ROYAL METEOROLOGICAL SOCIETY

CANADIAN BRANCH

PROGRAM

THE NATIONAL METEOROLOGICAL CONGRESS

Hamilton

June 6 and 7, 1962.

REGISTRATION

Conferees should register with the Conference of Learned Societies at the Central Registration Desk, in the foyer of Wentworth House, before attending sessions. In addition, conferees should register at the R. M. S. Registration Desk, at the entrance to the Physical Sciences Building Auditorium (the locale of our first session).

The Committee, Conference of Learned Societies, advises that (except for the specially-arranged Luncheon) meals should be taken in the Wentworth House cafeteria.

METEOROLOGICAL CONGRESS ARRANGEMENTS COMMITTEE

P. Johns (Chairman), Meteorological Service, Toronto, Ont.

W. L. Godson - Program, Meteorological Service, Toronto, Ont.

J.A. W. McCulloch - Meteorological Service, Toronto, Ont.

R.H. Douglas - McGill University, Montreal, P.Q.

D.E. McClellan - Meteorological Service, Montreal, P.Q.

Rapporteurs: J.L. Galloway - Chief rapporteur

June 6: a.m. J. Clodman

p.m. J.L. Knox

June 7: a.m. J.A.W. McCulloch

p.m. D.N. McMullen

PROGRAM SUMMARY

Wednesday, June 6. Registration* 8.30 - 5.00 Physical Sciences Building Auditorium.

Physical Sciences Building Auditorium

9 - 12 Noon Jointly with the Royal Society of Canada, Section III.
"Dynamic and Thermal Linkages between Successive Atmospheric Layers"

CHAIRMAN: A. Thomson

12 - 2 p.m. Luncheon**. Collins Hotel, Dundas.
Presentation of Awards.

Room B-121 Engineering Building.

2 - 5 p.m. "Dynamic and Physical Meteorology".

CHAIRMAN: J.S. Marshall.

Thursday, June 7. Registration*. 8.30 - 5.00 Physical Sciences Building Auditorium

Physical Sciences Building Auditorium.

9.30 - 12.30 p.m. Jointly with Canadian Association of Physicists.
"Symposium on Upper Atmosphere Physics".

CHAIRMAN: B.W. Currie.

Room B-121 Engineering Building.

2 - 5 P.M. "Hydrometeorology and Synoptic Meteorology".

CHAIRMAN: R. H. Douglas,
President, Canadian Branch.

* Registration Fee 0.50 R.M.S.
** Luncheon Fee 2.50 including transportation
(tickets at R.M.S. Registration Desk).

Wednesday, June 6. 9.00 - 12.00 Noon Physical Sciences Building Auditorium

"DYNAMIC AND THERMAL LINKAGES BETWEEN SUCCESSIVE ATMOSPHERIC LAYERS".

Joint Session with Royal Society of Canada.
Interdisciplinary Division, Section III

CHAIRMAN: A. Thomson.

Minutes*	
50	C. O. HINES: Internal Gravity Waves. A Dynamical Link Between the Lower Atmospheric and Lower Ionospheric Levels.
50	F. KENNETH HARE: Linkages Between Stratosphere and Troposphere.
10	RECESS
50	R. W. STEWART: Air-Sea Interaction.

1200 - 2.00 p.m. Luncheon, Collins Hotel, Dundas.

Presentation of Awards: Napier Shaw Memorial Prize: C. O. Hines.
Hugh Robert Mill Award: J.S. Marshall
Darton Prize (Canadian): W. Hitschfeld
Canadian Branch, Presidents' Prize: B. W. Boville and F. K. Hare.
Patterson Medals(two): To be announced.

2.00 - 5.00 p.m. Room B-121 Engineering Building.

"DYNAMIC AND PHYSICAL METEOROLOGY"

CHAIRMAN: J.S. Marshall.

20	R. E. MUNN: Empirical Formulae in Meteorology for Auto-correlation and Spectral Functions.
25	D. DAVIES: A Variational Approach to the Enigma of Turbulence.
20	O. JOHNSON, W.L. CLINK, G.H. GILBERT: Prediction of Anomalous Audibility for the Suffield 100- Ton Explosion.
15	RECESS
20	R.A. STRACHAN: Automatic Data Processing for Numerical Weather Prediction.
25	A.J. ROBERT: An Evaluation of a Four-level Statistical-Dynamical Model.
20	A. EDDY: Numerical Analysis of the Horizontal Divergence of the Wind.
25	W.L. GODSON: The Meteorological Program for the IQSY.

* Includes discussion, for which speakers must leave ample time.

Thursday, June 7. 9.30 - 12.30 Physical Sciences Building Auditorium.

"UPPER ATMOSPHERE PHYSICS"

Joint session with Canadian Association of Physicists.
CHAIRMAN: B.W. Currie.

Minutes*	
20	W.L. GODSON: Interactions Between Meteorological and Aeronomic Processes.
20	B.W. BOVILLE; M.A. MacFARLANE: Some Spectral Properties of Large-Scale Atmospheric Flow.
20	C.V. WILSON, W.L. GODSON: Structure of the Winter Stratosphere over a Ten-year Period.
20	R.L. GATTINGER, A. VALLANCE JONES: Seasonal Variation of the 1.58 Twilight 0_2 Band.
15	RECESS
20	J.S. BELROSE: Atmospheric Meteorology and the Ionospheric D-Region.
20	H.M. SULLIVAN, D.M. HUNTEN: Lithium and Potassium in Twilight.
20	G.G. SHEPHERD, E.C. TURGEON, R.L. HILLIARD: Upper Atmospheric Temperatures from Doppler Line Widths.
20	W.I. AXFORD: The Entrainment of Ionization in Atmospheric Gravity Waves.

2.00 - 5.00 p.m. Room B121 Engineering Building.

"HYDROMETEOROLOGY AND SYNOPTIC METEOROLOGY"

CHAIRMAN: R.H. Douglas.

25	G.K. RODGERS: Temperature Distribution in the Waters of the Great Lakes.
20	T.L. RICHARDS: The Contribution of Lake/Land Ratios to Evaporation Estimates of the Great Lakes.
20	J.P. BRUCE, U. SPORNS: Critical Meteorological Conditions for Maximum Floods.
20	G.A. McKAY: A Snow Budget for the Prairies.
15	RECESS
20	C.L. MATEER: The Relationship between Insolation and Cloudiness at Ocean Station 'P'.
25	A.E. CARTE and R.H. DOUGLAS: Characteristics of Hail Swaths in Alberta.
20	J.L. GALLOWAY: The Three-Front Model and the Thunderstorm.
20	G.R. KENDALL, A.G. PETRIE: The Frequency of Thunderstorm Days in Canada.

INTERNAL GRAVITY WAVES: A DYNAMICAL LINK BETWEEN THE LOWER ATMOSPHERIC AND LOWER IONOSPHERIC LEVELS.

C. O. Hines, Defence Research Board, Ottawa.

Internal atmospheric gravity waves provide a means of propagating dynamical energy upwards with little attenuation. A flux of energy that is small by tropospheric or stratospheric standards can be of tremendous importance at ionospheric levels, above 80 km say, where the gas density is so much smaller. In fact, there are strong reasons for believing that much of the motion observed at ionospheric heights is due to just such a flux. It seems probable, moreover, that turbulence detected at heights of 90-100 km is generated from the shear in these waves. The turbulence can affect in turn the chemical composition at higher levels, while the viscous dissipation of its energy can modify the heat budget and general circulation at 100 km. The coupling inherent in internal gravity waves then provides a new basis for understanding several features of the upper atmosphere, and for linking them causally to sources at tropospheric and stratospheric levels.

LINKAGES BETWEEN STRATOSPHERE AND TROPOSPHERE

F. Kenneth Hare, McGill University, Montreal.

The lower stratosphere (below 20 km) is dominated by the upper, damped parts of the great zonal currents of the troposphere, whereas the middle and upper stratosphere are dominated by zonal currents that in most cases extend into or above the mesosphere. At least two broad suites of perturbations are known: (i) those concentrated in the troposphere, deriving energy from baroclinic overturnings in unstable zonal currents, and (ii) those whose amplitude is a maximum in the middle stratosphere. Both suites actually extend throughout the whole depth of the column, but differ strikingly in their relevance to the question of linkage between troposphere and stratosphere.

AIR SEA INTERACTION.

R. W. Stewart, University of British Columbia.

Laws governing the interaction of the atmosphere and the ocean will have to be understood thoroughly before solution of the ultimate problem of the geophysical heat engine can be attempted. Even for the more restricted treatment of the ocean and the atmosphere separately their interaction determines the principal boundary conditions.

The transfer of momentum is of the greatest importance for both geophysical fluids. The mechanism of this exchange seems more complex than was at one time thought, and appears to be intimately connected with the phenomenon of surface wave generation. Since the free water surface may move both vertically and horizontally, the processes of energy and momentum transfer are different from those over a solid surface, with at least some of the motion of the air too highly organized to be called turbulence.

The transfer of internal energy, both by conduction and more importantly by evaporation, is a dominant contributor to the atmosphere's energy supply, and is not unimportant to the ocean. Here again the process is more complex than it seems at first sight. The turbulence pattern, basically determined by the momentum transfer, is not straight-forward. Also the behaviour of the top few millimeters of the water surface has a marked influence on this aspect of the problem.

EMPIRICAL FORMULAE IN METEOROLOGY FOR AUTOCORRELATION AND SPECTRAL FUNCTIONS.

R. E. Munn., Meteorological Service of Canada, Toronto.

Empirical formulae may be of value in the physical sciences if they provide satisfactory approximations for the behaviour of a variable over a usefully broad range. Another desirable but not essential attribute is that the formulae have some physical basis, e.g., that they are dimensionally correct, or that they yield an exact result at some discrete point such as the origin.

With these criteria in mind, a survey will be given of empirical formulae that have been used in meteorology to represent autocorrelation and spectral functions. Both the Eulerian and Lagrangian reference frames will be considered. A summary will be given of the necessary (but not sufficient) conditions that all such functions must obey if they are to represent the behaviour of a variable over its full range.

A VARIATIONAL APPROACH TO THE ENIGMA OF TURBULENCE

David Davies, Meteorological Service of Canada, Montreal.

Physical laws are most conveniently expressed by means of a minimum variational priciple in systems in which frictional forces can be ignored. Several workers have suggested that a turbulent fluid is one in which the vorticity is piecewise continuous. Weierstrass has shown that the vanishing first variation may yield a "strong", or true, minimum, but may also yield a "weak" minimum with certain inflection point characteristics.

Piecewise continuous ("corner") solutions do not exist for "strong" minimums (except in the limiting case), but do exist for "weak" minimums and are not generally unique. Thus, if it is possible to describe a physical system by a minimum variational principle, and if physical significance can be attached to piecewise continuous solutions (e.g. by a frontal spectrum interpretation), then whether or not turbulence will occur in a system can be predicted by the calculus of variations.

PREDICTION OF ANOMALOUS AUDIBILITY FOR THE SUFFIELD 100 - TON EXPLOSION

O. Johnson, W. L. Clink and G.H. Gilbert, Meteorological Service of Canada, and Defence Research Board, Suffield and Ottawa.

A description is given of the method used for the prediction of anomalous audibility for the Suffield 100 - ton explosion, and a comparison is made of the predicted effects with reports of audibility from observers. Some indication is also given of the variation of possible anomalous effects with time of day.

AUTOMATIC DATA PROCESSING FOR NUMERICAL WEATHER PREDICTION

R. A. Strachan, Meteorological Service of Canada, Montreal.

The role of automatic data processing in Numerical Weather Prediction is defined and its salient features outlined. Each of a variety of transmission codes for upper air data is recognized by scanning techniques, and the reporting station's identifier and pertinent data abstracted. Prestored data and updated information for each station reporting upper air information are obtained from a station catalogue and the individual pre-assigned storage location on magnetic tape is determined. Consideration of telecommunication schedules in this pre-assignment of storage locations is highlighted. A hydrostatic check, in which computed height values are substituted for erroneous intermediate mandatory levels, is performed prior to tape storage. Wind consistency checks are made to ensure that suspiciously large scale fluctuations between mandatory levels are eliminated. The automatic data processing scheme has been tested on an IBM 650 installation at McGill University and is currently being programmed for a Bendix G-20 system which includes a control buffer for off-line handling of input data.

AN EVALUATION OF A FOUR-LEVEL STATISTICAL-DYNAMICAL MODEL

Andre J. Robert, Meteorological Service of Canada, Montreal.

A description of the characteristic equation of a statistical-dynamical model illustrates some of the advantages resulting from the application of statistical concepts. This equation, applied at 1000 mb, 850 mb, 500 mb, and 200 mb, contains four arbitrary coefficients. Two different sets of coefficients are evaluated for each of the four levels. The first set results in a strictly dynamical model, whereas the second set introduces some statistical concepts.

An example illustrates the difference in behaviour resulting from the two approaches. Comparisons are also made with the barotropic model and other baroclinic models. Objective comparisons are attempted from a table of height and wind verification scores. The possibility of using the model operationally is examined and its advantages over other models are noted.

NUMERICAL ANALYSIS OF THE HORIZONTAL DIVERGENCE OF THE WIND

Amos Eddy, McGill University, Montreal.

The possibility of obtaining an organized pattern of the horizontal velocity divergence field from the observed wind data is examined. Divergence patterns on the synoptic scale are produced and are shown to have features conservative in space and time. These features are related qualitatively to the prevailing synoptic situation. The method used is the "Bellamy triangle" kinematic technique. The innovation introduced is the manner in which the results from this kinematic procedure are "objectively analysed" to give a three dimensional array of divergence values at equally spaced gridpoints.

THE METEOROLOGICAL PROGRAM FOR THE IQSY.

W. L. Godson, Meteorological Service of Canada, Toronto.

The two years 1964 and 1965, designated the International Quiet Sun Years, represent a period of expected minimum solar activity which has been selected for concentrated geophysical investigation. The meteorological program for the IQSY has been designed to study the large-scale physical, dynamical and thermodynamic characteristics of the atmosphere above the 100-mb surface, and the relations between the upper and the lower atmosphere. This study will include:

(1) The climatology of the upper atmosphere - the variation in space and time of the parameters of state and the motion of the atmosphere;

(2) The morphology of the disturbances in the upper atmosphere - the thermal structure and the flow patterns in the horizontal and vertical;

(3) The relation between stratospheric circulation and temperature field and the distributions of ozone and water vapour;

(4) Radiative processes in the upper atmosphere, particularly in relation to ozone and water-vapour distributions;

(5) The incidence and nature of clouds and aerosols in the upper atmosphere;

(6) The relation between solar activity and the composition, motion and temperature fields of the upper atmosphere.

INTERACTIONS BETWEEN METEOROLOGICAL AND AERONOMIC PROCESSES.

W. L. Godson, Meteorological Service of Canada, Toronto.

It has long been known that the dynamic and thermodynamic state of the upper atmosphere is strongly dependent upon the radiative properties of certain relatively rare atmospheric constituents, but it has only been in recent years that the converse has been accepted (the dependence of the concentration of these minor constituents on the basic meteorology of the atmosphere).

For many years, atmospheric ozone was virtually the sole common meeting ground of upper atmosphere physicists and lower atmosphere physicists. They discovered the intimate relations that exist between ozone concentrations and stratospheric temperatures, and these have led the way to the elucidation of many stratospheric circulation problems, including the riddle of the spring maximum in total ozone and in fallout of artificial radioactivity. We have also discovered that ozone concentrations in the upper stratosphere are sensitive to solar variability - which must, therefore, represent changes in the solar spectrum in the relatively long ultra-violet. This demonstration has very potent implications for a direct effect of solar variability on atmospheric thermodynamics (and probably dynamics as well) in the vicinity of the stratopause (50 - 55 km); subsequent indirect effects will undoubtedly prove elusive and/ or tenuous.

Direct evidence of correlations between stratosphere and lower ionosphere can now be provided - although the interpretation is far from simple. Mesospheric D-region radiowave absorption seems to be related to temperature at the base of the middle stratosphere, and there is increasing evidence for a coherence of dynamic patterns in the vertical between these layers. It is no longer at all apparent where the upper atmosphere begins - and this can be construed as a significant milestone in the evolution of atmospheric physics.

SOME SPECTRAL PROPERTIES OF LARGE-SCALE ATMOSPHERIC FLOW.

B. W. Boville and M. A. MacFarlane, McGill University, Montreal.

The variance of geopotential height at standard isobaric levels in the troposphere and stratosphere has been computed by Fourier analysis. The variance spectrum at 500 mb, 100 mb, and 25 mb is given for extended winter periods and complete vertical profiles for shorter periods. The data show the vertical propagation and changes in intensity and phase of atmospheric waves.

THE STRUCTURE OF THE WINTER STRATOSPHERE OVER A TEN-YEAR PERIOD.

C. V. Wilson, McGill University, Montreal, and W. L. Godson, Meteorological Service of Canada, Toronto.

A series of 100-mb temperature maps were drawn up for the winters 1949-50 to 1958-59 using ten-day mean data. These maps were used to summarize the large-scale events of each winter and of the ten winters in general. The results suggest the existence of two major patterns, both highly persistent:

(i) an asymmetric pattern with a warm ridge over east Siberia-Alaska and an elliptical cold core vortex over Eurasia.

(ii) An eccentric bi-polar distribution, the trough line extending from central Canada to central Siberia.

The striking asymmetry of both patterns in the stable stratosphere appears to require an external forcing agent and this analysis tends to highlight the role of tropospheric activity.

SEASONAL VARIATION OF THE 1.58 μ TWILIGHT O_2 AIRGLOW BAND

R. L. Gattinger and A. Vallance Jones, University of Saskatchewan, Saskatoon.

The 0,1 $^3\Sigma_g^- - {}^1\Delta_g$, O_2 twilight airglow band at 1.58 μ has been investigated during 1961 and a pronounced seasonal variation found with a maximum brightness in midwinter and a minimum in midsummer. Recent theoretical work suggests that the emission is controlled by the ozone concentration in the 50-60 km region. If this is true the seasonal variation must reflect a seasonal variation in the ozone concentration at this height.

ATMOSPHERIC METEOROLOGY AND THE IONOSPHERIC D-REGION

J.S. Belrose, Defence Research Telecommunications Establishment, Defence Research Board, Ottawa.

Recent studies of the ionospheric D-region at Ottawa have revealed that it contains two ionized layers, the upper one (the D-layer) depends on ionizing radiations from the sun, but the lower one (the C-layer) is independent of ionizing radiations from the sun. Differences in the daily formation of these layers provides an explanation of certain features found in LF propagation. Seasonal changes in the propagation of these waves, and regular changes over shorter intervals (cf one to two weeks), do not seem to be related to changes in the ionization intensities from the sun, and therefore may be related to some sort of atmospheric meteorology.

LITHIUM AND POTASSIUM IN TWILIGHT

H.M. Sullivan and D.M. Hunten, University of Saskatchewan, Saskatoon.

Lithium has been observed since October 1961; the intensity was 12 to 13 rayleighs until shortly after the two large thermonuclear explosions set off by the USSR. Peaks of around 400 R were observed with a time-delay of about 10 days. Assuming the earlier measurements to be of natural lithium, a Na/Li abundance ratio of 8000 is found. The average height of the lithium layer is 81 km, about 7.5 km lower than the sodium. A few measurements of emission attributed to potassium have also been made; this layer seems to be higher than the sodium.

UPPER ATMOSPHERIC TEMPERATURE FROM DOPPLER LINE WIDTHS.

G.G. Shepherd, E.C. Turgeon and R.L. Hilliard, University of Saskatchewan, Saskatoon.

The Temperature of the upper atmosphere at a given height can be determined by measuring the Doppler broadening of a spectral line emitted from that region. Some temperatures from the OI auroral lines at 5577 and 6300A have been obtained at Saskatoon, using a scanning photoelectric Fabry-Perot spectrometer[2]. These results will be presented. A new instrument is proposed that will accomplish the same purpose, but with a light-gathering power about 100 times as great as that of the Fabry-Perot instrument. It consists essentially of a field-compensated Michelson interferometer with which the autocorrelation curve is observed at a few selected points. Some preliminary tests on the prototype instrument will be described.

[1] This research is supported by a grant from the National Research Council of Canada.

[2] Nilson, J.A. and Shepherd, G.G., Journ. Planet. Space Sci. 5, 299 (1961).

THE ENTRAINMENT OF IONIZATION IN ATMOSPHERIC GRAVITY WAVES.

W. I. Axford, Defence Research Board, Ottawa.

Ionospheric ionization tends to collect at alternate nodes of atmospheric gravity waves due to the process originally proposed by Dungey (J.A.T.P. 8, 39, 1956). It can be shown that to some extent the ionization is entrained as the waves propagate, and is carried as a series of layers in the direction of the phase velocity. If, as is expected, the wave energy propagates upwards, then the phase velocity and the direction of motion of the entrained ionization is downwards. Thus it is possible that gravity waves may be the cause of a noticeable distortion of the ionospheric layers.

TEMPERATURE DISTRIBUTION IN THE WATERS OF THE GREAT LAKES.

G. K. Rodgers, Great Lakes Institute, TORONTO, Ont.

Some features of the recently observed vertical and horizontal temperature distribution within the Great Lakes are described. Most data available cover the seasons from May to November, but conditions are known for two winters in Lake Ontario. The relative importance of energy budget terms in the lakes is discussed. Factors influencing the vertical temperature structure in the water column are also related to the observations.

THE CONTRIBUTION OF LAKE/LAND RATIOS TO EVAPORATION ESTIMATES OF THE GREAT LAKES.

T. L. Richards, Meteorological Service of Canada, Toronto, Ont.

In the movement of air from land to lake a number of meteorological parameters including wind, temperature and humidity are affected. One approach to the problem of evaluating this lake influence is to obtain an empirical relationship between the parameter over land compared to the parameter over lake.

From the data collected by the Canadian Research Vessel "Porte Dauphine" a land-lake vapour pressure relationship has been found for the Great Lakes. Using this relationship and a similar land-lake wind ratio, climatological data from nearby land stations have been modified for use in a mass transfer equation to re-assess monthly evaporation figures for Lake Ontario and Lake Erie.

CRITICAL METEOROLOGICAL CONDITIONS FOR MAXIMUM FLOODS.

J.P. Bruce and U. Sporns, Meteorological Service of Canada, Toronto, Ont.

In the design of major dams, statistical analyses of stream-flow data often fail to give sufficiently safe design criteria. Thus engineers turn to a physical approach based on the best knowledge of the upper limits of flood-producing meteorological factors. The first comprehensive study of this nature, undertaken in Canada, was concerned with the Quebec North Shore area. The rainfall of 45 storms was analysed to determine maximum storm rainfall and its seasonal variation. The upper limits of winter snow accumulation were estimated by snowstorm maximization methods, a partial season method and a statistical analysis. In computing upper limits to melting rates, it was found that an energy budget approach yielded more realistic values than the more conventional degree-day calculations.

A SNOW-BUDGET FOR THE PRAIRIES.

G.A. McKay, Department of Agriculture, Prairie Farm Rehabilitation and Meteorological service of Canada, Regina, Sask.

The snowpack-water equivalent is required for the prediction of water supplies and floods, and in hydrological design studies. This information may be obtained by snow survey; however, for past years estimates must often be made from available climatological records. A budget method of estimating the pack-water equivalent from climatological data is proposed. Comparisons are made between the results obtained by this method and by snow survey.

THE RELATIONSHIP BETWEEN INSOLATION AND CLOUDINESS AT OCEAN STATION P.

C.L. Mateer, Meteorological Service of Canada, Toronto.

Measurements of insolation on the C.M.S. St. Catharines during the period January 1959 to August 1961 are related to average daily cloudiness by regression techniques. The regression equations are presented and evidence for increased depletion by clouds at low sun-heights is discussed. The qualitative effects of other weather parameters are indicated.

CHARACTERISTICS OF HAIL SWATHS IN ALBERTA.

A. E. Carte and R. H. Douglas, McGill University, Montreal.

An outstanding problem is that of the continuity or otherwise of the process of hail-generation within a storm. Extensive data have been collected in Alberta since 1956, and the analysis of a number of long swaths reveals a patchiness in the hail pattern suggestive of a discontinuous process.

THE THREE-FRONT MODEL AND THE THUNDERSTORM.

J. L. Galloway, Meteorological Service of Canada, Montreal.

Practical applications of the system of air mass analysis which forms the basis of Canadian synoptic meteorology ("The Three-Front Model") have been studied by the author in a number of papers.[1] The present paper extends these studies to the thunderstorm.

It is proposed that the occurrence of thunderstorms ahead of the main surface cold front, a phenomenon also remarked on in Europe, is often due to the presence of a trowal (trough of warm air aloft). The presence of a trowal is also sufficient for the occurrence of thunder on the Arctic cold front over land in winter, during snow and freezing surface temperatures. Air mass analysis substantiates reports of the penetration of cumulonimbus cloud into the stratosphere and has been used in preliminary studies of thunderstorms in the Canadian Arctic.

1. Weather, 1958 and 1960.

THE FREQUENCY OF THUNDERSTORM DAYS IN CANADA.

G. R. Kendall and A. G. Petrie, Meteorological Service of Canada, Toronto.

Maps are presented showing the distribution of thunderstorm days in Canada in the months of May to September and for the year.

It is shown that the Poisson distribution is a close fit (although not the best) and that use can be made of this one-parameter distribution to give useful indications of the probabilities of occurrence of any number of thunderstorm days, given the mean. Tables and a chart are given to facilitate the computation of such probabilities.

PROGRAMME OF EVENTS ORGANISED FOR THE CONFERENCE OF LEARNED SOCIETIES.

1. An exhibition of the Collection of Rare Books from the library of Sidney T. Fisher, Esq., of Montreal. Mr. Fisher's collection of items connected with Shakespeare's London will also be on display.

2. Three concerts by the Hamilton Chamber Orchestra. The Programmes will consist largely of 18th century music and compositions for small orchestra by contemporary composers.

3. A season of films by Ingmar Bergman. Among the films to be shown will be THE MAGICIAN, THE SEVENTH SEAL, SUMMER INTERLUDE, WILD STRAWBERRIES, and THE VIRGIN SPRING.

4. An exhibition of paintings and sculpture by contemporary Canadian artists.

5. A display of European posters advertising films.

There will also be a programme for wives of delegates, to be arranged by the Faculty Wive's Club, and a series of displays arranged by Canadian publishers.

McMaster University,
Hamilton Ontario,
May 4th, 1962.