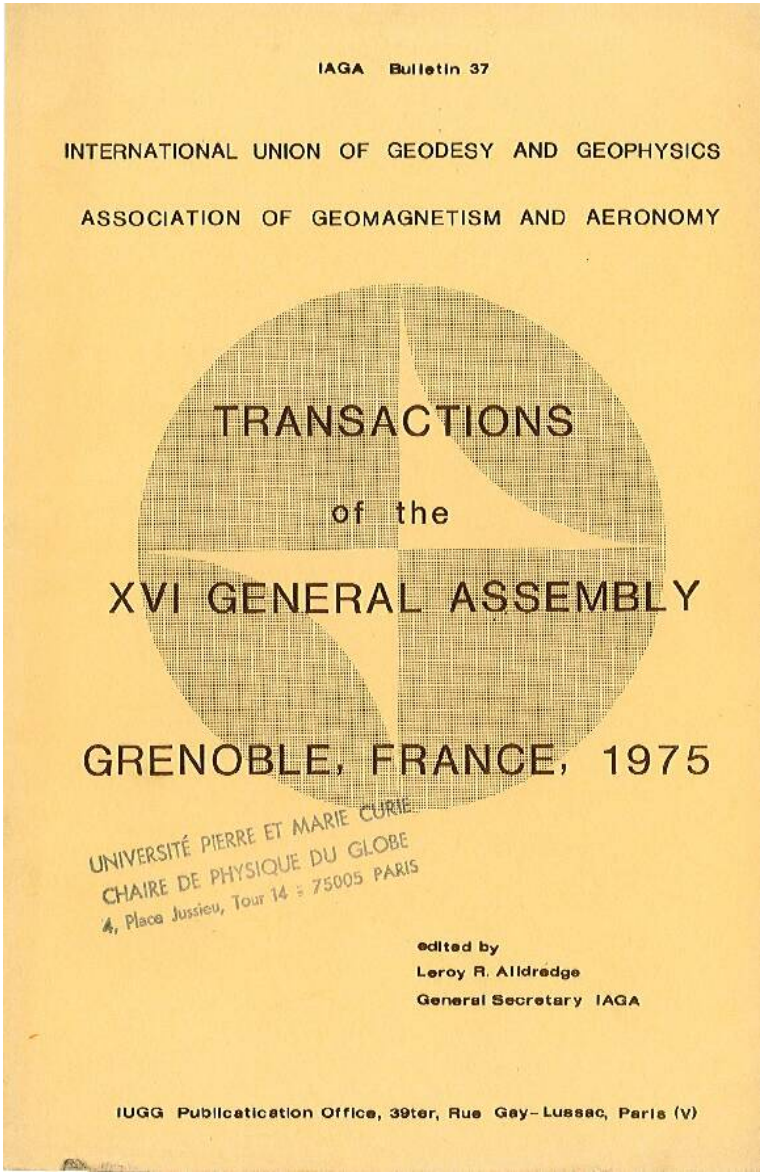

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IAGA Bulletin 37

INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS

ASSOCIATION OF GEOMAGNETISM AND AERONOMY

TRANSACTIONS

of the

XVI GENERAL ASSEMBLY

GRENOBLE, FRANCE, 1975

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CHAIRE DE PHYSIQUE DU GLOBE
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INTRODUCTION

The XVI General Assembly of the International Union of Geodesy and Geophysics (IUGG) was held at the Grenoble, France, University Campus from 25 August to 6 September 1975. The International Association of Geomagnetism and Aeronomy (IAGA) was provided excellent quarters and facilities for lecture halls and for the President and Secretariat.

IAGA convened seven interdisciplinary symposia for the IUGG and cosponsored eight others. In addition to the interdisciplinary symposia IAGA conducted scientific meetings and workshops on 25 different topics some of which ran for five half day sessions. Seven hundred and eighty-two papers were presented including those presented at interdisciplinary symposia convened by IAGA.

IAGA Bulletin No. 36 contains the detailed program and abstracts of the IAGA Assembly and should be used with these transactions to have a complete description of the Assembly.

ACKNOWLEDGEMENTS

Appreciation is extended to the Local Organizing Committee as listed below:

G. R. Laclavère	-	chairman
J. Goguel	-	vice-chairman
A. Lebeau	-	vice-chairman
A. Couzy	-	General Secretary
P. Bernard	-	member
J. Bricard	-	member
H. Lacombe	-	member
J. J. Levallois	-	member
M. Petit	-	member
R. Schlich	-	member
L. Serra	-	member
G. M. Weill	-	member

Special thanks goes to George Laclavère, Gilbert M. Weill and Michael Petit. The work of Drs. Weill and Petit was obvious to all IAGA participants. They were responsible for the lavish quarters provided for IAGA, for the services of a very qualified office staff brought from their Institute in Paris, and for the publications of IAGA Bulletin No. 36.

IAGA OPENING PLENARY SESSION

August 25, 1975

The meeting was opened by Vice-President G. M. Weill.

The French Official welcome was given by: Dr. M. Petit, President, Section of Geomagnetism and Aeronomy, French National Committee for IUGG.

The following delegates took seats at the front of the Auditorium as Chief Delegates of their Countries:

Africa	A. M. Van Wijk
Australia	F. Jacka
Belgium	M. Nicolet
Canada	C. M. Carmichael
Czechoslovakia	V. Bucha
England	B. R. Leaton
Egypt	M. Fahim
Finland	C. G. Sucksdorff
France	M. Petit
Germany (D.D.R.)	W. Mundt
Germany (F.D.R.)	G. Lange-Hesse
Japan	N. Fukushima
Netherlands	D. van Sabben
Norway	K. M. Storelvedt
Spain	J. O. Cardus
Sweden	C.-G. Falthammar
United States	T. M. Donahue

Dr. Weill requested that L. R. Alldredge chair the business meeting a report of which follows.

BUSINESS MEETING

Ad hoc Committees for this Assembly were recognized as follows:

(1) Resolutions Committee - A. J. Dessler, chairman
P. N. Mayaud, member
B. R. Leaton, member
N. Fukushima, member
A. Zaitzev, member

All resolutions must be in by noon Saturday, August 30, for consideration. They must be approved by the Chairman of a Division or Head of other IAGA Committee.

(2) Nominations Committee - T. Nagata, chairman
D. J. Williams, member
O. M. Raspopov, Member
E. Selzer, member
B. N. Bhargava, member

(3) Finance Committee - J. O. Cardus, chairman
C. G. Sucksdorff, member
K. L. Svendson, member

It was announced that pigeon holes are provided on the first floor for all participants. Marie Langerman (1st floor) and Chris Whitmarsh (IAGA Secretariat, 2nd floor) will be happy to assist delegates with any administrative problems they may have.

The U.S. Chief Delegate, T. M. Donahue, proposed a major change in the IAGA Statutes. These changes which amounted to a complete rewriting of the statutes had been circulated to all National Committees six months before the Assembly. The motion was seconded by J. C. Cain (USA). During the ensuing discussion J. O. Cardus (Spain) stated that although Spain favored a change they would not like to have it voted on and accepted at the first plenary session of this Assembly. J. O. Cardus suggested that a Committee be appointed to study the proposed changes and suggestions from others, and prepare the proposed changes for discussion and possible acceptance at the final plenary session of this Assembly. This idea was made into a subsidiary motion to the effect that the original motion by the USA be referred to a committee for study during this Assembly. A. A. Ashour (Egypt) seconded the motion.

B. R. Leaton (U.K.) stated that a formal motion had been prepared earlier by the U. K. delegation suggesting what J. O. Cardus had just presented but with the provision that the proposition be considered from now until the Scientific Assembly to be held in Seattle in 1977. This idea along with the provision that the committee's final recommendations should be sent to all National Committees at least six months before the Seattle Assembly was acceptable to J. O. Cardus and A. A. Ashour as amendments to their subsidiary motion. This amended motion was then approved.

L. R. Alldredge reminded the Assembly that there are 70 member countries with voting rights and that a 2/3 vote is needed for passing any amendments or changes in the Statutes. At this Assembly there are only 17 Chief Delegates present out of the needed 47. He suggested that if an Assembly fell short of a necessary 2/3 vote on changing the Statutes then those countries not present could be polled by mail.

M. Petit suggested that the Committee should be appointed very quickly to study the Statutes so that considerable work could be done

during this Assembly.

A. A. Ashour asked if the Executive Committee had discussed in detail the U.S. proposal for changes in the statutes. He stated that some of the Associations do this prior to bringing it to the floor of the Open Assembly.

L. R. Alldredge stated that according to the present statutes proposals for changes in the statutes must be made by National Committees; not by the Executive Committee.

B. R. Leaton moved that a limitation be put on the administrative and business matters at scientific assemblies that are held by IAGA between the IUGG General Assemblies. The question arose as to whether this would limit the business of the discussion of the statutes at the meeting to be held in Seattle, in 1977. Leaton replied that his motion would permit simple and reasonable business to be considered and that the problem of the statutes would be considered in this catagory for the Seattle meeting. C. M. Carmichael (Canada) seconded the motion which was then approved.

L. R. Alldredge read excerpts from a letter from Dr. A. F. Spilhaus, Jr., from the U. S. National Committee for the IUGG, regarding the Third IAGA General Scientific Assembly to be held August 22 - September 3, 1977, at Seattle, Washington. Further information regarding this meeting will be supplied later.

The General Secretary reviewed some of the actions of the IUGG Executive and Council meetings of the previous weekend as follows:

(1) The value of unit subscriptions was changed from $600 to $800.

(2) IAGA should benefit from (1) by receiving an increased allocation. Any increased allocation must first receive approval of the IUGG Finance Committee and Executive Committee.

(3) Dr. H. Charnock, president of IUGG, suggested that the IUGG Associations be catagorized as follows:

   (a) Two large Associations which should get an annual allocation of $19,000; IAG and IAGA.

   (b) Three medium sized Associations which should get an annual allocation of $14,000; IASPEI, IAMAP, and IAPSO.

   (c) Two small Associations which should get an annual allocation of $10,000; IASH and IAVCEI.

(4) IUGG has admitted three new countries to the Union; Ivory Coast, Nepal and Venezuela.

REPORT OF GENERAL SECRETARY

REORGANIZATION

IAGA completely reorganized itself during the Kyoto Assembly two years ago. Since that time, most of the details within the new Divisions have been worked out. The new organization has worked effectively in preparing for this General Assembly in Grenoble, and I would like to thank the new Officers and Conveners of Symposia.

THIS ASSEMBLY

At past assemblies all topics of interest to IAGA were accommodated. At this assembly, for the first time within my memory, definite topics were specified to delimit the scope of the assembly. Conveners were appointed for each topic and an over all program committee was appointed for the assembly. A time limit was predetermined for each topic. These new controls resulted in many tens of rejections to the discomfort of many faithful IAGA supporters.

In spite of these controls, more papers are scheduled for this assembly (782, including the interdisciplinary symposia IAGA is convening) than were scheduled for the Kyoto assembly (766 papers). This clearly demonstrates the scientific vigor of IAGA.

Dr. Gilbert M. Weill has been extremely helpful in making arrangements for IAGA in Grenoble. Dr. Weill has worn many hats in this enterprise including: Deputy Secretary General of the French National Committee for IUGG, Vice-President of IAGA, and Chairman of the IAGA Program Committee for Grenoble. He was very helpful to IAGA in obtaining additional facilities for scientific sessions, publication of the IAGA program booklet in France, and in getting additional personnel to help with typing, reproduction, etc.

THIRD SCIENTIFIC GENERAL ASSEMBLY

IAGA has accepted the invitation from the United States Academy of Sciences to hold its next scientific assembly in conjunction with IAMAP in Seattle, Washington, 22 August - 3 September 1977. It is very important that each Division submit its scientific program desires for the Seattle Assembly to the Executive Committee through Dr. Naoshi Fukushima at this assembly so orderly plans can be made.

PUBLICATIONS

Since our last assembly in Moscow, in 1971, IAGA News No. 10 appeared in August, IAGA News No. 11 in November 1972, IAGA News No. 12 in September 1973, and IAGA News No. 13 was distributed in November 1974. IAGA News No. 14, containing resolutions passed at this assembly, will be published immediately following this assembly.

Volume 52, No. 8 (1974) of the Canadian Journal of Chemistry contains a full account of the IAGA Symposium on Aeronomy of the Stratosphere and Mesosphere which was held during the IAGA Kyoto Assembly in 1973.

IAGA Bulletins No. 32 b, c, and d containing geomagnetic data from 1971 to 1973 have been published. A special IAGA Bulletin No. 33 was printed in October 1973. This bulletin which was compiled by Dr. P. N. Mayaud contains a hundred year's series of magnetic indices aa and a list of sudden commencements of magnetic storms, 1868-1967.

IAGA Bulletins Nos. 34 and 35, containing the program and abstracts and transactions for the Kyoto Assembly, were published and IAGA Bulletin No. 36, containing the program and abstracts for this assembly, has been published.

FINANCE AND BUDGET

A brief summary financial report for the period 1971-1974 has been forwarded to the Finance Committee. The accounts have been audited by Carl O. Lawrie, deputy chief of the NOAA Field Finance Office, Boulder, Colorado, USA, U. S. Department of Commerce. This auditor has verified that the money has been spent as indicated. This report shows cash assets of $31,000 as of 31 December 1974.

The General Secretary has been stingy in the use of IAGA funds to the detriment of the organization, resulting in a surplus which has tended to make it difficult to obtain a larger allotment from IUGG. This tight money trend has been revised by spending approximately $13,000 in travel grants to help scientists attend this meeting.

In formulating an estimate of our financial needs for the next four years, the new Division Chairmen and other organizational bodies were asked to submit a separate budget of their needs. These requests slightly edited to reduce overlap resulted in an estimate of nearly $190,000 as our needs for the next four years. This was submitted to the IUGG Finance Committee as our needs.

It would be irresponsible of us, however, to adopt such a large figure as an official budget for the next four years because the IUGG allocation will be much smaller than this. I can report that yesterday the IUGG Council increased the value of the unit of subscription to $800 to become effective in 1977. There are indications that the Finance Committee will recommend an allocation of $19,000 - $20,000 for IAGA. This will allow a budget of approximately $90,000 compared to $56,000 for the last four years (exclusive of special grants). This larger budget includes a reduction of our reserves by about $20,000.

SYMPOSIA AND SPECIAL MEETINGS

Our past president Professor T. Nagata was honored at a scientific conference on Magnetic Fields - Past and Present, at the University of Pittsburgh, on 3-4 June 1974, on the occasion of his retirement as Director of the Geophysical Institute at the University of Tokyo.

The Second Workshop on Electromagnetic Induction in the Earth was held in Ottawa, Canada, 22-28 August 1974. The Third Workshop on this topic will be held at Sopron, Hungary, in July 1976, with Dr. A. Ádám acting as convener. These workshops are well attended and seem to be filling a real need.

EXECUTIVE COMMITTEE

The Executive Committee met on the following occasions since the last General Assembly: Madrid, Spain, 8-10 May 1972 (see IAGA News No. 11 for minutes); Kyoto, Japan, 8-21 September 1973 (see IAGA Bulletin No. 35 for minutes); Moscow and environs, 12-16 August 1974 (see IAGA News No. 13 for minutes); an additional meeting will be held during this Assembly.

RELATIONS WITH OTHER ORGANIZATIONS

IAGA continued its contacts with many other ICSU bodies. One of the most important cooperative moves has been the establishement of five joint working groups between IAGA and URSI. Two of these "The Auroral Oval and its Extension into Space" and "Physics of the Plasmapause" were approved by IAGA at Kyoto and three more were established by an agreement signed at the time of the COSPAR meeting in Sao Paulo, Brazil, 24 June 1974. IAGA also has a joint committee with IAMAP on "Stratospheric and Mesospheric Processes." A profitable effort in which IAGA has played a very important role is The International Magnetospheric

Study (IMS). Dr. J. G. Roederer, who is chairman of the SCOSTEP IMS Steering Committee, and is also a Vice-President of IAGA, has been very active in promoting IAGA efforts in the IMS.

In conclusion, I would like to thank all the individuals who have helped me in this position as General Secretary; both for this Assembly and for the past 12 years. The former Commission Chairmen and now the Division Chairmen, Working Group Chairmen and Topic Reporters have all been very helpful. I would like to give special thanks to former Presidents Marcel Nicolet and Takesi Nagata and to our present President Valeria Troitskaya.

Leroy R. Alldredge
General Secretary

PRESIDENTIAL ADDRESS
by
President V. A. Troitskaya

Mesdames, Messieurs,

Notre vrai plaisir collectif d'être aujourd'hui réunis à Grenoble est dû à l'aimable invitation reçue du Comité National Français de Géodésie et Géophysique et je veux remercier particulièrement le Président de ce Comité, M. Georges LACLAVERE, le membre du Comité d'Organisation, M. Gilbert WEILL, pour le grand travail effectué et beaucoup des autres collègues français pour cet accueil magnifique et les moyens de travail pour les 40 symposia dans lesquelles participe IAGA.

Nos réunions se tiennent dans des pays variés et des pays de "Soleil Levant" où se tenait l'Assemblée scientifique de l'IAGA deux ans avant, maintenant c'est la "douce France" qui nous accueille et qui par elle-même, sans parler de l'intérêt du programme scientifique, a attiré par son charme, un nombre de participants sans précédent. Permettez-moi maintenant de continuer en anglais.

It is with deep sadness that I must note that during the last two years our community has suffered the loss of well-known scientists and friends: Drs. Neil Brice; Alfred Zmuda; James Armstrong, and James Stagg. We keep a moment of silence in memory of our departed colleagues.

Changes in conceptions and techniques during the last decade have shaken every institution and have even transformed the trends of individual human life. Therefore, it is no wonder that IAGA had to readjust its fields of research, as well as its internal organization and external ties, first, it had to react to the great discoveries in ionospheric, magnetospheric and planetary physics, and in aeronomy; second, it had to take into account the revolutionary changes of conceptions in solid earth geophysics and geotectonics to which geomagnetism, rock magnetism and paleomagnetism have contributed with creative genius and power of insight. Moreover, fundamental investigations in geophysics continue to bring together previously independent directions of research. The results of these investigations, besides the scientific value of their own, allow geophysicists to point out to society the practical value of a variety of these results, many of which are in the domain of geomagnetism and aeronomy.

Responding to the growing importance of environmental problems and the requirements to scientists in many countries to concentrate their efforts

on dedicated to applied so-called relevant problems, the activity of IAGA is developing also in this direction. We have at this Assembly several symposia dedicated to applied problems, namely, earthquake prediction, interconnection of magnetospheric processes with large-scale atmospheric circulation and possible effects of solar activity on weather, as well as other important problems connected with the state of our immediate environment.

Recent years also marked the beginning of the new era of in situ studies of other planets, in which our knowledge of the planet earth is used as reference in vast spaces of the universe. Geophysical techniques were successfully applied in the case of investigations carried out on the moon, and to a more or less extent this is also true for other planets. In turn, results of these investigations give us a new insight into our own planet.

Therefore, at this stage of space research, the earth sciences are being transformed from the study of one planet into comparative studies of many planets and other celestial bodies. Comparative studies of planets and small bodies of the solar system, which are at different stages of development give, for instance, the possibility to look into the history of the solar system and, therefore, to have a new look into the history of the earth. It is evident also, that studies of naturally occurring plasmas in the near-earth space, in which IAGA is actively engaged, provide a major impetus toward the understanding of other planetary environments.

Rotating magnetized plasmas seem to be a common feature of the universe. The one which is available for direct and detailed investigations, and which is a much better approximation to other cosmic environments than any laboratory simulation is the earth's magnetosphere. Knowledge gained in magnetosphere-ionosphere research proved to be unique and indispensable in interpreting new results from isolated flyby encounters with distant planets.

In consequence, the studies of planets and their environments represent a quite natural trend of development of the investigations in which IAGA is traditionally involved.

The widening of horizons of geophysics in general, and that of the fields of research in the framework of IAGA in particular, made a significant impact on the scope of IAGA's investigations. In consequence, and bearing in mind the responsibility of IAGA to find appropriate ways to serve the scientific community, an internal reorganization of IAGA was carried out at the Assembly in Kyoto. The last two years have witnessed the practical implementation of this structure, and the establishment of new constructive and practical forms of interaction with other international leaders, in order to diminish as much as possible overlapping interests and organization. I am confident that IAGA in the coming years will

continue to encourage and intensify this cooperation.

The new structure of IAGA encompasses five divisions, each having appropriate number of topical subdivisions represented by Reporters. Initally only one Reporter was appointed for each subdivision. An adjustment, which is required to achieve a better geographical and national balance, needs to be carried out mainly at this Assembly, taking into account suggestions made and experience gained until now. Internal Working Groups should be established in each division as the need arises, with well-defined tasks and with a prescribed period of time in which to accomplish them.

All this shows that IAGA is still in a transition period and that its new structure has to be further elaborated and consolidated. To bring order and clarity in our acitivity, we have to reconsider our Statutes and By-Laws and pay due attention to the already proposed alterations and methods of handling the alterations. IAGA also must take a serious look at the existing proliferation of symposia and should make every effort to help minimize their number and ensure highest quality.

Effective contacts with other international bodies to arrive at an optimized coordination of activities, rational elaboration and implementation of international projects for which IAGA is a natural home -- all this can be achieved only if IAGA is given the necessary financial support. IAGA has presented its case to the IUGG Executive Committee and got more money, but the existing funds are definitely far from the minimum basis which is needed for the fulfillment of its goals and obligations. Additional financial sources have to be sought.

Now I shall briefly describe some of the main directions of research in which IAGA Divisions have worked during recent years, and some of the results which the Division Chairmen and some of the Reporters have communicated to me. Of course, this description is far from complete and should be considered only as a brief summary of IAGA activities.

DIVISION I - INTERNAL MAGNETIC FIELDS

New data on the magnetic fields of the moon, Mercury, Venus and Jupiter were obtained recently. This information is important since it should give us some insight into the mechanism of the earth's magnetic field. The theory of this field has been developing rapidly. Precessional torques have been virtually eliminated as a driving mechanism leaving convection provided by super adiabatic thermal gradients as the most physically plausible explanation. Steady progress is being made on the difficult problems involved in the theory of an electrically conducting, rapidly rotating, viscous fluid with a distribution of heat sources. Models of

thermally driven dynamos have been completed and are related to physical parameters such as the heat flux from the core. Theories of the variety of wave phenomena possible in the core have been influenced by the recently identified periodicities in secular variation.

One of the most exciting new discoveries is that the paleomagnetic field can no longer be considered that of an axial dipole but instead appears to have substantial zonal harmonies of the type observed today. It is conjectured that such results, coupled with detailed analyses of the historical secular variation, should lead to an explanation of the mechanism of field reversals including the long term changes in the average frequency of this phenomenon. It is expected that these results will be pertinent to the understanding of the physical processes operating near the core-mantle interface.

New investigations of the structure of the geomagnetic field have been made by earth satellites which show the presence of long wavelength anomalies. These newly found features appear to be related to the gross tectonic structures of the earth's crust.

DIVISION II - AERONOMIC PHENOMENA

Division II is concerned with aeronomic phenomena in mesospheres, thermospheres, ionospheres, and exospheres of the earth and planets. Stratospheric-mesospheric relations are studied through joint activities with IAMAP.

During the last years it became clear that the upper atmosphere is a much more dynamic entity than had been believed earlier. The energy input comes not only from the long ago recognized solar EUV absorption but also due to the energy input into the auroral zone associated with particle precipitation and joule heating. Moreover, not only the auroral zone energy is carried to low latitudes by winds and waves, but the dissipation of wave energy propagating up from lower atmosphere appears to be significant. These recent developments in aeronomy have shown the necessity of considering together processes in the stratosphere, mesosphere, ionosphere, exosphere and magnetosphere. New connections between different emissions and a number of upper atmosphere parameters with geomagnetic activity were discovered.

The whole subject of the influence of solar disturbances on the lower atmosphere is of considerable relevance to human affairs and is being comprehensively discussed at this meeting.

Another development, which is of direct significance to future human well-being, has been the recognition of the fragility of the ozone layer to man-made and natural perturbations, and the consequent danger of exposure of people all over the world to harmful ultraviolet radiation if much of the ozone is destroyed. Its changes would lead also to climatic changes.

It is interesting to note, that recently it has been recognized that there is a large production of nitric oxide during penetration of energetic protons into the polar cap following solar flares, and this may also have an effect on ozone and climate.

In view of the historical concern of IAGA with aurora in polar regions and of new topics, especially connected with equatorial phenomena, to which attention is drawn during the period of the IMS, I would like to mention the recognition of a phenomena, which might be called the aurora equatorialis. This is an optical emission resulting from energetic particle precipitation near the magnetic equator. The emission rates are well below the visible threshold, but are detectable with sensitive instruments. Another equatorial phenomenon, that has been discovered, is the presence of metallic ions, apparently of meteoric origin, which have been raised to several hundred kilometers altitude. These may play a significant role in the generation of ionospheric irregularities at night.

New exciting findings have taken place during the recent years as regards the chemical composition, photochemical processes and energy balance in the upper atmospheres of the Earth, Venus, Mars, Mercury and Jupiter.

DIVISION III - MAGNETOSPHERE

The exploratory phase of magnetospheric physics is approaching its completion and with increased knowledge of dynamical processes in the magnetosphere there emerges the prospect of a new phase, characterized by active experimentation in the only cosmical plasma within man's reach. It is obvious that the results of such experiments can be extrapolated to be used in astrophysical and cosmological problems.

The recent advances in magnetospheric physics lead to the increasing awareness that in various magnetospheric phenomena the key role is played by dynamic processes, such as substorms, wave-particle interactions and by a great variety of instabilities occurring in the magnetosphere plasma. It is during the last years that the conceptions on the structure of the polar cusps and processes developing these regions representing the boundary between the closed and open field lines over the dayside magnetosphere, were developed. Classification of variations of geomagnetic field occurring in this region and having unusually high coefficients of correlation between their parameters and the properties of the interplanetary magnetic field was elaborated.

A boundary layer of flowing plasma in the high latitude magnetosphere - the plasma mantle was discovered and investigated.

These studies have led to changes in the conceptions on structural elements of the magnetosphere. For instance, the conception on the magnetopause as a net boundary between the zone of the intensive thermalized plasma in the magnetosheath and the zone where such plasma is absent inside the magnetosphere seems to be incorrect. The asymmetry of the plasmapause in the direction "day-night" was discovered and this obliges one to consider, from a new point of view, the problem of the magnetospheric convection.

Investigations in space showed drastic changes in the positions of the boundaries of the main structural elements of the magnetosphere, observed during severe magnetic storms. It has been realized that the so-called field aligned Birkeland currents intimately link the magnetosphere with the high latitude ionosphere, so that electrically and dynamically they form a unit.

A new phenomenon, which may be related to plasma instabilities driven by the Birkeland currents, is that, of intense terrestrial kilometric radiation, which makes the Earth comparable to Jupiter as a planetary radio source.

A recent development of great interest is the availability of data from still other magnetospheres, namely those of Jupiter and Mercury, the latter with basic features similar to those of the Earth's magnetosphere.

Although relatively limited, these data are a highly valuable input to magnetospheric physics and open, for instance, new ways to understanding the mechanism of the magnetic dynamo of planets.

Detailed new data on particle populations existing in the magnetosphere or precipitating from it and the establishment of the presence of high-energy heavy ions in the magnetosphere, have exciting implications concerning the interplay between the magnetosphere and the upper ionosphere and concerning the acceleration processes that operate in this dual plasma system.

DIVISION IV - SOLAR WIND AND THE INTERPLANETARY SPACE

Exploration into deep space has allowed a comparative study of the interaction of the solar wind with the moon and all the planets from Mercury to Jupiter, bodies with very different atmospheric and magnetic characteristics. It has also allowed us to measure solar wind properties for distances from 0.3 to beyond 5 astronomical units. It is interesting to note, that at a distance of 0.3 astronomical units significant oscillations of the velocity of ions, of the ion temperature and of the magnetic field, were discovered.

Electron temperature distribution was obtained in the range between the orbits of the Earth, Venus and Mars. These data are of great importance for elaboration of the model of the solar wind. From these data the heat flux from the corona into the solar wind can be derived and calculations of cosmic ray modulation can be based for the first time on the measured radial dependence of magnetic irregularities in the

planetary space.

In the course of the Apollo launches important results were obtained as regards the chemical composition of the solar wind. The specimens brought from the Moon illuminated the history of the solar wind and, particularly allowed one to conclude that the solar wind fluxes were in the past more intensive than now. Great progress is also being made in actually relating changes of solar wind properties to observations and processes in the corona and at the solar surface.

DIVISION V - OBSERVATORIES, TECHNIQUES, INDICES, DATA

Investigations of recent years have led to new forms of cooperative studies involving observatories, special profiles of stations, and simultaneous observations on balloons, rockets and satellites. These studies produce new requirements for the methods of data acquisition, to the ways and means of the exchange of information, to the possibility of making it available to all the scientific community, and finally, to the methods of data processing. As a result of these requirements efforts are directed to automatization of observatories and installing equipment with digital output. Usually the metric characteristics of the equipment remain the same, but the digital output quickens significantly the gathering and processing of data in special Centres. These systems, unfortunately not yet widely spread, allows one to achieve a high degree of effectiveness in data processing, their standardization, and gives new possibilities for intercomparison of a variety of different data. The development of auroral scanners for rockets and satellites, has provided a new and detailed picture of global distribution of aurora, which had a significant impact on conceptions of magnetospheric physics. Another important achievement in the investigations of aurora is the development of television systems which permit the study of pulsating aurora in several wavelengths with high resolution.

In connection with these developments changes also occurred in the form of data storing and their distribution by WDC's. For instance in the new consolidated Guide, which was published in December 1973, in the section "Geomagnetism" a wide international exchange of data in a form ready to be introduced in the computer is envisaged. Moreover, and this is a new trend, WDC's collect data for the periods of special projects and retrospective intervals. They are usually more unified, and they have the same form for the intervals of time determined in advance. Many questions arise in connection with utilization of these data, for instance what kind of additional analysis has to be done at each station for these intervals? Significant concern was given to the elaboration and analysis of different indices characterizing either the geomagnetic activity, or some parameters of the near earth space.

The scientific community has to answer which of the new existing indices are really needed for a general use. One of the most important questions is also the determining of the need for new methods of the analysis, both for the already existing data and for the wealth of surface and satellite data which will be flowing during the IMS. The sheer amount of these data can ensure the sufficient statistical accuracy which can be achieved in many different investigations, but there exists also a real danger of being submerged in the vast accumulation of the undigested data. Therefore, it would be a great mistake to under-estimate the magnitude of the challenge which presents their rational utilization.

The importance of discussions on these problems lead to the organization at the IUGG Assembly, on suggestion of IAGA, of an inter-association symposium dedicated to processing of series of geophysical data. The new experiences and development in technique of observations will be discussed at a special IAGA symposium.

In the near future, due to efforts of the MONSEE Steering Committee a Directory of MONSEE stations will be published, which will contain information on observations and techniques at more than 1,000 observatories supporting research in STP. This directory will be of great help to a wide community within and outside of IAGA.

Looking into the future, regarding research and international cooperation, we have to recognize that the ever growing importance of the solution of environmental problems makes the understanding of the earth, the sea, the atmosphere and near earth space of vital practical value; no field of scientific endeavor is more closely connected with the prospects of man's future. As regards cooperation I have to note that the major framework for most extensive international cooperation during the next years in the fields covered by most of the IAGA divisions will be the project International Magnetospheric Studies (IMS). The IMS program was developed by SCOSTEP in close association with IAGA, and at this Assembly a two-day workshop will be held in which final details of its scientific program and of the needed services will be worked out. In connection with this, it is important to stress once more that with the end of the era " exploration" in near-earth space, begins the stage of "understanding", which requires the continuation of an active near-earth research program consisting of satellite and ground-based observations, and of sophisticated active experiments designed to test a variety of hypotheses and theories. It is quite clear that, in addition to improvement of the fundamental knowledge of magnetospheric physics, this is the only way to illuminate, fertilize, and significantly enhance, the returns from all other large planetary exploration programs.

Besides the IMS, IAGA is, or will be, participating in a number of exciting international projects dealing with investigations of the solid earth and oceans, namely the Geodynamic Project, the International Program of Ocean Drilling, and the International Program of Magnetic Stratigraphy. IAGA also makes important contributions to the projects concerned with investigations in the interplanetary space, and to a variety of other international programs dealing with phenomena in the stratosphere, thermosphere, mesosphere, ionosphere and exosphere.

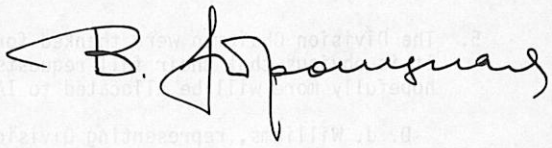
The scientific community considers IAGA responsible for producing a number of basic models - The International Geomagnetic Reference Field; Global Models of the Upper Atmosphere and Ionosphere; Global System of Winds; Quantitative Models of the Magnetospheric B-Field, and so on.

I am confident that the IAGA Divisions will find ways to fulfill energetically all these obligations, and thus serve the international scientific community.

In conclusion, I would like to make two remarks: First, during recent years the cooperation with other international bodies was nurtured and fostered by IAGA, because in our time it is more evident than ever that the vitality of an organization and the so much needed peace for effective work can only be achieved by opening the gates; not by building fences. Second, the most effective organizations with good internal health are those in which there is a full participation of its full membership in setting the goals and making the most important decisions. I sincerely hope that everyone present will contribute to every aspect of work we have to do here to the benefit of all sciences represented in IAGA.

В ЗАКЛЮЧЕНИЕ Я ХОЧУ ПОЖЕЛАТЬ ВАМ УСПЕШНОЙ РАБОТЫ, ПОЛЕЗНЫХ И ИНТЕРЕСНЫХ ВСТРЕЧ, КОНЕЧНО, ХОРОШЕЙ ПОГОДЫ И ПРИЯТНОГО ВРЕМЯПРОВОЖДЕНИЯ В ЭТОЙ ПРЕКРАСНОЙ СТРАНЕ.

СПАСИБО ЗА ВНИМАНИЕ.



EXECUTIVE COMMITTEE MINUTES

MEETING HELD IN GRENOBLE, FRANCE

The first session of the Executive Committee meeting was held on 23 August starting at 9:45 a.m. Members present were: V. A. Troitskaya, G. M. Weill, J. G. Roederer, M. Nicolet, O. Schneider, A. J. Dessler, J. W. Dungey and L. R. Alldredge. N. Fukushima was present as adjoint secretary. T. Nagata arrived later and attended subsequent sessions.

A letter was received from R. Turajlic explaining that he was unable to attend. His letter contained opinions regarding some agenda items. Several sessions were held concluding with the final session on the afternoon of Thursday 4 September.

MEETINGS WITH DIVISION LEADERS

In company with the Division Chairmen the following points were discussed before the scientific sessions started.

1. All resolutions must be submitted by noon on Saturday, 30 August. Since resolutions are printed and distributed to delegates before the final plenary session and can therefore be voted on by number without reading, they should contain more justification than in the past. Each resolution must be approved by the IAGA Division or Commission before being submitted.

2. Division reports on the highlights of the assembly should be submitted to the Secretary before the Division Leaders leave Grenoble.

3. Divisions should submit preliminary plans for topics for the Seattle Scientific Assembly, to be held in 1977, by noon 1 September. N. Fukushima will act as chairman of a program committee to work during this assembly and for at least a year. These plans will then be further refined at an Executive Committee meeting a year from now.

4. Satisfaction was expressed and thanks were given for the good work of the Division Chairmen since the Kyoto Assembly. The policy of having Division leaders retain their positions for at least four years (between general assemblies) was stressed. The minimum term for the present officers should be six years because they were installed midway between general assemblies. Division I was asked to reconsider their decision of plans to rotate leadership at this assembly.

5. The Division Chairmen were thanked for submitting budget estimates. It is obvious that their full requests cannot be provided, but hopefully more will be allocated to IAGA by IUGG in the future.

D. J. Williams, representing Division III, pointed out that there are still too many scientific meetings held on subjects of interest to IAGA and that greater effort should be made to coordinate and combine

meetings. It was agreed that IAGA should not cosponsor meetings until the exact date and proposed content of the meeting is determined.

To expedite cooperative planning for the Seattle Scientific Assembly with IAMAP, several Executive Committee members were instructed to help Division II work with the Ad Hoc Joint IAGA/IAMAP Working Group on Stratospheric and Mesospheric Processes during this assembly. It was also suggested that the members of the Joint IUGG(IAGA)-URSI Working Group on the Stratosphere-Mesosphere-Ionosphere Interactions might be engaged for this purpose.

On 1 September the Exectuive Committee met again with the Division Chairmen. Each chairman gave a report on the activities of his Division during the first week of the Assembly.

J. C. Cain, chairman of Division I, reported that he was retiring and the K. M. Creer had been nominated to be the new Division Chairman. This nomination was approved later by the Executive Committee. Some Working Group Chairmen are being replaced.

B. A. Tinsley, chairman of Division II, reported that there has been some talk in IAMAP about their Upper Atmosphere Commission holding a special session in Banff, Canada, prior to the Seattle Assembly. They should be encouraged to omit things of interest to IAGA so they can be included in joint sessions at the Seattle Assembly.

Special attention must be given to the question of joint sessions with IAMAP at the Seattle meeting in 1977. B. A. Tinsley and J. B. Gregory will take a strong personal interest in this problem.

C.-G. Fälthammer, chairman of Division III, reported that because of the URSI reorganization that deemphasizes geophysics not directly related to Radio Science, URSI has abolished their former connection with the URSI-IAGA Joint Working Groups on "Auroral Oval and Its Extension into Space" and "Physics of the Plasmapause". Division III is abolishing the second of these but will keep the first with the same chairman and vice-chairman. They may change the name of this Working Group a little. Two new Joint URSI-IAGA Working Groups on "Passive Electromagnetic Probing of the Magnetosphere" and "Wave Instability in Space Plasmas" may be established, each with two co-chairmen. M. J. Rycroft will represent IAGA on one of these new Working Groups. All

topic reporters were retained in Division III with the Exception of R. Gendrin who resigned.

J. Geiss, chairman of Division IV, reported that Division IV will retain the five topics it has had. Some reporters do not wish to be retained. In the future each topic will have only one reporter but will have several correspondents to help the reporter. J. Geiss wants to retire as chairman of Division IV. The present co-chairmen were recommended as candidates for the position. K. I. Gringauz was appointed later by the Executive Committee to be the new chairman of Division IV. The solar wind is being treated by many organizations: SCOSTEP, COSPAR, IUPAP, IAU, IUGG, and an independent organization, the Asilomar Conference (a place name near Santa Cruz, California). Another Asilomar Conference is planned to be held near Seattle one week before the IAGA-IAMAP Assembly. IAGA cannot cosponsor a separate restricted meeting near the time of an IAGA Assembly. If no compromise can be worked out, Division IV will plan its own meeting. President Troitskaya made it clear that the scientists from the USSR cannot go to another place near Seattle before or after the Assembly. J. Geiss, C.-G. Fälthammar and A. J. Dessler were appointed to meet with C. Russell to try to resolve this problem. Their resolution is reported under the heading IAGA Seattle Assembly 1977.

P. H. Serson, chairman of Division V, indicated that most working groups will continue with little change. The present topic No. 2 on "International Geomagnetic Survey by Satellites" may be changed to a working group in view of the USSR satellite MAGIC expected to fly in 1977 and the component magnetometer survey satellites being discussed by the USA for 1980. The possibility of establishing an Incoherent Scattering Working Group was discussed in view of the fact that URSI is no longer looking after this topic.

IAGA STATUTES AND BY-LAWS

In response to an action taken at the Opening Plenary Session, the Executive Committee appointed the following committee to consider modification of the IAGA Statutes and By-Laws: J. O. Cardus, Spain (chairman); C. M. Carmichael, Canada; B. R. Leaton, U. K.; M. Petit, France; A. Powsner, USSR, and B. A. Tinsley, USA.

The Committee is to start with the proposal as originally submitted

by the USA, and changes to this proposal already submitted by the French, United Kingdom and Canadian delegates. The committee is to complete its work early enough to send copies of its final proposal to all National Committee members at least six months before the Seattle Assembly. Member countries will be invited to approve this proposal by mail before the Seattle Assembly or be prepared to vote on the question at the Seattle Assembly.

RELATION WITH IUGG, URSI, AND OTHER IUGG ASSOCIATIONS

The President and Secretary attended meetings of the IUGG Executive Committee and Council. Some of the items which were approved at one or both of these meetings that are of particular interest to IAGA were reported to the IAGA Executive Committee as follows:

1. The value of the Unit Subscription was increased from $600 to $800.
2. The IUGG President indicated that he now felt the Associations of IUGG could be catagorized as follows:
   (a) IAG and IAGA are two large Associations which should receive equal annual allocations of approximately $19,000.
   (b) IASPEI, IAMAP, and IAPSO are three medium sized Associations which should receive equal annual allocations of approximately $14,000.
   (c) IASH and IAVCEI are two small Associations which should receive equal annual allocations of approximately $10,000.

   The increase in the value of the Unit of Subscription may permit these numbers to be increased.

The Committee as a whole, as well as the Acting Chairman of the Finance Committee, agreed that this was a fair classification.

3. The proposed Rules for Inter Union Working Groups formed by IUGG (involving IUGG/IAGA and URSI) were not approved. IAMAP objected to the inclusion of the terms stratosphere and mesosphere in supporting documents. Prof. Coulomb pointed out that an agreement between two unions requires ICSU approval. President Charnock decided that a commission in URSI which would be at the same organizational level as IAGA should be identified. An agreement could then be made between those two units without the need of Union or ICSU approval.
4. The Interassociation Commission on Tides and Related Phenomena was not approved. Two associations were reluctant because they already contain commissions on tides. President Charnock ruled, with the agreement of those present, that informal arrangements could be made among two or three associations without any union approval or financing. If more than three associations are involved, union action should be taken to form an Interassociation or Union Commission. Further action may be taken on the question of a

Union Commission on Tides after the outcome of the Interdisciplinary Symposium on Tidal Interaction, being organized by O. Schneider for this assembly, is known.

5. Further action on the proposed Solar System Decade is awaiting the results from a COSPAR ad hoc committee on this topic.

6. Retiring Association Secretaries were appointed to a committee chaired by Mr. George Laclavère to consider the future of the IUGG Publication Office. A major change must be made because the retirement of Mr. Laclavère from his former government post will limit the facilities available to him.

President Troitskaya and Vice-president J. G. Roederer noted that A. Nagy was the official IAGA representative to the URSI meeting in Lima earlier in August. URSI has done some reshuffling of commissions, the details of which will be forthcoming. It is know, however, that URSI has decided to concentrate more on radio science and items directly related to it and to leave most of the geophysics to IAGA(IUGG). IAGA must make sure that ionospheric physics is adequately cared for in Divisions II and III.

G. M. Weill, a member of the IUGG Committee on Geochemistry, recommended that IAGA nominate, H. I. Schiff as an additional member of the Committee. Dr. Schiff would be a good candidate for General Secretary of the committee.

M. Nicolet is willing to continue as the IUGG representative to COSPAR provided all Associations are more responsive to his requests for needed information from them for a better representation of the entire Union. (Subsequently, the IUGG Council did reappoint M. Nicolet to this post with J. London as an alternate.)

O. Schneider noted that representatives of various Associations met following the conclusion of the Interdisciplinary Symposium on Tides to discuss the earlier proposal for an Inter-Association Commission on Tides. Their conclusion, which Dr. Schneider will report back to the IUGG Executive Committee, is that the original proposal should be replaced by one calling for a Joint IAGA-IAMAP Working Group on the Tides.

A proposal from K. Runcorn that the Association should take some definitive action on the proposed International Solar System Decade (ISSD) was not approved. IAGA is already well represented on the COSPAR ad hoc committee considering the ISSD.

The Executive Committee endorsed the establishment of a Joint IASPEI-IAGA Inter-Association Commission or Working Group on Planetology, but preferred the name of Planetary Sciences. The Executive Committee agreed that K. Runcorn, D. Hunten and O. Vaisberg should be asked to represent IAGA on this Commission for the Quadrennium (1975-1979). The Executive Committee accepted E. A. Flinn as chairman as proposed by IASPEI.

Note was taken of the fact that Division III has already appointed a group of scientists, chaired by W. P. Olson, to help develop a "quantitative working model of the magnetosphere" in response to an IMS Steering Committee resolution requesting IAGA's assistance in establishing an ad hoc working group to cover this problem.

The question of participation in a project "Standard Earth-Preliminary Discussion on Contents and Volume of Parameters Specifying Modern State of the Earth" as proposed to the IUGG Executive Committee by N. V. Shebalin was discussed without reaching a definite decision. Following a later preliminary planning meeting on this topic chaired by Dr. Shebalin, President Troitskaya asked that Divisions I, II, and III be requested to appoint one scientist each to an informal group to help Dr. Shebalin further investigate this topic. (Editor's Note: J. C. Cain, L. G. Jacchia and W. P. Olson were finally appointed.)

The Executive Committee agree to the following sponsorship of meetings:

1. The Third Workshop on Electromagnetic Induction in the Earth, to be held July 5-12, 1976, in Sopron, Hungary. Dr. A. Ádám will be the convener. This workshop will be conducted without direct money from IAGA. The Hungarian Academy of Sciences and the Geophysical Research Institute of Hungary will provide support.
2. The International Symposium on Solar-Terrestrial Physics, to be held in Boulder, Colorado, June 7-18, 1976. This symposium is being sponsored by the American Geophysical Union, COSPAR, and SCOSTEP in addition to IUGG/IAGA. The hosts will be the University of Colorado, the University of Denver, the National Center for Atmospheric Research and the National Oceanic and Atmospheric Administration. D. J. Williams and J. G. Roederer are co-chairmen for the symposium and the program. (This sponsorship was originally approved over a year ago.)
3. The Fifth International Symposium on Equatorial Aeronomy (ISEA), to be held at the James Cook University of North Queensland, Townsville, Australia for one week starting 23 August 1976. S. Matasushita is chairman of the organizing committee and H. Rishbeth has been invited to be the co-chairman. IAGA will

finance one representative to be named later.

4. Symposium on Minor Constituents and Excited Species, to be held in early June 1976 in conjunction with the COSPAR meeting in Philadelphia. M. Ackerman and L. Thomas will be asked to represent IAGA on the organizing committee.

5. Symposium on Active Experiments in Space Plasmas, to be held in June 1976 in conjunction with the COSPAR meeting in Philadelphia. It is not clear yet, but it is thought that items 4 and 5 may be moved to Boulder, Colorado by COSPAR in cooperation with item 2.

It was agreed that IAGA's planning for symposia sometimes suffers from incomplete information on symposia being planned by other bodies. To improve the situation the new General Secretary will be instructed to compile and distribute yearly to both IAGA Division leadership and adhering bodies, a list of meetings within IAGA's field of interest, in which significant international attendance is expected.

REPORT FROM NOMINATIONS COMMITTEE

T. Nagata, chairman of the Nominations Committee, presented a tentative report on August 30, and a final report on September 1 to the Executive Committee. He explained that the Nominations Committee considered all proposals from various sources and paid attention to a best possible combination of scientific disciplines and a reasonable geographical distribution. The final nominations were presented as follows:

President:	J. G. Roederer (USA)
Vice Presidents:	G. M. Weill (France
	K. D. Cole (Australia)
General Secretary:	N. Fukushima (Japan)
Members:	M. Ackerman (Belgium)
	L. R. Alldredge (USA)
	V. Bucha (Czechoslovakia)
	A. J. Dessler (USA)
	M. Gadsden (United Kingdom)
	V. A. Troitskaya (USSR) ex-officio as retiring President.

J. G. Roederer suggested the following action, subsequently approved by the Executive Committee, regarding the two vice-presidents positions:

> Considering that in the present IAGA Statutes the specific roles of the two vice presidents are not clearly defined, the Executive Committee has agreed upon a line of action regarding this item that it believes will improve stability and continuity of the administrative and scientific work of the Association. First, the Executive Committee recommends to the Ad Hoc Group working on a revised version of the statutes to propose the institution of a first and a second vice president in which, as commonly done in many international scientific bodies, the first vice

president automatically becomes the president of the Association during the following period. Regarding the second vice president the statutes should state that "if possible, he or she pertain to the country that will host the next General Assembly".

Because of the benefits that such a practice would offer if applied to the period 1975-1978, the Executive Committee, empowered by Article 14 of the present IAGA Statutes, resolved to classify the two vice-presidential positions into the categories of first and second vice president, with the intention to satisfy the above-mentioned specifications. Subsequently, the nominations list should show G. M. Weill as the first vice president and K. D. Cole as the second vice president.

(Editor's Note:- Subsequent to this suggestion, the Statutes Committee did not agree to incorporate this idea into their present draft. The idea is however still available if the National Committees want to recommend it. However the idea was dropped for this Assembly and the slate of nominees as shown above was subsequently elected at the final plenary session without any official distinction being made between the two vice presidents.)

The Executive Committee approved in principle the suggestion by the Nominations Committee of creating honorary membership in the Executive Committee. T. Nagata and L. R. Alldredge were requested to draft details of how this might be implemented. Their report, which was made at a subsequent session, was as follows:

The Nominations Committee in their report to the Executive Committee recommended that an honorary membership in the Executive Committee be established to honor senior scientists who have served the IAGA Executive Committee in outstanding ways over long periods of time.

Following their recommendation the Executive Committee has decided to implement the following ideas.

1. The category of honorary member of the IAGA Executive Committee be established.
2. Honorary members may have a voice in the Executive Committee upon request of the Executive Committee, but no vote.
3. Honorary members shall consist of past presidents who are no longer members of the Executive Committee and who have served at least twelve years on the Executive Committee.

MEETING WITH NEW EXECUTIVE COMMITTEE AND DIVISION CHAIRMEN

The final session of the Executive Committee meeting was held immediately following the Final Plenary Session on Thursday afternoon, 4 September. Newly elected members of the Executive Committee and the newly

appointed Division Chairmen and the retiring Division Chairmen all met with the old Executive Committee.

President Troitskaya greeted the new members of the group. Most of those present spoke a few words of advice or pledged to work hard for IAGA during the coming quadrennium.

The new president elect, Juan G. Roederer, made three main points as follows:

1. He promised to follow the example of President Troitskaya in using wisdom, consideration, strength, and kindness.
2. He will do all he can to help developing countries.
3. For the next Scientific Meeting, he will try to work as hard as Dr. Weill did here at Grenoble.

FINANCES

Union financing of the Interunion Geodynamics project was discussed. Most members felt that money for it should not be given at the expense of IAGA, but that the project was a good one and should be continued.

The General Secretary submitted a revised budget for the next quadrennium. After further modification it was adopted as given at the end of these minutes.

INTERNATIONAL ASSOCIATION OF GEOMAGNETISM AND AERONOMY

Estimate of Income and Expense for period 1975-1978

Receipts	IUGG	Grants & Contracts
IUGG Allocation	$76,400	X
UNESCO Grants	X	X
Other Grants (IUGG Travel)	X	6,000
Contracts with UNESCO, etc.	X	.....
Sales of Publications	2,500	X
Miscellaneous	.....	X
Total Receipts	78,900	$6,000
Estimated Cash on Hand and in Banks Jan. 1, 1975	31,201.52	
TOTAL	$110,101.52	$6,000

Expenditures	IUGG	Grants & Contracts
Administration	$ 42,000	X
Publications	22,000	.....
Assemblies	16,000	$ 6,000
Symposia	.....	.....
Scientific Meetings	.....	.....
Grants (Permanent Services, etc.)	4,000	.....
Contracts with UNESCO, etc	.....	.....
Miscellaneous	2,000	X
Total Expenditures	86,000	6,000
Estimated Cash on Hand and in Banks Dec. 31, 1978	24,101.52	
TOTAL	$110,101.52	$6,000

The Executive Committee agreed that:

1. Centralized control of expenditures be retained in the General Secretary's Office, this will retain the flexibility needed and will not permit Division reserves.
2. The General Secretary should use the attached detailed allocations for Divisions as a general guide, but must adhere to the overall allocations.
3. IAGA should not encourage separate symposia requiring IAGA funding. Most activities should be in connection with Assemblies. For this reason no separate budget item is shown under Symposia.
4. The General Secretary will make every effort to encourage National Committees to provide travel support for their delegates.

DETAILED BREAKDOWN OF THE 1975-1978 BUDGET

	Total	Adminis-trative	Publi-cations	Assemblies
Executive	$50,000	25,000	22,000	3,000
Division I	5,000	3,000		2,000
Division II	6,500	3,500		3,000
Division III	6,500	3,500		3,000
Division IV	3,500	2,000		1,500
Division V	5,000	3,000		2,000
History Committee	250	250		0
Antarctic Committee	250	250		0
External/Internal Committee	1,250	250		1,000
IAGA/IAMAP	250	250		0
IAGA/URSI	1,250	250		1,000
IUGS/IAGA	250	250		0
Permanent Services	4,000			
Miscellaneous	2,000			
IUGG Special Travel Grants	6,000			
	$92,000			

REPORTS OF IAGA ORGANIZATIONAL UNITS

DIVISION I

INTERNAL MAGNETIC FIELDS

J. C. Cain - Chairman

BUSINESS MEETING

The business meeting of Division I was held on 29 August 1975.

A discussion was held regarding the term of office of Division officers. The recommendations adopted by majority vote were:

(a) The name "vice-chairman" replace the name "co-chairman".

(b) An officer be limited to a term of 4-years in a given position.

(c) That the rotation of division officers be phased so that all do not change at the same time.

Symposia for the 1977 Seattle Scientific Assembly were discussed. Agreement was reached on the following topics:

WG-1 Representation of Geomagnetic Field and Secular Variation, a Workshop on the IGRF, and collaboration with Division V on a Workshop Concerning the Construction of Magnetic Charts.

WG-2 Planetary Core Theory and Geomagnetic Secular Variations (Paul Roberts)

WG-1, 2,5,6 Geomagnetic and Paleomagnetic Relations with Weather and Climate (Joint with IAMAP)
(Historical field, B. R. Leaton)
(Paleofield, V. Bucha and R. Thompson)

WG-1, 2, 4 Long Wavelength Anomalies (A. Hahn)

WG-5, 6 Paleomagnetism in Orogenic Belts (R. van der Voo)

WG-1, 2,5,6 Long Term Trends in the Geomagnetic Field (F. J. Lowes and R. Wilson)

WG-6 Rock Magnetism (G. N. Petrova and S. K. Banerjee)

WG 3 Magnetic Induction (focus on deep layers and global distribution) (U. Schmucker)

WG-4 Interpretations of Magnetic Anomalies in Terms of Petrology

WG-6 Stable Remanence: Origin and Alteration Effects (D. J. Dunlop, R. L. Larsen and C. Radhakrishnamurty)

The present plan for the officers was discussed and the following recommendation made for the interval 1975-1979:

Chairman:	K. M. Creer
Vice-Chairmen:	T. Yukutake W. D. Parkinson (1975-1977) D. I. Gough (1977-1979)
WG-1	B. R. Leaton*, chairman A. N. Pushkov, vice-chairman
WG-2	D. E. Winch*, chairman P. H. Roberts, vice-chairman
WG-3	U. Schmucker, chairman A. Ádám, vice-chairman
WG-4	J. Heirtzler, chairman C. C. Weber, vice-chairman
WG-5	V. Bucha*, chairman J. C. Briden, vice-chairman
WG-6	G. N. Petrova, chairman S. K. Banerjee, vice-chairman

* Term to end at Seattle Assembly in 1977. It is assummed that in these Working Groups the vice-chairman will take over as chairman and the designation of new vice-chairmen will be deferred until 1977.

The consensus of the meeting was that younger active scientists should be used in positions of temporary responsibility and that when possible the vice-chairmen should move up to the position of chairman to provide continuity.

The support of Division I for the International Solar System Decade (ISSD) was raised and discussed but no formal vote was taken since the General Secretary reported that it was already being considered by the IUGG Executive Committee. It is the intent of Division I to continue to deal with the magnetic fields and other related interior processes of the planets.

The question of a permanent service for the International Geomagnetic Reference Field (IGRF) was raised but action was deferred until a proposal is made by Working Group I after their meeting on September 1.

The question of establishing an Inter-Association working group between IAGA and IASPEI, on Tectonomagnetism, was raised and it was agreed that Division I would represent IAGA in cosponsoring such a group if there was sufficient interest from IASPEI. T. Rikitake was to explore this possibility and report to Division I at the end of the Assembly. I. Rikitake later reported that the group met and recommended that such a committee be formed and that Malcolm Johnston be asked to be chairman. Further, that a symposium on the subject be convened by V. Shapiro at the Seattle meeting.

The Inter-Union group on Magnetic Stratigraphy was reported as alive and functioning by N. D. Watkins. He agreed to give a summary of their recommendations at the end of the assembly.

ATTENDANCE AT DIVISION I WORKING GROUP MEETINGS

The following table shows the number of scientists and the countries they represented attending the various working group meetings.

Working Group No.	1	2	3	4	5	6
Country						
Australia	1				1	
Argentina					1	
Canada	1	1		2	5	7
Czechoslovakia			1		1	1
Denmark	1	1			1	
DDR Germany	1	1		1		
FDR Germany	4		6	1	1	6
Finland	1					
France	2		2	2	3	3
Hungary			1			
Iceland						1
India					1	1
Italy					1	
Japan	2			1	2	3
Netherlands				4	1	
New Zealand	3	1				
Nigeria					2	2
Norway				2	2	1
Poland			1		1	1
Spain	1					
Scotland						1
Sweden	1					
Switzerland					1	1
Sudan		1				
Turkey		2	1		1	
United Kingdom	7	5	4	2	9	6
United States	11	5	4	6	4	5
USSR			2		3	2
Totals	36	17	22	21	41	41

WORKING GROUP I-1, ANALYSIS OF THE MAIN FIELD AND SECULAR VARIATIONS
B. R. Leaton - Chairman

The meeting of Working Group I-1 was held in two sessions as discribed below.

Open Meeting on the International Geomagnetic Reference Field (IGRF)

An open meeting on the IGRF was held in the evening of Monday, 1 September. Chairman B. R. Leaton conducted the meeting. Thirty-seven scientists were in attendance.

The Chairman reminded those present of the Kyoto 1973 Resolution No. 18 and its explanation on page 22 of IAGA News No. 12. The question was raised as to whether the Kyoto resolution permitted the introduction of only pure secular change terms at this time or whether correction terms could also be added. A majority agreed that the Kyoto proposal permitted only pure secular change terms although it was noted that it was passed by a narrow majority. A motion to proceed as described in the Kyoto proposal came to a 17 to 2 vote. A motion to add secular acceleration was lost 5 to 13.

The two candidate models for IGRF 1975 were discussed. Evaluations of them were reported by F. J. Lowes, N. W. Peddie, D. R. Barraclough and T. Rikitake (reporting for T. Yukutake). These and other results from Scientific Meeting No. 6 (SM6) at this assembly and the Zmuda Conference, held during March 1975, at Colorado Springs, Colorado, USA, were discussed. A motion to adopt the mean of the USA model (AWC75) and the U.K. model (IGS75) for the secular change coefficients, was proposed. An amendment for the IGS75 model to have double weight was lost 10 to 13. An amendment to add coefficients representing 2 years of acceleration was lost 8 to 16. The original motion was then carried.

There were lively discussions about (a) correction terms; (b) discontinuity; (c) revision every 5 years; (d) representation other than by spherical harmonics and (e) number of terms.

There being no clear view as to what form the next IGRF should take, it was suggested that the whole matter be reviewed at Seattle in 1977.

A motion that the IGRF 1975, as agreed upon above, should be assumed to be valid for the period 1975-1980 was carried 17 to 7.

Closed Meeting of Working Group

A closed meeting for the working group was held at 2:00 p.m. on Tuesday, 2 September with 9 attendees for a discussion on resolutions for this assembly.

An emergency resolution was agreed to as follows:

> IAGA recommends that, for the interval 1975.0 to 1980.0, the original International Geomagnetic Reference Field (IGRF 1965) be replaced by International Geomagnetic Reference Field (IGRF 1975).

B. R. Leaton was assigned the responsibility for drafting and publishing notes on the IGRF in suitable journals such as EOS, Geophysical Journal of the Royal Society, Geomagnetism and Geoelectricity, plus a short item for IAGA News.

The structure of the working group was discussed. It was agreed that the following would be proposed to the Division leadership as members of the working group.

B. R. Leaton, chairman (U.K.)
A. N. Pushkov, vice-chairman (USSR)
L. R. Alldredge, (USA)
D. R. Barraclough (U.K.)
N. P. Benkova (USSR)
E. B. Fabiano (USA)
F. J. Lowes (U.K.)
W. Mundt (GDR)
D. E. Winch (Australia)
D. Zidarov (Bulgaria)
T. Yukutake (Japan) ex-officio

It was decided that the working group would have the following small ad hoc committee to deal specifically with IGRF topics: B. R. Leaton, E. B. Fabiano, and A. N. Pushkov. It will be the responsibility of the ad hoc committee to contact other interested bodies such as IUGS, URSI, SEG, IAGA Divisions III and IV regarding their IGRF interests.

The Chairman brought a letter from the Society of Exploration Geophysicists (SEG) which contained proposals for the form of the IGRF (including charts).

Two sessions were proposed for the 1977 Seattle Assembly:

1. Representation of the Main Geomagnetic Field and its Secular Change. This session would cover:
   (a) Parametric representations such as spherical harmonic coefficients, dipoles, multipoles and free vectors
   (b) Solar-cycle effects
   (c) Evaluation of the internal part of the field.

2. International Geomagnetic Reference Field (IGRF). This session would cover:

   (a) Errors of IGRF 1975
   (b) Desirable precision
   (c) Uncertainties
   (d) Updating methods
   (e) Modes of representation

In addition, the Working Group would support Working Group I-4 in its meeting on Long-Wavelength Anomalies.

Discussions were held on the research areas of secular variation and the need for a definitive field without coming to any definite conclusions.

WORKING GROUP I-2, THEORY OF PLANETARY MAGNETIC FIELD AND GEOMAGNETIC SECULAR VARIATION.

D. E. Winch - Acting Chairman

Business Meeting

A business meeting of Working Group I-2 was held Tuesday, 26 September.

The Working Group considered a proposal by T. Yukutake for a symposium to be held at the Seattle 1977 IAGA-IAMAP meeting. After some discussion, it was resolved that the title of the symposium should be: "The Theory of Core Dynamics and Geomagnetic Secular Variations" and convener should be P. H. Roberts.

The resignation of S. I. Braginsky as co-chairman of the working group was discussed, and accepted, with regret. S. I. Braginsky's association with this group has played an important part in ensuring the success of the scientific meeting No. 5 (SM5), "Theory of planetary fields," organized by Working Group I-2 for the Grenoble Assembly.

It was resolved that P. H. Roberts should become co-chairman in place of S. I. Braginsky, (and as noted above be convener of the Seattle 1977 WGI-2 symposium.)

WORKING GROUP I-3, ELECTROMAGNETIC INDUCTION AND ELECTRICAL CONDUCTIVITY (EARTH AND MOON)

D. I. Gough - chairman

During the two-year period ending at the General Assembly of the IUGG at Grenoble, August-September 1975, the membership of the Working

Group has been:

Chairman: D. I. Gough

Co-Chairman: U. Schmucker

Members:

A. Ádám	B. A. Hobbs	O. Praus
A. A. Ashour	P. Morat	T. Rikitake
M. N. Berdichevsky	W. D. Parkinson	T. J. Shankland
J. H. Filloux	G. Porstendorfer	

The Working Group has supported the development of science in its field of interest through organization of specialized Workshop meetings attended by 100 to 150 scientists. The First Workshop on "Electromagnetic induction in the Earth and Moon" was held, in September 1972, at the University of Edinburgh, Scotland. The Review Papers given at the First Workshop were published as a special issue of the journal Physics of the Earth and Planetary Interiors, in September 1973. This volume has become a valued addition to the literature of our science.

The Second Workshop on "Electromagnetic induction in the Earth and Moon" was held in Ottawa, Canada, in August 1974 and was attended by 125 participants drawn from most of the countries represented in IAGA. It was highly successful. The Review Papers given in Ottawa will be published in September 1975, again as a special issue of the journal Physics of the Earth and Planetary Interiors.

Much information has been gathered through observations of time-varying electromagnetic fields, both by means of magnetometer arrays and by means of magnetotelluric studies. As a result many continental areas which exhibit local anomalies of the geomagnetic and geoelectric variation fields from pulsation to diurnal periods have been mapped quite accurately. In the ocean, induction studies have been carried out either by means of observations at the sea floor or by observations on islands. In the latter case the "island effect"is used as a tool to estimate the strength and phase of the induced currents in the open ocean surrounding the islands which in turn are electromagnetically coupled to the deep conductivity structure beneath the ocean. The ultimate goal is a comparison of the deep continental and the deep oceanic conductivity structure down to about 700 km depth. These structures may turn out to be fundamentally different, indicating a deep-seated difference of the respective thermal states. Considerable progress has been made in handling the forward modelling problem

of laterally non-uniform substructures with expedient numerical methods. For the test of such calculations new methods have been developed to obtain analytic solutions in case of special geometries. In addition, the forward problem has been attacked by analog laboratory induction experiments with models on a reduced scale. Various inverse methods for a direct interpretation of observational data have been tested, mainly with regional and global data on the assumption of a laterally uniform substructure. It appears that presently available data allow a depth resolution of 300 km for a modelling error of 25% from zero to 800 km depth. First attempts have been made to tackle the inverse problem for laterally non-uniform structures, if those structures are two-dimensional.

In regions close to the auroral and equatorial jets emphasis has been placed on finding expedient ways of separating magnetic fields observed at the surface into internal and external parts on a regional scale. Here the understanding of the source field structure in time and space remains essential to progress in the field of geomagnetic induction.

Laboratory experiments with rock-forming minerals under high temperature and pressure have now reached a state that determinations of the conductivity under upper mantle (p,T) conditions may be compared directly with conductivity estimates from induction studies. In addition to the well-known temperature dependences of conductivity it is realized now that in the case of olivine the partial pressure of oxygen, i.e. the Fe^{II} : Fe^{III} ratio, is a controlling factor.

Business Meeting

A business meeting of the Working Group was held during the IUGG General Assembly at Grenoble, on August 26. Seven members and sixteen guests were present.

The Working Group plans to hold its Third Workshop on "Geomagnetic Induction" in Sopron, Hungary, July 5-12, 1976. Dr. A. Ádám, Sopron, will be in charge.

It was announced that in 1977 IAGA will meet jointly with IAMAP in Seattle. The possibility that the Working Group should meet instead with IASPEI at Durham roughly at the same time was discussed, but this

break-away from IAGA was considered as ill-conceived and the plan was dropped. It was decided to have a symposium on induction jointly with the Interdivisional Working Group on "Relations between external and internal fields" in Seattle.

Nevertheless, it was realized that better communication should be sought with solid earth geophysicists and those making laboratory measurements with rocks under extreme temperature and pressure conditions. T. J. Shankland stressed the importance of such interconnections which might help to emphasis the importance of geomagnetic induction studies in solving current problems in geodynamics on the basis of improved electric conductivity and thermal models for the Earth's mantle.

At the close of the meeting D. I. Gough resigned as chairman and the co-chairman U. Schmucker assumed the position of chairman. He asked that A. Ádám be appointed as the new co-chairman and those present agreed to A. Ádám's appointment by acclamation.

WORKING GROUP I-4, MAGNETIC ANOMALIES

A. Hahn - chairman

A business meeting of Working Group I-4 was held on Monday, 25 August.

Exchange of Data Information

In response to Circular 1/75 of 21 May 1975 a number of institutes were nominated which are capable of giving information about geomagnetic surveys carried out in a country or in a large area or at sea. A list of addresses of those institutes shall be established and circulated. The members of the Working Group were requested to improve this list by appropriate supplementary information.

A trial to collect the titles of papers dealing with magnetic surveys and their interpretation showed that these papers are published at a rate of approximately one paper per day. Therefore, it is thought useless to establish a list of these titles. Those who want information should make use of the possibilities offered by documentation centers.

Long-wavelength Anomalies

In the circular 1/75 long-wavelength anomalies are described as follows:

> "These anomalies shall be characterized by the wavelength of the harmonics which form the main part of them. The wavelengths range between about 300 and 3000 km. Still longer waves build up the IGRF and shall not be the object of these studies. The following problems should be considered:
>
> 1. How can these long-wavelength anomalies be detected reliably and completely?
> 2. Can the contributions of core and crust be separated?
> 3. How can the crustal part of these anomalies be geologically interpreted?"

D. R. Barraclough suggested that the upper limit of the long-wavelength-interval be put at 1600 km. It seems appropriate consequently to consider an interval of 100-1600 km. The following steps are envisaged:

1. The Institute of Geological Sciences, Geomagnetism Unit, Herstmonceux is requested to compile field data in two areas where there is a good coverage of measurement and make it available in a form so that the long-wavelength anomalies of these areas can be interpreted in terms of magnetization distribution in the crust and/or magnetic sources in the core.
2. When these data are available the members of the Working Group will be informed. The data would be sent for further treatment to those who are interested. It would be appropriate if each interpreter would himself seek a cooperative arrangement with other colleagues in complementary scientific disciplines who are interested in ascertaining long-wavelength phenomena in the Earth's crust.
3. At an appropriate time the organization of a symposium on this topic should be considered

Interpretation of Magnetic Anomalies in Terms of Petrography

This topic is described in the circular 1/75 as follows:

> "The Working Group should try to collect and to study combinations of geomagnetic surveys in areas with outcropping crystalline rocks so that it becomes possible to correlate anomaly types with rock types. Although this correlation may differ from one area to another this attempt seems to be hopeful. Perhaps one can select quantifiable parameters for a description of anomaly types. The following regions will be

of special interest: Africa, Australia, Canada, Japan, Scandinavia, United Kingdom, United States and the Soviet Union."

Obviously this topic is a permanent task of the Working Group. The problem of how to proceed now was discussed.

The participants concluded that it might be most fruitful to ask a number of scientists with broad experience in this field to contribute reviews of their experiences to a book (or papers to a special issue of a journal). It remained open whether or not a symposium should be held before the compilation of such a book. P. Hood, P. T. Taylor and C. Weber were nominated as authors for the proposed book.

Since this activity is to be executed in tight cooperation with Working Group I-6, on Rock Magnetism, the final establishement of this committee was postponed to the business meeting of Working Group I-6 scheduled for Friday, 29 August.

Rock Magnetization by Lightning

The participants accepted the following recommendation:

> Authors dealing with the interpretation of geomagnetic local anomalies are kindly requested to adopt "lightning magnetization" as a keyword for documentation of their article if there is any evidence for such a phenomenon in their object of investigation.

IAGA Meeting in Seattle, 1977

The Working Group proposed to hold a scientific session on "The Interpretation of Magnetic Local Anomalies - Methods and Results" at the Seattle Assembly in 1977.

WORKING GROUP I-5, PALEOMAGNETISM

V. Bucha - chairman

The first meeting of the working group on Paleomagnetism was held on 27 August 1975 with 40 interested people attending with V. Bucha as chairman.

It was resolved that the term of office of Working Group I-5 chairman and vice-chairman should be four years. V. Bucha and J. C. Briden elected in 1973 were therefore confirmed in office until 1977. A recommendation from the chairman of Division I, J. C. Cain, that the vice-chairman should normally succeed to the chairmanship to ensure continuity in administration was noted.

No resolutions were proposed for presentation at the final plenary session of this Assembly.

For the Third Scientific Assembly of IAGA, to be held in Seattle, August 27 - September 3, 1977, the following symposia were proposed:

1. Palaeomagnetism in Orogenic Belts: A paper by F. J. Vine on Alpine-Mediterranean paleomagnetism was noted. A brief discussion on older orogenic belts and problems of analysing polyphase magnetization followed. These topics may form the foundation of the symposium. Convener for the symposium: R. Van der Voo (USA)

2. Geomagnetic and Paleomagnetic Relations with Weather and Climate: This should be as broad a symposium as possible, explaining magnetic-meteorologic correlations on all time scales. The Working Group Chairman is to define content as he envisages it and contact both Working Group I-1 and IAMAP with a view to joint sponsorship. Convener for the symposium: R. Thompson (Scotland)

3. Long-Term Trends in the Geomagnetic Field: F. J. Lowes suggested this title to cover asymmetry and the long term reversal frequency. Convener for the symposium: F. J. Lowes (U.K.) and R. Wilson (U.K.)

Summary of Working Group Activities

An important activity in which the Working Group participated during the last two years was the reconstruction of distribution of continents in the geological past on the basis of paleomagnetic research. New results were obtained for individual geological periods with the aim of making the interpretation of paleomagnetic curves more precise. Many members of the Working Group participated on problems of interest to the Inter-Union Commission of Geodynamics mainly in Working Group 10 "Global Synthesis of Evidence Leading to the Reconstruction of Distribution of Continents and Oceans Through Time" of which D. A. Valencio is chairman. An interdisciplinary symposium "Ancient Plate Margins" convened by J. C. Briden was organized for the Grenoble IUGG Assembly.

Paleomagnetic research of Quaternary and Tertiary rocks concerned the elucidation of fluctuations in the geomagnetic field during times of constant polarity and the fine structure of geomagnetic reversal history. Progress was achieved in identifying and describing the behavior of changes in magnetic declination, inclination and intensity

during several time periods. Two scientific meetings on these topics were organized for this Assembly.

Participants of this Working Group cooperated on problems of magnetic stratigraphy and an UNESCO project "Glaciation of Northern Hemisphere". New trends have appeared showing an application of paleomagnetic results to possible explanation of the changes of climate and weather processes.

A number of fields for emphasis in future research were identified as follows:

1. Investigation of lower paleozoic data and their interpretation.
2. Paleomagnetic Research of Quaternary Sediments.
3. Remagnetization and Resetting of Radiogenic ages in Metamorphic Rocks.

WORKING GROUP I-6, ROCK MAGNETISM

C. M. Carmichael - chairman

A meeting of the Working Group on Rock Magnetism held on August 29, 1975, at Grenoble during the XVIth General Assembly of IUGG was attended by 41 members from 16 countries. It was unanimously agreed that the Rock Magnetism Working Group served a very useful and constructive purpose and should continue on as a permanent working group of Division I.

With the ending of C. M. Carmichaels'term as chairman, G. N. Petrova, the vice-chairman, became chairman and S. K. Banerjee was elected to be the new vice-chairman.

The Working Group agreed to assist Working Group I-4 on Magnetic Anomalies with a project on Magnetic Anomalies and Petrography. This project is an extension of the joint symposium on this subject held in Kyoto, in 1973. It will involve the production of a book on the correlation between magnetic anomalies and the rock bodies that produce them written by a number of experienced workers shown from different parts of the world. The project will be under a committee consisting of P. Hood (Canada) chairman, P. T. Taylor (USA), C. Weber (France), R. I. Wilson (U.K.), and M. Ozima (Japan). The last two names having been selected by the Rock Magnetism Working Group.

It was decided to hold an open session on general rock magnetism in Seattle, in 1977, and also to sponsor a symposium entitled "Stable

Remanence: Origin and Alteration Effects", with D. J. Dunlop (Canada), R. H. Larson (USA), and C. Radhaksrishnamurty (India) as conveners. It is intended that this symposium will include studies on the magnetization of magnetic particles of different size and composition to better understand and identify the carriers of remanence and also studies on the effects of alteration that are being found for example in sediments and submarine volcanics.

The Working Group adopted no resolutions, expressing little sympathy with the types of resolutions that IAGA frequently adopts, declined to list areas of future research affirming its faith in the creativity and fertility of the minds of its members, adopted a rousing vote of thanks and appreciation for the past efforts of the retiring chairman, and adjourned.

REPORT OF THE THIRD MEETING OF THE IUGS-IUGG MAGNETIC POLARITY TIME SCALE SUBCOMMISSION, SEPTEMBER 2ND AND 3RD, 1975, GRENOBLE, FRANCE

N. Watkins - Reporter

The Polarity Time Subcommission is part of the International Commission on Stratigraphy which is part of the International Union of Geological Sciences (IUGS). Formed in 1972, and comprised of representatives from eight countries, the subcommission has met twice, first during the 24th International Geological Congress in Montreal, August 1972; and second, during a meeting of the Geological Society of America, in Miami, November, 1974. A series of recommendations for the establishment of an unambiguous nomenclature in magnetic polarity stratigraphy, which is as consistent as possible with conventional stratigraphic terminology, were produced during these meetings, and several publications have resulted (see the last section of this report). The Subcommission has also been recognized by the International Union of Geodesy and Geophysics (IUGG).

The subcommission met for a third time during the 16th IUGG Congress in Grenoble, France between 5:30 PM and 7:00 PM, on September 2nd and 3rd, immediately following sessions convened by the International Association of Geomagnetism and Aeronomy (IAGA). More than 20 members of IAGA from 14 different countries attended and contributed to the discussions. Members of the Subcommission present were: Dr. P. Burek (Germany), Dr. K. Creer (United Kingdom),

Dr. A. Khramov (USSR, for Dr. D. Pechersky, USSR), Dr. R. Larson (USA), Dr. I. McDougall (Australia), Dr. M. McElhinny, Dr. N. Niitsuma (Japan, for Dr. H. Nakagawa, Japan), Dr. M. Prevot (France), and Dr. N. Watkins (USA).

Debate centered on only two topics, data acceptability criteria, and a nomenclatural problem involving short period geomagnetic field behavior. A summary of the discussions and recommendations is given below.

Data Acceptability Criteria

Because of the current rapid growth in the application of the paleomagnetic method to stratigraphic problems, it was proposed that in addition to establishing a uniform magnetostratigraphy terminology, the subcommission should consider recommending a series of minimum data acceptability criteria in order to discourage the use of possibly misleading results in magnetostratigraphic studies.

Igneous Rocks

Early work on compilation of the polarity time scale included proposals that any paleomagnetic data and K:Ar ages involved should be based on samples from the same body, and that more than one geographically oriented sample should be used for the paleomagnetic determinations. In addition, laboratory methods (such as alternating magnetic field demagnetizing treatment) should be used to minimize unstable components. The subcommission recommended that the same philosophy should govern all magnetostratigraphic work in igneous provinces: at least two separate geographically oriented samples should be taken from each separate body, and unstable components should be minimized by appropriate conventional laboratory procedures. While recognizing that measurement of polarity at the outcrop, using a compass or a magnetometer, can provide valuable stratigraphic information, the subcommission believes that the possiblity of later overprinting of the original polarity (especially during the present period of normal polarity) has been demonstrated

to be sufficiently high to require unstable component examination for any definitive magnetostratigraphic data.

Sediments

It is well known that ancient geomagnetic field directions may not only be imperfectly recorded in sediments because of dynamic distortion during the original deposition, but that post-depositional processes (particularly those of a chemical nature) can lead to overprinting of the original detrital remanent magnetism signature. The subcommission therefore recommends that any definitive magnetostratigraphy not be formally proposed unless multiple sampling of horizons has been made, and that laboratory measurements have included methods appropriate to the removal of unstable components or overprinting. For various reasons, a definitive formal magnetostratigraphy which has been derived for any part of geological time using sediments should ideally be based on data from several sequences involving different sedimentation rates, sediment types, and depositional and post-depositional environments.

Nomenclature and Definition of Rapid Large Swings of the Geomagnetic Field

The subcommission has hitherto considered nomenclatural problems involving only polarity changes. A polarity event is presently understood to be a chronologic unit characterized by a single geomagnetic polarity which lasted between 10^4 and 10^5 years. Polarity epochs, periods, and eras are much longer duration chronologic units. During the last few years in particular, it has been suspected that an even shorter geomagnetic behavior, involving migration of the virtual geomagnetic pole (VGP) to the opposite hemisphere for a period of perhaps only 10^2 to 10^4 years, may have occurred. While it is yet to be demonstrated that such globally behavior is synchronous, and thus due to reversal of the dipole field, the phenomenon has been apparently recorded in sediments and some basalts,

and has been given in the literature names such as 'short event', 'excursion', 'departure', and even 'flip'. The subcommission recommends that the term polarity excursion be employed for the phenomenon, and that all other terms be dropped. The logic for this recommendation is contained in the subcommission's recommended definition of a polarity excursion, which is a sequence of virtual geomagnetic poles which may reach intermediate latitudes and which may extend beyond 135° of latitude from the pole, for a short interval of time, before returning to the original polarity. The polarity excursion can, as with other magnetostratigraphic terms, be locally identified using an appropriate geographic prefix. The preferred definition leaves open the questions of the limits of the duration of the excursion (although our definition of a polarity event requires excursion to be less than 10^4 to 10^5 years), and whether or not the geomagnetic behavior involved is due to dipole or non-dipole field activity. The assumption is made that the associated paleomagnetic data reflect the ancient geomagnetic field direction and the term cannot therefore be applied to data which may be due to other effects.

Publications Resulting From The First Two Meetings Of The IUGS/IUGG Polarity Time Scale Subcommission

- Magnetic polarity time scale, Geotimes, v. 18, p. 21-22, 1973.
- Subcommission on the magnetic polarity time scale, Journal of the Geological Society of Japan, v. 79, p. 319-322, 1973.
- Editorial Comment, in Nature Physical Science, v. 242, p. 65, 1973.
- Magnetostratigraphic nomenclature I - Terminology, Comments on the Earth Sciences: Geophysics, vol. 3, p. 55-58, 1973.
- Correlating stratigraphic zones and magnetic polarities, Geotimes, v. 20, p. 26-27, 1975.

DIVISION II

AERONOMIC PHENOMENA
(Mesospheres, Ionospheres, Thermospheres, Exospheres)

B. A. Tinsley - Chairman

BUSINESS MEETING

The business meeting of Division II was held on 29 August 1975.

The division structure as presently evolved was outlined by the chairman. The Joint Working Groups 1 and 2 with URSI have been dropped by URSI and may lapse. A. F. Nagy indicated that the Joint Working Group 1, "The Auroral Oval and Its Extension into Space", may be resurrected by Division III.

Reports of several Joint Working Groups (JWG) are given below.

IAGA-URSI JWG3, Structure and Dynamics of Thermosphere, Ionosphere and Exosphere.

An open meeting of the Joint Working Group was held August 26, in Grenoble. H. Rishbeth was chairman of the meeting.

Following the setting up of the Joint Working Group last year, its officers have been carefully considering what activities it should undertake. Some proposals were set out in a document (TIE-1) circulated to the appropriate URSI and IAGA mailing lists. The responses are still being received, and were reported upon at the Joint Working Group open meeting. Certain scientists are being approached informally to see whether they would be willing to take charge of specific projects. The Chairmen of URSI Commission 3 and IAGA Division II have been kept informed of the Joint Working Group proposals.

A considerable undertaking, carried out in association with the Joint Working Group activities, has been the organization of the 2-day URSI/IAGA/COSPAR Symposium on "Transport Phenomena in the Thermosphere and Exosphere" which took place during the IUGG meeting at Grenoble. The program committee comprised H. Rishbeth, A. F. Nagy, and M. Roemer.

The Chairman remarked that the functions of the Joint Working Group have evolved considerably from those that seemed appropriate some years ago, e.g. at the setting-up of IUCSTP in 1967. This is largely due to the good work carried out by various specialized groups of URSI, IAGA, IUCSTP/SCOSTEP, and COSPAR. These groups are coping well with many of the problems that exercised the Joint Working Group's predecessors, notably the coordination of different kinds of experimental observations. The value of such coordinated experiments has been amply demonstrated by the progress in upper atmosphere science that they have brought about. The Joint Working Group will do what it can to further this cooperation, but it must clearly avoid duplicating work that is already being done. To this end it is essential to maintain good contacts between the various interested groups. If it becomes obvious that all necessary work is already being done, there is no need to continue the Joint Working Group.

During the open meeting the written suggestions for specific projects suggested as appropriate for the Joint Working Group were discussed, and further projects suggested at that time. The Chairman will explore with appropriate scientists plans for implementation of these suggestions.

IAGA-URSI JWG4, Neutral and Ion Chemistry and Solar Fluxes. An open meeting of this Joint Working Group was held 27 August at Grenoble. L. Thomas was chairman of the meeting.

In opening the meeting the Chairman briefly described the setting up of the Joint Working Group and announced the membership of his group.

A. D. Danilov mentioned that COSPAR Working Group 4 has recommended that a two-day symposium on "Minor Constituents and Excited Species Photochemistry" be held in conjunction with the 1976 COSPAR

meeting to be held at Philadelphia. The program committee includes K. S. W. Champion, A. D. Danilov and D. Serafimov. It is intended that review papers and theoretical studies would be presented in addition to reports of experimental work. A. D. Danilov requested suggestions for invited papers. It was agreed that IAGA should be asked to co-sponsor this symposium and that this matter would be raised at the IAGA Division II meeting to be held on 29 August. This was later agreed to at the Division II Business Meeting.

A. P. Mitra announced that a planning meeting for Middle Atmosphere Program (MAP) was to be held at the University of Illinois during 21-24 June 1976. He emphasized that there would be no duplication with the proposed symposium on "Minor Constituents and Excited Species." It was agreed that those concerned with MAP should be informed of this symposium, and that a summary of the main results of the symposium on "Minor Constituents and Excited Species Photochemistry" could be presented at the MAP meeting.

The Chairman invited suggestions of topics within the area of interests of the Working Group for a joint IAGA/URSI symposium that might be held as part of the IAGA General Scientific Assembly to be held at Seattle during 1977. Such suggestions should be sent to L. Thomas as well as to other members of the Working Group by 1 April 1976.

The Chairman drew attention to the need for continuing solar-flux measurements during the 1980's. Remote sensing measurements of minor constituents at heights below about 120 km are featured strongly in the proposed SPACELAB/AMPS program, and for their interpretation it is essential that simultaneous observations of solar-flux intensities be made at wavelengths below about 2500 Å. G. Schmidtke mentioned that it was important to avoid any misunderstanding concerning requirements for monitoring and calibration. H. E. Hinteregger emphasized the value of a combined program of monitoring with automatic satellites and calibration experiments on SPACELAB.

D. W. Rusch gave a brief review of the fourteen experiments mounted on the Atmospheric Explorer series of satellites. AE-C which was launched near the end of 1973 and had an orbital inclination of 68° would be succeeded by the polar-orbiting AE-D and the low inclination

orbiting AE-E to be launched during September and November 1975, respectively. A brief description of some of the major results was described by the Chairman. D. W. Rusch stated that requests for A.E. data should be made directly to the individual experimenter concerned. H. E. Hinteregger pointed out that it was planned that A.E. data would be deposited in World Data Centres for access by the international scientific community.

The Chairman drew attention to the transfer of interest to the stratosphere by a number of groups previously active in D-region studies and enquired about the present and future plans of groups presently engaged in such studies. He emphasized the need for continuing mass-spectrometer observations and laboratory measurements. In response, D. Krankowsky and M. A. Hidalgo indicated that their present funding would enable a continuation of their respective activities for at least five years. In the discussion of laboratory measurements, R. Burke emphasized the need for obtaining data in the 100-200°K temperature range.

IAGA-URSI JWG5, Stratosphere-Mesosphere-Ionosphere Interactions. An open meeting of this Working Group was held August 28, in Grenoble. J. B. Gregory was chairman of the meeting.

This was the first meeting of the Joint Working Group. The membership has not yet been fixed. The Middle Atmosphere Program (MAP) is also interested in this area of research as also is the IAMAP/IAGA joint committee and the three bodies are closely coordinated through common membership. For MAP the immediate project will be the production of a basic document stating the objectives of the project. It is being written by the authors who are first writing abstracts of their sections. (Excerpts of a MAP planning document of July 1975 is given in IAGA News No. 14.)

IAGA-IAMPA Joint Committee

The purpose of this committee is to coordinate activities and arrange joint symposia between IAMAP and IAGA on subjects of common interest to the two Associations. The membership is given in IAGA News No. 13. This committee will coordinate the joint activities of the IAGA/IAMAP Scientific Assembly in Seattle, August 1977.

Other Working Groups and Joint Working Groups

P. L. Dyson agreed to be an officer for a new joint URSI-IAGA working group, which has been suggested by Division III to be concerned with "Wave Instabilities in Space Plasmas." The group would thus be joint between Division II and III and URSI.

Resolutions

J. W. Wright proposed the adoption of a recommendation for updating digital ionosonde systems. This had already been approved by Division V and its endorsement by Division II was approved. (See final Resolution No. 8 elsewhere in this publication.)

In discussion of the above resolution, the value of a resolution supporting an URSI resolution advocating the continuance of networks of geophysical observations after the IMS was debated. It was agreed to draft such a resolution after L. Thomas and J. W. Wright had examined the text of the URSI resolution.

Seattle Assembly

The Chairman noted that five or six frontier type public lectures would be given at the Seattle Assembly, in 1977. Ideas were solicited to go to the IAGA-IAMAP Committee. Suggestions for symposia for the Seattle Assembly were discussed.

It was suggested that one on "Problems of Equatorial Aeronomy" would be appropriate but S. Matsushita noted that an international "Symposium on Equational Aeronomy" was to be held in Townsville next year. He requested endorsement from IAGA through Division II for this symposiun in Townsville. This endorsement was given by Division II.

The following other symposia topics were discussed:

- Division V has suggested a symposium on "Progress in Optical Calibration." It was agreed not to seek Division II participation for this symposium.
- Cooperative Tidal Observations (below 90km). This could be joint URSI-IAGA-IAMAP with Divisions II and possible Division V.
- E-region Structure and Dynamics During Magnetically Quiet Conditions.
- Recent Advances in Ionospheric and Atmospheric Models, to be sponsored by IAGA-URSI-COSPAR. (It was agreed that this referred to the thermosphere, and should become "Recent Advances in Neutral and Ionospheric Models in the Thermosphere".)

- Basic Physical and Chemical Investigations (Laboratory and Theoretical) Relevant to Aeronomic Measurements.
- Metallic Ions and Atoms in the Upper Atmosphere.

The above topics may be modified to incorporate IAMAP participation. A suggestion for "Comparison of Simultaneous Aeronomic Measurements" (with 2 satellites or with satellite ground observations, etc.) was felt, by the Chairman, to be not sufficiently phenomenologically oriented, but could be restructured with this orientation.

S. J. Bauer suggested that a formal reporter review session as held this year by Division III would be desirable for the Seattle meeting, and there was general agreement.

The subject of the frequency of COSPAR meetings was discussed. J. W. Wright suggested that COSPAR could concentrate on different topics each year, coordinated with IAGA meetings. A. D. Danilov felt yearly presentations of the latest data was the most valuable feature. L. P. Block suggested that COSPAR meetings could be joint with IAGA. J. W. King felt it could be recommended that the COSPAR program be rationalized with that of IAGA in IAGA years.

HIGHLIGHTS OF PROGRESS AND SCIENTIFIC MEETINGS

A number of reports of highlights of symposia or scientific meetings (SM), and/or of progress in the field of Division II topic were received by the Division Chairman, B. A. Tinsley, who edited them essentially as given below.

Topic II-3, Atmospheric Quantal Emissions, Including Auroral Processes and Airglow

J. C. Gerard - Reporter

The global distribution of OI λ 5577 and O_2 Herzberg emissions measured by satellite was reported. These airglow techniques would be sensitive methods to determine the density and dynamics of the atomic oxygen if better information on rate coefficients and temperature dependence were available. Similarly, global observations of the

ultraviolet NOγ bands have been made by the ultraviolet NO experiment onboard the AE-C spacecraft. They provide new information on the latitude, local time and altitude distribution of nitric oxide. Rocket and satellite measurements of the NOδ emmission in the nightglow has been reported. Since the NO is excited by the N + O reaction, they provide a good way to probe the atomic nitrogen distribution and density. Infrared techniques have been successfully used to determine the profile of minor constituents such as O_3, NO, and CO_2 in the quiet and disturbed atmosphere. It is also clear that the use of resonance lamps in the ultraviolet is a promising tool to measure the atomic oxygen and nitrogen and minor species down to the stratosphere.

Recent progress in study of atmospheric excitation mechanisms include:

- New observations and models of the OH and $O_2(^1\Delta g)$ molecules in quiet and auroral conditions.
- Detailed study of the O_2 and N_2 excitation in the aurora.
- Confirmation of the presence of NOγ in the nighttime aurora and discussion of energy transfer reactions.
- Extensive day and night airglow observations of atmospheric emissions by the Visible Airglow Experiment on Atmosphere Explorer C and discussion of the O^+ (^2P), N(^2D), O(^1S) production and deactivation mechanisms.

Detailed quantitative analysis of the photoelectrons excitation of λ6300Å, λ5577Å and λ7774Å emissions by groundbased and rocket techniques have shown a general agreement between observed emission rates and measured electron fluxes. Conjugate photoelectron impact has also been discussed and compared with observations. The presence of [OII]λ834 Å in the nightglow is also attributed to conjugate electrons. The discrepancy between measured particle fluxes and optical emissions in the equatorial regions for the fluxes of $10^8 cm^{-2}$ sec^{-1} reported may be because they result from an interaction of the vehicle with the enviroment. Optical measurement confirms a much weaker flux due to energetic neutrals from charge exchange in the ring current, and the emission is found in a single equatorial arc along the dip equator with an intensity of a few Rayleighs in lines of hydrogen and helium.

Atmospheric emissions have also been used to detect or monitor the dynamical effects of the ionosphere or neutral atmosphere. These studies include:

- Optical measurements of neutral winds by airglow or auroral observation
- Transport of metallic ions in the F region
- Mapping of the equatorial F region by measuring intensity ratios
- Detection of gravity waves
- Neutral hydrogen escape flux and temperature effects.

Topic II-4, Ionospheric Irregularities, Including Small Scale Auroral Structures.

R. S. Unwin and P. L. Dyson - Reporters.

In the last four years there has been substantial progress in the knowledge and understanding of the origin and behavior of the small scale irregularities in electron density in the equatorial and auroral ionospheres that give rise to VHF radio reflections.

The ion-acoustic instability of Farley and Buneman is now well established as the cause of Type I echoes from the equatorial electrojet, and the gradient-drift instability of Simon and Hoh as giving rise to Type II echoes. Several theoretical advances have been made and it now seems that most experimental observations can be at least qualitatively explained. Perhaps the most important of these is the theory of Sudan et al which predicts that the local (vertical) velocity and horizontal density gradients associated with long wavelength plasma waves are capable of generating meter-wavelength obliquely propagating irregularities detected by VHF radar. High resolution radar studies are consistent with the theory. Rocket observations of the irregularities in the equatorial electrojet have been made.

Satellite probes have shown that equatorial type spread F is associated with Fe^{+}, that the irregularity amplitude is greatest in the equatorial and auroral regions, and that the power spectrum of the irregularities generally follows a power law ($P \alpha K^{-n}$ where $n \sim 2$) at least in the size range of 70m to 7km. This power law behavior has also been determined from scintillation observations. The occurrence of SHF scintillation is not so surprising when it is realized that the irregularity spectrum is a power law rather than Gaussian. However, it is still difficult to account for the properties of SHF scintillation by a layer of F region irregularities near the F2 peak and it is likely that irregularities in the magnetosphere also need to be taken into account.

In the equatorial region irregularities are probably initially formed with relatively large sizes (> 10km) perpendicular to the field lines. These may result from convection by electric fields generated in the E region, by internal instability in the F region, or by gravity waves. Smaller irregularities are probably generated by instabilities involving electric fields and/or electron density gradients.

There has been a great deal of experimental study of small scale irregularities in the auroral ionosphere, the so-called radio or radar aurora. Radio auroral pulsations have been further classified, confirming earlier work and describing new features, and suggesting an association with hydromagnetic waves. Synoptic studies of radio auroral occurrence in space and time have confirmed earlier work. More detailed analysis of data obtained at 48 MHz has confirmed that aspect sensitivity between 4° and 20° from perpendicular to the magnetic field is between 1.3 and 1.5db per degree. Theoretical studies suggest that conditions in the local ionosphere may cause the aspect angle for maximum backscatter from plasma waves produced by the Farley-Buneman instability to depart from 90° by up to several degrees, as has been observed experimentally.

It is established that both the evening and early morning diffuse radar aurora are correlated with the eastward and westward auroral electrojets respectively. The auroral arc occurs on the poleward boundary of the evening diffuse radar aurora region. Discrete radar auroral occurs at the borders of auroral forms. The behavior in time and space of diffuse and discrete radar aurora at the onset of the expansive phase of polar substorms has been identified, and further conjugate observations have been made. Doppler observations suggest that the ionospheric irregularities convect with the electron drift in auroral electrojets. The potential usefulness of auroral radar observations for studying the electrojets, deducing ionospheric electric fields and monitoring substorms has been pointed out.

It is now generally accepted that plasma waves arising through some sort of plasma instability give rise to virtually all radio aurora observed at VHF and UHF. Fairly good experimental evidence exists in support of the theory that the gradient-drift instability is responsible for the discrete radar aurora - the relevant horizontal electric field

and electron density gradient are those at the borders of auroral forms. It has been shown by doppler observations that the primary irregularities generated by the Farley-Buneman instability do not give rise directly to the diffuse radar aurora as previously thought, and it has been suggested that secondary gradient-drift irregularities generated by the process of Sudan et al may be responsible. The (long wave-length) primary waves from which the secondaries are derived could arise either from the Farley-Buneman instability or the gradient-drift instability, the electron density gradient in the latter case being the component of the vertical density perpendicular to the magnetic field. There is some experimental indication that the processes giving rise to diffuse radar aurora observed at 50MHz and 400MHz may have differences, but further work is required.

Some of the instability mechanisms relevant to high and low latitudes still apply at mid-latitudes but not as much effort has gone into the study of this region as has gone into the study of equatorial and auroral irregularities. The one notable exception has been the production and study of artificial spread F at mid-latitudes. There are similarities to natural spread F in that irregularities over a very wide size range are produced. These are formed by several different processes which result from the interaction of the powerful radio waves used, with the ionosphere. At this stage the processes involved do not appear to be immediately relevant to the production of natural spread F.

Topic II-5, Ionosphere-Magnetosphere Interactions, Including Large Scale Auroral Structures

L. P. Block - Reporter

The ionosphere and magnetosphere interact in several qualitatively different ways. This report is confined to electro-magnetic interactions through current systems common to both "spheres" and some consequences thereof.

The mapping of the current systems linking the ionosphere with the magnetosphere has made great progress during the last two years, particularly due to the work by Zmuda and Armstrong [1974] and by Sugiura [1975], who have used magnetometers onboard the TRIAD and OGO 5 satel-

lites. It has been shown that these systems contain four intense sheets of field-aligned currents in each auroral zone, two on the evening side and two on the morning side of the earth. The sheets are very large, extending in the east-west direction from near noon to near midnight. Just poleward of the auroral zone on the morning side the current is directed downward, towards the earth. Just equatorward of the zone the current direction is away from the earth. The total intensity of each of these sheets is very nearly the same, of the order of one million amperes.

On the evening side the directions are reversed. It is the task of future work to clarify, theoretically and observationally, how these current systems are generated and closed.

The density of these field-aligned so called Birkeland currents is of the order of 10^{-6} - 10^{-4} A/m^2 . This is sufficient to excite various instabilities in the topside ionosphere. The instabilities may develop into a state of turbulence, causing anomalously high resistivity, or they may develop into thin double layers where the particle fluxes are generally laminar. In both cases large potential drops (several kilovolts) must develop along the geomagnetic field lines. Under what conditions one or the other will develop is still not clarified. Observational evidence exists for both anomalous resistivity and double layers but they are rather inconclusive. In the case of anomalous resistivity the electric field would be rather evenly spread out over large distances, whereas in the case of double layers it would be concentrated in a limited number (perhaps a few hundred) thin layers each providing a step in the potential.

Theoretically great progress has been made both in anomalous resistivity and double layer theories but the problems are extremely complex, and it is not yet possible to relax some unrealistic but simplifying assumptions, such as of infinite and homogeneous plasmas, which are not good representations of the real ionosphere and magnetosphere.

It is likely that the extremely large power (10^9 watts) of kilometric radiation recently discovered by Gurnett [1974] is generated by instabilities due to the field-aligned currents.

The task of future experiments would be to make direct conclusive observations of anomalous resistivity effects and double layers.

Topic II-8, Laboratory Experiments of Aeronomical Interest

B. A. Thrush and D. C. Cartwright - Reporters

The main developments in laboratory experiments in the last two years have come from the tremendous interest in the catalytic destruction of odd oxygen by halogen atoms. Several groups have determined the rate coefficients (k) of the key reaction

$$Cl + O_3 = ClO + O_2 \qquad k = 3 \times 10^{-11} \exp(-300/T) \text{ cm}^3 \text{ s}^{-1}$$

The rate of the second step

$$O + ClO = Cl + O_2 \qquad k = 4.3 \times 10^{-11}$$

and of the process which couples the Cl_x cycle to the NO_x cycle

$$NO + ClO = Cl + NO_2 \qquad k = 3.3 \times 10^{-11} \exp(-50/T)$$

are less well established.

The main source of these halogen atoms is believed to be photolysis of CF_2Cl_2 and $CFCl_3$ at altitudes of 30 - 40 km, but the reaction of OH radicals with naturally occurring halocarbons such as CH_3Cl, as in the following example, can also be important sources.

$$OH + CH_3Cl \rightarrow \text{products} \qquad k = 1.7 \times 10^{-12} \exp(-1066/T).$$

Chlorine atoms are removed by

$$Cl + CH_4 \rightarrow HCl + CH_3 \qquad k = 5.4 \times 10^{-12} \exp(-1133/T)$$

but are regenerated by

$$OH + HCl \rightarrow H_2O + Cl \qquad k = 2 \times 10^{-12} \exp(-313/T).$$

The most recent reviews are

F.S. Rowland and M.J. Molina "Chlorofluoromethanes in the Environment," Rev. Geophys. & Space Physics, 13, 1 (1975).

R.F. Hampson and D. Garvin, "Chemical Kinetic and Photochemical Data for Modelling Atmospheric Chemistry" N.B.S. Tech. Note 866, June 1975.

There is much laboratory work on the reactions of OH, Cl, ClO, Br etc. in discharge-flow systems studied by resonance absorption and fluorescence and by mass spectrometry. Work on the photolysis of halogenated hydrocarbons, particularly in the atmospheric window between 180 and 210nm, is also in progress.

There has been a great deal of progress during the past two years in understanding electron impact processes, and this was reviewed at the session On the morning of September 4.

Sandor Trajmar (JPL) reported on electron impact excitation cross sections for 19 electronic states of N_2. Previously, only one electronic state of N_2(the C-state) had a cross section that was well-known experimentally. The others were known only from very approximate theoretical estimates. Since N_2 plays an important role in atmospheric processes, this new collection of cross sections in itself represents significant progress. He also reported the first cross section measurements for excitation out of metastable $(a\,^1\Delta g)O_2$. This cross section is similarly of considerable interest.

Dick Hall (U of Paris) reported on the wealth of new information recently obtained involving negative ions. He reported cross sections for the dissociative attachment of CO, NO and CO_2. These results serve as an important ingredient in the necessary data base for the field of aeronomy.

E. Zipf (University of Pittsburgh) reported on some puzzling measurements concerning the UV emissions from N_2 and his tentative interpretation. If the predissociation is as rapid as he believes, then this mechanism could provide the source of N-atoms necessary to produce large amounts of auroral NO.

SM12, Transport Phenomena in the Thermosphere and Exosphere
H. Rishbeth - convener.

This program was largely composed of invited review papers which were of a very high standard. In the first session, the observational and theoretical pictures of upper atmosphere hydrogen and helium were set out in a very satisfactory way.

The remaining sessions provided a good overview of the great amount of progress in understanding the thermosphere that has been achieved within the last few years. Incoherent scatter radars and satellites like Atmospheric Explorer have produced a wealth of data on the thermosphere at high, middle, and low latitudes in recent years, enabling some difficult problems of interpretation to be properly tackled for the first time. In particular the field of ionosphere-magnetosphere coupling is becoming reasonably well explored. One looks forward confidently to a continuation of this progress into the IMS period, using modern techniques and inter-disciplinary approach.

Highlights of Scientific Sessions - SM23 and SM16.
Ionospheric Irregularities, Auroral Zone and High Latitudes, and Plasma Instabilities in Magnetospheres.

R. S. Unwin and R. Thorne - conveners.
R. S. Unwin - Reporter

It is now well established that the radio aurora (or radar aurora when it is detected by backscatter) is produced by various types of current driven instabilities in the electron component of the plasma. Theoretically the ionospheric electric field is the most important single parameter in determining the presence of instabilities, and increasing experimental evidence is being obtained in support of this point of view. Although a threshold electric field of 30mV/m appears to be required for observation of auroral echoes at 400 MHz, no such threshold is apparent at 50 MHz, suggesting that different processes may operate with plasma waves of substantially different wavelength.

Auroral precipitation giving rise to visual forms may be anti-correlated with radar aurora, particularly in the evening and morning diffuse type associated with the eastward and westward electrojets driven by convection electric fields. Discrete radar aurora is loosely associated with active optical forms, particularly in the substorm westward electrojet. The value of the auroral radar as an instrument to delineate the location and structure of auroral current systems and substorms was demonstrated.

There has been substantial development of instability theories concerning the equatorial electrojet and some of these have been applied with some success to the auroral ionosphere, though much remains to be done. A puzzling feature of radar auroral doppler spectra is that velocities several times greater than the ion-acoustic velocity have been observed (at 50MHz but not at 400MHz) and are as yet unexplained by developments of the theories of the Farley-Buneman or gradient drift instabilities, which give rise to Type I and Type II irregularities in the equatorial electrojet. These developments, involving drift retardation, wave coupling and secondary processes giving rise to a turbulent structure, are aimed at explaining the apparent stabilization that

occurs in the auroral electrojet, and their applicability to the auroral ionosphere, where the electric field is larger and physical conditions different. The Hall current instability and electrostatic ion cyclotron instability may operate to produce the broad spectra of diffuse radar aurora that are observed at 50MHz (but not at 400MHz). Further theoretical development is urgently required.

Two regions of F region ionization density irregularities have been identified from topside ionospheric sounders, one of which appears to arise from soft particle precipitation in the cleft. The origin of the other on the evening side, between 65° and 75° latitude inside the auroral oval, is obscure.

In a review of the present state of theories of anomalous resistivity, it was shown that current driven instabilities such as the ion-acoustic and Buneman instabilities are not expected to play a major role unless Te/Ti>10. Resonance broadening in the ion cyclotron instability can produce only a fast temporal but not a steady state resistivity. Various parametric instabilities involving ion waves shown some promise, particularly since they can operate down to F region heights where parallel electric fields have been reported experimentally. The Papadopoulos-Coffey model of anomalous resistivity due to the presence of a fast electron beam is another candidate. However, substantial theoretical development, backed by experimental observation of the locations of anomalous resistivity, is required before the phenomenon can be satisfactorily explained. In a simple model calculation it was shown that significant heating of the electron component of the plasma arises through anomalous resistivity.

Large scale structure in the visible aurora is associated with shear in the magnetosphere accompanied by Birkeland currents while small scale structure implies the existence of highly transitory electric fields transverse to the magnetic field. A colour movie film of the optical aurora in real time was a strong reminder that a great many phenomena (e.g. flickering and certain types of convolution development) remain unexplained.

DIVISION III

MAGNETOSPHERIC PHENOMENA

C. -G. Fälthammar - Chairman

BUSINESS MEETING

Division III held one extra and one regular business meeting. It also held additional meetings of the Chairman, Co-Chairmen, Reporters and Working Group Leaders. The main results are given in brief below.

Division Leadership

The proposal of the Executive Committee to retain the present Division leadership in office for the period up to 1979 IUGG General Assembly was submitted to the Division III business meeting and subjected to a secret ballot. The result was (by 92%) in favor of retaining the present leadership, which agreed to accept the mandate.

Joint Working Groups with URSI Commissions

It was noted that the two joint working groups (JWG) with URSI; namely

JWG 1 - The Auroral Oval and its Extension into Space, and

JWG 2 - Physics of the Plasmapause,

had both been discontinued by URSI at its August 1975 General Assembly as a consequence of an URSI reorganization to deemphasize geophysics (considered to belong in IAGA).

Division III decided that

JWG 1 - should be retained, with unchanged leadership as an internal IAGA Working Group (expected, and later confirmed to be joint with Division II) and that

JWG 2 - should be discontinued as far as Division III is concerned. Most of its tasks can be performed by another, new working group described below.

It was noted that URSI recently established two new working groups intended to be joint with IAGA. (To avoid confusion with previous JWG1 and

JWG2 the new groups will temporarily be called I and II). These new Joint Working Groups are:

JWGI - Passive Electromagnetic Probing of the Magnetosphere
Co-chairmen: D. Carpenter and someone to be appointed by IAGA.

JWGII - Wave Instabilities in Space Plasma
Co-chairmen: F.L. Scarf and someone to be appointed by IAGA.

Division III agreed to accept both these proposals and decided to request that IAGA take the formal steps required to establish them as Joint Working Groups with URSI.

For co-chairman of JWGI, Division III chose M. J. Rycroft (and if required request formal approval of the Executive Committee for this choice).

For co-chairman of JWGII, Division III chose V. I. Karpman, (confirmation, if needed, is requested). Although JWGII was conceived to concern primarily Division III and Division II, Division IV engagement is welcomed. In agreement with the chairman of the URSI Commission concerned (R. Gendrin) it is envisaged that a third co-chairman may be added at a later date.

Internal Working Groups of IAGA Division III

The present chairman of Working Group III-1, Magnetic Pulsations, expressed a desire to retire. To replace him Division III appointed two co-chairmen: B. J. Fraser and F. Glangeaud. The Working Group will retain its present name but will establish new terms of reference in consulatation with the Division leadership and active researchers in the field.

No change was made in Working Group III-2, Geomagnetic Meridian Project.

It was decided to establish a new Working Group on "Quantitative Magnetospheric Models", with Dr. W. P. Olson as chairman. Terms of reference for this Working Group will be defined after further consultations with active scientists in the field and taking into account the needs identified in a resolution of the IMS Steering Committee urging IAGA to establish a Working Group on Quantitative Magnetospheric Models.

A summary of the new Working Group structure of Division III is given below:

Joint Working Groups (JWG) with URSI

JWG1 - Passive Electromagnetic Probing of the Magnetosphere
Co-chairmen: D. L. Carpenter and M. J. Rycroft

JWG2 - Wave Instabilities in Space Plasmas
Co-chairmen: F. L. Scraf, V. Karpman, P. L. Dyson and K. Papadopoulos

Joint Working Group with IAGA Division II

WG II-III-1 The Auroral Oval and its Extension into Space
Chairman: B. Hultqvist
Vice Chairman: C. T. Russel

Internal Working Groups of Division III

WG III-1 Magnetic Pulsations
Co-chairmen: B. J. Fraser and F. Glangeaud

WG III-2 Geomagnetic Meridian Project
Chairman: A. N. Zaitzev

WG III-3 Quantitative Models of the Magnetosphere
Chairman: W. P. Olson

Reporters

The reporter of Topic III-5, Magnetic Oscillations, Waves and Wave-particle Interactions, R. Gendrin wished to retire. He is both Co-chairman of IAGA Division III and Chairman of an URSI Commission. D. Southwood was chosen to replace him.

No other changes were made at this time. (One may note that the Reporter system of Division III seems to function very well. In particular the Reporter Reviews presented at Grenoble met with great appreciation.)

Scientific Meetings at Seattle

Taking into account the experience from the present Assembly, and views expressed in an extensive discussion during the business meeting, Division III has planned a number of scientific meetings at the IAGA General Assembly in 1977. The plan of meetings was given to N. Fukushima on September 2 for coordination purposes. A listing is given below:

A. Reporter Review Session, convener C. -G. Fälthammar, 2 half days.

B. Topical Sessions

1. High Latitude Phenomena[x], convener C. Russel, 4 half days.
2. Planetary Magnetospheres - How do They Compare?[xx], 4 half days.
3. Magnetosphere-Ionosphere Interactions[xxx], convener K. Cole, 4 half days

C. Latest Significant Results. (Contributed papers within any Division III field of responsibility; screened by Division Reporters concerned.) 3 half days

In addition Division III is willing to cosponsor "E-Region Electric Currents and Atmospheric Dynamics". It is assumed that G. Rostoker is then added to the Program Committee as Division III representative.

x The session will be limited to selected topics in this area, the selection to be made by the Working Group on "The Auroral Oval and its Extension into Space". One half day expected to be joint with B2.

xx Conveners not yet confirmed.

xxx The session will be limited to selected topics within this area, the selection to be made later in consultation with C.-G. Fälthammar (as Division chairman) and R. Boström (as reporter concerned). One half day expected to be joint with B1. Contacts with Division II will ensure complementarity and not competition with Division II - initiated activities in related fields.

Comments

No overlap tolerable for A and B sessions (among themselves or with C). Within C, parallel sessions will be tolerated to the extent required by the number of papers accepted.

Division III cosponsorship of "E-Region Electric Currents and Atmospheric Dynamics" should be safeguard against any harmful overlap with A, B or C.

Resolutions

One resolution was approved by Division III at its business meeting and has been submitted to the Resolutions Committee for consideration.

WORKING GROUP ACTIVITIES

Report on Working Group III-1, Magnetic Pulsations

See report of this Working Group under Division III Business Meeting.

Report on Working Group III-2, Geomagnetic Meridian Project

This Working Group did not hold formal business meetings at the Grenoble Assembly. Its activity (before the meeting) included distribution of circular letters concerning planning of ground based magnetic measurements and data analysis. Joint international studies involving ground based, satellite and ballon data have been initiated. Proposals for new scientific investigations have been made.

The Working Group circular letters are available to anyone interested through its Chairman, A. N. Zaitsev.

An international symposium on "The Geomagnetic Meridian Project" is being planned for May 23-26, 1976. The symposium will be held in Petershoff, Leningrad. Further information is available through the Working Group Chairman, A. N. Zaitsev.

Report on Joint Working Group 1 with URSI - The Auroral Oval and its Extension into Space

This Working Group had been charged with the task of convening one of the Scientific Meetings at this Assembly namely, "High Latitude Phenomena". Within this broad title, the meeting concentrated on two main topics, namely Birkeland Currents and Field Aligned Electric Fields (a session dedicated to the memory of the late J. Armstrong and A. Zmuda) and on Satellite Auroral Photography. A certain number of contributed papers outside these specific topics had also been accepted.

At its General Assembly in early August, URSI had decided to discontinue its involvement of this Joint Working Group as a consequence of a reorientation of its activities away from geophysics. The Working Group will however continue within IAGA (Division II and III) and has been charged with convening one of the Scientific Meetings at the IAGA Scientific Assembly, in Seattle, 1977. This meeting will again fall within the field of High Latitutde Phenomena, but will be limited to a few selected topics to be defined by the Working Group in consultation with the Division leadership.

The leadership of the Working Group remains unchanged.

Between meetings the Working Group issues a Newsletter, which is distributed using a mailing list open to everybody interested.

Report on Joint Working Group 2 with URSI - Physics of the Plasmapause

This Working Group had been charged with the task of convening one of the Scientific Meetings at this Assembly, namely "Physics of the Plasmapause".

As a consequence of the above-mentioned reorganization of URSI this Joint Working Group was also discontinued from URSI's side. During the Grenoble Assembly it was decided (in business meetings of Divisions II and III) to discontinue it also within IAGA, as most of its tasks can in a natural way be taken care of as part of the tasks of a new URSI/IAGA Joint Working Group (see Report on Division III Business Meeting).

SCIENTIFIC HIGHLIGHTS

In the last few years there has been very important progress in several key areas of magnetospheric physics. This progress was reflected in the Reporter Reviews as well as in the topical sessions. A few of the highlights are given below (without ordering by sessions).

The discovery and continued study of the boundary plasma of the magnetosphere ("entry layer" on the dayside and "plasma mantle" on the nightside) completes our knowledge of magnetospheric plasma structures in a way which is essential to the understanding of the magnetosphere's response to the solar wind and in particular of the plasma entry.

The availability of the topside auroral photography covering large areas has remarkably increased our knowledge of large-scale auroral morphology and has proved to be a powerful tool for studying magnetospheric dynamics.

The quantitative experimental investigations of the distribution and polarity of Birkeland currents has taken major steps forward towards filling what used to be a serious gap in our knowledge of the structure of the magnetosphere. The knowledge obtained is of fundamental importance to the understanding of magnetospheric dynamics.

Partly related to the problem of Birkeland currents and also of profound consequence is the problem of the existence and role of magnetic-field aligned electric fields. Their possible roles for example, in particle acceleration, is increasingly taken into account as the indications of their existence continue to accumulate.

For the study of transverse electric fields two new methods have started to give extensive results: incoherent scatter radar and ballon-borne electric probes. Another new technique expected to become important during the IMS is whistler-duct tracing by goniometers.

In the study of magnetospheric particles a new and much more advanced stage has been reached where extensive information of the (phase space) distribution function is being obtained. This provides a much improved basis for quantitative understanding of the magnetospheric plasma and corpuscular radiation as well as of important types of wave-particle interactions.

In particular, quite exotic particle distributions have been discovered in some regions of the magnetosphere - notably the source-cone phenomenon at the geostationary orbit and the presence in the magnetosphere of substantial amounts of energetic heavy ions. These and other unexpected experimental discoveries prove that the plasma physics of the magnetosphere-ionosphere system is even more exciting than was believed only a few years ago.

The wave environment of the earth has become further explored. One noticeable discovery is that of the remarkably intense kilometric (and shorter) radiation which gives the Earth a distinguished position as a radio source. Study of magnetospheric wave phenomena and wave-particle interactions has made it necessary to face extremely difficult non-linear plasma physical problems. The degree of difficulty of some of these problems was at the assembly occasionally manifested in highly controversial views among the active scientists in the field.

Finally, the availability of in situ experimental data from magnetospheres other than the earth's starts a new era in magnetospheric science. Its impact was being felt already at this assembly and it will be one of the focal points of Division III activities at the forthcoming IAGA Scientific Assembly in Seattle.

DIVISION IV

SOLAR WIND AND INTERPLANETARY MAGNETIC FIELD

J. Geiss - Chairman

BUSINESS MEETING

About 30 participants attended the business meeting of Division IV which was held at 4:30 p.m. on 28 August. The meeting was chaired by J. Geiss.

Topics and Reporters

L. Davis and K. I. Gringauz announced their intention to retire as reporters, F. M. Neugebauer and L. Svalgaard agreed to continue.

It was decided to retain the five topics of activity of Division IV, and to have one reporter for each topic. Wherever desirable, reporters should be assisted by correspondents. The following names were proposed for reporters and/or correspondents. (Where reporters have been chosen it is so indicated. Others will be designated later.)

Topic 1 - Large Scale Characteristics of the Interplanetary Medium.
P. D. Feldman, A. J. Hundhausen and S. Pinter

Topic 2 - Waves, Discontinuities and Shocks in the Interplanetary Plasma.
F. M. Neugebauer - Reporter.

Topic 3 - Solar Wind Interaction with Unmagnetized or Weakly Magnetized Bodies.
S. Dolginov, C. T. Russel and M. K. Wallis.

Topic 4 - Solar Activity, Interplanetary Dynamics and Terrestrial Disturbances
L. Svalgaard - reporter, and S. M. Mansurov.

Topic 5 - Evolution of the Sun and Solar System as Deduced from Solar Wind Observations.
H. Alfvén, J. Geiss, A. J. Hundhausen and C. P. Sonett.

Division Officials

The Chairman announced that he wanted to retire after the Grenoble Assembly. Thereupon, those present unanoumously nominated the three cochairmen K. I. Gringauz, P. Hedgecock and N. F. Ness as candidates for the chairmanship. (Editor's note - The Executive Committee later designated K. I. Gringauz as Division Chairman.)

Working Groups

It was decided that there was presently no need for Division IV Working Groups. The meeting discussed, however, proposals for two Joint Working Groups between IAGA and other organizations.

- Joint URSI-IAGA Working Group on "Wave Instabilities in Space Plasmas". Division IV took note of this proposal, but did not express strong support. If the Executive Committee decides to create this Working Group, Division IV would nominate J. Hollweg for cochairman.
- Joint SCOSTEP-IAGA Working Group on "The Study of Travelling Interplanetary Phenomena (STIP). The creation of such a Working Group was not supported by the participants of the meeting. It was suggested that any necessary coordination could be achieved directly between STIP and the Division IV chairmen. A step in this direction would be the augmentation of the mailing lists of STIP and Division IV.

Future Conferences

The participants of the meeting expressed concern about the large number of international organizations and conferences dealing with solar wind and interplanetary magnetic field: (a) IAGA (every two years), (b) COSPAR (yearly), (c) IUPAP (Cosmic Ray Conference, every two years), (d) SCOSTEP (every two years), and (e) the ASILOMAR Conference (every three years). Division IV and representatives of the Organizing Committee of the ASILOMAR Conference decided therefore to join this conference in 1977 with the program of IAGA's Division IV at the Seattle Assembly. During the business meeting and in subsequent discussions the following plan was tentatively agreed to:

- In 1977 the ASILOMAR Conference will be held in Seattle at the University of Washington Campus as part of the IAGA Assembly.
- Its sessions will be scheduled for the period Thursday, August 18 to Tuesday August 23 (no session on Sunday).
- Topics with emphasis on astrophysics and solar physics will be discussed during the first 3 days, topics related to geophysical phenomena will be scheduled for Monday and Tuesday. During these two days IAGA's Divisions III and IV will not schedule conflicting sessions.
- A Program Committee will be formed including (tentatively)
  - The Organizing Committee of the ASILOMAR Conference: C. T. Russell, R. Jokipii, and C. P. Sonett
  - Representative of Division IV: P. C. Hedgecock
  - Representative of Division III: T. Obayashi
  - Other members
- The following topics are foreseen, subject to alterations by the Program Committee:
  - Solar magnetic field and its continuation into space.
  - Coronal structure and solar wind structure.
  - Solar spindown

- Evidence for secular changes.
- Radial and latitudinal gradients.
- Cosmic ray propagation.
- Solar wind interaction with the interstellar medium.

SM-21, REPORTER REVIEW SESSION

Large Scale Characteristics of the Interplanetary Medium

L. Davis - Reporter

The solar wind has been directly studied in a large range of solar distances, i.e. from 0.3 to 5 astronomical units. Thus, radial variations of solar wind parameters can now be discussed in a meaningful way. As expected, the ion velocity generally does not show marked changes with r, but the velocity streamers appears to decrease with solar distance. The flux and the radial component of the B-field decrease with $1/r^2$. However, the azimuthal component of B varies more rapidly than 1/r, in disagreement with the spiral field structure predicted by uniform and radially symmetric expansion models. This observation cannot be explained in a simple way by an excessive divergence of the flow away from the ecliptic, because then the ion flux would not follow the $1/r^2$ law.

High velocity streamers in the solar wind are associated with coronal holes. Thus, one would expect higher expansion velocities in the polar solar wind than those observed at low solar latitudes. In fact typical expansion velocities of 600 km/sec at high latitudes are inferred by the scintillation method.

Out-of-ecliptic measurements in the solar wind could not only improve our knowledge of the coronal expansion mechanism, but they are also essential for understanding cosmic ray modulation.

Waves, Discontinuities and Shocks in the Interplanetary Plasma

F. M. Neugebauer - Reporter

Great progress has been made in the theoretical treatment of Alfvén wave propagation, stability and nonlinear processes, as well as in the field of shock generation and propagation in the presence of solar wind inhomogeneities.

Many of the observed features of Alfvén waves in the solar wind, like polarization or variation with radial distance, are in reasonable

agreement with theory. The observed waves even in "purely" Alfvénic regions of streams are contaminated by other fluctuation modes, the nature of which is unclear. A widely accepted source mechanism for Alfvén waves is still lacking.

The relative numbers of rotational and tangential discontinuities as a function of stream position are still not known. The nature of directional discontinuities may become more tansparent if their radial variation is understood. Generation of rotational discontinuities by steepening of elliptical nonlinear MHD-waves has been proposed by Cohen and Kulsrud.

Generation of fast shocks by flares, coronal transients, steepening of compressional waves and steepening streams has been observed. The large variation of their surface normals around the radial direction is understood in terms of stream effects and scattering by tangential discontinuities. At the leading edge of streams, fast shocks can even be transformed into slow shocks by relatively moderate tangential discontinuities.

An interesting research area in the future will be waves beyond the MHD-range. The dispersion relations in the hot solar wind plasma are essentially understood and first attempts of a quantitative treatment of wave particle interactions have been published. Observations concerning the distribution functions of electrons and protons imply the importance of wave-particle effects in the solar wind.

Solar Wind Interaction with Unmagnetized or Weakly Magnetized Bodies

K. I. Gringaus - Reporter

The interaction of the solar wind with a variety of planetary bodies has now been studied by in situ measurements; Earth and Jupiter have strong magnetic fields, and consequently they are surrounded by well developed magnetospheres on a scale of many times the radius of the planet. The fast rotation of Jupiter has an influence on the internal structure of its magnetosphere. Mercury and Mars possess weaker magnetic fields, just strong enough to cause bow shocks and to form small magnetospheres. Venus and the Moon provide pure examples of solar wind interaction with an atmosphere and a solid body respectively. Both these interactions are essentially unimpeded by magnetic fields.

From studies of plasmas and magnetic fields in the vicinity of the moon and planets values or upper limits of magnetic dipole moments have now been derived for six bodies in the planetary system. This knowledge is important for developing a theory on the origin of planetary magnetic fields.

Solar Activity, Interplanetary Dynamics and Terrestrial Disturbances

L. Svalgaard - Reporter

Our picture of solar magnetic fields is rapidly changing. At present a certain level of insight is being consolidated. X-ray photographs of the sun reveal high emission regions of plasma particles trapped on closed magnetic field lines and low emission regions of open diverging fields. Outside sunspots the magnetic field is very clumpy and exists as small knots with very high field strengths, $\approx$ 2000 gauss. In fact, most (99%) of the photosphere is not magnetic at all. Most field lines close near the sun, only $\approx$ 10% or less are open to interplanetary space. The open, diverging field geometry plays a crucial role in modulating the coronal expansion. The magnetic sector structure of the interplanetary medium is a result of a similar ordering of the photospheric field within $\pm$ 30° of the equator. The interplay of this structure with the polar fields results in a systematic behavior of coronal streamers along current sheets separating the oppositely directed fields. These current sheets appear to be inclined to the North-South direction more and more as we go away from the sun. In the interplanetary medium they are almost in the equatorial plane during most of the solar cycle. Galactic cosmic ray entry to the solar system appears to be dependent on the large-scale geometry of the interplanetary magnetic field. The coronal structure was particularly simple in 1974 resulting in one of the most geomagnetically active years in the last 100 years.

For highlights of other scientific sessions of interest to Division IV see the particular reports on SM18 and SM22 elsewhere in this publication.

DIVISION V

OBSERVATORIES, INSTRUMENTS, INDICES AND DATA

P.H. Serson - Chairman

BUSINESS MEETING

The business meeting of Division V was held on 29 August 1975, by which time all of the working groups except one (V-9) had met at Grenoble. The chairman of each working group in turn presented (a) a brief report on the activities of his group, (b) suggestions for the scientific program of the Seattle Assembly of IAGA in 1977, and (c) resolutions and recommendations proposed for sponsorship by the division.

Suggestions for Seattle Assembly

The division proposed the following scientific sessions for the Seattle Assembly, 1977:

- Filtering methods applied to geomagnetic recordings (2 sessions).
- Progress in optical calibration (1 session).
- Cooperative radio meteor and incoherent scatter tidal observations (1 session). (This is co-sponsored by Division II, and will be integrated with other sessions on tides in the upper atmosphere.)

In addition, the division proposed two workshops:

- Magnetic observatory practice (3 or 4 half-days)
- Techniques and evaluations of recent magnetic charts and models (2 half-days) (jointly with Division I).

Resolutions and Recommendations

The division approved 12 resolutions, which eventually became IAGA Resolutions 1 to 10, IAGA Resolution 12, and IUGG Resolution 17.

The division also approved 4 recommendations which are published in IAGA News No. 14, pages 50-51:

Division V notes that much useful information concerning the magnetic standards at 15 European magnetic observatories has been derived from regular comparisons of quiet momentary values, and urges observatories in other parts of the world to initiate cooperative exchanges of simultaneous momentary values with adjacent observatories. The division believes that such cooperation will contribute to a worldwide raising of the quality of magnetic observatory data.

. Division V urges all concerned with the operation of magnetic observatories and the development of magnetic instruments to communicate notes on their work to the chairmen of the appropriate working groups for general distribution and inclusion in the IAGA News.

. At the business meeting of Division V, in Grenoble, it was agreed that the K-indices of individual observatories no longer need to be punched and placed on magnetic tape by the International Services of Geomagnetic Indices.

. During IMS, many experiments will record data at a sampling interval shorter than 2.5 minutes and 1 minute for which IAGA has recommended standard magnetic tape formats (IAGA News No. 8, page 24; IAGA News No. 12, page 34). In view of the immediate need for a flexible format for the exchange of geophysical time series on magnetic tape, Division V urges all with experience in self-documenting tape formats to send documentation of such systems to the World Digital Data Centre, Institute of Geological Sciences, Herstmonceux Castle, Hailsham, Sussex, U.K., to help in devising a format which can be read by as many computers as possible.

Changes in Organization

The division approved the recommendation of R. A. Langel that his position as Reporter on Topic V-2, International Geomagnetic Survey by Satellite, be abolished, and that a new working group with the same title be established in Division V to organize a project for the international coordination of surface observations to supplement satellite data which may become available in the interval 1977-1980. It was agreed that D. Voppel would be asked to act as chairman of the new working group, and A. Hahn would propose a membership list in consultation with appropriate officers of Divisions I and V.

Subsequently to the 29 August business meeting, it was proposed that IAGA should organize a new working group on Incoherent Scatter as part of Division V. This was discussed on 1 September with the Executive Committee, which indicated that it would react favourably to a formal proposal to create such a group. Pierre Bauer agreed to serve as chairman and to propose a list of members.

Proposed IAGA Statutes

The division recommended that the revised IAGA statutes and by-laws authorize the General Secretary to provide financial assistance as necessary for the regular publication of the international series of Geomagnetic Indices for which IAGA has primary responsibility.

HIGHLIGHTS OF SCIENTIFIC MEETINGS

Two scientific meetings at the Grenoble Assembly were organized by Division V. Twenty-five papers were presented in two half-day sessions entitled "New Techniques of Magnetic and Electric Measurements in Geophysical Phenomena", convened by W.F. Stuart. This meeting attracted a large attendance from all parts of IAGA, and a good many from other scientific associations. The first group of 8 papers on methods of measuring electric fields in the upper atmosphere and magnetosphere provided a rare opportunity to compare in one session the advantages and limitations of the various

techniques. The remaining papers on magnetometers were about evenly divided between instruments and techniques for magnetic observatories, and sensitive variometers with rapid response for studies of magnetic pulsations and electromagnetic induction in the earth. Unfortunately, the schedule allowed almost no time for discussion of the papers.

The scientific meeting "Airglow and Aurora Calibrations", convened by R. Pastiels and G.G. Shepherd, was attended by about 40 persons. In addition to the three papers listed in the program, reports were presented on the world-wide intercalibration of photometers by means of the Atmospheric Explorer-C satellite, and on the laboratory intercomparisons of optical sources from Continental America carried out at the University of Michigan. A wide-ranging discussion and business meeting followed, as reported by Working Group V-4 elsewhere in the Transactions.

WORKING GROUP V-1, MAGNETIC OBSERVATORIES

C. Sucksdorff - Chairman

Since the Kyoto Assembly, the working group has concentrated its efforts mainly on the following topics:

- creation of information channels between IAGA and the magnetic observatories
- preparation of a detailed guide on international data exchange for magnetic observatories.
- creation of a new list of magnetic observatories, their equipment and practices.
- cooperation with Working Groups V-3 and V-7 on topics of mutual interest.

Nine members of the working group and 24 other delegates from 19 different countries attended two meetings at Grenoble. The above items were discussed and the following main decisions were made:

. IAGA News will be suggested as the main information channel between IAGA and the magnetic observatories. Using this channel the operators of magnetic observatories will be encouraged to make contact with IAGA working groups. Direct communication with the observatories by mail will be continued.

. The draft of a guide to international data exchange for magnetic observatories was adopted after discussions which led to changes, partly based on recommendations made in Working Group V-3. The draft was passed to Working Group V-7 for further comments. Publication of the guide is planned before the end of 1975.

. A questionnaire to be sent to magnetic observatories was adoped as a first step in the preparation of a new list of observatories, their equipment and practices. The purpose is to provide a rather complete description of each observatory and to update this description as necessary. In this matter as in many others, close cooperation with Working Group V-3 was found helpful. Financial assistance from IAGA toward printing and mailing costs may be necessary.

For the immediate future, in addition to continuing work on the description of magnetic observatories and the development of channels of communication with their operators, the working group decided to

. take action to increase interest in maintaining high standards of absolute accuracy in the observatories,

. take action to provide better information to the scientific community about the data produced at the observatories,

. try to find out from those who require magnetic observatory data the form in which they can best use the data, and

. try to collect information about existing and available data from temporary magnetic recording stations.

The working group sponsored two resolutions which were adopted by IAGA. In addition it proposed, jointly with Working Group V-3, a workshop on magnetic observatory practices to be arranged for the 1977 IAGA Assembly at Seattle.

WORKING GROUP V-2, METEOR OBSERVATORIES

R.G. Roper - Chairman

The meeting on 25 August, 1975, was attended by 5 members of the working group and 7 other delegates. The chairman read his report and several alterations were suggested. The revised report is as follows. (Unfortunately, the bibliography containing some 90 references cannot be reproduced here.)

Chairman's Report

While attempting to summarize the progress of meteor science since the XVth General Assembly of the IUGG, with the literature explosion in the meteor field which has occurred so far in this decade I have found it necessary to restrict myself to those areas directly related to aeronomy, with particular emphasis on radio meteors and wind determination. Although we have representatives from the optical and radar astronomy meteor communities, I have assumed that these areas will be adequately reported by Commission 22 of IAU. Details of rocket measurements of meteoric ionic species will be reported by IAGA Division II. In addition to these reports, a valuable guide to the literature is the NASA/SCAN series of abstracts - in particular 13-05 Upper Earth Atmosphere and 13-06 Meteors and Meteorites, available bi-monthly from the National Aeronautics and Space Administration, Scientific and Technical Information Office, Post Office Box 33, College Park, MD. 20740, U.S.A.

Comparisons have been made between drifts measured from rocket vapor trails, by E layer drifts, by the partial reflection technique by incoherent backscatter, and by meteor radars. These have demonstrated that simultaneous measurements made at the same height, using similar time integration intervals, produce the same winds.

The partial reflections technique samples the height range from 70 to 120 Km during the daytime, and the region around 95 Km at night. However, even with the development of daylight wind measurements from chemical releases in the upper atmosphere, the meteor wind radar, and, with the aforementioned limitations, the partial reflection technique, remain the only economically feasible ways to measure the synoptic meteorology of the 80 to 100 Km region. Short period observations of internal atmospheric gravity waves and turbulence have continued, using high powered radars and/or miltiple receiving sites to detail vertical structure.

Advances have been made in our understanding of the long period wind oscillations which exist in the meteor region, and correlations have also been made with stratospheric warmings and even tropospheric circulation, emphasizing the reality of wind energy coupling from below. Furtherance of this work needs cooperative observations on a global scale using several techniques designed to simultaneously sample the troposphere, stratosphere, mesosphere, and lower thermosphere.

The Global Radio Meteor Wind Studies Project (GRMWSP)

GRMWSP was conceived by the Steering Committee of Working Group 10 of the Inter Union Commission on Solar Terrestrial Physics at the International Symposium on Waves in the Upper Atmosphere in Toronto in January 1970. Subsequently, responsibility for the project was vested in Working Group 6 of Commission VIII of the International Association of Geomagnetism and Aeronomy (IAGA), which had already established a network of stations in Europe. With the reorganization of IAGA at the Kyoto Assembly in 1973, this group became Division V, Working Group 2 (Meteor Observatories). Two coordinators (Members of W.G. 2) were appointed, Dr. M. Glass, of CNET, France, and Dr. R.G. Roper, School of Aerospace Engineering, Georgia Institute of Technology, Atlanta, Georgia, USA.

Proposed goals of GRMWSP, which measures winds in the 80 to 100 Km region of the Upper Atmosphere, are:

- Definition of a synoptic meteorology.
- Delineation of tidal wind parameters, and their variation with latitude, longitude, height, and time.
- Determination of the variations of the random wind component, also with latitude, longitude, height, and time.

Applications of measurements are:

- Prediction of the wind field, and its probable variations, and
- Inference of temperature and density from the wind field for input to:
  (a) global models of the general circulation of the atmosphere,
  (b) space shuttle and reentry model atmosphere, and
  (c) ionization models - in particular, of sporadic E.

The realization of the above is contingent on the development and maintenance of an adequate network of meteor wind measuring stations. Such a network exists in Europe, and extends into Siberia, but the rest of the globe is inadequately covered, and most of those stations which do exist operate only spasmodically. The exceptions are those facilities which are operated directly by government agencies, such as the radar operated by the Hydrometeorological Service of the USSR at Obninsk, the facility operated by CNET which has gathered data both at Garchy, France and Kiruna, Sweden, and the Tokyo meteor radar of the Radio Research Laboratories of the Japanese Ministry of Posts and Telecommunications. Whereas the meteor radar is an excellent tool for graduate research in a tertiary education institution, the aim of GRMWSP requires long term routine operation, which such institutions can rarely accomplish. These limitations notwithstanding, the University of Sheffield is to be congratuled on their portable operations in northern Scotland, and their assistance in the establishment of facilities at Bracknell, and in the West Indies.

In the USA, three stations, located at the Geophysical Institute, Fairbanks, Alaska; at the University of New Hampshire, Durham, New Hampshire, and at Georgia Institute of Technology, are contributing data from the USA to GRMWSP. Two other stations are being established; at the White Sands Missile Range, New Mexico; and at the University of Illinois, Urbana, Illinois (operational, but not yet measuring echo heights). When these are fully operational, the USA will be represented by five stations out of a total of 18 in regular operation, 8 of these being in the USSR.

A particularly noteworthy recent development is the proposed installation by the Indian Space Research Organization of a meteor radar at Trivandrum (8° N, 78° E). While some excellent work has been done by the USSR scientists at Mogadishu in equatorial East Africa, more equatorial data is badly needed, and the station in India, together with that operated in Jamaica by the University of the West Indies, will fill a real need of GRMWSP as a global organization.

In the southern hemisphere, the station operated by the Physics Department of the University of Adelaide, Australia, continues to provide data with excellent height and time resolution. The Department of Physics at the University of Christchurch, New Zealand, is pursuing wind measurement, but as a subsidiary of their meteor physics program.

Significant developments in wind measuring equipment design, both hardware and software, have been made, in particular at the Kharkov Institute of Radio-Electronics; at Budrio, operated by the University of Bologna; at Garchy, France; at the University of Illinois; and at Georgia Tech. The use of online computers, made possible by the recent advances and cost reduction in solid state circuitry, has improved both echo recognition techniques, and the accuracy of echo parameterization. These developments are being evaluated by the joint IAU/IAGA Committee on Radar Observations of Meteor Flux and Radiants, and Anomalies at the Base of the Thermosphere. Particular emphasis is being placed on the accurate measurement of individual echo heights, so as not to oversmooth the large wind gradients with height.

The first real test of the capabilities of GRMWSP came with the proposal by URSI Commission III to IAGA at the Kyoto Assembly for joint "Cooperative Tidal Observations in the Lower Thermosphere". Carried out over the period from August 9-14, 1974, during the Perseid. meteor shower, this effort produced data from at least four incoherent scatter radars, and six meteor wind facilities. Intercomparison and publication of these results is the subject of an informal URSI/IAGA sponsored workshop at this Assembly, on the evening of Monday, September 1, 1975. Preliminary discussions, attended by representatives of five nations, and held at the American Meteorological Society's Conference on the Upper Atmosphere in Atlanta in September, 1974, indicated that the venture was successful - so much so, that a further effort is being planned for October, 1975.

Additional cooperative programs are being encouraged by the International Council of Scientific Unions. In particular Project SESAME* - the Structure and Energetics of the Stratosphere and Mesosphere, is of particular interest to GRMWSP. The Period 1975-1980 inclusive has been proposed to ICSU for an intensive onslaught on the Structure and Energetics of the Stratosphere and Mesosphere (Project SESAME) by SCOSTEP. The International Scientific Radio Union (URSI) has assumed, through its Commission III, responsibility for communication with COSPAR, IMAP, and IAGA in this project. In his 1973 report to members of URSI Commission III on this project, Professor K. Sprenger (G.D.R.) noted that "there will be active participation of several stations in Europe . . . and in the Asiatic parts of the USSR. Additional participation of stations in other geographic regions would be particularly welcome".

The Soviet sponsored International Research Project MISPI (Mesospheric and Ionospheric Structure Parameter Interaction) will also benefit from the cooperation of GRMWSP participants.

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* Because the same acronym is being used for an already established project of the U.S. National Atmospheric and Oceanic Administration, SESAME has been renamed MAP - the Middle Atmosphere Program.

Other Business

The next item involved consideration of a draft resolution proposed by the Soviet Geophysical Committee to IAGA and IAMAP. While the working group agreed in principle with the preamble and sections 1 and 2 of the resolution, the detailed wording of these portions, and the implications of section 3, could not be adequately discussed since no representatives from the USSR were present. It was proposed that the chairman of the working group contact the chairmen of Divisions II and V and the General Secretary of IAGA, and discuss with them the possibility of further correspondence with the Soviet Geophysical Committee directed toward a possible resubmission of a resolution at the next Assembly of IAGA in 1977. Consideration of Section 3 at this time was considered inappropriate, since the joint IAU/IAGA working group on meteors is in the process of preparing a report on the several meteor systems now routinely gathering meteor wind data throughout the world. (IAGA has not yet received word from IAU of its official ratification of the joint working group.)

A joint IAGA/URSI symposium on Cooperative Tidal Observations, involving the presentation of one or two review papers and perhaps 10 other papers (a half-day session) was proposed for the 1977 Assembly of IAGA. J. Salah, on behalf of URSI Commission III, assured the working group of the continuing sponsorship by URSI of the cooperative endeavours. The next year's timetable for GRMWSP was to be discussed at the Grenoble Workshop on the International Cooperative Tidal Experiment.

WORKING GROUP V-3, GEOMAGNETIC INSTRUMENTS AND STANDARDS
W.F. Stuart - Chairman

The working group began its activity in September 1974 when the IAGA Executive Committee approved its constitution. Preliminary correspondence and the discussion at the meeting of 26 August, attended by 25 delegates from 15 countries, revealed several problem areas within the range of interest of the working group.

The Danish Meteorological Institute has provided QHM's for magnetic observatories to carry out H calibrations, and a close watch has been kept on their accuracy. Three comparisons have been carried out during the report period, giving the following differences between observatory standards of H:

September 1973, Rude Skov - Fredericksburg = 1.0 nT.
January 1974, Rude Skov - Halley Bay = -3.4 nT
March 1974, Rude Skov - Argentine Islands = -5.1 nT

Three IAGA QHM's numbers 32-34 which have been lent to the instrumental equipment of the non-magnetic vessel Zarya of the USSR have not been checked during the review period.

It was felt that more use could be made of this facility. The problem is how best to publicise the service, to identify any difficulties in its operation and to attempt to overcome them.

There is no journal which provides an adequate international forum for the publication of papers typical of those describing the general range of geomagnetic instrumentation. Progress reports which may contain little original research but a great deal of instrumental information and circuitry should be encouraged and widely distributed.

Looking to the future there is a need for information about commerically available instrumentation for those seeking to establish new observatories or for the replacement of obsolete instrumentation. The status and future availability of the Danish, Russian and Japanese classical instruments should be established. It may be that this is the time for Working Group V-3 to consider recommending other types of magnetometers for standard observatory purposes.

A list of commerical manufacturers of all types of instruments used in the measurement of the geomagnetic field will be compiled to meet the need of item 3 and also for the use of the geophysical community in general. A preliminary list of manufacturers of non-magnetic theodolites has been compiled and distributed.

The desirability of interactive communication between observatories and research workers has been discussed with the chairmen of Working Group V-1. They generously encourage Working Group V-3 to comment on their

affairs and agree to explore ways of having a bulletin of observatory affairs circulated among the geomagnetic community. Such a bulletin might contain basic articles written by observatory personnel and by research workers who use observatory data. In the expectation that observatory recordings will become increasingly important for magnetospheric diagnostics in the future a simple effective communication system between the observatories and those who use their recordings is essential to standardization of both instrumental output and useful observatory reporting. IAGA News was suggested as the appropriate vehicle for such communications.

A summary of instrumental work being carried out in various countries is being prepared. In addition, a mailing list is being compiled of scientists who are actively working in the fields of magnetic and electric instrumentation. It is intended that both of these will be updated regularly and that copies will be available to anyone concerned with instrumental work.

WORKING GROUP V-4, OPTICAL CALIBRATION STANDARDS
R. A. Pastiels - Chairman

The launching of the Atmospheric Explorer-C Satellite (AE-C) in December 1973 has offered the possibility of a world-wide intercalibration of auroral and airglow photometers, using the visual airglow experiment (VAG) on board. This photometer has been described by P.B. Hays, G. Carigan, B.C. Kennedy (University of Michigan), G.G. Shepherd (York University, Toronto) and J.G.C. Walker (Arecibo Radio Observatory) in Radio Science, 8, 369-377, 1973.

The intercalibration project has been undertaken by M. Torr of the University of Michigan, and the results were reported in Grenoble by G. Carigan in the scientific meeting Airglow and Aurora Calibration.

The working group has in addition initiated laboratory intercomparisons of optical sources on a regional basis. The American continental region has been coordinated by P.B. Hays and M. Torr at the University of Michigan, which has allowed a good correlation with the satellite intercomparison. All observatories in continental America are able to send their sources to Ann Arbor, and many have done so. Preliminary results were presented in the Grenoble scientific meeting.

Work in the European region has been delayed by the lack of suitable sources, but some comparisons have been made by H. Lauche of the Max Planck Institute, Lindau, with the Observatories of Uppsala and Oslo. This work will be continued at the Institut d'Astrophysique de Paris by J. Christophe, following the Grenoble Assembly.

Approximately 40 persons attended the scientific meeting Airglow and Aurora Calibration, which was followed by a lengthy discussion and business meeting. It was agreed that the regional concept should be continued and strengthened, and that each region be encouraged to develop its own techniques. It is clear that there is as yet no proven "best technique".

The coordinators for each region are as follows:

Continental America:

Dr. M. Torr,
University of Michigan,
Ann Arbor, Michigan, USA

Dr. G.G. Shepherd
York University
Downsview, Ontario, Canada.

Europe:

Dr. H. Lauche,
Max Planck Institut fur Aeronomie
D3411 Lindau, Postfach 20
Federal Republic of Germany

Dr. R. Pastiels,
Institut d'Aeronomie Spatiale
3 Avenue Circulaire, 1180 Bruxelles
Belgique.

Australia: Dr. P. Dyson
La Trobe University
Bundoora, Victoria 3083
Australia.

WORKING GROUP V-5, MAGNETIC SURVEYS AND CHARTS
E.B. Fabiano - Chairman

The working group concluded after some discussion that information concerning the existence of many national magnetic charts has not been widely disseminated. It was therefore recommended that a bibliography of recent maps be prepared and its availability be made known through the IAGA News. B.R. Leaton suggested that the working group assume as its responsibility the extension of the World Magnetic Survey 1957-1969, and in particular that it should update the lists of references on magnetic surveys and the International Geomagnetic Reference Field which were published in the final report of the WMS (IAGA Bulletin No. 28, 1971).

The working group conveys its gratitude to H.G. Barsczus for the completion of an extensive bibliography of geomagnetic measurements in Africa. Copies of this volume have been deposited in the World Data Centers.

Reports were received and reviewed on magnetic maps in Scandinavia (F. Eleman) and the 1975 magnetic charts of Canada (E. Dawson and L.R. Newitt). F.S. Barker of the United States Naval Oceanographic Office reported that his department will conduct one 30-day vector survey each year under Project Magnet for the purpose of accumulating magnetic data for the world magnetic charts of 1980.

The following information was obtained from a questionnaire sent to 80 countries; more than 40 replies were received.

. 30-nations have published or plan to publish national magnetic maps for epoch 1975

. 95% agreed to furnish maps and repeat station data to the World Data Centers

. More than 900 repeat stations were occupied during the past 5 years.

It was recommended that observatory annual mean values and repeat station data be forwarded promptly to the World Data Centers, and that the Centers issue requests for these data if they are not received in a reasonable period of time.

The working group drafted a resolution eventually adopted by IAGA as Resolution 10.

A workshop entitled "Techniques and evaluations of recent magnetic charts and models" was proposed for the 1977 Assembly in Seattle. L.R. Alldredge has agreed to act as convenor of the workshop.

WORKING GROUP V-6, GEOPHYSICAL INDICES

J.V. Lincoln - Chairman

Seven members of the working group attended the meeting on 27 August, 1975, and two members sent representatives. In all, 21 delegates from 10 countries were present. In addition to proposing five resolutions which were adopted by Division V and by IAGA (Resolutions 3 to 7), the following actions were taken.

An amendment to the Statutes under Finances was requested: "Assist as necessary the regular publication of the International Service of Geomagnetic Indices for which IAGA has primary responsibility".

A supplementary bulletin in the IAGA Bulletin 32 series will be required to publish indices now recommended, but which has not as yet been published in the series. It will contain (1) D_{st} 1957-1969, (2) "aa" indices 1968-1974, (3) K_M, K_N, K_S 1959-1963. (4) s.s.c. and s.f.e. 1968-1974. The fourth item is required in order to include measurement of amplitude and duration of the s.s.c. as published in IAGA Bulletin 33 as now recommended.

The IAGA Bulletin No 32 for the data of the year 1975 will include invariant latitude and L-shell values as well as geomagnetic coordinates for each observatory. The values will be calculated by a selected standard program with magnetic field model and epoch stated. It is essential that all observatories verify their geographic coordinates as in the IAGA Bulletin 32 series and report any discrepancies to the International Service of Geomagnetic Indices.

All publications including geomagnetic indices should clearly cross reference the other sources of indices.

Prompt submission of magnetograms to the World Data Centers from observatories whose data are used in preparing indices is encouraged.

At the business meeting of Division V it was agreed that the K-indices of individual observatories no longer need to be punched and placed on magnetic tape by the International Service of Geomagnetic Indices.

It was felt premature to adopt any suggested auroral indices. Dr. Feldstein is encouraged to continue his proposed use of all-sky camera data. Consideration should be given to an index based upon the equatorward borders of the auroral forms as observed by the DMSP satellites.

The archives on rapid variation may be consulted at the Observatorio del Ebro, and the archives used in the preparation of IAGA Bulletin 33 will be transferred to del Ebro.

Thanks were expressed to several of the Working Group for their preparation of the recommended indices: Dr. Siebert for Kp, Ap, Cp; Dr. Van Sabben for the quiet and disturbed days; Dr. Mayaud for K_M, K_N, K_S and "aa"; Dr. Sugiura for Dst; and J.H. Allen for AE. Special thanks are due to Dr. Van Sabben as Director of the International Services of Geomagnetic Indices.

WORKING GROUP V-7, COLLECTION AND DISSEMINATION OF DATA
H. Maeda - Cochairman

The working group met on 29 August and 4 September, 1975. The meetings were attended by 19 and 22 delegates respectively, from 10 countries in both cases. Because of the absence of Chairman V.P. Golovkov, H. Maeda took the chair.

The draft of a guide on international data exchange for magnetic observatories, prepared by Working Group V-1, was discussed. The meeting agreed to support the publication of the guide.

The working group drafted a resolution urging the continued support of World Data Centers by national governments (IAGA Resolution 9).

It was noted that during the International Magnetospheric Study many experiments will record data at a sampling interval shorter than 2.5 minutes and 1 minute for which IAGA has recommended standard magnetic tape formats. A proposal by A. Nandi for a generalized format for geophysical time series data on magnetic tape was presented. Several delegates had used flexible self-documenting tape formats of the type suggested, and recognized the advantages of the early adoption of an international format which can be read by as many computers as possible. However, it was apparent that agreement on the details could not be reached at Grenoble.

The second meeting of the working group was held to find a procedure for reaching agreement on a flexible tape format for international data exchange. It was decided to ask all with experience in self-documenting tape formats to send documentation of such systems to the World Digital Data Centre, Institute of Geological Sciences, Herstmonceux Castle, Hailsham, Sussex, England. Experts at this WDDC will draft their recommended version of an international format and ask other World Data Centers for comment. It is hoped that a final version can be published early in 1976.

WORKING GROUP V-8 (AD HOC), COORDINATION OF IMS GROUND-BASED, BALLOON AND ROCKET EXPERIMENTS

M. Sugiura - Chairman

Both Chairman Sugiura and Cochairman G. Rostoker have been actively involved in the planning of the International Magnetospheric study through participation in the IMS Steering Committee of the Inter-union Committee on Solar-Terrestrial Physics. The tasks of this working group will begin after the IMS Workshop and the meeting of the IMS Steering Committee are held during the second week of the Assembly. We anticipate that this working group will require close cooperation from other working groups of Division V to achieve its objectives, in particular with regard to the observatories, data handling and indices.

At the working group meeting held on 27 August, 1975, the main discussion concerned the operational coordination center that has been proposed for the IMS by the European Space Agency.

TOPIC V-1, GEOPHYSICAL ALERTS AND FORECASTS

D. J. Willaims - Reporter

Activities of the Past Year

In the areas of space exploration and monitoring the following occurred:

- SOLTERWARN has provided SHUTTLE planners (administrators and principal investigators) with known support capabilities that should be developed for SHUTTLE experiments.

- HELIOS control has been provided daily forecasts of 10cm flux, soft and hard x-ray fluxes and solar activity since 15 September 1974.
- Since June 1974, x-ray, particle and geomagnetic sensors carried by the SMS-A have provided SOLTERWARN with a nearly continuous real time capability to monitor the x-ray and particle flux and the state of the geomagnetic field at synchronous altitudes over the Atlantic. (These data have proven most valuable in the

detection and prompt evaluation of solar x-ray events.) In 1975, this information will be disseminated to other RWCs on a daily basis.

- SOLTERWARN has supported several rocket and balloon launches where timely and accurate information concerning the level of solar activity, location of coronal holes, and the state of the geomagnetic field is essential to mission success.

Other activities of interest during the past year are itemized below:

- In support of the ever increasing need for geomagnetic information, SOLTERWARN prepares a 60 day outlook (long range forecast) of geomagnetic conditions. This outlook is used by pipe line companies and electric power companies to schedule maintenance and to anticipate potential periods of outage due to geomagnetic variations.
- SOLTERWARN issued several page changes to the IUWDS Synoptic Code booklet. The vast majority of these changes were minor in nature.
- The solar observatory at Carnarvon in West Australia was deactivated on 1 July 1974, and the equipments were installed in eastern Australia (optical at Culgoora, radio at Fleurs) in October 1974. This movement to eastern Australia reduced the effectiveness of the operational global solar flare network because of the more adverse meteorological situation in the east and the decrease of two hours in duplicate coverage between the Iranian and Australian sites.
- Due to financial limitations, The Weekly (Preliminary Report of Solar and Geophysical Activity) was discontinued in August 1974. Many of the 1000+ recipients of the Weekly have indicated their concern with the loss of this publication.

- As an integral part of the Space Environment Laboratory, SOLTERWARN personnel were involved in the development of STEM (Solar Terrestrial Environment Model), however again due to financial limitations, SOLTERWARN participation in this effort ceased in August 1974.
- As mentioned in the April 1974 report, SOLTERWARN has performed a small amount of data reduction and analysis and association with the ATM SKYLAB Data Analysis program; Unfortunately the major effort in this area - the proposed SOLAR INSTITUTE - has been delayed; - again due to financial limitations.

Future Activities

In the area of space exploration and monitoring the following are planned:

- A follow-on satellite (SMS-B) and a new satellite (SOLRAD HI) should provide additional x-ray, particle and solar wind information to SOLTERWARN during 1975. The present plan is for these data to be continously available to SOLTERWARN forecasters. After a checkout period, SOLTERWARN will disseminate pertinent data from these satellites to other RWCs on a near real time basis.

- SOLTERWARN hopes to be provided data from the HELIOS satellite. Of prime concern are data which reflect conditions on the "back side" of the sun. It is thought that "back side" information would materially improve the quality of 3 to 5 day predictions of solar activity.
- Within our limitations, SOLTERWARN will serve as a "specialist" in the development of support packages needed by SHUTTLE experiments.

Other Activities Planned for the Future :

- SOLTERWARN personnel will utilize the quiet sun period of 1975-76 to develop better displays, models and objective forecast system which the new data sources and increased computer capabilities permit. Our goal is to provide a more effective and accurate forecast support system during the next solar cycle.
- Several SOLTERWARN forecasters are expected to visit RWCs in Moscow and Paris during 1975. These meetings are expected to improve overall operation as well as increase the effectiveness of IUWDS support to scientist and operational personnel.

TOPIC V-2, INTERNATIONAL GEOMAGNETIC SURVEY BY SATELLITE
R.A. Langel - Reporter

Although this is not a designated working group, a meeting was held on 27 August, 1975, to discuss international geomagnetic surveys by satellite. A report describing past surveys and possible future surveys was presented as described below.

By definition, a geomagnetic survey refers particularly to data in the inner magnetosphere rather than data beyond about 2Re where magnetopause and tail currents exert a dominant effect.

Past contributions to such surveys have been made by the Cosmos 26, 49, and 321 satellites and by the OGO 2, 4, and 6 satellites. More recently, TRIAD and AZURE have surveyed fields near the earth due to field aligned currents. TRIAD and AZURE data are not suitable for use in geomagnetic field models and are not really global in coverage. Thus the latest global survey data is that from OGO-6 which ceased operating in July 1971.

Although several candidate satellite programs seem promising, there is no firmly approved satellite magnetic survey program in existence today.

Proposed programs which if carried out would contribute geomagnetic survey information by satellite are as follows:

- MAGSAT, perhaps the most promising USA candidate, is presently under consideration by NASA. At present the outlook is favorable. If approved, MAGSAT goals would be to make global measurements of 3 gamma accuracy in field magnitude and 6 gamma accuracy in each component. The altitude would be in the 300-500 km range with an inclination between 80 and 90 degrees. The tentative launch date is 1980.

- ELECTRODYNAMICS-EXPLORER, is another USA mission under consideration by NASA. Two polar orbiting satellites are contemplated, one in a near circular low altitude orbit and the other in an elliptical orbit with initial apogee at about 3Re and with adjustment up to 6Re. No scalar instrument is presently planned but vector measurements to a 20-50 gamma accuracy are a goal at the lowest altitudes. Launch goal is approximately 1979.

- MAGIC is a new generation of satellites under consideration by the Soviet Union. Orbits would lie in the 200-1000 km altitude range with up to 75^{o} inclination. The vector magnetometer measurements would be carried out by IZMIRAN, with participation of a research team from Rumania. The reporter does not presently know the accuracy goal that has been set. The projected launch date is approximately 1977.

In view of the indication that there are now three possible satellites which might carry out or contribute to a future magnetic survey, J. C. Cain suggested that Division V should organize a project of international cooperation for collection of supplemental data. A copy of a subsequently issued statement of his proposal is appended. It was suggested that if sufficient interest exists a working group might be formed at this assembly to investigate the possibility of

J. C. Cain's proposal, and if possible begin to carry it out. A. Hahn agreed to contact informally those having potential interest, and report to the Division V business meeting. Finally, a resolution in support of geomagnetic surveys by satellite was drafted for consideration by Division V and IAGA (IAGA Resolution 10 and IUGG Resolution 12).

Proposal by J. C. Cain

Division V has just reported the plans of the USSR to fly a low altitude vector magnetometer satellite in 1977 and of the USA to fly two about 1979-1980. While such coordination and prior arrangement is in progress for such cooperative projects as the International Magnetospheric Study (IMS), these plans are deficient relative to such coordination as will be necessary to adequately develop the satellite data for the purpose of internal magnetic field studies and for the IGRF. Accordingly, a supplemental project is proposed to encompass the following:

1. Items to be coordinated with the IMS.

   (a) Arrays of surface magnetometers, especially around the dip equator, to make simultaneous observations during times of satellite traversals. Equatorial sounding rockets and meteor radar are also recommended to assist in satellite data interpretations.

   (b) Establishment of data reduction centers especially to collect and format digital magnetic observatory data for correlation with satellite results.

2. Items separate from the IMS.

   (a) Special high altitude aeromagnetic surveys to be flown in areas where the satellites have detected long wavelength anomalies.

   (b) Repeat station data to be taken over the earth, with emphasis on isolated locations of rapid secular change. (These will be essential for obtaining secular accelerations.)

It will be assumed that all surface and satellite date pertinent to the definition of the near surface magnetic field structure and its variations would be made available for cooperative analyses by all contributors of data.

INTERDIVISIONAL COMMISSION ON HISTORY

E. J. Chernosky - Chairman

N. V. Pushkov - Cochairman

ORGANIZATION

The new officers and members of the Working Groups are given below:

Working Group 1 - American Sector

Chairman: D. G. Knapp (USA)

Members: N. Smith (USA)
H. B. Garrett (USA)
D. H. Hall (Canada)

Working Group 2 - Pacific-Asian Sector

Chairman: B. N. Bhargava (India)

Members: F. H. Hibberd (Australia)
D. E. Winch (Australia)
G. O. Walker (Hong Kong)
R. Susanto (Indonesia)
M. Ota (Japan)
A. Kimpara (Japan)
R. S. Unwin (New Zealand)
S. R. de Guia (Philippines)

Working Group 3 - European-African Sector

Chairman: G. Fanselau (GDR)

Members: J. Bouska (CSSR)
W. Dieminger (GDF)
M. Fahim (Egypt)
S. R. Malin (U.K.)
P. N. Mayaud (France)
C. A. Onwumecheli (Nigeria)
G. N. Petrova (USSR)
N. V. Pushkov (USSR)
W. Schröder (GFD)
C. Sucksdorff (Finland)
K. Wienert (GFR)
M. van Wijk (So. Africa)

Working Group 4 - Development of Research

Chairman: C. S. Gillmor (USA)

Members: C. N. Gilbert (U.K.)
G. W. Gardiner (U.K.)
D. P. Stern (USA)

REPORT ON SM20 - HISTORY OF GEOMAGNETISM AND AERONOMY

At the Wednesday afternoon (27 August) session of the Inter-divisional Commission on History eight papers were presented and two given by title in the absence of the authors. A large audience (about 50) received the papers very well, some of which gave interesting insights into the personalities of the early scientists working in the IAGA disciplines. Of particular note is the perspective accorded historical developments and the rather cyclic sequence presented by authors who had changed from their original fields of engineering into sociological and true historical evaluations. Papers in this session were by S. R. Malin, M. van Wijk

C. Brodskaya, J. Bouska (by Rosa), C. S. Gillmor, W. Messerschnudt, G. N. Gilbert, M. Fahim, and G. P. Gregori. They involved several disciplines and efforts in the European-African sector.

In the Thursday afternoon (28 August) session six presentations were made and five given by title. Information papers by N. Petersen, W. Schröder, K. Wienert, K. Legning, W. Zander and G. Fanselau on the activities in several disciplines and on the lives of important scientists were presented or read by title. An unscheduled report on the long history of geomagnetic observations in India was given by B. N. Bhargava at the request of the Chairman. An invited paper by E. Selzer on the development of science in Grenoble was welcomed by the audience.

The efforts of G. Fanselau, who did much of the organizing of the program, is greatly appreciated. It was regretted that he could not attend this assembly.

BUSINESS MEETING

At the business meeting, called after the scientific session, there was a brief report from each of the four working groups. Mention was made of the activity in the American Geophysical Union looking forward to the establishment of a new committee within AGU to be concerned with the history of advances in the solar-terrestrial relations and cognate fields. The Commission also decided to initiate a resolution concerning archival material (see Resolution No. 11 elsewhere in this publication).

G. P. Gregori has collected much historical auroral altitude data. Other qualified persons are being contacted to serve as focal points for other specific types of historical auroral data. N. Fukushima has offered to serve as central solicitor and coordinator for all historical auroral observations made up to 1920. These data will then be sent to the World Data Centers. The specialists who are being contacted to serve as specific or regional coordinators are as follows: S. -I. Askasofu, B. W. Currie, G. Fanselau, F. Jacka, D. G. Knapp, G. Lange-Hesse, F. Link, K. Lassen, S. R. Malin, S. Matsushita, A. Ohl, N. V. Pushkov, O. Schneider, D. J. Schove, W. Schröder, W. Stoffregen, R. S. Unwin and the Auroral Group Reporters during the IGY. This effort will activate one aspect of the resolution submitted to IAGA.

INTERDIVISIONAL COMMISSION ON ANTARCTIC RESEARCH

T. Nagata - Chairman

A Scientific Meeting, SM19, on Observations in Antarctica with Special Emphasis on Unmanned Observatories was sponsored by this Interdivisional Commission.

Technical systems and observational results of ground-based unmanned automatic observatories for upper atmosphere physical phenomena at Australian, Japanese, USA and USSR stations in Antarctica were reviewed. Possible improvements of the systems in the future were discussed on the basis of mutual exchange of scientific and technical information.

It was agreed in this meeting that an unmanned automatic observation system is extremely useful in Antarctica and that this kind of observational system could be successfully used in other areas even though they are inhabited.

It has been reported that the coordinated studies of the polar substorm phenomena by combining satellite and ground-based data, and sounding rocket data also when available, are extremely significant in the substorm studies. The satellite telemetric receiving systems at French and Japanese stations in Antarctica will play a significant role for this purpose.

INTERDIVISIONAL WORKING GROUP ON RELATIONS BETWEEN EXTERNAL AND INTERNAL MAGNETIC VARIATIONS

A. A. Ashour - Chairman

The Working Group held a business meeting and a full day scientific session. It was agreed in the business meeting that:

- The Working Group will confine its work to fields covered by its title - i.e. work on the Ionosphere not including relations between internal and external variations will be out of its scope.
- A scientific session will be organized at the Seattle Assembly 1977, possibly in cooperation with Working Group I-3.

In the scientific sessions papers were presented and considerable discussion took place which assured the necessity of the continuation of the Working Group.

REPORT TO GENERAL SECRETARY OF IUGG ON TIDAL INTERACTION PROBLEM

Although this topic did not come directly from one of the existing IAGA organizational units, it is reported here because a few years back this topic was included in the IAGA organization and as the report explains it may again become a part of the IAGA organization. The following report was submitted by O. Schneider.

An informal discussion group convened on Tuesday, 2 September, to discuss the tidal interaction problem in the IUGG structure. The meeting was attended by some 30 representatives including the earth and ocean tide areas, geomagnetism, aeronomy, meterology, and a somewhat smaller participation of specialists in the fields of hydrology and physics of the earth's interior. The object of the meeting was to assess the convenience of setting up an Inter-Association Body at Union level, in the light of the outcome of the Interdisciplinary Symposium, IS24 on "Tidal Interactions, including Earth Tides," held at the present XVIth IUGG Assembly.

Convener O. Schneider reviewed the situation and activities of the already existing bodies on Earth Tides and Ocean Tides, as well as the history of the former Joint IAGA-IAMAP (later, just IAGA) Committee on Lunar Variations. He pointed out that IAMAP had withdrawn from the latter in 1971 (at the Moscow Assembly) and had declared they were not interested in the tidal problems. IAGA in turn, had dissolved the Committee on Lunar Variations two years later. It was pointed out that the Union cannot instruct the Associations as to what aspects of their respective disciplines they should cultivate. On the other hand, the Union as a whole could not be indifferent to the necessity of securing a form of family of closely related global phenomena, such as tides.

Three different possible solutions were discussed:

1. A Broad interdisciplinary body which might be assigned the following tentative objectives, by way of Working Groups:
   (a) Physics of interactions and interaction chains.
   (b) Assessment of methods of analysis.
   (c) Global planning
   (d) Organization of interdisciplinary tidal symposia

2. A minimum solution consisting of just periodical interdisciplinary symposia without a permanent organizational background.

3. A pragramtic approach which would leave the present practice unchanged as far as solid earth and ocean tides are concerned, and reestablish a Joint IAGA-IAMAP group with the explicit mention of tides in its denomination.

Those in favor of solution 1 considered that the lack of a permanent organizational body, as implied in solution 2, would not be satisfactory; judged by past experience. A majority of those present favored solution 3, and the convener was therefore instructed to convey to the General Secretary of the Union the opinion of this group that an appeal should be made to IAGA and IAMAP for establishing a joint body on atmospheric, ionospheric and geomagnetic tides.

HIGHLIGHTS OF SYMPOSIA, SCIENTIFIC MEETINGS AND WORKSHOPS

INTERDISCIPLINARY SYMPOSIA

IAGA was asked to convene seven Interdisciplinary Symposia (IS) and to cosponsor eight others. The IS Symposia convened by IAGA are described and the conveners listed in IAGA News No. 13. The program for each IS topic is included in IAGA Bulletin No. 36. Abstracts which were available are included in a publication "Abstracts of Papers Presented at the Interdisciplinary Symposia" published for the IUGG XVI General Assembly by the French Local Committee. In many cases the above information adequately describes the symposia. In a few cases conveners submitted additional highlight statements which are given below.

IS6 - MAGNETIC PROPERTIES OF SUBMARINE BASALTS AND THEIR RELATION TO MAGNETIC ANOMALIES AT SEA

J. M. Ade-Hall - Convener

Organization

This symposium was held on Friday 29th and Saturday 30th August, 1975. Originally two sessions were scheduled but owing to heavy oversubscription a third session, on the Friday evening was added. The convenor was J. M. Ade-Hall and the program committee consisted of the convenor plus H. P. Johnson (rock magnetism specialist), R. Larson (magnetic anomaly interpretation specialist) and A. R. McBirney (volcanological specialist). The final printed edition of the program consisted of 39 papers; two reviews and the remainder reporting specific results. Eight authors (including six of the seven from the USSR) were unable to attend the meeting and the program committee decided to omit the relevant papers in order to give more time for discussion of the remainder. This was a fortunate decision as discussion time was in great demand throughout. It is recommended that convenors of interdisciplinary symposia in the future limit both the number of papers and the time per paper to a total of no more than half the available time, so as to allow for lengthy discussions, which must be one of the main aims of this type of symposia.

Magnetics of Ocean Floor Basalts

More than half the papers in this section described results from the study of basalts from the Deep Sea Drilling Project. This matches the trend of the "Glomar Challenger" away from sediment sampling and toward

oceanic basement sampling. Studies on material from the median valley of the Mid Atlantic Ridge in the FAMOUS area were the next most abundant. Individual papers described ophiolites from Macquarie Island, basalts from the Explorer Ridge and the possibility of distinguishing extrusives and intrusives by magnetic susceptibility anisotropic tests. Valuable discussions took place on a number of subjects, in particular:

- Problems facing IPOD investigators, such as the reality and distribution of reversely magnetized basalts in median valleys, the thickness of the magnetic anomaly source layer and the explanation of the frequent occurrence of markedly non-dipolar NRM inclinations in Layer 2 basalts.
- Whether oxidation or grain size effects are responsible for the observed changes in the magnetic properties of submarine basalts as they are carried away from spreading centers.
- How in situ viscous remanent magnetization can properly be determined, with the trade-off between temperature and time being identified as an important factor in laboratory tests of VRM acquisition.

Magnetic Anomalies at Sea

Reports here covered a much wider range of interests than in the ocean floor basalt section. R. L. Larson reviewed the development of the interpretation of oceanic linear magnetic anomaly patterns and pointed out that the magnetization of an effective source layer showed on a world wide basis significant secular change, of which only the initial sharp decrease could be explained by low temperature oxidation associated with chemical interaction with sea water. He suggested that the remainder of the cyclic secular change pattern is best explained in terms of variation in the time average strength of the geomagnetic source. Novel suggestions from other authors include the idea from K. D. Klitgord that small peaks on anomaly number 1 indicate very recent eruptions in that area (and their absence that eruptions are due) and from G. F. Hinton that electric current flow may be responsible for the Reykjanes Ridge linear magnetic anomaly pattern.

IS7 - TECTONOMAGNETISM AND TECTONOELECTRICITY

T. Rikitake - Convenor and M. J. S. Johnston - Co-convener

The symposium was held on September 5, 1975. In addition to the

scheduled papers the following three papers were read.

- V. A. Shapiro (USSR) - A review on secular variation anomaly work in the USSR.
- Y. Ispir, A. M. Isakara and H. Öxden (Turkey) - Variations in the local magnetic constant and seismicity of Turkey.
- K. Yanagihara and T. Nagano (Japan) - Time change of transfer function in the central Japan anomaly with special reference to earthquake occurrence.

The morning session was devoted to topics of tectonomagnetism. On the basis of nationwide magnetic surveys, M. Tazima pointed out that there are a number of areas in Japan where the geomagnetic secular variation is anomalous, although it is not quite clear why we observe such anomalies. They may well be correlated to volcanic and seismic activities.

M. J. S. Johston summarized the U. S. Geological Survey work on tectonomagnetism in California and Nevada. It appears that there are instances for which a clear geomagnetic change is associated with earthquake occurrences. A geomagnetic change preceding the Thanksgiving Day earthquake, on November 28, 1974, was especially outstanding. This had also been reported in IS4. Local anomalous change in the geomagnetic field would doubtless provide a means for clarifying earthquake phenomena.

T. Nagata calculated the geomagnetic changes associated with the 1964 Niigata earthquake (M=7.5) on the basis of focal parameters reaching a conclusion that they are of the right order and pattern.

The magnetic work on Hawaii Island made by P. M. Davis indicates that the deformation within a volcano does not seem entirely elastic. Some considerations on possible thermal effects may be required in interpreting geomagnetic changes in a volcano.

V. A. Shapiro presented an enormous secular variation anomaly in the Ural area. This anomaly must have something to do with a large scale tectonic movement there. He also presented a review of secular variation anomaly work in the USSR.

When B. K. Bhattacharyya talked about theoretical geomagnetic variations associated with a strike-slip fault, T. Nagata remarked that similar studies on a dip-slip fault must be extensively made.

Y. Ispir presented some proton precession magnetometer work in Turkey. It appears that seismomagnetic effects were sometimes observed although they are not quite certain. An interpretation of geomagnetic secular variation in terms of local geomagnetic constants was given by A. M. Isakara.

The first talk for the tectonoelectricity session in the afternoon was given by T. Rikitake. He presented some of the recent results obtained by the Yamazaki resistivity variometer. It was shown that a very small mechanical strain of the order of $10^{-8} \sim 10^{-9}$ is monitored by the instrument in terms of resistivity change when a large earthquake occurs at a teleseismic distance. In many cases a precursory change is observed.

T. Rikitake talked about electromagnetic induction within an earth in which there is a highly conducting inclusion which is probably caused by dilatancy. In some cases the magnetic field of short period is modified to an extent that can be detected by geomagnetic variometers. It may be that changes in geomagnetic variations can well be applied to earthquake prediction.

On behalf of J. Miyakoshi, who was unable to attend the meeting, T. Rikitake read a paper on an anomalous secular change in the Parkinson vector at Tashkent. The change preceded the 1966 earthquake. This could be accounted for by assuming a change in the configuration of the underground conductor.

Similar changes in geomagnetic variations at Kakioka Magnetic Observatory in Japan was reported by K. Yanagihara. It seems likely that the changes in transfer function of geomagnetic variation do occur prior to moderately and extremely large earthquakes. It may be said on the basis of the theoretical and experimental results that changes in geomagnetic variations may provide a basis of earthquake prediction.

J. H. Witcomb reported on the preliminary geoelectric work in southern California.

H. Mizutani emphasized the importance of the electrokinetic effect associated with water diffusion. Even a suggestion that earthquakes may be controlled by applying an electric field to the earth's crust was made.

In summary it may be said from what we learned in the symposium that seismomagnetic effects can be observed in favorable cases and that monitoring of geomagnetic variations of short period originating outside the earth can well provide a means of earthquake prediction.

The papers presented at the symposium will be published in the Journal of Geomagnetism and Geoelectricity.

Two abstracts which were not available before the Assembly are given below:

Variations in the Local Magnetic Constant and Seismicity of Turkey.

Y. Ispir, A. M. Isikara and H. Özden (x), I. U. J. Kürsüsü, F. Fakültesi, Istandul, Turkey

(x) H. G. Mudurlugu, Cebeci, Ankara, Turkey

Secular variations of the geomagnetic field and the variations in the local magnetic constant (G) between the epochs 1965.0 and 1970.0 for whole Turkey are considered. G isolines are found to be almost perpendicular to the stress directions obtained by earthquake mechanism studies for this region. There is also a good correlation between the values of G and the energy density which is calculated for only the western part of Turkey.

Time change of transfer function in the central Japan anomaly of conductivity with special reference to earthquake occurrences

K. Yanagihara and T. Nagano

Electrical conductivity change of the earth interior is confirmed in relation with earthquake occurrences by using transfer functions which connect three components of geomagnetic variation. During 22 months from August 1973 to May 1975, 6 conspicuous changes of transfer function are found at Kakioka coinciding with 10 large and near earthquakes. High seismic activity extends near the edge of a local conductivity anomaly in the vicinity of Kakioka.

IS9 - ANALYSIS, PROCESSING AND INTERPRETATION OF GEOPHYSICAL DATA

R. A. Langel - Convener

The symposium was divided into three parts, the following is a summary of highlights from each part.

Assimilation/Compression, Quality Evaluation, and Representation of Large Amounts of Data.

In this part five major emphases were present:

. Field equipment, in the form of a multi-rate, variable channel, gain ranged recording system was discussed by M. Landisman. A future

system will be completely automated and will include a telemetry capability.

- Field networks were discussed by B. Massinon (seismic) and W. H. Klein (weather). The weather stations will utilize mini-computers and both systems are tied together with new instantaneous communication facilities. Features of such systems have potential applications in the IMS and in earthquake prediction networks in the future.
- Formatting of data in a generalized way was discussed by R. L. McPherron. Essential features of this format were a header record of fixed format which described the data records to follow. Such systems have also been applied elsewhere with success since they enable the input of very diverse types of data into standardized analysis programs.
- Pre-analysis discrimination and filtering of data was touched by D. W. King, K. Watson and A. J. Surkan. Techniques such as comparison with model predictions, intercomparison of related spectra, and color coded display of potentially interesting parameters were all utilized for this purpose.
- Representation and display were discussed by A. J. Surkan and K. Watson. Interactive usage of cathode ray tube plots is now widespread. Another technique of great value in the two-dimensional data is false color plots of various parameters. In many cases a pre-analysis operation such as performing spectral ratios of simultaneous data or amplitude stretching is applied to the data prior to plotting.

Mathematical Techniques for Geophysical Data Analysis.

Nineteen papers were presented in this part of the symposium covering five areas of research:

- Analysis of stationary and non-stationary time series.
- Spectral analysis.
- Presentation and interpretation of gravity and magnetic data.
- Determination of earth structure using seismic methods.
- Theoretical papers on miscellaneous topics.

The maximum entropy method developed by Burg is continuing to receive a lot of attention. In this symposium it was shown that this method of spectral analysis, with high resolution capability, can be effectively applied to diverse fields of research such as astronomy (T. Ulrych) and geomagnetic studies (H. R. Radoski, et al., V. E. Courtillot, et al.). Interesting new time domain filters were also presented by B. K. Bhattacharyya, for interpretation of magnetic and gravity data, and by R. F. Mereu who presented a new deconvolution and wave shaping filter which optimizes the distribution of errors. J. C. Dooley developed a method of interpreting irregularly spaced data using two-dimensional spline surfaces. A number of papers (e.g., J. L. Lacoume, et al,

K. Kodera and C. de Villedary, M. Landisman) showed how the characteristics of non-stationary time series may be displayed and studied using frequency-time analysis techniques. Geodetic applications of stochastic processes were reviewed by W. Grafarend.

Data Inversion. Application of Mathematical/Computer Techniques to Physical Problems.

V. Keilis-Borok pointed out that geophysicists are engaged in the task of reducing large amounts of data to a few descriptive model parameters. For example, D. J. Olbers and J. Willebrand reduced about a hundred thousand data points to about 20 model parameters through a filtering technique. Often in this process we over produce data instead of designing more efficient experiments. V. Keilis-Borok suggested that our problem solving needs to more nearly simulate the human mental process as applied to identifying general characteristics of objects, people, etc., instead of detailed and, often, inconsequential details. He noted that many of the great discoveries are qualitative rather than quantitative models. One example is the model of plate tectonics whose major features even today are conceptual. One attempt to move in this direction was given by F. Press in a paper read by L. Knopoff. In this case a pattern recognition technique was applied to Chandler Wobble data to attempt to isolate major correlative patterns. Other highlights include the use of maximum entropy spectral analysis by T. E. Landers to filter signal echoes from seismic data of underground explosions, a description by R. D. Brown of Binary Sample Functions, and related Walsh functions, to data inversion problems. These functions may prove advantageous in models where fine spatial resolution is required where they have advantages over high order expansions of harmonic analyses for example. A. L. Fymat presented a technique for solving the non-linear atmosphere radiative transfer inversion problem. An educated trial and error approach using ratios of the Fredholm equations was used. The use of ratios removed some of the mathematical problems otherwise encountered. Two papers presenting interpretations of specific data were also presented. R. A. W. Haddon analyzed seismic data and concluded that precursors to P'P' signals arise from the same source as precursors to PP and PKIKP signals. Doppler radio data from Mariners 9 and 10 were analyzed by P. B. Esposito and a new value of GM of

398600.67 $\pm$.2 km^3/sec^2 was reported. This work weighed heavily in the recommendation of the IUGG for the value of 398600.5 +.3 km^3/sec^2.

IS14 - DEEP AND SHALLOW STRUCTURES OF VOLCANOES
R. Wilson - IAGA Reporter

Of twenty papers presented at this interdisciplinary symposium, five were concerned with magnetic or electromagnetic techniques.

G. V. Keller discussed electromagnetic sounding surveys revealing high electrical conductivity to depths of a few km, beneath a few volcanoes.

L. Kristjansson presented results of a marine magnetic and gravity survey of the offshore extension of Snaefellsnes, Ireland. This work showed similarities with the Iceland-Faeroes ridge. R. Alvarez discussed aeromagnetic and surface surveys in the Mexican volcanic belt. These surveys revealed magnetic necks of various depths beneath volcanic cones, maars, and calderas, and perhaps shallow magma chambers beneath the maars.

Studies using combined techniques by V. Arana et al. led to a model of the Timanlaya volcanic area consistent with petrology, high surface temperature, strong seismic noise and isotopic composition. C. Corrado et al. used combined gravity and magnetic surveys of the Neapolitan and Roman areas of Italy to create a model of fairly shallow magma following fractures. Geological control of the volcanoes was discussed.

Particularly interesting work by H. M. Iyer and J. R. Evans established a 10% decrease in P-wave velocity beneath the Yellowstone caldera, down to at least 250km, suggesting a convection plume.

IS25 - GLOBAL EFFECTS OF THE INTERPLANETARY MEDIUM - MAGNETOSPHERE - LOWER ATMOSPHERE INTERACTIONS
W. O. Roberts - Convener

The symposium consisted of 17 invited papers, 27 contributed papers, and a brief discussion session about possible solar-weather mechanisms. Several additional papers were presented by title only, abstracts being available.

Substantial new statistical evidence was given supporting the existence of significant interactions between geomagnetism and weather, and between solar activity and weather.

An important highlight was a statistical analysis by C. O. Hines and I. Halevy strongly supporting a physically meaningful relationship between the solar magnetic sector structure (data of J. W. Wilcox, et al.) and the northern hemisphere 500 mv vorticity area index (data of W. O. Roberts, et al.). The authors suggested, based on signal/noise considerations, that the solar signal may organize or phase-lock the meteorological fluctuations, rather than superimposing a solar-produced perturbation.

The Symposium focused on the importance of efforts to develop physical hypotheses to explain the complex interactions which appear most markedly in winter and at high latitudes, and exhibit differences over oceans and continents. No satisfactory hypotheses exist at present.

The bulk of the program was as shown in IAGA News No. 13 and IAGA Bulletin No. 36. A few of the papers listed there were not given and the following papers were included:

- V. Bucha - Variations of the Geomagnetic Field, Climate and Weather
- M. Shiraki - IMF Sector Structure and Day to Day Changes of Focus Latitude and Intensity of Equivalent Current System of Geomagnetic Solar Daily Variations
- K. D. Cole - A Physical Argument and a Hypothesis about Sun-Weather Relationships
- C. Polk - Influence of Solar Activity on Electrical Conductivity below 80 km by A. Tranh and C. Polk
- F. Link - Relationships of Solar Activity and Weather from Ancient Records
- E. R. Mustel - Solar Activity and Droughts

SCIENTIFIC MEETINGS

IAGA held scientific meetings (SM) on 23 topics as described in IAGA News No. 13 and IAGA Bulletin No. 36. Bulletin No. 36 contains abstracts of papers if they were available. A few of these scientific meetings were cosponsored by other organizations such as COSPAR and URSI. In many cases the above information adequately describes the meetings. In some cases conveners submitted additional highlight statements which are given below.

If highlights of a given SM of interest to the reader are not in this section, the reader should scan the section Reports of IAGA Organization Units where some of the SM highlights are interwoven with Division reports.

SM15 - PHYSICS OF THE PLASMAPAUSE

T. R. Kaiser - Convener

Through the kindness of the editor of the Journal of Atmospheric and Terrestrial Physics (J. A. Ratcliff) the proceedings of this meeting will be published as a special issue of JATP. It is hoped that this will appear within less than one year.

For more information on this SM see the report of Division III elsewhere in this publication.

SM18 - SOLAR WIND INTERACTION WITH BODIES OTHER THAN THE EARTH

P. Schindler - Convener

The dominant topics of the meeting were the solar wind interaction with the planets Jupiter, Mars, Venus, Mercury, with the Moon, and with comets. Some of the results are briefly summarized. Names in parenthesis indicate authors of papers presented at the Assembly on the topic being discussed.

Jupiter

E. J. Smith demonstrated that a combined discussion of the results of the space probes Pioneer 10 and Pioneer 11

strongly suggest that the Jovian magnetosphere shows considerably more similarity with the Earth's magnetosphere than one had tentatively concluded from the Pioneer 10 results alone. As is true of the magnetosphere of the Earth, the Jovian magnetosphere can be described as a blunt obstacle situated in the solar wind with a correspondingly shaped detached bow shock and a thin magnetospheric boundary. The shape of the magnetopause may be described theoretically by methods similar to those developed for the terrestrial case (D. B. Beard). A disc-shaped configuration which played a central role in the earlier discussions of the shape of the entire magnetosphere seems to be present also, but it seems to apply only to the thermal plasma distribution on closed field lines rather than to the entire magnetosphere. The Jupiter-Earth-analogy clearly breaks down as soon as one considers the Jovian magnetosphere in somewhat greater detail.

Among the distinguishing features that were discussed are the plasma disk which can be deduced theoretically from an existing model of the measured magnetic field (H. Goldstein), and the apparent need for escape processes for high energy particles (A. J. Dessler, et al. and A. Nishida). The observed 10-hour modulation of relativistic electron fluxes may be explained by a longitudinal asymmetry in the ionosphere (A. J. Dessler, et al.).

Mars

The dominant problem appears to be the nature of the obstacle. While results from the space probes Mars 2, Mars 3 and Mars 5 clearly indicate the presence of a bow shock it seems difficult to decide whether the obstacle is a magnetosphere associated with an intrinsic magnetic dipole moment of Mars or whether the concept of the solar wind interaction with a non-magnetized planet applies. An intrinsic dipole moment of about 2.5×10^{22} Gauss cm^3 was favoured by K. I. Gringauz on the basis of his own plasma measurements, of the magnetic field results of S. Dolginov, et al.

and of the paper by T. K. Breus and M. I. Verigin. The opposite view is expressed by O. L. Vaisberg and his colleagues in their paper which was read by M. K. Wallis. A comparative study using all available information may in the near future lead to a more definite answer (K. I. Gringauz).

Venus.

In connection with Venus the discussion centered around the solar wind interaction with non-magnetized bodies surrounded by an ionosphere. For small absorption the magnetohydrodynamic flow pattern was quantitatively modeled for a specific case (J. R. Spreiter and A. W. Rizzi). P. A. Cloutier described a general scheme that would allow one to compute the interaction of the solar wind with the ionosphere in greater detail. M. K. Wallis favours a stronger interaction. More quantitative computations seem to be required before the controversy can be settled. Naturally, similar questions would be of interest for Mars in the absence of an intrinsic dipole moment.

Mercury.

N. F. Ness reported on the magnetic field measurements that were made during the encounters of the Mariner 10 space probe with Mercury. The results are consistent with the existence of a magnetosphere due to an intrinsic magnetic dipole of 5.1×10^{22} Gauss cm^3. The magnetosphere represents a blunt obstacle in the solar wind. In this picture the bow shock and the magnetopause can be clearly identified.

In the absence of an ionosphere, an induction process (without an intrinsic dipole) requires complicated processes which are not yet very well understood (C. P. Sonett).

Moon.

The properties of several ion species of the solar wind as detected on the surface of the moon have several interesting applications. For instance, an astrophysical consequence is based on the fact that one can determine the abundance ratio of C^{12} and C^{13} on the surface of the sun. As J. Geiss pointed out this ratio differs very much from the values

expected near the center of the sun, which suggests the absence of significant large-scale mixing in the sun. Detector experiments on the moon provide information about the configuration of electric potentials (J. W. Freeman). Local structures of the magnetic field on the lunar surface may give rise to enhancements of the magnetic field in the terminator regions on a lunar orbiter (C. T. Russell). A new technique to measure local magnetic structures is based on electrons which are reflected back from the magnetic inhomogenities at the surface (K. A. Anderson, et al.).

Comets.

H. U. Schmidt presented new two-dimensional computations of the plasma and magnetic field configuration in the subsolar cometary environment. One of the quantitative features that the model predicts is that upstream of the comet the solar wind is changed significantly at distances of 10^6 km. The fact that the result of one-dimensional computations is substantially different (D. B. Beard) might indicate that quantitative models require at least two dimensions.

A non-linear theoretical study shows that observed helical waves in cometary tails may be interpreted as stable MHD-waves excited by the Kelvin-Hemholtz process (A. Ershkovich).

The results of the meeting demonstrated that during the past two years an unusually large step forward was made in the field of the solar wind interaction with several objects in the solar system. Quantitative results have become available and have already initiated some quantitative theory in areas where in the past we had to live with largely qualitative and speculative approaches alone.

SM22 - INTERPLANETARY MEDIUM BETWEEN 0.3 AND 5 AU AND BEYOND
L. F. Burlaga and P. C. Hedgecock - Conveners

The presentations in this session were based on data obtained from the relatively recent flights of Mariner 10 (J. D. Scudder and K. W. Behannon), Mars 3 (K. I. Gringauz

and M. I. Verigin), Pioneer 10/11 (P. J. Coleman, et al.) and Helios (F. M. Neubauer, et al., and F. Mariani et al.). Among the significant observations or conclusions are the following:

- The rather slowly varying field and plasma signature of a fast/slow stream interaction region at 1 AU becomes appreciably steepened by the time the phenomenon has propagated out to Jupiter, with the slow rising and falling wings of the event becoming steepened to form forward and reverse shocks. Few statistics on this were presented but the suggestion that this is normal seems unavoidable from the presentation.
- Apparently the direction of the Archimedian spiral as defined by the mean values of the magnetic field components differs from the direction predicted by Parker's model of an uniformly expanding corona as one proceeds out to Jupiter. It is not clear whether this descrepancy is due to the use of a single parameter (the mean) to represent the changing distribution functions which characterize the field fluctuations or whether the mean field directions to be expected in the actual, longitudinally asymmetric solar wind should differ from the predictions of the Parker model.
- Relative to the magnetic field strength, the transverse fluctions increase towards the sun, whereas the fluctuations in magnitude remain constant. Coherent wave trains have been observed for the first time by the Mariner 10 magnetometer. The search coil magnetometer on Helios has detected bursts in the 100 Hz frequency range. All these observations will have to be considered in devising theories of energetic particle diffusion.

It appears that further significant results of the radial dependence of solar wind parameters could emerge from more extensive combinations of plasma and field data.

WORKSHOPS

Two workshops were held at Grenoble: W1 - The IMS Workshop and W2 - A Workshop on "International Cooperative Tidal Experiment". Additional information not published before is given for W1 below.

W1 - Workshop on the IMS

J. G. Roederer - Convener

The following schedule was arranged just prior to the workshop to take full advantage of latest developments. Each presentation was a short critical review (15 minutes each) of outstanding physical and/or organizational problems of the individual topics as they relate to the IMS program. Each presentation was followed by a 15-minute discussion period of which the first 5 minutes was reserved for the Panel Members (i.e., the invited speakers), with the remaining time open to the floor.

1. Tuesday, September 2, 9:00 - 12:00 h

Physical Problems

René Pellat - Chairman

General Configuration of the Magnetosphere - V. Vasyliunas

Magnetospheric Perturbations - A. Nishida

Electric Fields and Ionosphere-Magnetosphere Interactions (to include Field-Aligned Phenomena) - R. A. Wolf

Wave-Particle Interactions - R. Gendrin

Magnetic Pulsations - O. M. Raspopov

2. Tuesday, September 2, 14:00 - 17:00 h

Physical Problems (continued)

René Pellat - Chairman

Numerical Magnetospheric Modelling - W. P. Olson

Ionospheric Plasma and Ionosphere-Atmosphere Coupling - H. Rishbeth

Propagation of Magnetospheric Disturbances to Lower Latitudes - C. Park

Aeronomic Inputs to the IMS - N. Spencer

Magnetospheric Dynamics and Atmospheric Responses on a Global Scale - K. D. Cole

3. Wednesday, September 3, 10:00 - 13:00 h

Experimental/Observational Projects

V. A. Troitskaya - Chairman

The GEOS Project - K. Knott and D. E. Page

the ISEE Project - F. L. Scarf

Other IMS Satellites - J. I. Vette

The CCOG Project - W. Stoffregen

Antarctic Programs for the IMS - T. Nagata

Incoherent Backscatter Facilities - P. Williams

4. Wednesday, September 3, 14:30 - 18:00 h

Observational Projects (continued)

R. H. Manka - Chairman

IMS Magnetometer Chains - M. Sugiura

Magnetic Meridian Project (past and present) - A. Zaitsev

Auroral Observations - B. Hultqvist

Electric-Field-Measurement Balloon Programs - J. -J. Berthelier

The Satellite Situation Center - M. J. Teague

IMS Data Retrieval and Distribution - D. J. Williams

Panel Discussion - Moderator - J. G. Roederer

FINAL PLENARY SESSION

The final plenary session was held Thursday afternoon 4 September, at 2:00 p.m.

President Troitskaya welcomed the delegates and expressed the hope that their meetings had been very useful.

REPORT OF RESOLUTIONS COMMITTEE

A. J. Dessler reported for the resolutions committee. Except for the resolution of Thanks to the French Organizing committee, the resolutions were not read aloud because they had been distributed in the pigeon holes of delegates several days earlier. There was some minor discussion from the floor, but the resolutions were finally passed as shown elsewhere in this bulletin.

Following the adoption of the resolution of Thanks, M. Nicolet, speaking in French, for himself and the other chief delegates again expressed thanks to the local committee for all they have done to make this assembly a success.

REPORT OF FINANCE COMMITTEE

J. O. Cardus reported for the Finance Committee.

The Finance Committee, consisting of J. O. Cardus, chairman, C. G. Sucksdorff, and K. L. Svendsen, held a meeting during the General Assembly of the IAGA, on Thursday, August 28, 1975, and examined the finance account for the period 1 January 1971 to 31 December 1974. All the documents received from the General Secretary, Leroy R. Alldredge, were very clear and had already been checked by an official accountant.

At the beginning of the period the cash on hand and in banks amounted to $26,970.33 and at the end of the period to $31,201.52, which means an increase of about $4,000. A talk with the General Secretary revealed, however, that this increase will be spent in the next period to support the work of the Divisions in a more substantial way.

On the basis of the statement presented and the detailed information supplied by the General Secretary, which we deem satisfactory, we endorse the report and recommend that it be accepted.

We also propose that IAGA express its thanks to Dr. Alldredge for excellent management of the limited funds and to his Institute for its

assistance which contributed to keeping the management costs of the IAGA Secretariat at a very low level.

Following the above report it was accepted by a vote of the delegates present.

REPORT OF IAGA/IAMAP JOINT WORKING GROUP

B. A. Tinsley reported on the work of the IAGA/IAMAP Joint Working Group. The chairman of the Joint Committee, J. B. Gregory gave a similar report at the IAMAP Plenary Session. Their report follows.

Our committee was set up in 1973 following a request by Dr. Fritz, president of IAMAP, to Dr. Troitskaya, president of IAGA, to coordinate activities and arrange for joint symposia between IAGA and IAMAP on subjects of common interest to the two Associations.

We arranged the "Stratosphere-Mesosphere Relations" symposium at this meeting, and coordinated other activities. We are working with URSI in the project initiated by SCOSTEP called the "Middle Atmosphere Project". We have been asked by both the IAMAP Executive Committee and the IAGA Executive Committee to coordinate the programs of the two Associations for the forthcoming Joint Scientific Assembly, of IAGA and IAMAP, in August 1977, in Seattle. We have asked for suggestions for joint symposia topics from both IAGA Divisions and IAMAP Commissions, and have synthesized these into five (5) topics for joint symposia. While there may be some further modification during the next year, these form a basis for present planning. We have also agreed on having five (5) Inter-Association lectures, of the type that were so successful here in Grenoble. We will work with the Secretaries of the two Associations in coordinating the internal programs of the Associations with this joint program.

We are now looking forward to an era of cooperation rather than conflict between the two Associations.

REPORT OF AD HOC COMMITTEE ON STATUTES

J. O. Cardus gave the following report for the Ad Hoc Committee on Statutes.

At the Opening Plenary Session it was agreed that an ad hoc committee be established to produce an ammended version of the United States proposal for new statutes and that National Committees should be invited to

contribute to this proposed amended version.

As you know the Committee was established by the Executive Committee as follows:

J. O. Cardus (Spain), chairman
C. M. Carmichael (Canada)
B. R. Leaton (United Kingdom)
M. Petit (France)
A. D. Powsner (USSR)
B. A. Tinsley (USA)

A request was circulated to the effect that National Committees give the Statutes Committee suggestions for modifications, amendments, etc. I am sorry that I have to mention the answer to this request has been very poor.

The Committee held several meetings during this Assembly meeting for a total of 27 hours; most of the time all the members were present; in some cases some of us had to attend other urgent business, but all members were immediately informed of the resolutions adopted. The result of this work is the Draft you have before you. I am sorry we had no time to prepare at the same time the French version of the statutes; nevertheless as the adoption of the new statutes is to be done in accordance with the old ones, I can inform you that the French text will be distributed to National Committees together with the English text.

I wish to mention that we had time for a more thorough revision of the Statutes than of the By-Laws, and therefore, you will probably find more amendments to suggest to this part of our work.

Now I would like to put before you some of the main ideas adopted by the Committee in order to perform our work. First of all we accepted the United States proposal as a good and workable document and also the written remarks presented by France and Canada and the remarks that we got from United Kingdom and Spain. We used the United States text as the main document and the other suggestions as amendments.

When discussing any point of the Statutes or of the By-Laws we had in mind the following leading ideas: To produce a text that will help in a more smooth and easy running of the Association; to make it as democratic as possible; to conform as much as possible to the IUGG

Statutes, and also to preserve, when possible, the old statutes.

Finally we also accepted the principle that the Statutes should be by themselves a more permanent document than the By-Laws and therefore that they should not contain such expressions that were apt to be changed in a short time. One example of this was in Article 2 of the Statutes where we accepted the principle that IAGA may establish its own IAGA Bodies and also other Joint Bodies with other Associations of the IUGG and ICSU organizations, but the names of "Divisions", "Inter-Division", etc., were given only in the By-Laws. The same reasoning applies to the definition of the objectives of the Association. It must be clear enough to define our field of interest, avoiding, as much as possible, clashes with other organizations, but at the same time must be general in such a way that if in the future there appears some new subject that is certainly within the domain of IAGA, as happened some years ago with the discovery of the solar wind, no modification of the Statutes be necessary in order to allow IAGA to deal with it.

I would like to draw your attention to three points that we think have some special interest: First of all to the fact that through a ruling of the IUGG the membership of IAGA is very large, because all member countries of IUGG are automatically members of all seven IUGG Assocations even if they have no active interest in the objectives of a particular Association. We tried to arrange this with definitions of accredited delegates and chief delegates and with the voting rules established in the Statutes and By-Laws. We would like the National Committees to look very carefully at these points keeping in mind that there are some 76 adhering countries to IUGG and that at the first meeting of this General Assembly there were only some 15 persons duly accreditated as Chief Delegates.

A new idea that was introduced in Article 17 of the Statues was the possibility that a President's ruling may be challenged at a General Assembly. This is the only case where the Committee was faced with a tie: three of us were in favor of this amendment and three were against it. We finally agreed to introduce it in the Draft proposal, subject to the possible revision that may be needed after comments are received before the Seattle meeting.

The third point we have to mention is the fact that we used the new term "Conference of Delegates". In this we follow in some way the

idea of the new Statutes of IASPEI and the reason for it is that at the present time the old term "General Assembly" means all of the meetings that take place at four year intervals either administrative or scientific, or any others that may occur. A suggestion put forward to preserve the old term was to use "Plenary Meetings of the General Assembly" but this term seems not to be the best as it is difficult to say (Statutes, Article 5) that the work of the Association shall be directed by the plenary meetings of the General Assembly. We wish to be directed by a body of persons and not by things.

Finally, we have to mention that much thought was given to Article 3, of the By-Laws, where rules are given for the nominations of leaders of Divisional and Inter-Divisional bodies. As we could not find a better proposal we left the original one; perhaps we may receive some good suggestions from National Committees.

I come now to the procedure for future work on this matter in order to be in time to make a final decision at the Seattle meeting. The General Secretary of the Association shall send to National Committees copies of the Draft Text of the Statutes and By-Laws and request that they send to the Committee suggestions for amendments before the end of February 1976 (i.e. practically a six month period). The Committee then will consider these suggestions and will produce a new revised draft text by the end of June 1976. This text will again be circulated to the National Committees for minor amendments if they feel they are still necessary, and finally by the end of February 1977, that is to say six months prior to the Seattle meeting, as required by the Statutes actually in force, the final text will be distributed to the National Committees and it will be put to formal voting at the Seattle meeting.

This is the work we did and the lines of thought that have helped us in doing so; now it is up to you and your National Committees to help us in the task of producing new Statutes and By-Laws for the best interests of our Association.

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The General Secretary gave a summary report on actions taken by the Executive Committee. This report is not reproduced here because the full minutes of the Executive Committee are included elsewhere in this publication.

REPORT OF THE NOMINATIONS COMMITTEE

T. Nagata gave the report of the Nominations Committee. After explaining the rationale used in the deliberations of the Committee he posted the nominations as follows:

President:	J. G. Roederer (USA)
Vice President:	G. M. Weill (France)
Vice President:	K. D. Cole (Australia)
General Secretary:	N. Fukushima (Japan)
Members:	M. Ackerman (Belgium)
	L. R. Alldredge (USA)
	V. Bucha (Czechoslovakia)
	A. J. Dessler (USA)
	M. Gadsden (U.K.)
	V. A. Troitskaya (USSR) (Ex-officio member as retiring President)

Several delegates including R. Gendrin, J. Dungey, E. Selzer, and A. A. Ashour discussed the problem of having a greater representation from developing countries than now exists in the IAGA structure, but no new nominations were made. The above slate of nominees was then elected.

President Troitskaya explained that the Executive Committee had established honorary memberships in the Executive Committee to honor senior scientists who have been President of IAGA and have served at least 12 years on the Executive Committee, but are no longer members of that body. Honorary members may have a voice in the Executive Committee, upon request of the Executive Committee, but no vote. Distinguished scientists that are now honorary members are: J. Couloumb, V. Laursen, M. Nicolet and T. Nagata. All of these scientists were present except V. Laursen. They were invited to stand for recognition. They were honored by a standing round of applause.

President Troitskaya asked for a moment of silence in memory of Drs. James Paton and Vincenzo Ferraro who have died since our last Assembly.

T. Nagata, for all those present, thanked President Troitskaya for the very fine work she has done for the IAGA during her term as President. This was followed by a standing round of applause after which the Assembly was declared closed until the Seattle Assembly in 1977.

RESOLUTIONS

Resolution of Thanks

The International Association of Geomagnetism and Aeronomy expresses its warmest thanks to the Organizing Committee of the French National Committee of Geodesy and Geophysics for the XVIth IUGG Assembly. In particular, IAGA wishes to express its gratitude to all who have worked in making the excellent preparations and arrangements for its meetings and to the Director and staff of the Ecole Nationale Supérieure d'Electrotechnique et de Génie Physique.

Résolution de remerciements

L'Association Internationale de Géomagnétisme et Aéronomie exprime ses plus vifs remerciements au Comité d'Organisation du Comité National Francais de Géodésie et Géophysique pour la XVIème Assemblée de l'UGGI. En particulier, l'AIGA désire exprimer sa reconnaissance à tous ceux qui ont contribué à la préparation et à l'organisation de ses propres réunions ainsi qu'au Directeur et au personnel de l'Ecole Nationale Supérieure d'Electrotechnique et de Génie Physique.

Resolution 1

IAGA, noting that some observatories find it difficult to microfilm their magnetograms and hourly-value tables for submission to the World Data Center, urges the observatories concerned to offer their records to a visiting World Data Center representative for filming in order to make these data available to the scientific community.

Résolution 1

L'AIGA, notant qu'il est difficile pour certains observatoires de microfilmer leurs magnétogrammes et tableaux de valeurs horaires pour les envoyer aux Centres Mondiaux de Données, invite ces observatoires à un représentant des Centres Mondiaux de Données de reproduire les documents en question afin de les mettre à la disposition de la communauté scientifique.

Resolution 2

IAGA, noting the increasing importance of permanent magnetic observatory recordings to the understanding of many fundamental concepts in the geophysical sciences, in addition to their necessary contributions to practical applications, urges that any proposal to change the number and distribution of magnetic observatories be discussed with IAGA.

Résolution 2

L'AIGA, notant que les enreqistrements réalisés dans les observatoires magnétiques permanents ont une importance croissante pour la compréhension de maints concepts fondamentaux en géophysique, aussi bien que pour leurs contributions indispensables à des applications pratiques, demande que toute proposition de modification du nombre et de la répartition des observatoires magnétiques soit discutée avec l'AIGA.

Resolution 3

IAGA, considering that the three-hourly indices "aa" constitute a homogeneous series for quantitative estimation of geomagnetic activity beginning with the year 1868, recommends the yearly publication of the "aa" indices in place of the Ci-indices in the IAGA Bulletin 32 beginning with the data for the year 1975.

Résolution 3

L'AIGA, considérant que les indices tri-horaires "aa" constituent une série homogène pour l'estimation quantitative de l'activitè géomagnétique depuis l'année 1868, recommande que les indices "aa", à partir de 1975, soient publiés annuellement à la place des indices "Ci" dans le Bulletin AIGA 32.

Resolution 4

IAGA, recognizing the importanct of in situ indices that reflect the state of the solar wind for the Travelling Interplanetary Phenomèna Program of SCOSTEP planned in 1976, 1977, and 1978 and for the International Magnetospheric Study, recommends that those indices that are dependent on the existence of dedicated satellite coverage become available to the World Data Center, and that studies continue in order to improve the indices inferred from the interpretation of activity on polar-cap magnetograms, as long as final, in situ indices are not fully available.

Résolution 4

L'AIGA, reconnaissant que les indices in situ qui reflètent les conditions du vent solaire sont importants pour le Programme des Phénomènes Interplanétaires Itinérants du SCOSTEP prévu pour 1976, 1977 et 1978, ainsi que pour l'Etude Magnétosphérique Internationale, recommande que ces indices qui dépendent de l'existence d'une couverture par satellites adaptés à ce but soient envoyés aux Centres Mondiaux de Données et que des études soient poursuivies afin d'améliorer les indices déduits de l'interprétation des magnétogrammes provenant des calottes polaires aussi longtemps que les indices in situ définitifs ne sont pas totalement disponibles.

Resolution 5

IAGA, recognizing the importance of the lists of rapid variations prepared by the Observatorio del Ebro and published in IAGA Bulletins 12 and 32 series for the development of the understanding of classification of these events, thanks the Observatory for its long service in this field.

Résolution 5

L'AIGA, reconnaissant l'importance des listes de variations rapides établies par l'Observatoire de l'Ebre et publiées dans les séries des Bulletins 12 et 32 de l'AIGA pour une meilleure compréhension de la classification de ces évènements, remercie cet Observatoire pour les longs services rendus dans ce domaine.

Resolution 6

IAGA recommends that the publication of pulsations, bays and s.i. be discontinued after reporting the data for 1974 and that the list of s.s.c., s.f.e., and unusual events continue to be provided by the Observatorio del Ebro for publication in the IAGA Bulletins 32 and recommends that the present procedure should be supplemented by sending copies of magnetograms from selected low-latitude stations to del Ebro Observatory on request.

Résolution 6

L'AIGA recommande que les pulsations, baies et s.i., à partir du début de 1975, ne soient plus publiés et que la liste des s.s.c., s.f.e. et évènements anormaux continue à être préparée par l'Observatoire de l'Ebre pour publication dans les Bulletins AIGA 32, et recommande que la méthode actuellement utilisée soit complétée par l'examen des copies de magnétogrammes provenant d'un réseau de stations de basse latitude, envoyées à l'Observatoire de l'Ebre à sa demande.

Resolution 7

IAGA, noting with satisfaction that AE-indices have now been prepared for the years 1966 through 1973 by World Data Center A for Solar-Terrestrial Physics, and recognizing the need for even more rapid preparation of AE-indices during the International Magnetospheric Study, urges that the flow of magnetograms from contributing stations be even more rapid and hopes that other WDC's will assist in their digitization to permit the routine derivation of AE-indices both for prompt use during the IMS and for publication in the IAGA Bulletin 32 series. Furthermore, IAGA urges the establishment of new magnetic observatories to improve the distribution, in both geomagnetic latitude and longitude, of the contributing stations used for AE-indices.

Résolution 7

L'AIGA, notant avec satisfaction que les indices AE ont été préparés pour les années 1966 à 1973 par le Centre Mondial de Données A pour la Physique Solaire-Terrestre, et reconnaissant le besoin, pendant l'Etude Magnétosphérique Internationale, d'une préparation encore plus rapide de ces indices, demande que l'envoi des magnétogrammes des stations du réseau AE soit accéléré et espère que d'autres Centres Mondiaux de Données aideront à la numérisation des magnétogrammes afin de permettre le calcul régulier des indices, tant pour leur utilisation rapide pendant l'IMS que pour leur publication dans la série des Bulletins AIGA 32. L'AIGA demande de plus l'installation de nouveaux observatoires magnétiques afin d'améliorer la distribution, en latitude et en longitude, des stations du réseau AE.

Resolution 8

IAGA, recognizing the value of high-frequency radio soundings of the ionosphere by ionosondes and other sounding systems (drift, doppler, and angle-of-arrival), and being aware that the world network of ionosonde stations now consist mainly of limited-purpose and aging instruments that are thus inadequate for IMS and aeronomical needs, encourages national plans toward the modernization of ionosondes, particularly to introduce digitization of all relevant echo data and to include new features in the equipment permitting efficient conversion of the data to geophysical parameters.

Résolution 8

L'AIGA, reconnaissant la valeur des sondages radio-électriques de l'ionosphère par des ionosondes et d'autres systèmes de sondage (vents ionosphériques, Doppler, angles d'arrivée), et ayant conscience qu'actuellement le réseau mondial d'ionosondes est constitué principalement d'appareils désuets ou à objectif limité, inadaptés aux besoins de l'Etude Magnétosphérique Internationale et de l'Aéronomie, encourage les projets nationaux de modernisation des ionosondes, en particulier par la numérisation de toutes les informations intéressantes fournies par les échos ionosphériques et par la modification des équipements permettant de transformer ces informations en paramètres géophysiques.

Resolution 9

IAGA recognizes the support provided by various national governments for the World Data Centers for their necessary services to the scientific community and urges these governments to continue this support.

Résolution 9

L'AIGA reconnait l'appui apporté par divers Gouvernements aux Centres Mondiaux de Données pour les services indispensables qu'ils rendent àla communauté scientifique, et demande à ces Gouvernements de poursuivre leur aide.

Resolution 10

IAGA, recognizing that available surface data are not sufficient for the accurate definition of the main geomagnetic field, and noting that no satellite measurements useful for this purpose have been made since early 1971, and that none is definitively planned for the future, urges that world magnetic surveys by low-altitude satellite be conducted. Because of uncertainties in field models derived from scalar data alone, IAGA recommends that such surveys measure the field components with the appropriate accuracy. Furthermore, because of the critical importance of the secular variation in the definition of the main geomagnetic field, IAGA urges the prompt release of the data through the World Data Centers to the scientific community.

Résolution 10

L'AIGA, reconnaissant que les données au sol disponibles ne sont pas suffisantes pour une définition précise du champ géomagnétique principal, et notant qu'aucune mesure utilisable dans ce but n'a été faite par satellite depuis 1971, demande que soient entrepris des levés magnétiques mondiaux par satellites à basse latitude. Dans le but de pallier les incertitudes qui existent dans les modèles de champ déduits des seules données scalaires, l'AIGA recommande que les composantes du champ soient mesurées avec une précision suffisante lors de tels levés. De plus, étant donné l'importance fondamentale de la variation séculaire lors de la définition du champ géomagnétique principal, l'AGIA, demande que les données de variation séculaire soient mises à la disposition de la communauté scientifique par l'intermédiaire des Centres Mondiaux de Données.

Resolution 11

IAGA, recognizing that reports of many expeditions and important collections of older observations have not been adequately distributed, recommends that the preparing institutes or present holders of older archival material of this type be encouraged to provide information concerning their holdings to the World Data Centers, and the World Data Centers be encouraged to maintain bibliographies and catalogs of important monographs.

Résolution 11

L'AIGA, reconnaissant que les rapports de maintes expéditions et que d'importantes collections d'observations anciennes n'ont pas été diffusés de manière adéquate, recommande que les instituts responsables de leur préparation ou les actuels détenteurs de ce type d'archives soient encouragés fournir aux Centres Mondiaux de Données les renseignements concernant les documents qu'ils détiennent et que les Centres Mondiaux de Données soient encouragés à tenir à jour des bibliographies et des catalogues des monographies importantes.

Resolution 12

IAGA expresses its thanks to the retiring General Secretary for creating and editing IAGA News, urges the continued publication of IAGA News and recommends its wide distribution to geophysical observatories as well as to research workers.

Résolution 12

L'AIGA exprime ses remerciements au Secrétaire Général sortant pour la création et l'édition des IAGA News, demande que cette publication soit continuée et recommande qu'elle soit largement diffusée aux observatoires géophysiques aussi bien qu'aux chercheurs.

Resolution 13

IAGA, noting the recent concern for the formulation of a comprehensive program of study of the middle atmosphere, essentially the stratosphere and mesosphere in relation with the lower ionosphere, and recognizing that the present programs of GARP and IMS are not intended to provide such a study, endorses the concept of the Middle Atmosphere Program (MAP), formerly SESAME (Structure and Energetics of the Stratosphere and Mesosphere), as an interdisciplinary program at present under SCOSTEP, with global scope and the requirements of international cooperation, to which IAGA expects to make substantial scientific contributions.

Résolution 13

L'AIGA, notant l'intérêt récent pour la définition d'un programme extensif d'études de la moyenne atmosphère, essentiellement la stratosphère et la mésosphère en relation avec la basse ionosphère, et reconnaissant que les programmes actuels du GARP et de l'IMS ne concernent pas de telles études, approuve l'idée du Programme de l'Atmosphère Moyenne (MAP), anciennement SESAME (Structure et Energétique de la Stratosphère et de la Mésosphère), en tant que programme interdisciplinaire, actuellement sous les auspices du SCOSTEP, présentant une portée générale et nécessitant une coopération internationale et auquel l'AIGA compte apporter une contribution scientifique importante.

Resolution 14

IAGA recommends that, for the period 1975.0 to 1980.0, the original International Geomagnetic Reference Field (IGRF 1965) be replaced by IGRF 1975.

Résolution 14

L'AIGA recommande que, pour la période 1975.0 à 1980.0, le premier Champ Magnétique International de Référence (IGRF 1965) soit remplacé par l'IGRF 1975.

Resolutions numbers 10 and 13 above were subsequently made into IUGG resolutions. In addition, the following resolution of interest to IAGA was also passed as an IUGG resolution.

IUGG, recognizing the support provided by the Commission on Geophysics of the Pan American Institute of Geography and History in a program of calibrating against international standards the instruments of the magnetic observatories in Mexico, Colombia, Peru, Bolivia, Chile and Brazil, IUGG expresses its thanks for the funds provided and the generous cooperation of the institutions and scientists involved.

L'UGGI, reconnaissant l'aide apportée par la Commission de Géophysique de l'Institut Panaméricain de Géographie et d'Histoire lors d'un programme d'étalonnage, par rapport à des étalons internationaux, des instruments d'observatoires magnétiques au Mexique, en Colombie, au Pérou, en Bolivie, au Chili et au Brésil, exprime ses remerciements pour les crédits attribués et la coopération généreuse des instituts et des chercheurs qui ont participé à ce programme.

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