatologiques: température de l'air, à l'extérieur et à l'intérieur de la serre, vitesse du vent, humidité absolue, ensoleillement et rayonnement thermique.

Pendant le jour, le paramètre le plus important est l'ensoleillement; c'est la cause principale du réchauffement de la serre. Après le coucher du soleil, le refroidissement de la serre est principalement dû aux divers rayonnements de grandes longueurs d'onde.

Jusqu'à présent, on mesurait les rayonnements de courtes longueurs d'onde, notamment au moyen de pyranomètres; quant aux rayonnements de grandes longueurs d'onde, on en faisait seulement une estimation, soit à l'aide de formules empiriques, soit par soustraction entre d'autres types de rayonnement.

Actuellement la valeur des rayonnements de grandes longueurs d'onde peut être mesurée directement par des *pyrgéomètres*. Pour notre étude, nous utilisons un pyrgéomètre de marque *EPPLEY* (modèle *PIR*) dont la précision est de 0.02 cal/(cm² min).

Au cours de l'hiver 1975-76, nous avons fait des tests sur la transparence au rayonnement atmosphérique des plastiques utilisés comme couvertures de serre. Nous avons pris le verre comme référence, car il est opaque aux rayonnements thermiques. Cette première étude montre que les polyéthylènes habituellement utilisés comme couvertures de serre ont une transparence à l'infrarouge de 80 à 85%, donc un effet de serre négligeable; par contre, le polychlorure de vinyle (PVC) en film mince a des caractéristiques équivalentes à celles du verre dans l'infrarouge, ainsi que dans le visible.

Parallèlement à cette étude, nous avons fait des tests sur la variation du rayonnement thermique émis par le sol de la serre en fonction de la température de l'air intérieur et du rayonnement solaire incident, ainsi que sur la température radiative de la surface de la neige.

CANADIAN PARTICIPATION IN THE WMO PROGRAMME FOR WORLD WIDE MONITORING OF BACKGROUND CARBON DIOXIDE LEVELS

K. G. Pettit

Under the aegis of WMO, a global monitoring network to measure background concentrations of carbon dioxide is being established. Data from this network will permit assessment of world-wide distribution and trends primarily to achieve more realistic modelling of climatic change. Canada has agreed to provide three stations in the network.

A brief historical survey of carbon dioxide measurements is presented. Site selection criteria and the testing of two Canadian sites are discussed. Some measurements at Canadian stations are presented.

ON MONITORING THE ATMOSPHERE AEROSOLS BY REMOTE SENSING SATELLITE TECHNIQUES

T. Takashima

The objective is to seek an appropriate method of monitoring the atmospheric aerosols on a global scale by using remote sensing satellite techniques. This turns out to be a problem of radiative transfer in the inhomogeneous atmosphere bounded by the ground surface. In the present work, the effect of each of the parameters representing the atmospheric aerosols as well as the surface characteristics are discussed in terms of a model atmosphere-ground system.

PUBLIC PERCEPTION OF AIR POLLUTION IN NEW BRUNSWICK

James W. S. Young

The general public's perception of air pollution was surveyed in New Brunswick in the summer of 1975. The purpose of this survey was to determine the man-on-the-street requirements for pollution information, specifically as it applies to the issuance of an Air Pollution Index. A total of 1600 questionnaires were mailed and the return rate was over 24%.

This paper points out the major areas of confusion to the public and suggests that, in the design of an index, great care must be taken to ensure that it follows the public perception of air pollution.

PHOTOCHEMICAL OZONE (O_3) AND REGIONAL TRANSPORT OF AIR POLLUTANTS IN THE BOUNDARY LAYER

Y. S. Chung

Photochemical air pollution is being studied in the lower Great Lakes region of southern Ontario, using O_3 data for 1973-1975 inclusive. High O_3 concentrations are observed to depend primarily on the following meteorological variables: pressure, temperature, radiation and low-level winds. The generation of low level O_3 is highly dependent on the synoptic-, meso- and small-scale airflow. On the other hand, temperature changes due to cold air advection, local rainshowers and thunderstorm activity, as well as oxides of nitrogen (NO_x), are mechanisms for O_3 destruction.

In general, O_3 concentrations tend to increase when a ridge of a surface anticyclone passes over a region. Relatively high values were recorded in the warm sectors, well ahead of cold fronts. In other words, elevated concentrations of surface O_3 usually occurred in periods of high temperature with southerly and/or southwesterly flows. After the passage of cold fronts, when strong N-NW flows developed in low levels,

(e.g. in a new anticyclone with general subsidence), O_3 concentrations began decreasing and became very low. These observations were supported by results obtained from using a regional-scale trajectory model. The results of this study do not agree with the earlier theories which state that surface O_3 has transported downward from the stratosphere. The evidence from the present study suggested that large surface O_3 concentrations are, in many cases, the result of photochemically-active precursors (of anthropogenic origin) being transported over long distances ($\sim 1,000$ km).

This study also indicated that lake effects influence photochemical air pollution concentrations. In addition, an examination of hourly observations indicated that there are 2 maxima in the diurnal cycle of O_3 for large urban centers (Toronto and Montreal) and only one maximum for rural stations. In urban centers the maximum concentrations usually occur between 2 and 3 p.m. and secondary maximum at 4 a.m.

CONCENTRATIONS TRIDIMENSIONNELLES DU SO_2 À MONTRÉAL RELIÉES AUX CONDITIONS MÉTÉOROLOGIQUES.

East, C., P. Zwack, G. Desautels et G. Perrier

En 1968-69, des profils de température et de la concentration du SO_2 furent obtenus par des sondages faits par hélicoptère à 12 sites prédéterminés de l'île de Montréal. Sept de ces sites étaient le long d'un axe sud-ouest/nord-est, et cinq le long d'un axe perpendiculaire au premier.

Les patrons des concentrations le long de l'axe sud-ouest/nord-est furent classifiés en six groupes typiques. Les données de température furent utilisées pour calculer la stabilité verticale ainsi que les hauteurs et intensités des inversions. Les effets des conditions météorologiques (stabilité verticale, vent, température) sur les concentrations du SO_2 ont été examinés.

**DIXIEME ASSEMBLEE GENERALE ANNUELLE
DE LA SOCIETE METEOROLOGIQUE DU CANADA**

**UNIVERSITE LAVAL, QUEBEC
LE 26 MAI, 1976**

ORDRE DU JOUR

1. Procès-verbal de la 9^{ième} assemblée générale annuelle, 28 mai 1975
2. Rapport annuel du comité d'administration
 - a) rapport du président
 - b) rapport du trésorier
3. Rapport annuel des comités
 - a) Comité de rédaction
 - b) Comité des récompenses
 - c) Comité des citations
 - d) Comité d'information publique
 - e) Comité scientifique
4. Rapport annuel des centres locaux
5. Budget pour 1977
6. Cotisations en 1977
7. Propositions du conseil d'administration
8. Section océanographie
9. Localisation des congrès à venir
10. Divers
11. Rapport du comité de mise en candidature et investiture du bureau d'administration pour 1976-77

**TENTH ANNUAL GENERAL MEETING
CANADIAN METEOROLOGICAL SOCIETY**

**LAVAL UNIVERSITY, QUEBEC
26 MAY 1976**

AGENDA

1. Minutes of the 9th Annual General Meeting, May 28, 1975
2. Annual Report from the Executive
 - a) President's Report
 - b) Treasurer's Report
3. Annual Reports from the Committees
 - a) Editorial Committee
 - b) Awards Committee
 - c) Citations Committee
 - d) Standing Committee on Public Information
 - e) Scientific Committee
4. Annual Reports from the Local Centres
5. Budget for 1977
6. Membership Fees for 1977
7. Motions from Council
8. Oceanography Division
9. Location of Future Congresses
10. Other Business
11. Report of the Nominating Committee and Installation of Officers for 1976-77.



CANADIAN METEOROLOGICAL SOCIETY

SOCIÉTÉ MÉTÉOROLOGIQUE DU CANADA

MINUTES OF THE 9TH ANNUAL MEETING
HELD ON THE 28TH OF MAY AT 19:30
IN THE RUTH BLAIR LOUNGE
UNIVERSITY OF COLUMBIA, VANCOUVER

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1974

The meeting was chaired by Dr. André Robert, President of the Society. 64 persons were present, including 15 or 20 guests.

After some welcoming remarks, the President proposed to add the following three items between nos 6 and 7 of the agenda:

Motions by council.
A division of oceanography?
The CMS development fund.

1. Minutes of 8th Annual General Meeting held on the 29th of May 1974.
The approval of the minutes was proposed by J. Derome, seconded by E.C. Rhodes, and carried.
- 2.a President's Report
Please refer to page 59 of the Congress Issue of Atmosphere. The President thanked the two past-presidents, G. McKay and W. Hitschfeld, for their contributions to the good financial standing of the Society by having obtained significant grants from the AES and established the subsidies to Local Centres respectively. Good support for the Scientific Committee and Atmosphere are thereby assured.
- 2.b Treasurer's Report
Please refer to page 60-62 of the Congress Issue of Atmosphere. The Treasurer warned the members against over optimism regarding the financial standing of the Society and recommended them to consider the amount of \$5,902.64 on page 62 as net worth rather than Surplus Funds.
The approval of the Treasurer's report was moved by N. Yacowar, seconded by A. Robert and carried.
- 3.a Report from the Editor of Atmosphere
Please refer to page 64 of the Congress Issue of Atmosphere. The Editor repeated his appeal to the members to support their own journal by submitting more papers.
- 3.b Report from the Awards Committee
Please refer to page 65 of the Congress Issue of Atmosphere. The recipients of awards were warmly applauded.

3.c Report from the Citations Committee

Please refer to page 65 of the Congress Issue of Atmosphere.

3.d Report from the Public Information Committee

Please refer to pages 66-68 of the Congress Issue of Atmosphere. Concerning Item 7 of that report, the CMS Booklet, the President indicated that the Executive had just now received from J. Moakler the outline of the text and would be examining it shortly. It is expected that the booklet will be available near the end of the summer.

3.e Report from the Scientific Committee (formerly SOMAS)

Note: the letters SC are used in these minutes to refer to the Scientific Committee. The suggested pronunciation is "psycho".

The Report on page 69 of the Congress Issue of Atmosphere was written before any meeting of the Committee took place. The chairman R. List expressed the interest of the Committee in the rain enhancement program just announced by WMO. He also indicated that administrative guidelines have been approved for SC and their GARP sub-committee. In mentioning that one of the responsibilities of SC is to produce the section on atmospheric science for the Canadian Geophysical Bulletin, he noted with pleasure the considerable increase in reported research and congratulated the members for it.

4. Reports from the Local Centres

These reports are printed on pages 70-81 of the Congress Issue of Atmosphere. A few remarks were added:

BC Centre (Scheafer)

J. Hay was responsible for the local program during the season.

Alberta Centre (Lozowski)

N. Yacowar spoke to them in March. They held an annual meeting in Calgary. Their bank balance is now down to \$200.

Regina Centre (Wojtiw)

Prizes were given to the Regional Highschool science fair and also to a junior highschool. Their new executive is now composed of S. Meares, chairman and R. Brian, secretary-treasurer.

Winnipeg Centre (Siemieniuk)

Two other dinner-meetings were held. Two prizes were given at the Manitoba Science Symposium. A display was set up for the WMO day. The chairman congratulated the national executive for its efficient operation in the season 1974-75. The President of the Society responded with congratulations to

all Centres for their interesting initiatives, particularly in the use of their grants.

Quebec Centre (Ferland)

They are planning to award a prize for outstanding contribution to Meteorology in Quebec.

Discussion: G. McKay noted with satisfaction that the Centre's finances are now being reported and suggested that in the future a full society financial report should be prepared so that our financial standing is firmly established.

5. Budget

Please refer to page 63 of the Congress Issue of Atmosphere. Approval of the budget was requested by N. Yacowar, seconded by A. Robert.

Discussion: J. Maybank questioned the Executive about the amount of \$700 allocated for SCITEC in the budget. It was clarified that since the preparation of this budget, the decision to pull out of SCITEC was taken by the Executive. Therefore, the amount of \$700 will become available for other activities. After this clarification, the proposed budget was approved.

Grants to Centres

J. Maybank inquired about the formula for grants to Centres. Merilees referred to his report to the first Council Meeting which he summarized briefly. The total grants in 1973 amounted to \$1524 and in 1974 they amounted to \$1985.

The formula used for the grants is heavily weighted in favour of the first few members. It is as follows: \$10 for each of the first ten members; \$5 for each of the next 20 members; \$2 for each of the following 70 members and 75¢ for each additional members.

N. Thyer inquired whether grants could be made available to individuals who cannot be members of a Centre. The President said that such a special request would be considered favourably by the Executive if the purpose reached the aims of the Society.

The President referred again to the excellent uses of funds by the Centres. He referred particularly to the use made by the Toronto Centre which was reported on last year and again in Atmosphere on page 74 this year.

6. Membership Fee

N. Yacowar seconded by J. Derome and P. Zwack proposed no change of fee for 1976.

Discussion: F. McDougall (a non-member from the Edmonton area) spoke to the meeting about his objection to joining CMS because of the impossibility of having the collection of fees done by the Local Centres. It was recalled by G. Pincock that the excessive volunteer work which this requires had led the Society a few years ago to contracting its

collection to the U of T Press. The new chairman of the Edmonton Centre, D. Fraser, expressed his willingness to participate in the membership drive. Several opinions were expressed in support of a mixed recruiting-collecting procedure by the Press and by the Centres. The President promised that the new Executive would examine this option. Motion carried.

Note: To avoid the procedural vice in the future, the membership fee should be adopted before the budget.

7. Motions from Council

Please refer to pages 82 and 83 of the Congress Issue of Atmosphere for the text of the motions.

- The first motion was moved by A. Robert, seconded by R. Asselin. It was noted that it is not necessary to have different persons serving the different functions of chairman, secretary and treasurer of Local Centres. The motion was carried.

- Motion no. 2. This motion was moved by A. Robert and seconded by P. Merilees.

Discussion: The President gave an extensive explanation, at the request of several members, in order to clarify the status of the Andrew Thomson prize. In short, the Andrew Thomson prize must be temporarily cancelled at the desire of Andrew Thomson himself who wished to have a more prestigious purpose attached to his prize. He had left a written document about this to the Executive but unfortunately died prematurely before all the details of his new prize could be worked out and before he could endow the Society with necessary funds. After a long discussion in which several members stressed their desire to have the name of Andrew Thomson perpetuated by the Society, or even expressed their desire to contribute to the necessary fund, the motion was carried when the President formerly promised that the next Executive would work out a new arrangement.

Specifically, it was moved by P. Merilees and seconded by G. Pincock that the Executive is instructed to prepare a proposal to re-establish a suitable Andrew Thomson Prize and to submit it to the next Annual Meeting of the Society. This motion was carried.

It was noted that the English text of paragraph d may be misinterpreted. Specifically, the last sentence of paragraph d should be changed to end by "or maybe some single notable achievement".

Regarding the French text, R. Fichaud noted that the title of the prize should be "Prix de Météorologie opérationnelle Rube Hornstein". There is also a spelling error on the last word.

The Executive was instructed to re-examine carefully the text of paragraph d and to clarify it according to the wishes of the membership.

- The third motion was moved by A. Robert, seconded by J. Maybank and R. Asselin.
In the discussion, A. Chisolm inquired whether the wording in paragraph 8 should not spell "atmospheric" in relation to pollution problem and environmental improvements.
R. Fichaud and others supported the broader interpretation which allows more freedom to the Citations Committee and favours publicity for the Society. The motion was carried.

8. A Division of Oceanography?

The President recalled that during the last year the SC had formed a sub-committee on oceanography. This sub-committee after surveying the opinion of most of the oceanographers in Canada had come up with the recommendation that CMS should form some kind of division of oceanography. The following motion was moved by ~~P. Merilees~~ *W. Hulsefeld*, seconded by S. Smith and S. Orvig:

"Whereas the Scientific Committee of the CMS has received and reviewed a report of its Oceanography sub-committee, and on the strength of this recommends that CMS move toward the establishment of an oceanographic division.

The executive of the CMS recommends to Council and the Annual meeting of CMS that:

- a) The CMS declare its readiness to establish an oceanography division, and invite the oceanographers participating at the 9th CMS congress to elect a chairman and Secretary for such Division;
- b) The Chairman and Secretary of the Oceanography Division so constituted be invited to attend CMS Council and Executive meetings;
- c) these arrangements be reviewed in 1976/77 with a view to their becoming permanent, or modified, or discontinued. Any constitutional amendments that may become necessary should be proposed by Council to the 1977 Annual meeting.

Should these recommendations be accepted by Council and Annual meeting, the Executive further intends to ask the Editor of Atmosphere to propose the appointment of an Associate Editor (oceanography), whose particular task will be to insure the inclusion of papers on research in oceanography in Atmosphere."

Discussion: The President clarified that it is the suggestion of the Executive that some oceanographers be included, at least on an ad hoc basis, in the Executive for the next year before any formal decision is made. R. List stressed the importance of the interaction between

Atmospheric Scientists and Oceanographers, but warned the Society that such an inclusion of oceanographers in our Society might lead the way to our Society becoming an "umbrella society". This possibility should therefore be examined during the next two years. To the question by G. Pincock, as to whether our By-Laws and constitution permit such an inclusion of extra members on the Executive, the President told the audience that the Executive and Council meetings are generally run by a concensus rather than by vote. Therefore, their presence at Executive or Council meetings would not have to be sanctioned by too much officiality. The Vice-President further stressed that the Division of Oceanography would be handled much like a Local Centre. To the question by G. Scheafer as to whether the oceanographers would have to be members of the CMS, the answer was clearly yes. The motion was carried.

9. CMS Development Fund

The President announced to the membership the generous donation by one of its senior members of an amount of \$2000 for the advancement of the aims of the Society, and the creation by the Executive of a CMS Development Fund for which further contributions were invited. The Treasurer indicated that income tax deduction receipts will be provided for such contributions. The intention of the Executive at this time is to use the revenue from this fund to promote several activities such as sponsoring of speakers, increase in publications quality, publication of special papers, monographs, conference tours, etc. The President indicated that the Executive is also considering turning over the Congress surplusses into this fund in order to make it grow as fast as possible.

10. ASG Speaker's Tour

The President indicated that unfortunately the name of the nominee is not available at this time, but should be available in two or three weeks. P. Merilees took the occasion to thank the Centres for their good reception during his own tour. P. Merilees was in turn thanked by loud applause for his excellent presentations.

11. Location of Future Congresses

M. Ferland, the President of La Société de Météorologie de Québec, extended again his formal invitation to all memberships to assist to the next Annual Congress to be held in Quebec City at the end of May 1976. The theme of the Congress will be Observational Networks. The Congress will be held in association with the congress of the Learned Society. For the 1977 Congress, C.J. Brosch, the chairman of the Winnipeg Centre, proudly announced that his Centre is

happy to be the host of the 1977 Congress to be held at the University of Manitoba in Winnipeg again in conjunction with the Learned Society.

12. Report from the Nomination Committee

The report of the Nomination Committee can be read on page 84 of the Congress Issue of Atmosphere. It was proposed by S. Orvig, seconded by J. Derome that the report be accepted. Carried.

13. New President

Dr. P. Merilees, the new President of the Society, thanked the retiring Executive for their excellent work and welcomed the incoming Executive. He extended special thanks to the Editor of Atmosphere, Dr. I. Rutherford, for his excellent work.

THE MEETING WAS ADJOURNED AT 21:55



Richard Asselin
Recording Secretary, CMS.

RAPPORT DU PRÉSIDENT

La Société Météorologique du Canada en 1975

Pendant l'année écoulée, la SMC a assisté à l'écroulement de certains espoirs, à la réalisation de certaines promesses, à l'ajournement de certains projets et à l'apparition de certains défis. Notre société a fini l'année avec une force et une maturité accrues.

Il y a eu un renforcement appréciable dans l'attitude des membres de la SMC envers leur société et ses publications, comités et responsabilités. L'Exécutif se félicite notamment de l'intérêt manifesté par les membres du Conseil qui participent aux débats du Conseil et lui adressent de nombreuses lettres et appels téléphoniques. Il ne fait pas de doute que ces délibérations ainsi que celles de notre comité scientifique revêtiront une importance croissante car les Canadiens sont tenus de fixer avec sérieux les priorités nationales. La Société continue de bénéficier d'une subvention du gouvernement canadien par le biais du Service de l'Environnement Atmosphérique. Nous sommes heureux d'annoncer également que le Dr. P. D. McIntyre a décidé de faire un don supplémentaire de \$2000 pour le développement de la Société. Si la SMC a toujours quelques dettes à payer, il est manifeste que notre situation financière est saine, ce qui nous permettra de prendre de nouvelles initiatives.

Notre politique en matière de publications est demeurée inchangée cette année. Même si la grève des Postes a eu des retombées certaines sur la rédaction et la distribution, les scientifiques continuent de manifester un intérêt croissant à l'égard d'*Atmosphere*. Nous espérons rattrapper le retard de publication de notre revue d'ici le milieu de l'année en cours. Je tiens à remercier les personnes qui nous ont fourni un nombre accru de manuscrits de qualité ainsi que M. Ian Rutherford pour l'excellence de ses travaux de rédaction. Notre bulletin d'actualités qui a lourdement souffert de la grève des Postes, continue de présenter des nouvelles intéressantes qui reflètent l'originalité de son rédacteur en chef, M. W. S. Creswick. L'amélioration de ce bulletin devrait donner lieu à de nouvelles initiatives de la part de la SMC. Par contre, la brochure de la SMC qui est en cours d'élaboration depuis deux ans n'a pas encore vu le jour. Non satisfait des premières tentatives, l'Exécutif a décidé de prendre sur lui-même la responsabilité de sa direction. Nous espérons enregistrer des résultats positifs à cet égard. Nous restons persuadés qu'il s'agit là d'un effort valable.

Le Comité scientifique se fusionnera entièrement avec la SMC en vertu d'un règlement qui sera soumis lors de l'assemblée annuelle. Ce comité et son sous-comité chargé du Programme de recherche sur l'atmosphère globale (GARP, pour Global Atmospheric Research Programme) continuent de fournir des directives à la communauté scientifique et de faire autorité en la matière auprès des gouvernements. Cette dernière activité prendra davantage d'importance à mesure que nous continuerons de prendre conscience que les ressources sont limitées et qu'il convient de fixer et de respecter des priorités scientifiques. C'est grâce à son comité scientifique que notre groupe a, et continuera d'avoir, un impact important sur les décisions gouvernementales relatives aux sciences atmosphériques. Cela, ajouté à la stagnation du projet HOST, a conduit l'Exécutif à décider, sur la recommandation du comité scientifique, de résilier son adhésion au SCITEC.

L'un des faits saillants de l'année 1975 a été la création d'une division d'océanographie au sein de la SMC. Cette division a organisé les séances océanographiques du Congrès 1975 de Vancouver qui ont remporté un très grand succès et prépare celle du Congrès 1976. Un certain nombre d'articles consacrés à l'océanographie seront publiés sous peu dans *Atmosphere*, et environ 50 océanographes sont devenus membres de notre société. La division s'est également occupée de rechercher les meilleurs moyens de se développer afin de servir les intérêts des océanographes du Canada. Les ententes provisoires conclues avec les océanographes se sont révélées fructueuses jusqu'à présent, mais la SMC doit décider

très prochainement d'élargir ou non ses objectifs fondamentaux afin d'y inclure les sciences océaniques.

C'est en 1976 que pour la première fois le comité exécutif national aura son siège en dehors de la région de Montréal-Toronto. Cela représente un important pas en avant qui a pu être franchi grâce à l'assainissement de notre situation financière. Le déménagement de l'exécutif dans la région de Vancouver entraînera certes des frais supplémentaires, qu'il est indispensable d'assumer si l'on veut donner un caractère véritablement national à notre Société.

La SMC a enregistré des progrès notables dans certains domaines et éprouvé certaines déconvenues dans d'autres. Dans l'ensemble, cette année a été positive. Les membres de la société devront prendre des décisions fondamentales et fournir des efforts considérables dans un avenir immédiat. Je suis sûr que nos membres sont à même de relever ces défis.

Le Président de la
Société météorologique du Canada

Philip E. Merilees

PRESIDENT'S REPORT

The Canadian Meteorological Society in 1975

During the past year, the cms has seen some hopes dashed, some promises fulfilled, some projects delayed and some new challenges appear. It has been a year of growth in strength and maturity.

Significant growth has taken place in the attitudes of the cms members towards their Society, its publications, its committees and its responsibilities. The Executive is particularly pleased with the interest shown by the members of Council through their participation in the discussions of Council as well as the many communications by letter and telephone. Undoubtedly, these deliberations as well as those of our scientific committee will assume even greater importance as Canadians are faced with the problem of seriously determining national priorities. The Society has continued to benefit from a grant received from the Canadian government through the Atmospheric Environment Service. We are also pleased to report that Dr. P. D. McIntyre has seen fit to donate an additional \$2000 for the development of the Society. While the cms still has some deferred obligations, it is clear that we are in a healthy financial state; and that condition will enable us to take some new initiatives.

Our publication policy has not changed during this year. While the postal difficulties had a significant effect on operations, *Atmosphere* continues to grow in acceptance by the scientific community. We expect that by the middle of 1976, the journal will be up-to-date. I would like to thank both those who contributed to the increasing number of high quality manuscripts and Ian Rutherford for a high standard of editorial work. The *Newsletter* suffered more significantly from postal difficulties but continues to provide interesting news presented from the unique slant of its editor W. S. Creswick. The development of the *Newsletter* may well be one of the areas of new initiatives for the cms. On the other hand the cms booklet which has been planned for a couple of years is still not off the ground. The Executive was not satisfied with the first attempts and has decided to take direct responsibility itself. It is hoped that significant progress will result from this action. We are still convinced that this is a worthwhile endeavour.

The Scientific Committee will be completely incorporated into the cms through a by-law to be presented at the annual meeting. This committee and its subcommittee on the Global Atmospheric Research Programme (GARP) has continued to provide leader-

ship to the scientific community as well as to represent scientific opinion to governments. This latter activity will be more and more important as we continue to discover that resources are limited and scientific priorities must be decided and adhered to. Our community has and will continue to have significant impact on government decisions on atmospheric science through its scientific Committee. For this reason and the lack of progress on project HOST the executive has decided to follow a recommendation of the Scientific Committee to discontinue our membership in SCITEC.

A significant development in 1975 was the formation of an oceanography division within the CMS. This division organized the very successful oceanographic sessions for the 1975 Congress held in Vancouver and is doing the same for the 1976 Congress. A number of articles on oceanography will appear shortly in *Atmosphere*, and about 50 oceanographers have joined the society. The division has also continued to discuss how best to develop in order to serve the oceanographic community in Canada. So far the temporary arrangements with the oceanographers have worked well, but in the very near future the CMS must decide whether or not it wishes to broaden its basic purposes to include ocean sciences.

In 1976, the location of the national executive will be for the first time outside the Montreal-Toronto area. This is a significant step forward and a deliberate policy decision made possible by our improved financial position. The location of the executive in the Vancouver area does involve additional costs, but such costs are worthwhile and necessary for the Society to be truly a national body.

The CMS has made significant progress in a number of areas and had some disappointments in others. Over all, it has been a year of consolidation. The immediate future will involve some fundamental decisions and require considerable effort from the members. I am very confident that the membership has the talent and the will to meet these challenges.

Philip E. Merilees, President
Canadian Meteorological Society

RAPPORT DU TRESORIER

Pour l'année 1975 seulement, la société a fait des transactions de \$50,000.00. On peut s'attendre à dépasser ce montant en 1976. C'est la raison pour laquelle je me suis attardé à instaurer un système de comptabilité selon des principes généraux reconnus en sciences administratives.

Quelques trésoriers ont mentionné par les années passées qu'il est pratiquement impossible d'établir des états financiers qui correspondent concrètement à l'année fiscale qui s'étend du 1er janvier au 31 décembre. Il est à souhaiter, comme le cite le président dans son rapport, que d'ici quelques années, c'est-à-dire lorsque tous les numéros de la revue *Atmosphère* seront publiés avant le 31 décembre, les états financiers de chaque année fiscale représenteront réellement les revenus et les dépenses.

Un premier avantage de ce système, c'est de posséder un registre de toutes les transactions quotidiennes. De plus, on peut connaître le solde de chaque compte à n'importe quel moment de l'année. J'ai établi quarante comptes en 1975. Certains pourront être ajoutés ou retranchés dans les années futures. Pour l'étude des états financiers, j'ai groupé différents comptes sous une même appellation. Ainsi, par exemple, on retrouve neuf comptes de dépenses groupés sous un seul nom: opérations.

Ce système est excellent pour le contrôle. Par sa simplicité et son processus méthodique, il nous fournit quelques états financiers qui s'intègrent les uns aux autres. C'est un moyen de surveiller la budgétisation de chaque compte.

Enfin, il est efficace pour fins de comparaison d'une année à l'autre, car on se réfère toujours aux mêmes éléments comptables.

Etats financiers pour l'année 1975

Sous le titre: ETAT DU REVENU, on trouve un revenu net de \$743.03. Quelques numéros de la revue *Atmosphère* de l'année 1975 (sous le nom: publications) ne sont pas comptabilisés, car ils seront publiés en 1976. Les volumes 12 (numéros: 2, 3, 4), 13 (numéros: 1, 2) et le volume se rapportant au neuvième congrès ont été comptabilisés en 1975. Si les Presses de l'Université de Toronto nous avaient facturé un numéro supplémentaire, on aurait facilement accumulé une perte nette. Enfin, le BILAN situe la Société en ce qui a trait à son actif et son passif.

En APPENDICE I, on trouve le solde de chaque compte pour l'année se terminant le 31 décembre 1975.

Budget de l'état du revenu 1976, 1977

En 1976, on prévoit une perte nette d'environ \$3,850.00. Les présents dépôts à court terme épongeront cette perte. Les coûts d'opérations seront plus élevés en 1976, car les dépenses de voyage augmenteront substantiellement étant donné que le prochain conseil exécutif sera localisé à Vancouver. En 1975, aucune dépense n'a été occasionnée au chapitre des services d'information; toutefois, en 1976, le comité exécutif tient à publier un document sur la météorologie.

Pour l'année 1977, la subvention du Service de l'Environnement Atmosphérique atteindra \$16,000.00 et les coûts d'opérations diminueront de \$2,000.00 car les frais de déplacements seront moindres du fait que l'exécutif demeurera dans l'ouest du Canada. Les frais de publications des Presses de l'Université de Toronto et des autres frais qui en découlent directement seront relativement plus élevés en 1977 si l'on arrive à publier tous les volumes de la revue *Atmosphère* au cours de l'année fiscale. Ainsi, un revenu net de \$400.00 est prévu en 1977.

Jean-Guy Cantin
Trésorier

TREASURER'S REPORT

For the year 1975 alone the Society had transactions of \$50,000.00. We may expect to exceed this amount in 1976. For this reason I have spent some time in setting up an accounting system based on principles generally recognized in the science of administration.

Several treasurers have mentioned in the past that it is practically impossible to establish financial statements corresponding accurately to our fiscal year, which is from the 1st of January to the 31st of December. It is to be hoped that in future years, when all the issues of *Atmosphère* will be published before the end of December, as stated by the President in his report, the financial statements will truly reflect the income and expenditure for each year in question.

One advantage of the new accounting system is to make available a daily record of all transactions. Moreover, the balance of each account at any given moment is ascertainable. Forty separate accounts have been established for 1975. Some of these may be

dropped and/or others added in future years. In studying the financial statements, note that I have grouped several different accounts under a single heading. For example, nine different expenditure accounts have been reported under the heading: operations.

This system, by its simplicity and its methodical procedure, provides an excellent means of surveying and controlling each account and it easily furnishes an integrated set of financial statements.

Finally, it is effective in comparing one year to another since we refer always to the same accounting elements.

Financial statements for 1975

Under the title: INCOME STATEMENT, we find a net gain of \$743.03. Two of the 1975 issues of *Atmosphere* are not accounted for, because they will be billed in 1976.

Volume 12, Numbers 2, 3 and 4, Volume 13, Numbers 1 and 2 and the Ninth Annual Congress Issue were accountable in 1975. If the University of Toronto Press had billed us for one more issue, we would easily have accumulated a net loss.

The STATEMENT OF FINANCIAL POSITION clearly shows the assets and liabilities of the Society.

In APPENDIX I will be found the year-end balance of each account.

Budget for 1976-1977

In 1976 we foresee a net deficit of about \$3,850.00. This loss will be absorbed by the existing short term deposits. The costs of operation will be higher in 1976 because of increased travel expenses associated with the move of the executive to Vancouver. In 1975, no expenditure was made for information services; nevertheless, the executive committee is determined to publish in 1976 the CMS booklet on meteorology.

For 1977, the subvention from the Atmospheric Environment Service will reach \$16,000.00. The costs of operations will be \$2,000.00 lower because travel costs should be less with the executive remaining in the West. However, if the publication schedule for *Atmosphere* is fully caught up, publication costs will be relatively greater in 1977. Therefore a net surplus of \$400.00 is forecast.

Jean-Guy Cantin
Treasurer

**SOCIETE METEOROLOGIQUE DU CANADA/
CANADIAN METEOROLOGICAL SOCIETY
ETAT DU REVENU/INCOME STATEMENT
POUR L'EXERCICE FINANCIER TERMINE LE 21 DECEMBRE 1975/
FOR THE FISCAL YEAR ENDED DECEMBER 31, 1975**

REVENU/INCOME

Subvention SEA/AES Grant	\$10000.00	
Cotisations et souscriptions/ Dues and subscriptions ¹	16318.14	
Autre/Other ²	1321.77	
Revenu reproduction d'articles/ Sale of reprints	906.68	
Revenu Congrès/Congress revenue	<u>342.26</u>	
		\$28888.85

DEPENSES/EXPENDITURES

Opérations/operations ³	3250.64	
U of T Press (Commissions)	2851.63	
Publications ⁴ 5 issues & congress	14833.95	
Comité scientifique/Scientific Committee	2241.46	
Dépenses du Congrès/Congress expenses	1641.25	
U of T Press (Reproduction/reprints)	491.39	
Dépenses centres/Centers expenses	<u>2835.50</u>	
		<u>\$28145.82</u>

REVENU NET/NET GAIN

\$743.03

¹Comptes/Accounts no. 106, 120

²Comptes/Accounts no. 20, 21, 22, 61

³Comptes/Accounts no. 23, 24, 25, 26, 27, 28, 29, 30, 45

⁴Comptes/Accounts no. 99, 100, 101, 103, 105

RAPPORT DU VERIFICATEUR

J'ai examiné les livres de la Société Météorologique du Canada et je suis satisfait que le Rapport du Trésorier présente équitablement la situation financière de la Société au 31 décembre 1975.

R. D. Easto
Vérificateur

**SOCIETE METEOROLOGIQUE DU CANADA/
CANADIAN METEOROLOGICAL SOCIETY
BILAN/STATEMENT OF FINANCIAL POSITION
31 DECEMBRE 1975/DECEMBER 31, 1975**

ACTIF/ASSETS

DISPONIBILITES/CURRENT ASSETS

Caisse/Cash (Banque Royale Bank)	\$ 539.54	
Banque Royale Bank-Depôt à court terme/ Short term deposit	14000.00	
Fonds de développement/Development fund	2000.00	
Intérêts du fonds de développement/ Development fund interest	88.41	
Fonds Hornstein fund	1000.00	
Intérêt du fonds Hornstein/Horstein fund interest	111.56	
Obligations d'épargnes du Canada I/ Canada Savings Bonds I	950.00	
Obligations d'épargnes du Canada II/ Canada Savings Bonds II (Coupons)	515.38	
Parts de Bell Canada Shares ¹	513.00	
Comptes à recevoir/Accounts receivable	81.95	
TOTAL ACTIF/ASSETS		<u><u>\$19799.84</u></u>

PASSIF ET AVOIR DE LA SOCIETE/LIABILITIES AND SOCIETY'S EQUITY

EXIGIBILITES/CURRENT LIABILITIES

Comptes à Payer/Accounts payable ²	\$ 2224.76
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AVOIR DE LA SOCIETE/SOCIETY'S EQUITY

Avoir de la société/Society's equity	<u>17575.08</u>
31 décembre 1975/Decembre 31, 1975	

TOTAL PASSIF ET AVOIR DE LA SOCIETE/ LIABILITIES AND SOCIETY'S EQUITY	<u><u>\$19799.84</u></u>
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¹Valeur des parts au 31 décembre 1975/Values of shares as of December 31, 1975

²U of T Press

AUDITOR'S REPORT

I have examined the records of the Canadian Meteorological Society and am satisfied that the Treasurer's Report presents a proper statement of the financial position as at December 31, 1975.

R. D. Easto
Auditor

APPENDICE I/APPENDIX I

SOCIETE METEOROLOGIQUE DU CANADA/ CANADIAN METEOROLOGICAL SOCIETY SOLDE DE CHAQUE COMPTE/BALANCE OF EACH ACCOUNT POUR L'ANNEE TERMINEE LE 31 DECEMBRE 1975/ FOR THE YEAR ENDED DECEMBER 31, 1975

F ¹	COMPTES/ACCOUNT	
1	Caisse/Cash (Banque Royale Bank)	\$ 539.54
20	Revenue annonces/Advertising revenue	229.52
21	Revenu intérêt/Interest earned	1010.02
22	Revenus divers/Miscellaneous revenues	41.91
23	Dépenses intérêts/Interest expenses	19.05
24	Dépenses-frais d'échanges/Exchange expenses	.12
25	Dépenses-frais de services/Service expenses	23.15
26	Dépenses de bureau/Office expenses	106.93
27	Dépenses-prix, dons/Prize, gift expenses	435.00
28	Dépenses de communications/Communication expenses	47.40
29	Dépenses de voyages/Travel expenses	2548.99
30	Dépenses de traduction/Translation expenses	20.00
31	Banque Royale Bank-Dépôt à court terme/Short term deposit	14000.00
41	Revenu reproduction d'articles/Sale of reprints	906.68
45	Dépenses-auditeur/Auditor expenses	50.00
50	Dépenses de congrès/Congress expenses	1641.25
51	Revenu Congrès/Congress Revenue	342.26
61	Dividendes encaissés/Dividends cashed	40.32
70	Fonds de développement/Development fund	2000.00
71	Intérêt du fonds de développement/Development fund interest	88.41
72	Fonds Hornstein Fund	1000.00
73	Intérêt du fonds Hornstein/Hornstein fund interest	111.56
75	Obligations d'épargne du Canada I/Canada Savings Bonds I	950.00
76	Obligations d'épargne du Canada II/Canada Savings Bonds II (Coupons)	515.38
77	Parts de Bell Canada Shares	513.00
80	Comptes à payer/Accounts payable	2224.76
81	Comptes à recevoir/Accounts receivable	81.95
85	Avoir de la société/Society's equity	16832.05
86	Subvention SEA/AES Grant	10000.00
99	U of T Press (Atmosphere)	13907.85
100	U of T Press (Nouvelles/Newsletter)	580.32
101	U of T press (Etiquette, en-tête de lettres/Labels, Letterheads)	178.30
102	U of T Press (Reproduction/Reprints)	491.39
103	U of T Press (Citation)	97.81
104	U of T Press (Commissions)	2851.63
105	U of T Press (Divers/other)	69.67
106	U of T Press (Cotisations et souscriptions/Dues and Subscriptions)	16258.14
110	Comité Scientifique/Scientific Committee	2241.46
120	Revenu membre de soutien/Revenue sustaining member	60.00
130	Dépenses-centres/Centers expenses	2835.50

¹Numéro de compte/Account number

**SOCIETE METEOROLOGIQUE DU CANADA/
CANADA METEOROLOGICAL SOCIETY
BUDGET DE L'ETAT DU REVENU/
INCOME STATEMENT BUDGET**

REVENU/INCOME	1976	1977
Cotisations et souscriptions/ Dues and Subscriptions ¹	\$17,000	\$18,000
Subvention SEA/AES Grant	10,000	16,000
Revenu congrès/Congress Revenue	2,600	2,800
Revenu Reproduction d'articles/ Sale of Reprints	1,550	1,700
Autre/Other ²	1,200	1,300
	<u>\$32,350</u>	<u>\$39,800</u>
DEPENSES/EXPENDITURES		
Publications ⁴	\$16,500	\$19,300
U of T Press (Commissions)	3,200	3,500
Dépenses Centres/Centers Expenses	3,100	3,200
Opérations/operations ³	5,500	3,500
U of T Press (Reproduction/Reprints)	1,500	1,600
Comité Scientifique/Scientific Committee	2,500	3,000
Dépenses du Congrès/Congress expenses	2,600	2,800
Services d'information/Information Services	1,300	2,500
	<u>\$36,200</u>	<u>\$39,400</u>
REVENU NET/NET GAIN	<u><u>(\$3,850)</u></u>	<u><u>\$400</u></u>

¹Comptes/Accounts no. 106, 120

²Comptes/Accounts no. 20, 21, 22, 61

³Comptes/Accounts no. 23, 24, 25, 26, 27, 28, 29, 30, 45

⁴Comptes/Accounts no. 99, 100, 101, 103, 105

**REPORT OF NOMINATING COMMITTEE
RAPPORT DU COMITE DE MISE EN CANDIDATURE**

The following names are submitted in nomination for Council and Auditor for the year 1976-77. All nominees have been contacted and have agreed to accept the office if elected.

Le comité de mise en candidature soumet la liste suivante des candidats aux postes de conseillers et de vérificateur pour l'année 1976-77. Tous ont consenti à occuper le poste si élus.

President/Président	J.E. Hay
Vice-President/Vice-Président	K.F. Harry
Corresponding Secretary/Secrétaire-correspondant	B. Sagar
Treasurer/Trésorier	D.G. Schaefer
Recording Secretary/Secrétaire d'assemblée	L. Parent
Councillors-at-large/Conseillers	D.B. Fraser M. Ferland A.D.J. O'Neil
Auditor/Vérificateur	R.D. Easto

J.L. Knox
Chairman/Président

RAPPORT DU COMITE DE LA REDACTION

1975 a été une année plus ou moins bonne pour *Atmosphère*. Les statistiques et la qualité des manuscrits reçus prouvent que le journal jouit d'un accueil de plus en plus favorable de la part de la communauté de la recherche, et que celle-ci l'a accepté comme véhicule pour la présentation de ses résultats. En dépit de tout cela, aucun progrès n'a été réalisé en avançant les dates de publication, surtout par suite d'une grève des postes de six semaines.

Le nombre de manuscrits reçus en 1975 était d'environ 40% supérieur à celui de 1974. Environ 46% de ceux-ci ont été considérés propres à la publication (21% ayant été un peu ou pas du tout révisés, 25% ayant exigé une révision plus importante), 21% ont été retournés afin d'être révisés et nous ne les avons pas encore reçus, enfin 31% ont été refusés. Ces proportions sont presque égales à celles de l'an dernier. En 1975 on a réussi à imprimer un total de 22 articles, autant qu'en 1974, mais le nombre de pages était supérieur de 33%. La plupart de ceux-ci consistaient en articles ou notes de recherche mais on trouvait aussi 3 articles sommaires ainsi que 6 critiques de livres.

Les efforts déployés afin de faire connaître *Atmosphère* à l'extérieur du Canada semblent avoir porté fruits étant donné que presque un tiers des articles soumis provenaient de sources étrangères. Quelques institutions, à qui on avait envoyé des souscriptions de faveur, nous ont répondu, quelques-unes sous forme d'abonnements, d'autres nous ont envoyé des livres ou des journaux en échange. Les souscriptions de faveur continueront à être envoyées pendant au moins une autre année.

Le groupe océanographique nous a vraiment donné des preuves de son appui en nous faisant parvenir 4 articles dont 3 propres à la publication. Ces contributions représentent environ 10% du total reçu, la proportion est à peu près égale à celle des membres. Cependant, le potentiel est de beaucoup supérieur, vu que la plupart de nos membres océanographiques oeuvrent surtout dans la recherche.

L'année prochaine on a l'intention de publier un numéro spécial de *Atmosphère* consacré à des articles découlant des recherches stratosphériques en ballon du SEA et des universités. Avec ceci, plus l'afflux croissant d'articles réguliers en météorologie et en océanographie, les perspectives s'avèrent bonnes quant à rattraper le retard sur les dates de publication durant 1976, et en vue d'un nouvel épanouissement en 1977. J'aimerais encore une fois inviter tous les auteurs d'articles au Congrès de cette année, à soumettre des versions écrites pour une publication éventuelle dans *Atmosphère*.

Ian D. Rutherford
Rédacteur, *Atmosphère*.

EDITORIAL COMMITTEE REPORT

1975 was a rather mixed year for *Atmosphere*. The statistics of manuscripts received and their quality indicate a growing acceptance by the research community of the journal as a suitable vehicle for the presentation of their results. In spite of this, it was not possible to make any headway in advancing the dates of publication, mainly because of the effects of a six-week mail strike.

The number of manuscripts received in 1975 was up about 40% over 1974. Of these, approximately 46% were accepted for publication (21% with little or no revision, 25% after more extensive revision) 21% were returned for revision and are still out, while 31% were rejected. These proportions are about the same as last year's.

A total of 22 articles were actually printed in 1975 the same as in 1974 but the number of pages was greater by 33%. Most of these were research articles or notes but there were 3 review articles and 6 book reviews published as well.

The efforts to publicize *Atmosphere* outside Canada seem to have had some effect, as about one-third of articles submitted came from foreign sources. Some of the institutions to which complimentary subscriptions were sent have replied, some with subscription orders, others with books or journals sent in exchange. These complimentary subscriptions will be continued for at least another year.

There is good evidence of support from the oceanographic community with 4 papers having been received and 3 accepted for publication. These contributions represent about 10% of the total received, about the same proportion as the membership. However, the potential is much greater than this, since most of our oceanographic members are research-active.

From the coming year, a special issue of *Atmosphere*, devoted to articles arising from the Canadian stratospheric balloon investigations, is planned. With this, plus the increased flow of regular material in both meteorology and oceanography, the prospects are good for catching up to the publication schedule during 1976 and for further expansion in 1977. I would like once more to invite all contributors to this year's Congress to submit written versions of their papers for consideration for publication in *Atmosphere*.

Ian D. Rutherford
Editor, *Atmosphere*

RAPPORT DU COMITE DES RECOMPENSES

Le comité des récompenses (composé de B. W. Boville, J. Gregory, R. M. Gagnon, R. W. Burling, G. Shimizu et R. Daley) fait les recommandations suivantes pour l'année 1975:

Prix du président: Prof. Philip E. Merilees

Pour ses contributions importantes et fondamentales dans le domaine de la dynamique de la circulation générale comprenant la représentation spectrale et la prévisibilité; pour sa tournée de conférences SEA/SMC 1974-75; et pour ses articles "The effect of grid resolution on the instability of a simple baroclinic model", *Mon. Wea. Rev.*, **103**, 101-104 et "Numerical experiments with the pseudo-spectral method in spherical coordinates", *Atmos.*, **12**, 77-96.

Prix de météorologie appliquée: Gordon A. McKay (par le centre de Toronto)

Pour son rôle important et sa direction dans le développement des techniques d'applications météorologiques, particulièrement en rapport avec les conditions canadiennes et pour sa participation aux programmes nationaux et internationaux reliant la météorologie aux problèmes de l'économie et des ressources naturelles.

Prix aux étudiants gradués: Dr. Helen Warn (par le centre de Montréal)

Pour son investigation approfondie et son travail de thèse "A spherical model of baroclinic instability" - une étude originale d'un fluide barocline sur une sphère faite à l'aide des équations primitives.

Prix de météorologie opérationnelle Rube Hornstein: Waldimar L. Gutzman (par le centre d'Halifax)

Pour un travail exceptionnel dans l'exploitation des services météorologiques au Centre Météorologique Canadien par l'établissement et le maintien de standards très élevés d'analyse et de prévision.

B. W. Boville
Président

CMS AWARDS COMMITTEE REPORT

The Awards Committee (composed of B. W. Boville, J. Gregory, R. M. Gagnon, R. W. Burling, G. Shimizu and R. Daley) offers the following recommendations for 1975:

President's Prize: Prof. Philip E. Merilees

For his important and fundamental contributions to the field of General Circulation Dynamics including Spectral Representation and Predictability; for the 1974-75 AES/CMS speaker's tour; and for his papers, "The Effect of Grid Resolution on the Instability of a Simple Baroclinic Model", *Mon. Wea. Rev.* **103**, 101-104 and "Numerical Experiments with the Pseudo-spectral Method in Spherical Coordinates", *Atmos.* **12**, 77-96.

Prize in Applied Meteorology: Gordon A. McKay (by Toronto Centre)

For his significant role and leadership in developing meteorological applications techniques with particular reference to Canadian conditions and his participation on national and international programs relating meteorology to economic and resource problems.

Graduate Student Prize: Dr. Helen Warn (by Montreal Centre)

For her thorough investigation and thesis work on "A Spherical Model of Baroclinic Stability", an original study of a two-layer baroclinic fluid on a sphere with the primitive equations.

The Rube Hornstein Prize in Operational Meteorology: Waldimar L. Gutzman (by Halifax Centre)

For outstanding operational meteorological service in setting and maintaining very high standards in analysis and prediction at the Canadian Meteorological Centre.

B. W. Boville
Chairman

RAPPORT DU COMITE DES CITATIONS

Le Comité (composé de M. Kwizak, J. Renick, G.-O. Villeneuve, K. Clark et R. Hornstein) recommande la citation suivante:

A M. Tony Le Sauter, Directeur, programme des lacs, service de protection de l'environnement du Québec, en reconnaissance de l'excellence de son rôle comme éducateur populaire, animateur social et conseiller averti dans la lutte pour la conservation du milieu au Québec. Par ses discours, conférences, interviews et écrits il a élaboré tout un programme d'éducation publique et a été à l'origine de la formation de nombreux comités de citoyens voués à la lutte contre la pollution. Sa devise, "un fleuve, un parc", réclamant la création d'un grand centre récréatif le long du St-Laurent démontre bien son approche positive au problème du contrôle de la pollution par l'exploitation intelligente de notre environnement.

M. Kwizak
président

CITATIONS COMMITTEE REPORT

The Committee (composed of M. Kwizak, J. Renick, G. O. Villeneuve, K. Clark and R. Hornstein) recommends that the following citation be made:

To Mr. Tony Le Sauter, Directeur, programme des lacs, service de protection de l'environnement du Québec, for his tireless efforts as writer, educator, organizer and consultant to increase public awareness of environmental issues and to bring this awareness into focus through constructive action. His "One River, One Park" concept, calling for the creation of a large recreational complex along the St. Lawrence, typifies the breadth of vision which he brings to the problems of pollution-control and the wise management of our natural environment.

M. Kwizak
Chairman

RAPPORT DU COMITE PERMANENT DE L'INFORMATION PUBLIQUE

Les membres du comité pour l'année 1975-76 furent:

J. Vanier	Président
H. B. Kruger	Agent de liaison (Direction Centrale SEA)
Dr. A. J. Chisholm	Centre de Toronto
D. A. Faulkner	Centre de Vancouver
M. G. Ferland	Centre de Québec
H. M. Fraser	Centre de Winnipeg
A. D. Gates	Centre d'Halifax
J. R. Hendricks	Centre de Régina
A. Ouellet	Centre de Montréal
D. J. Webster	Centre d'Ottawa
H. P. Wilson	Centre de l'Alberta

On a beaucoup parlé, par les temps passés, de la publication par la SCM d'un livret destiné à la promotion de la société. Au début de l'année, ce projet semblait aller bon train, mais très tôt après que les premiers jalons furent franchis, Monsieur J. J. Moakler, le rédacteur responsable de ce livret, devait entreprendre une tâche prioritaire, soit celle de la mise en application du rapport Kennedy concernant la carrière des techniciens météorologiques. Depuis ce temps, le projet a lamentablement stagné. Le conseil exécutif jugea que l'échéancier était tellement en arrière qu'on se devait de dégager moralement Monsieur Moakler de la finalisation de ce livret et prendre lui-même la responsabilité. Telle décision fût entérinée.

Il est assez décevant de constater qu'aucun des centres de la SCM n'ont eu à rapporter quoi que ce soit au cours de l'année qui vient de passer. On est à se demander si la science de la météorologie peut soulever quelque sujet d'intérêt qui soit. Au mieux, on peut conclure que tout va si bien dans la discipline météorologique, qu'on n'en souffle pas un mot. Ce qui est sérieusement mis en doute.

J. Vanier
Président

REPORT OF THE STANDING COMMITTEE ON PUBLIC INFORMATION

Committee members for the year 1975-76 are as follows:

J. Vanier	President
H. B. Kruger	Liaison Officer (AES Headquarters)
Dr. A. J. Chisholm	Toronto Centre
D. A. Faulkner	Vancouver Centre
M. G. Ferland	Quebec Centre
H. M. Fraser	Winnipeg Centre
A. D. Gates	Halifax Centre
J. R. Hendricks	Regina Centre
A. Ouellet	Montreal Centre
D. J. Webster	Ottawa Centre
H. P. Wilson	Alberta Centre

We have spoken often in the past on the publication by the CMS of a booklet concerning the promotion of the society. At the beginning of the year, the project seemed to be going fairly well, but soon after accomplishing the first few steps, Mr. J. J. Moakler, the writer responsible for the booklet, had to undertake a task of higher importance, namely the putting into effect of the Kennedy report concerning the careers of meteorological technicians, and therefore was unable to give his energies to the publication of the booklet. The target date being so much behind, the executive has decided to take upon itself the direct responsibility for completion of the booklet.

It is very disappointing to see that no CMS centres have reported anything of importance in the course of the year. One can ask oneself if the science of Meteorology could really bring up a subject of interest. At best, it could be concluded that all goes well in the field of meteorology and that there is nothing to mention. But, can we really believe this?

J. Vanier
Chairman

RAPPORT SUR LES ACTIVITÉS DU COMITÉ SCIENTIFIQUE (CS) DE LA SMC 1975-76

La transformation de SCMSA/CAGG en Comité Scientifique de la SMC s'est finalement réalisée et les nouvelles lignes de conduite de la SMC, en ce qui a trait au CS et au Comité Scientifique concernant GARP (CS-GARP) ont été proposées et acceptées par le Conseil. Les rôles du Comité Associé pour la Géodésie et la Géophysique (CAGG) du CNR ont été transférés au Comité National Canadien (CNC) pour les affaires relatives au UIGG. Dans CNC, le SC est représenté par son président et un autre membre.

Le CS s'est occupé de préparer les démarches entreprises par la SMC afin de créer une division océanographique. On a également invité les océanographes à publier dans *Atmosphere*.

Du côté scientifique le CS a continué de suivre attentivement les activités portant sur la modification des conditions météorologiques. Cependant, son principal intérêt était surtout dirigé vers les programmes de recherche internationale. Le CS discutait et approuvait les recommandations provenant de son CS-GARP, à savoir, le traitement des vents mesurés par radar ETGA, l'analyse des données aérologiques, le traitement

général des données canadiennes d'ETGA, etc. . . On souhaitait ardemment avoir une Participation Canadienne dans le PEMG; le Sous Programme Polaire ainsi que la Recherche du Climat ont été particulièrement recommandés. "Vivant avec le changement climatique" constitue une série continue de symposiums commandités par le Canada, les E.U. et le Mexique et le CS suivait attentivement son évolution.

C'est avec une grande inquiétude que le CS assiste au tarissement des fonds destinés à la recherche dans les sciences atmosphériques; il faut envisager les voies et les moyens nécessaires pour remonter cette pente, ceci en expliquant au public et aux gouvernements comment on pourrait en tirer profit à long et à moyen terme. Le fait que le prix OIM ait été attribué par l'OMM au Dr. W. L. Godson, Directeur Général de la Recherche, SEA, prouve que les canadiens peuvent contribuer internationalement à l'évolution des sciences atmosphériques, si on leur en donne l'opportunité.

La question de la main d'oeuvre a toujours été une affaire de la SCMAS et maintenant du CS. Au Congrès de la SMC, en mai 1976, un symposium particulier traitera de cette question d'une nouvelle façon.

La réunion du CS a eu lieu le 5 novembre 1975 à Toronto, un jour après la tenue de l'assemblée du CS-GARP. D'autres assemblées successives seront tenues le 25 mai 1976 dans la ville de Québec.

Finalement, j'aimerais exprimer ma reconnaissance à tous les Présidents de la SMC, pour lesquels j'ai travaillé pendant les trois dernières années, et aussi à tous les membres du CS et du CS-GARP qui ont rendu mon travail intéressant et stimulant. Le transfert de SCMAS à la SMC est maintenant achevé et un élan nouveau vient d'être produit par cette association très appropriée et on ne peut plus opportune.

R. List
Président, cs

REPORT OF THE ACTIVITIES OF THE SCIENTIFIC COMMITTEE (SC) OF THE CMS, 1975-76

The transformation of SÔMAS/ACGG into the Scientific Committee of the CMS has been made complete and new CMS guidelines for the SC and the GARP Scientific Committee have been proposed to and accepted by Council. The roles of the Associate Committee for Geodesy and Geophysics of NRC have been transferred to the Canadian National Committee for IUGG matters. The SC is represented on CNC by its chairman and one other member.

The SC was active in the preparation of a CMS move to establish an oceanographic division. The oceanographers were also encouraged to publish in "*Atmosphere*".

On the scientific side the SC kept continuous track of the weather modification activities in Canada. Its main area of concern, however, was connected with international research programs. It discussed and supported recommendations by its GARP Scientific Committee re GATE radar wind processing, upper air data analysis, general processing of Canadian GATE data, etc. The feeling was very strong for a Canadian Participation in FGGE; the Polar Sub-program and Climate Research were particularly recommended. "Living with Climatic Change" is an ongoing symposia series sponsored by Canada, U.S.A. and Mexico and the SC was kept well informed about its progress.

The SC is following the deterioration of the research funding in the atmospheric sciences with great concern; ways and means need to be developed to counteract this trend by education of the public and the governments about benefits which could be achieved in the long or short haul. The award of the IMO Prize by WMO to Dr. W. L. Godson, Director-General of Research, AES, demonstrates that Canadians can contribute internationally to the advancement of the atmospheric sciences, if they are given the opportunity.

The manpower situation has always been a concern of SOMAS and now of the SC. A special symposium at the CMS Congress in May, 1976, will deal with this subject in a novel way.

The SC met on November 5, 1975, in Toronto the day after the meeting of its GARP Scientific Committee. Back to back meetings will follow again on May 25, 1976, in Quebec City.

Finally I wish to express my gratitude to all the CMS presidents whom I served in the past three years and all the SC and GARP-SC members who made my task rewarding and stimulating. The transfer of SOMAS to the CMS is now completed and new impetus is provided by this very appropriate and timely association.

R. List
Chairman, SC

AVIS DES PROPOSITIONS DU CONSEIL D'ADMINISTRATION NOTICE OF MOTION FROM COUNCIL

It is moved:/Il est proposé:

1. That the constitution be amended by adding:/Que la constitution soit amendé en ajoutant:

Article 6 - Non-profit status

The Society does not have as its purpose financial gain for its members and any profits or other accretions to the organization shall be used in promoting the advancement of meteorology. In the event of the dissolution or winding-up of the Society all its remaining assets, after payment of liabilities, shall be distributed to one or more recognized non-profit organizations in Canada.

Article 6 - Societe sans but lucratif

Cette Société a pour but de stimuler l'intérêt pour la météorologie. La Société ne doit pas viser des gains financiers pour ses membres, et tout bénéfice ou autre somme revenant à la Société sera utilisé à promouvoir la stimulation de l'intérêt pour la météorologie. Advenant la dissolution ou la liquidation de la Société, tous les biens restants, après paiement des dettes, seront distribués à une ou plusieurs organismes sans but lucratif reconnues au Canada.

2. That *by-law 6* be amended by adding:/Que le règlement 6 soit amendé en ajoutant:

h) A Scientific Committee shall be established to study and act on scientific matters of concern to the society when directed by the Executive or on the initiative of the Committee itself. The Committee shall have a total of not more than 11 regular members, including the Chairman and Secretary. The Chairman and Secretary shall be elected from and by the members of the committee. The Chairman and Secretary shall not hold office for more than 3 consecutive years and, except for the Chairman and Secretary, no one shall be a member of the committee for more than 3 consecutive years. Members are appointed by Council with advice from the Scientific Committee. The President and the Chairman of the GARP Scientific Committee shall be ex-officio members of the Committee. The Committee shall meet at least once a year and will prepare an annual report on its activities for Council.

h) Un Comité Scientifique doit être formé afin d'étudier et de donner suite aux problèmes scientifiques de la Société soumis par l'Exécutif, ou à l'initiative du comité lui-même. Le Comité comprendra au maximum 11 membres, y compris le Président et le Secrétaire. Le Président et le Secrétaire doivent être élus parmi les membres du

Comité, et par le Comité lui-même. Le Président et le Secrétaire n'occuperont pas leur fonction pendant plus de 3 années consécutives et, à l'exception du Président et du Secrétaire, personne ne sera membre du Comité pendant plus de 3 années consécutives. Les membres seront nommés par le Conseil après consultation du Comité Scientifique. Le Président de la Société et le Président du Comité Scientifique du GARP seront des membres à titre d'office du comité. Le Comité doit se réunir au moins 1 fois par année et doit soumettre au Conseil un rapport annuel de ses activités.

3. That *by-law* 5h)2) be amended to read: /Que le règlement 5h)2) soit amendé et se lise:

No sum of money payable on account of the Society and amounting to five hundred dollars (\$500.00) or more shall be paid except by an order of the Executive recorded in the minutes. Accounts for amounts less than five hundred dollars (\$500.00) may be paid by the Treasurer subject to later approval by the Executive.

Aucune somme d'argent de cinq cents dollars (\$500.00) ou plus ne peut être déboursée sans une autorisation formelle préalable du bureau d'administration, inscrite au livre des procès-verbaux. Les comptes s'élevant à moins de cinq cents dollars (\$500.00) peuvent être acquittés par le trésorier sous réserve d'une approbation ultérieure par le bureau d'administration.

DIVISION DE L'Océanographie

La Division de l'Océanographie, SMC, fut créée pour une période d'essai de deux ans, suite à une proposition faite par W. F. Hitchfeld à l'Assemblée Générale Annuelle, le 28 mai 1975. Au cours d'une assemblée d'océanographes qui assistaient au 9^e Congrès Annuel, C. R. Mann était élu au poste de président et S. D. Smith à celui de secrétaire de la nouvelle Division. P. H. Leblond est le rédacteur associé de *Atmosphere* pour l'océanographie.

Environ la moitié des sessions tenues durant le Congrès étaient océanographiques; le succès obtenu dans la qualité et le nombre de présentations était dû au fait qu'il n'y avait pas eu d'assemblée océanographique durant plusieurs années de recherche active dans le domaine, et aussi au choix fortuné de l'emplacement, le Campus UBC, qui est à l'origine d'une grande partie de la recherche et qui a donné un bon nombre de chercheurs en océanographie au Canada.

La Division de l'Océanographie est en train de s'implanter en tant qu'organisation nationale des océanographes physiciens et chimistes (incluant les limnologues), elle compte actuellement environ 50 membres et ce nombre s'accroît rapidement pour atteindre 10% du total de la SMC. Bien que le statut de membre s'adresse à tous les océanographes, les activités de la Division, se rapportant à ceux qui travaillent dans des disciplines océanographiques autres que celles citées précédemment, devront attendre des marques d'intérêt de la part de ces autres groupes. Outre les sessions océanographiques, les membres pourront exprimer leurs opinions au sujet des responsabilités, des buts et de l'avenir de la Division, au Congrès de 1976.

On procédera aussi, pendant le Congrès, à l'élection de l'exécutif pour 1976 lequel sera composé d'un président, d'un secrétaire et d'un autre membre. L'exécutif devrait comprendre au moins un physicien et un chimiste. Un responsable de la tenue du Congrès, préférablement de la région de Winnipeg, pourra être élu au Congrès et au cas où il n'y aurait pas de nomination, il sera désigné par l'exécutif. Il incombera à l'exécutif de l'année prochaine de proposer des amendements à la constitution et aux règlements locaux de la SMC, ou d'entreprendre d'autres démarches afin de créer une organisation qui continuera de pourvoir aux besoins de l'océanographie au Canada.

C. R. Mann, *Président*
S. D. Smith, *Secrétaire*

OCEANOGRAPHY DIVISION

The CMS Oceanography Division was established for a two-year trial period on a motion by W. F. Hitchfeld at the Annual General Meeting, May 28, 1975. At a meeting of the oceanographers present at the 9th Annual Congress, C. R. Mann was elected chairman and S. D. Smith was elected secretary of the new Division. P. H. LeBlond is associate editor of *Atmosphere* for oceanography.

Nearly half of the sessions at the Congress were oceanographic, and the fine response in quality and number of papers was due to the lack of a national oceanographic meeting for several years of active research in the field, and to the fortunate choice of location, the UBC campus, where much of the research and many of the researchers in oceanography in Canada originated.

The Oceanography Division is establishing itself as the national organization for physical and chemical oceanographers and limnologists, with membership now about fifty and rapidly increasing to approach ten per cent of the total in CMS. While membership is open to all oceanographers, activities relating to those working in other disciplines will await indications of their interest.

In addition to oceanographic sessions, time will be allocated at the 1976 Congress for members to express their views on the responsibilities, purpose and future of the Division.

The 1976 executive, to be elected at the Congress, will consist of a Chairman, Secretary, and Member at Large. There should be at least one physicist and one chemist in the executive. A Congress Convener, preferably from the Winnipeg area, may be elected at the Congress or, if nominations are not forthcoming, may be appointed by the executive. Next year's executive will face the task of proposing amendments to the CMS Constitution and by-laws or of taking other steps to create an organization which will continue to serve the needs of oceanography in Canada.

C. R. Mann, *Chairman*
S. D. Smith, *Secretary*

REPORTS FROM LOCAL CENTRES

B.C. CENTRE

Chairman:	Dr. J. Hay	Dept. of Geography, UBC
Vice Chairman:	D. Faulkner	Headquarters Pacific, AES
Past Chairman:	G. Schaefer	Headquarters Pacific, AES
Secretary-Treasurer:	M. Horita	Pacific Weather Centre
Program Director:	U. Sporns	BC Hydro & Power Authority

An executive meeting was held in September to plan the course of events for the 1975-76 season and to determine the use of the subvention grant. A questionnaire was prepared and circulated among the membership for suggestions. A spring executive meeting will determine whether to purchase meteorological instruments for schools or to provide prizes for BC science fairs.

Two meetings of the BC Centre were held and a third planned for late February. Subsequent meetings will be held during the spring session.

October 21 Mr. Vail Schermerhorn, US National Weather Service, "Applications of Meteorology to Operational River Forecasting".

- January 28 Dr. John Maybank, Head of Physics Division Saskatchewan Research Council, "Atmospheric Diffusion and Deposition of Agricultural Spray".
- February 26 Dr. John Hay, Dept. of Geography UBC., "Feasibility of Solar Energy as a Domestic Heat Source in Vancouver and Other Canadian Locations".

Due to the postal strike, activities of the BC Centre were curtailed during the months of November and December.

1975 Financial Statement

Feb. 13, 1976

Income

Cash on hand January 1, 1975	821.91
Grant for 1975 CMS Congress, Feb.	500.00
Bank interest, April	.54
1975 CMS Congress revenue	5066.82
BC Gov't grant for Congress	1000.00
Bank interest, Oct.	1.95
Grant from National Executive, Dec.	305.00
Grant covering CMS Congress deficit	141.25
Total	\$7837.47

Expenses

1975 CMS Congress expenses	7208.07
Bank service charge	2.40
6 Meetings; printing costs for notices, stationary, stamps and refreshments	57.68
Total	\$7268.15

Credit balance, Feb. 13, 1976 \$ 569.32

M. M. Horita
Secretary-Treasurer

ALBERTA CENTRE

Meetings held in 1975

January	15, 1975	Dr. P. Lester, University of Calgary: The Real Time Forecasting of Lee Waves.
February	4, 1975	Dr. P.E. Merilees: General Circulation Models — problems and progress.
April	4, 1975	Dr. R. Bryson: Climate Change (joint meeting with the Alberta Geographical Society and the Institute of Earth and Planetary Physics, U of Alberta).
April	30, 1975	Dr. R.D. Rowe: The Fate in the Atmosphere of SO ₂ from Sour Gas Plants (Calgary Chapter Meeting).
May	14, 1975	Dr. M. English: Hailstone Trajectories from Isotope Measurements and Model Calculations.
October	23, 1975	R. Angle, Meteorologist, Alberta Environment: Air Pollution Field Study for Edmonton, November 1974.

December 4, 1975 Vincent J. Oliver, Chief, Applications Group, NESS:
Very High Resolution Satellite Imagery from Geo
Stationary and Polar Orbiting Satellites—Applications.

Meetings held or planned in 1976

January 26, 1976 D. J. Maybank, Head, Physics Division, Saskatchewan
Research Council: Air Pollution Problems from Agri-
cultural Spraying Operations.
March 4, 1976 Dr. J. Hay, Geography Dept., UBC: An Applied
Radiation Climatology of Canada: Information of In-
terest to the Solar Energy Engineer.
April 1976 Meeting to take place in Calgary. Topic and date may
be related to the Western Snow Conference in Calgary,
April 20-22, 1976.

D.B. Fraser
Chairman

Financial Statement

Income

Bank balance from May 14, 1975	\$240.00
Interest received	3.60
Alberta Centre Allocation 1975-76	347.00
Coffee Fund	5.30
Total	\$595.90

Expenses (May 14, 1975 to December 31, 1975)

Postage (1 mailing)	\$ 6.12
Coffee (Oct. 23 and Dec. 4)	6.50
Service Charges	2.00
Total	\$ 14.62

Balance as of December 31, 1975 \$581.28

F.R. Bowkett
Secretary-Treasurer

REGINA CENTRE

Past Chairman: J. Dmytriw, DND Base Moose Jaw
Chairman: L. S. Meeres, Regina Weather Office
Sec. Treasurer: R. J. O'Brien, Regina Weather Office

The Regina Centre held three meetings up to the end of March, 1976, with another planned for April. The speakers and topics were:

December 12, 1975	Mr. C. J. Baker – "The Experimental Extended Farm Forecast Program at Regina" Mr. L. S. Meeres – "Report on cms Congress – May 1975"
February 3, 1976	Dr. John Maybank – "Air Pollution Problems from Agricultural Spraying Operations"
February 17, 1976	Dr. John Hay – "Radiation Climatology of Southern Saskatchewan"
April 1976	Mr. Randy Sentis – "Environmental Problems in Saskatchewan – a Provincial Viewpoint"

The meetings were held at the University of Regina with attendance varying from about 10 to 30 persons.

Many of the members of the Regina Centre live in Saskatoon and consequently have found it difficult to attend meetings. It has been proposed by the Saskatoon members that they form a Chapter as provided under the constitution. Judging by the interest shown by the Saskatoon members in the past, this should be an active Chapter.

WINNIPEG CENTRE

Summary of meetings:

1. October 14, 1975 – dinner meeting attended by members and wives at the Canadian Forces Base Portage la Prairie Officers' Mess.
– Presentation of the Burn Lowe Award to Ed Russenholt
– Speaker – Dr. Tom Booth – from University of Manitoba – topic – Micro-Meteorology as related to the Biology of the Arctic (illustrated with slides).
2. November 26, 1975 – Dinner meeting attended by members and wives at the Marlborough Hotel.
– Speaker – Mr. S. V. A. Gordon – Officer-in-Charge, Prairie Weather Central – slide presentation of his visit to Nigeria in June 1975.
3. February 18, 1976 – Dinner meeting attended by members at the Horizon Room, Winnipeg International Airport.
– Speaker Dr. John Hay – University of British Columbia – topic – An Applied Radiation Climatology of Canada.

Proposed activities for the remainder of the year

1. March 16, 1976 – Dinner meeting at the Horizon Room, Winnipeg International Airport. Speaker Dr. John Maybank, Head Physics Division Saskatchewan Research Council. Topic Air Pollution Problems from Agricultural Spraying Operations.
2. March 23, 1976 – Prairie Weather Centre will be manning a display at a Brandon Manitoba Shoppers Mall. In keeping with the theme of "Meteorology and Food Production" it was decided to sponsor the display in a more rural and agricultural setting removed from the urban surroundings.
3. May 7–8, 1976 – Winnipeg Branch of cms executive will be supplying two prizes and judging of exhibits held by the Manitoba Schools Science Symposium.
4. May 22–23, 1976 – Winnipeg Branch of the cms on behalf of the National Executive of the cms will be judging and awarding of a prize to the Youth Science Foundation Canada Wide Science Fair being held in Brandon, Manitoba.

Financial Statement as of January 31, 1976

Cash on hand as of January 1, 1975

\$243.19

Receipts

Dinner meeting March 7, 1975	\$ 80.00	
Dinner meeting October 14, 1975	68.00	
Dinner meeting November 26, 1975	190.00	
Received from national executive 1975	297.50	
Interest and petty cash	14.10	
	<u>\$649.60</u>	<u>649.60</u>
		<u>\$892.79</u>

Expenditures

Dinner meeting January 29, 1975	\$ 5.20	
Dinner meeting March 7, 1975	83.84	
Science Fair Award 1975	72.98	
WMO Day expenses 1975	50.90	
Projector rental	13.13	
Science award	20.00	
Dinner meeting October 14, 1975	96.56	
Dinner meeting November 26, 1975	187.91	
Burn Lowe Award 1975	17.50	
Long distance phone call, CMS - November 1975	4.46	
Stamps used	3.20	
Incidental expenses	19.32	
	<u>\$475.00</u>	<u>\$475.00</u>
		<u>\$417.79</u>

Cash on hand as of January 31, 1976

\$417.79H. T. Beal
Secretary-Treasurer

TORONTO CENTRE

The Centre had held five formal meetings so far this winter, with another two tentatively planned for the period late March to the beginning of May. Most talks were given in the evening and the attendances were somewhat disappointing. Nevertheless all visitors stimulated a lot of interest among their audience and lively discussions followed each meeting.

The various speakers and topics are listed below:-

September 17, 1975	Dr. C. H. B. Priestley, Environmental Research Laboratories, Aspendale, Australia, "Atmospheric Science in Australia."
November 24, 1975	Dr. Philip W. Ogilvie, Director Metropolitan Toronto Zoo. "Nature versus Naturalistic."
December 9, 1975	Mr. Bernard Power, President, Weather Engineering Corporation Ltd. "Weather Modification, World Food Production and National Security."

January 13, 1976

Prof. J. Iribarne, University of Toronto. "Droplets, Ions and Electrical Charges" and Prof. H. U. Dütsch, Atmosphärenphysik Eth, Zurich. "Interaction between the photochemical systems grouped around the ozone and the transport processes in the stratosphere". A joint Atmospheric Research Directorate and CMS meeting.

February 26, 1976

Dr. John Maybank, Head, Physics Division, Saskatchewan Research Council. "Air Pollution Problems from Agricultural Spraying Operations."

Discussions are taking place with the Greater Toronto Boy Scouts Association with the aim of providing meteorological instruments for their camp in the Haliburtons.

The present executive is:-

Chairman	R. Nelis	Atmospheric Environment Service
Program Chairman	D. W. Phillips	Atmospheric Environment Service
Secretary	T. Agnew	Atmospheric Environment Service
Treasurer	L. Wilson	Atmospheric Environment Service

Our final meeting will take place early in May, when next year's executive will be elected.

OTTAWA CENTRE

Executive 1975-76

Past Chairman:	K. H. Clark
Chairman:	B. W. Watson
Vice-Chairman:	A. D. Rutkus
Secretary-Treasurer:	H. R. Armstrong
Publicity:	C. MacNeil

Summary of Meetings

The Centre has held four meetings during the period October 75 to February 76 and plans at least one more before the season's end.

October 2	Dr. T. W. R. East, Director of Advanced Development, Raytheon Canada: "Weather and Radar".
December 4	Mr. M. K. Thomas, Director Meteorological Applications Branch, AES: "Climatic Change". This meeting was a special dinner meeting and guest night with a total attendance of 63.
January 8	Dr. J. E. Hay, Associate Professor of Geography, University of British Columbia and Vice-president, Canadian Meteorological Society: "An Applied Radiation Climatology of Canada".
February 16	Dr. J. Maybank, Head, Physics Division, Saskatchewan Research Council: "Air Pollution Problems from Agricultural Spraying Operations".

1975 Financial Statement

Receipts

Cash on hand, January 1, 1975	232.62
Bank interest, April and October	2.63
Sale of tickets for dinner meeting in December	434.00
Grant from National Executive	335.00
Total Receipts	\$1004.25

Expenditures

Dinner, Professor P. E. Merilees, Jan. 22, 1975	9.20
Dinner, Mr. J. P. Bruce, February 26, 1975	8.30
Dinner, Mr. G. A. McKay, April 16, 1975	9.00
Stamps and Envelopes	15.55
Bank service charge	1.00
Dinner, Dr. T. East, October 2, 1975	9.50
Expenses for dinner meeting, Dec. 4, 1975	443.64
Total Expenditures	496.19
Balance on hand, December 31, 1975	\$508.06

H. R. Armstrong
Secretary-Treasurer

MONTREAL CENTRE

Chairman: Dr. D. Davies, Division de Recherche en Prévision Numérique, AES.

Secretary-Treasurer: R. Rioux, Canadian Meteorological Centre, AES.

Past Chairman: A. A. Boucaud, Canadian Meteorological Centre, AES.

Nine meetings were held during the 1975-76 season. The speakers and topics were:

September 23	Dr. Charles Warner, Department of Meteorology, McGill University: "Structural features of Alberta hailstorms" (held at the McGill Faculty Club)
October 14	Dr. Gaston Paulin, Directeur, Service de la Météorologie du Québec: "Le service de la météorologie du Québec" (Université de Québec à Montréal)
November 18	Dr. Michael Kwizak, Director, Air Quality Research Branch, AES: "Research activities in Air Quality" (Division de Recherche en Prévision Numérique)
December 9	Dr. David Frost, Chairman, Geography Department, Concordia University: "Varied landscapes of Mexico, the Caribbean and Guiana, with climatological comments" (Concordia University)
January 20	M. Chandu, Directeur des Applications, Projet de traduction automatique, Université de Montréal: "Un système pour la traduction automatique des prévisions régionales" (Division de Recherche en Prévision Numérique)

February 19	Dr. John Maybank, Chief, Physics Division, Saskatchewan Research Council: "Air pollution problems from agricultural spraying operations" (Bureau des Prévisions du Québec)
March 18	Dr. John Hay, Department of Geography, University of British Columbia: "Utilization of solar energy for domestic heating in Montreal" (McGill Faculty Club)
April 1	Dr. Kirk Bryan, Geophysical Fluid Dynamics Laboratory, Princeton University: "The ocean and climate" (McGill Faculty Club)
May 11	Dr. Claude Girard, Division de Recherche en Prévision Numérique, AES: "Les effets physiques dans le modèle spectral aux équations primitives en exploitation au Centre Météorologique Canadien" (Division de Recherche en Prévision Numérique)

The National President, Dr. P. Merilees, presented Dr. Roger Daley with the CMS 1974 Prize in Applied Meteorology at the September 23rd meeting, as he had been unable to attend the Vancouver Congress in May. This award was made for the development of the Spectral Forecast Model which is now in operational use at the Canadian Meteorological Centre.

Financial Statement

This year's financial statement is composed of two parts to reflect the change-over of the reporting period from the academic year to the calendar year as required by the new By-Law 12g.

Period 1 May 1974 to 31 May 1975

Operating Account

1) Revenues	
Balance 1 May 1974	71.52
Annual fees	36.00
Refreshment collections	95.94
CMS Central Grant	249.00
UQAM Contribution to Wine and Cheese Party	101.34
TOTAL RECEIPTS	553.80
2) Expenditures	
Stamps	1.50
Cheques	1.00
Refreshments	35.00
Faculty Club Rental, including refreshments (3 meetings)	197.87
Wine and Cheese Party	183.00
TOTAL EXPENDITURES	418.37
SURPLUS	135.43

Capital Account

Net assets as of 31 May 1975	135.43
Net assets as of 1 May 1974	71.52
Net capital increase	63.91

Period 1 June 1975 to 31 December 1975

Operating Account

1) Revenues	
Balance 1 June 1975	135.43
Interest 31 October 1975	.38
Refreshment collections	20.00
CMS Central Grant received 25 November 1975	<u>374.00</u>
TOTAL RECEIPTS	529.81
2) Expenditures	
Bank service charge	1.60
Stamps	5.72
Refreshments	101.37
Faculty Club Rental, including refreshments (1 meeting)	53.53
Parking	4.50
Dinners for guest speakers	<u>38.00</u>
TOTAL EXPENDITURES	204.72
SURPLUS	325.09

Capital Account

Net assets as of 1 June 1975	135.43
Net assets as of 31 December 1975	325.09
Net capital increase	189.66

CENTRE DE QUEBEC

La Société de Météorologie de Québec comptait pour l'année 1975-76 près de 50 membres et son conseil d'administration se composait comme suit:

Président	M. Michel Ferland
Vice-président	M. André Hufty
Conseillers	Mme Angèle Houde M. Pierre-André Dubé M. Paul Lamb M. Gaston Paulin M. André Plamondon
Secrétaire	M. Guy Bergeron
Trésorier	M. Gaétan Soucy

Cinq réunions ont été tenues durant le présent exercice et les principales décisions portèrent sur les sujets suivants:

La préparation du 10ième Congrès annuel de la SMC canalisa la majorité des énergies des membres du conseil et de leurs collaborateurs. Aucun effort ne fut négligé en vue de rendre cet événement aussi intéressant et agréable que possible à tous les participants.

Il fut aussi décidé d'utiliser les subventions accordées par la SMC à la réalisation d'une station météorologique mobile utilisable à des fins éducatives, projet qui verra vraisemblablement le jour dans peu de temps.

Enfin, une série de six conférences d'information publique fut mise sur pied, en voici la description:

15 Octobre	1975	Dr. Bernard Seguin -Aperçu des recherches bioclimatologiques effectuées à l'Institut national de la Recherche agronomique de France.
11 Novembre	1975	Dr. J.-Edgar Chevrette -Les études phénologiques effectuées à l'université Laval.
13 Janvier	1976	Dr. Conrad East -Problèmes d'environnement atmosphérique urbain.
4 Février	1976	Dr. Terry Gillespie -Weather effects on 14 plant tests and diseases.
24 Février	1976	Dr. John Maybank -Air Pollution Problems from Agricultural Spraying Operations.
23 Mars	1976	Dr. Barney W. Boville -Climat et Environnement.

Le secrétaire,
Guy Bergeron

Rapport du trésorier
Exercice 1975
(1er janvier au 31 décembre 1975)

Actif

Actif en caisse au début de l'exercice	\$ 346.38
Cotisation (47)	188.00
Octroi du MRN	600.00
Subvention de la SMC	120.00
Intérêts	0.37
Total	\$1254.75
Capital social	5.00
Actif total	\$1259.75

Passif

Frais de séjour et de déplacement des conférenciers	\$ 187.00
Achat de timbres et de matériel de bureau	55.57
Frais de secrétariat (dactylographie)	30.00
Frais de réception	135.00
Administration à la caisse populaire	0.40
Total	\$ 407.00
Immobilisation du capital social	5.00
	\$ 412.97
Excédant de l'actif sur le passif	\$ 846.78

Gaétan Soucy
trésorier

HALIFAX CENTRE

Chairman: Mr. C. MacNeil
Secretary: Dr. G. Strong
Treasurer: Mr. G. Strong

The following is a list of the speakers who spoke to the Halifax Centre of the CMS in 1975:

February 26, 1975	Mr. G. Strong, AES, Spatial Variability of Convectively Produced Precipitation
April 2, 1975	Prof. P. E. Merilees, McGill University General Circulation Models and Numerical Weather Prediction
June 11, 1975	Dr. F. Dobson, Bedford Institute of Oceanography Mr. A. Hoover, AES Mr. G. Strong, AES Highlights from the CMS Congress held in Vancouver in May, 1975
November 6, 1975	F. Colin Dureden, EPS Oil Spill Cleanup Operations

C. F. MacNeil
Chairman

Financial Statement

Receipts

Funds on hand January 13, 1975	\$ 738.78
Interest, April 30, 1975	10.80
CMS centre grant, October 27, 1975	323.00
Interest, October 31, 1975	<u>3.10</u>
TOTAL	\$1075.68

Expenses

Postage expenses owing past secretary	\$ 18.85
School weather instruments, April 24, 1975	<u>104.50</u>
TOTAL	\$ 123.35

TOTAL ASSETS	\$1076.68
TOTAL EXPENSES	<u>123.35</u>
BALANCE	\$ 952.33

Present Outstanding Expenses

Additional O.E. High School instruments	\$ 224.80
Postage expenses owing past secretary	6.40
Refreshment expenses owing past chairman	6.80
Refreshment expenses owing current treasurer	<u>3.10</u>
TOTAL	\$ 241.10

G. S. Strong
Treasurer

INFORMATION FOR AUTHORS

Editorial policy. *Atmosphere* is a medium for the publication of the results of original research, survey articles, essays and book reviews in all fields of atmospheric science. It is published quarterly by the CMS with the aid of a grant from the Canadian Government. Articles may be in either English or French. Contributors need not be members of the CMS 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 exceed 16 printed pages and preferably should be shorter.

Manuscripts should be submitted to: the Editor, *Atmosphere*, West Isle Office Tower, 5th Floor, 2121 Trans-Canada Highway, Dorval, Quebec H9P 1J3. Three copies should be submitted, typewritten with double spacing and wide margins. Heading and sub-headings should be clearly designated. A concise, relevant and substantial abstract is required.

Tables should be prepared on separate sheets, each with concise headings.

Figures should be provided in the form of three 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.

RENSEIGNEMENTS POUR LES AUTEURS

Politique éditoriale. *Atmosphère* est un organe de publication de résultats de recherche originale d'articles sommaires, d'essais et de critiques dans n'importe quel domaine des sciences de l'atmosphère. Il est publié par la SMC à l'aide d'une subvention accordée par le gouvernement canadien. Les articles peuvent être en anglais ou en français. Il n'est pas nécessaire que les auteurs soient membre de la SMC; les contributions étrangères sont bien-venues. A cause des limitations d'espace les articles ne doivent pas dépasser 16 pages dans le format final. Tout article sera soumis à un critique indépendant avant d'être accepté.

Les manuscrits doivent être envoyés à : le Rédacteur, *Atmosphère*, West Isle Office Tower, 5e étage, 2121 route Trans-canadienne, Dorval, Québec H9P 1J3. Ils doivent être soumis en trois exemplaires dactylographiés à double 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.

Les tableaux doivent être préparés et présentés séparément accompagnés d'un titre et d'un numéro explicatifs concis.

Les graphiques doivent être présentés en trois copies dont les originaux devraient être conservés par l'auteur au cas où ils seraient nécessaire de les reviser. Une liste des légendes des graphiques doit être dactylographiée séparément. L'étiquetage doit être de grand format de façon à ce qu'il soit facilement lisible après réduction du format. Le traçage des lignes doit s'effectuer au moyen d'encre de chine en doublant, au moins, le format final, le tout sur papier blanc ou sur papier à calquer et identifié adéquatement. Les photographies (demi-teintes) devraient être présentées sur épreuves glacées au double du format final.

Les unités. Le Système International (SI) d'unités métriques est préférable. Les unités devraient être abrégées seulement lorsqu'elles sont accompagnées de nombres, ex: "10m", mais "plusieurs mètres".

Les notes de renvoi au texte doivent être évitées.

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The Canadian Meteorological Society / La Société Météorologique du Canada

The Canadian Meteorological Society came into being on January 1, 1967, replacing the Canadian Branch of the Royal Meteorological Society, which had been established in 1940. The Society exists for the advancement of Meteorology, and membership is open to persons and organizations having an interest in Meteorology. At nine local centres of the Society, meetings are held on subjects of meteorological interest. *Atmosphere* as the scientific journal of the CMS is distributed free to all members. Each spring an annual congress is convened to serve as the National Meteorological Congress.

Correspondence regarding Society affairs should be directed to the Corresponding Secretary, Canadian Meteorological Society, c/o Dept. of Meteorology, McGill University, P.O. Box 6070, Montreal, P.Q. H3C 3G1

There are three types of membership – Member, Student Member and Sustaining Member. For 1975 the dues are \$20.00, \$5.00 and \$60.00 (min.), respectively. The annual Institutional subscription rate for *Atmosphere* is \$15.00.

Correspondence relating to CMS membership or 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 météorologique du Canada a été fondée le 1^{er} janvier 1967, en remplacement de la Division canadienne de la Société royale de météorologie, établie en 1940. Cette société existe pour le progrès de la météorologie et toute personne ou organisation qui s'intéresse à la météorologie peut en faire partie. Aux neuf centres locaux de la Société, on peut y faire des conférences sur divers sujets d'intérêt météorologique. *Atmosphere*, la revue scientifique de la SMC, est distribuée gratuitement à tous les membres. À chaque printemps, la Société organise un congrès qui sert de Congrès national de météorologie.

Toute correspondance concernant les activités de la Société devrait être adressée au Secrétaire-correspondant, Société météorologique du Canada, Département de Météorologie, l'Université McGill, C.P. 6070, Montréal, P.Q. H3C 3G1

Il y a trois types de membres: Membre, Membre-étudiant, et Membre de soutien. La cotisation est, pour 1975, de \$20.00, \$5.00 et \$60.00 (min.) respectivement. Les Institutions peuvent souscrire à *Atmosphère* au coût de \$15.00 par année.

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ATMOSPHERE

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