



# IAGA NEWS

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**March 1990**

**No:28**

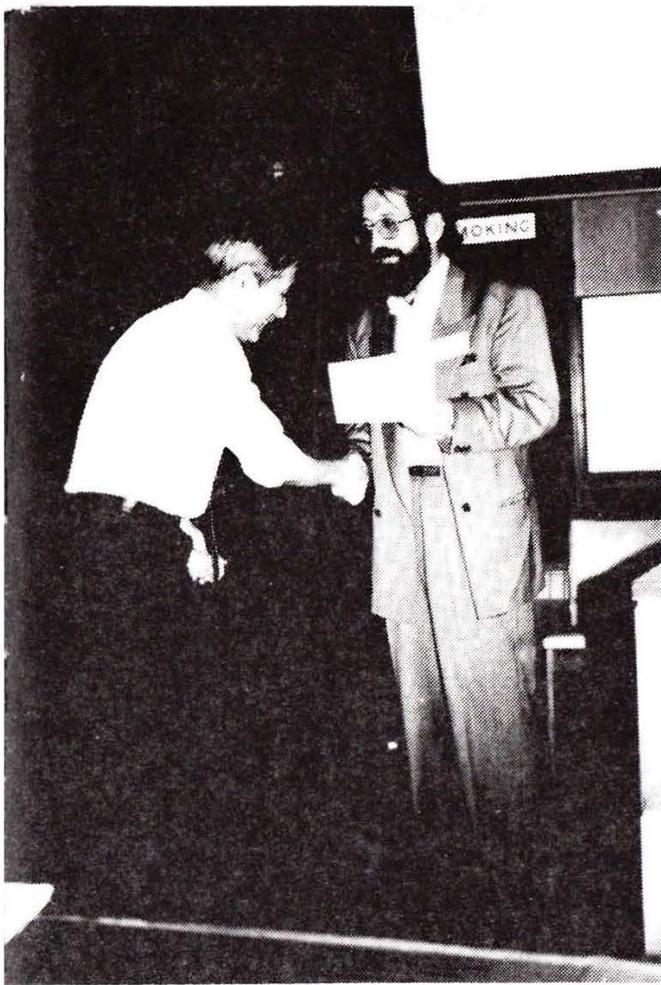
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**IAGA**



*News*

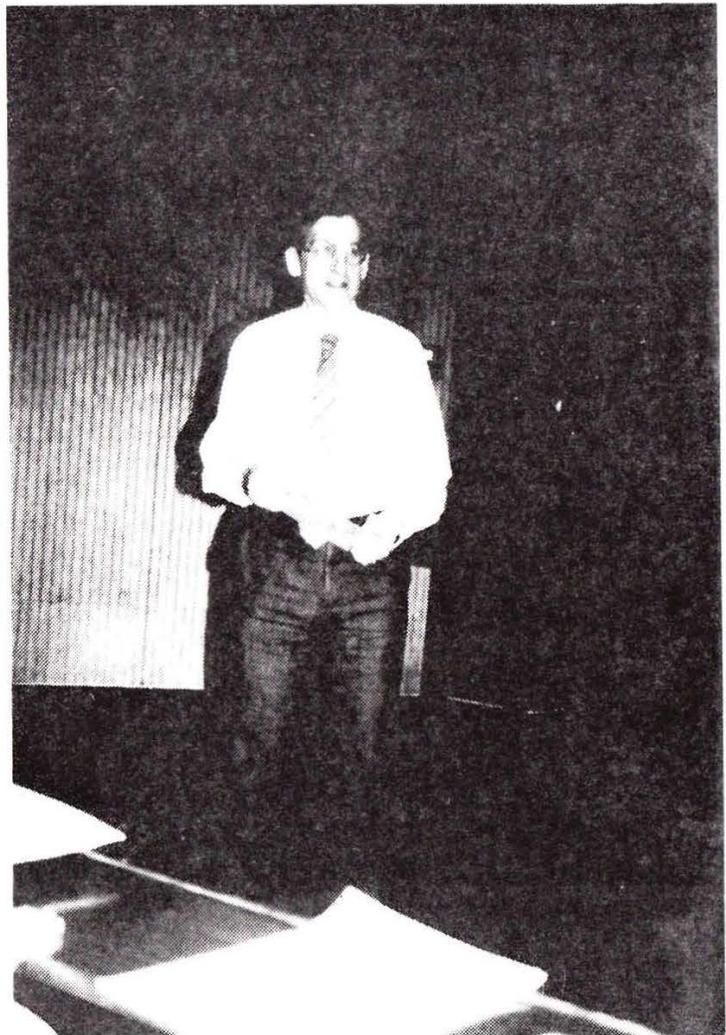
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MOMENTS AT EXETER IN 1989:

Naoshi Fukushima receives his scroll of Honorary Membership from President Gendrin

Keith Cole says a few well-chosen words after receiving the Honorary Membership.



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## FOREWORD

The Sixth Scientific Assembly has come and gone: it is always a surprise to see how quickly an Assembly dissolves after the final Conference of Delegates. Your Secretary-General has to stay on after everyone else has gone, to clear out pigeon holes, to pack up the office, to say goodbye to the porters, to make sure that all that should be done has been done. Believe me, the Saturday morning is a desert - just me and the mice.

The 1989 Assembly appears to have been another good one - most people seem to have been happy with the arrangements and the weather was excellent. The University campus seemed to fit well with the needs of the many hundreds who worked away at their favourite occupations (talking, meeting colleagues, expounding, thinking). For most of this contentment, the local organizers must take the credit; while the scientific programme is the result of a couple of years' work by the Division and InterDivisional Commission leaders, the framework for the meeting and the atmosphere that surrounds a meeting are the creation of the local people, in this case led by Dr Roy Jady, ably backed up by Dr Derek Stone, and the university organization inspired by them.

Now (and for the last few months) it is "away with what's gone and let's get what's coming organized". Each Assembly gives rise to a few complaints and I try to take account of these in arrangements for the next. This coming Assembly, for example, the problem of polypresentation is to be tackled [see page 70] and the difficulty at General (Union) Assemblies of overlap of similar sessions is to be watched and guarded against, as well I can.

Meantime, this issue of IAGA News comes to you with hopes that our research endeavours will each and everywhere prosper, with increased knowledge of geomagnetism and aeronomy, and to each of us bring intellectual fulfilment and satisfaction.

*Michael Gadsden*

Michael Gadsden  
IAGA Secretary-General

CONVENT

The first scientific assembly has been held since it is always a pleasure to see the quality of the scientific disciplines and the high standards of the scientific work. The scientific work is always of high quality and the scientific work is always of high quality. The scientific work is always of high quality and the scientific work is always of high quality.

The first assembly began to have been studied and the scientific work is always of high quality. The scientific work is always of high quality and the scientific work is always of high quality. The scientific work is always of high quality and the scientific work is always of high quality.

Now that the first assembly is in progress it is very interesting to see the quality of the scientific work. The scientific work is always of high quality and the scientific work is always of high quality. The scientific work is always of high quality and the scientific work is always of high quality.

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Michael G. ...  
Michael G. ...  
1988-1989-1990

6TH SCIENTIFIC ASSEMBLY

Exeter, UK  
24 July - 4 August, 1989

MINUTES  
of  
Conference of Delegates

9 am Monday, 24 July  
2 pm Friday, 4 August

1. Introduction The President, R E Gendrin, welcomed the Delegates to the Assembly and spoke of the activities since 1987 of the Executive Committee, the Divisions and InterDivisional Commissions. [The full text of his address will be published as part of the Transactions of the Assembly in the Chronicle of the IUGG.]

A Ashour spoke about the forthcoming review of the Association's activities by the Bureau of the Union and pointed out that the Associations are autonomous bodies within the Union and should be left the final decision as to the arrangement of their activities.

Ashour agreed with the President that more encouragement should be given to the activities of the ICSU Committee for the Teaching of Science. This Committee (on which Ashour is the Union representative and President Gendrin is a member) meets biennially, the most recent meeting being in Paris in 1989.

2. Minutes of the previous meeting [published in IAGA News No.26, pages 3-27; December, 1987]. The Secretary General reported that P Melchior [Union Secretary General] had requested that it be made clear in the Minutes that the draft resolutions printed on pages 26 and 27 (which were resolutions discussed by the Conference of Delegates in 1987 and approved for forwarding to the Union for consideration) had failed to be accepted by the Union and therefore had no force. The Conference of Delegates accepted this gloss to the Minutes without discussion.

3. Matters arising from the Minutes There were no matters arising from the Minutes.

4. Report from the Secretary-General

1. Publications. IAGA News Nos.26 and 27 have been published. The long-expected Transactions of the 5th Scientific Assembly, held in Prague (Czechoslovakia) in 1985, are finally printed and are in process of distribution. The Secretary-General was glad to note that regular publication of IAGA Bulletin 32 has resumed, under the inspiration of Michel Menvielle, Institut de Physique du Globe de Paris, and Annick Berthelie, CRPE-CNRS in Saint-Maur; this is the work of the International

Service of Geomagnetic Indices [ISGI], long a part of IAGA's work under the Federation of Astronomical and Geophysical Data Analysis Services [FAGS].

2. Obituary. It is a sad duty at these Assemblies to give notice of the names of those members of the IAGA scientific community who have died since the last Assembly:

J R Barcus [USA]  
Ed Chernosky [USA]  
J A Gledhill [RSA]  
M Rakotondrainibe [Madagascar]  
D G Singleton [Australia]  
C-U Wagner [GDR]

The Delegates were asked to stand for a short while in memory of treasured colleagues who will no longer be attending the Assemblies.

5. Presentation of the first "IAGA Long-Service Awards" President Gendrin announced the names of recipients of the first so-called "long service" awards conveying recognition by the IAGA community of service to the global community extending over many years. Each recipient was present to receive his medal and to be congratulated by the President on behalf of the IAGA community:

Steinar BERGER (Norway)  
D GILBERT (France)  
Matti KIVINEN (Finland)  
John B TOWNSHEND (USA)

6. Report of the Executive Committee The President put on record the appreciation of the Executive Committee of the magnificent efforts put in by the Local Organizing Committee to make the Assembly a success. (At this point, he was interrupted by loud and sustained applause from the Delegates.) He also thanked the Division and InterDivisional Commission chairmen, the meeting convenors and the contributing scientists for their work in making a success of the Assembly.

Before reviewing the work of the Executive Committee, the President announced the election to Honorary Membership of IAGA of the following:

K D Cole [President, 1979-1983]  
N Fukushima [Secretary-General, 1975-1983]  
J G Roederer [President, 1975-1979]

To applause, the President presented scrolls to Cole and Fukushima and instructed the Secretary-General to send a scroll without delay to Roederer, who was unable to be present at the Assembly.

## MINUTES (CONF. DELEGATES)

The Executive Committee had met five times during the Assembly and from these deliberations [the minutes of which are given on pages 16-24], three matters were brought forward for discussion by Delegates:

1. Division I had had a total of more than 570 papers in its sessions, outweighing the other components by a considerable margin. To ease the pressure on the programme, the Executive Committee proposed to reassign the current working groups I-1 and I-4 to Division V. Leading the discussion, M Kono (the Chairman of Division I) noted that there had been 23 separate symposia (580 papers) in three parallel sessions. Under the new structure, he expected there would be less than 400 papers in the Division I sessions and that this number would be a great deal more manageable. R Coles (Chairman of Division V) welcomed the proposal on behalf of Division V members. C G A Harrison pointed out that moving working groups does not of itself get rid of programme conflicts and that the chairmen of both Divisions must now work closely together to avoid overlapping and conflicting sessions. The Secretary-General assured Delegates that the programme committee would take all possible care to see to this.

2. The International Geosphere/Biosphere Program [IGBP]. The Executive Committee agreed on full support for the Solar-Terrestrial Energy Program [STEP] and noted that studies of the response of the middle atmosphere to changes in Solar-Terrestrial input would be carried forward in close collaboration with IAMAP. K D Cole welcomed the news that no matter how the programme for the IGBP develops, IAGA will support STEP.

3. International Geomagnetic Reference Field [IGRF]: proposal to charge for commercial use of geomagnetic data and models. The President announced that a proposal from W F Stuart had come before the Executive Committee in which it was proposed that charges should be made for the use by non-scientific organizations (especially oil companies and commercial ge-exploration organizations) of the data and models currently developed by IAGA scientists and published in IAGA Bulletins. While recognizing the generous nature of the proposal to raise money to support geomagnetic observatories, the Executive Committee felt that there were technical and legal difficulties in setting up such an arrangement. Furthermore, the Executive Committee was worried lest such an arrangement could be regarded as being consonant with the basic principles of IAGA, in particular with the concept of open publication of the results of researches. Stuart pointed out that free data exchange is not compromised because it is a product (not the data) that will be sold. He requested that the Conference of Delegates approve his arranging a two-year trial of the proposal, with a report back to the Conference of Delegates at the General Assembly in 1991. In response to a question whether oil companies could not make a donation *ex gratia* in lieu of purchasing and holding enforceable rights in the IGRF,

Stuart said that the companies he was in touch with asked for a legally-enforceable contractual obligation with IAGA. The President announced that he declared this matter to be an administrative matter, for vote by Chief Delegates only; there was a challenge to this ruling by F J Lowes (seconded by W F Stuart) which succeeded by 34 for, 4 against, 8 abstentions. The Conference then proceeded to a spirited debate of the legal, ethical and moral considerations of arranging to charge commercial users of the IGRF. T Gombosi moved (seconded by G Siscoe) that the Conference of Delegates accept the recommendation of the Executive Committee to reject the proposal and this motion was approved by 31 for, 14 against, with 5 abstentions.

7. Resolutions J F Vilas, chairman of the Resolutions Committee, thanked his fellow members of the Committee (M Menvielle and J O Cardùs) and moved the adoption of twelve resolutions. After minor amendments, additions, and corrections these were approved as follows:

Resolution No.1 [see page 8]:

Seconded by D I Gough, passed nemine contradicente.

Resolution No.2 [see page 8]:

Seconded by G Siscoe, passed nemine contradicente.

Resolution No.3 [see page 9]:

Seconded by J R Dudeney, passed nemine contradicente.

Resolution No.4 [see page 10]:

Seconded by D I Gough, passed nemine contradicente.

Resolution No.5 [see page 11]:

Seconded by G Siscoe, passed nemine contradicente.

Resolution No.6 [see page 11]:

Seconded by C G A Harrison, passed nemine contradicente.

Resolution No.7 [see page 12]:

Seconded by G Siscoe, passed with 2 against, 1 abstention.

Resolution No.8 [see page 12]:

Seconded by A Orozco, passed nemine contradicente.

Resolution No.9 [see page 13]:

Seconded by D I Gough, passed nemine contradicente.

Resolution No.10 [see page 13]:

Seconded by M Kono, passed nemine contradicente.

Resolution No.11 [see page 14]:

Seconded by A Orozco, passed nemine contradicente.

Resolution No.12 [see page 15]: passed by acclamation.

8. The 7th Scientific Assembly (1993) Upon the proposal of Mariani (approved 13 for, 1 against, 3 abstentions) this item was taken before item 6. The President reported that three invitations had been received for IAGA to hold the next Scientific Assembly in, respectively, Argentina, Hungary and the USSR, and that the Executive Committee, after thorough discussion, by a majority vote recommended acceptance of the invitation from Argentina. The President invited comments and presentation from the three National Committees before proceeding to a poll of the Chief Delegates.

MINUTES (CONF. DELEGATES)

Accordingly, Vilas presented a world map showing locations of IAGA and IUGG Assemblies and noted that 1979 was the last time that a IAGA/IUGG Assembly had been held in the Southern hemisphere. In answer to questions from Delegates who were concerned about the relatively high cost of travel to Argentina, Vilas said that there would be travel grants for scientists from developing Countries and that, although airline costs were high, the cost of local accommodations would be very modest: the total cost of attending the Assembly would therefore be not out of line with what was usually involved.

Vero, in urging that Budapest (Hungary) was the best place for the Assembly referred to the advantages of Budapest's central position for travelling by IAGA scientists and reminded the Delegates that geomagnetism and aeronomy had long-lasting and proud places in Hungarian-based science.

Oraevsky proposed that the Assembly should be in Moscow, USSR, and announced that Delegates could feel confident that all arrangements and facilities would be available at that location with full support from the Soviet geophysical community.

Upon the question being put, that the recommendation of the Executive Committee to accept the invitation of the Argentinian National Committee be accepted, the motion was passed 14 for, 3 abstentions, nemine contradicente.

9. Any other competent business There being no other business, the President closed the Conference of Delegates at 4 pm.

Chief Delegates, duly accredited to the Assembly:

China:	X-R Kong
Finland:	E Kataja
FRG:	H Soffel
Hungary:	J Vero
Ireland:	A Brock
Italy:	F Mariani
Japan:	Takesi Yukutake
Kenya:	J P Patel
Mexico:	A Orozco
New Zealand:	E M Poulter
RSA:	G J Kuhn
Sweden:	C-G Falthammar (vice G Marklund)
Switzerland:	F Heller
UK:	D Southwood
USA:	C G A Harrison
USSR:	V N Oraevsky
Zimbabwe:	D L Jones

Résolution No.1

IAGA reconnaisant que l'installation sur les glaces épaisses de l'Ouest de l'Antarctique d'une station comportant un émetteur radio EBF/TBF très puissant et une instrumentation complémentaire constitué un moyen efficace pour études non seulement de l'interaction non-linéaire ondes-ondes et ondes-particules dans la magnétosphère, mais aussi la précipitation de particules chargées dans la haute atmosphère, demande instamment aux pays concernés via l'intermédiaire du Comité Scientifique pour la Recherche en Antarctique de collaborer à la conception, au financement, à la construction et à la mise en oeuvre d'une station internationale en Antarctique permettant de mettre à profit les conditions uniques offertes par l'Antarctique pour mener de futures recherches dans ce domaine.

IAGA recognizing that a high power ELF/VLF radio transmitter sited on the thick West Antarctic ice with complementary instrumentation is an efficient way of studying not only nonlinear wave-wave and wave-particle interactions in the magnetosphere but also the precipitation of charged particles into the upper atmosphere urges concerned nations operating through the ICSU Scientific Committee on Antarctic Research to collaborate by designing, constructing, and resource sharing and by operating an international station in Antarctica to use the unique features of Antarctica for further scientific research in this field.

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Resolution No.2

IAGA recognizing the need to distinguish between natural and anthropogenic changes in the atmosphere, so that early signs of the latter can be more accurately evaluated and noting that there is a growing effort in the understanding of solar variability effects in the middle atmosphere, on short term, interannual and decadal time scales and recognizing that there is now evidence for solar variability effects in the lower stratosphere, recommends more intensive studies of atmospheric responses to solar activity and downward coupling processes to be carried out as one of the IAGA contributions to the goals of the IGBP in conjunction with IAMAP.

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AIGA reconnaisant la nécessité de savoir discriminer entre les modifications d'origine naturelle et anthropogénique dans l'atmosphère pour pouvoir évaluer plus précisément les signes avant-coureurs de ces dernières, notant l'effort croissant de compréhension des effets de la variabilité intra-annuelle, inter-annuelle et décennale du soleil sur l'atmosphère moyenne, reconnaisant qu'il y a maintenant des observations mettant en évidence l'existence dans la basse stratosphère d'effets liés à la variabilité solaire, recommande que des études plus intensives sur les réponses de l'atmosphère à l'activité solaire ainsi que des processus de couplage vers le bas, soient menées comme l'une des contributions de l'AIGA aux objectifs de l'IGBP, en coopération avec l'AIMPA.

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Résolution No.3

AIGA notant que les mesures magnétiques du vent solaire constituent une part indispensable de la synergie des programmes SOHO/CLUSTER qui sont ensemble considérés comme la mission "pierre angulaire" dans le domaine de la physique du système Soleil-Terre, constate avec inquiétude la décision prise par les autorités compétentes des agences concernées de supprimer du programme SOHO le magnétomètre et les instruments de mesure du vent solaire, et recommande que cette décision soit reconsidérée.

IAGA noting that the magnetic and solar wind measurements contribute an indispensable part of the synergistic aspects of SOHO/CLUSTER which are jointly considered as the cornerstone mission in solar-terrestrial physics views with concern the decision by the managing authorities of the agencies involved to remove the magnetometer and solar wind instruments from the SOHO payload and recommends that this decision be reconsidered.

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Resolution No.4

IAGA recognizing that key developments in the understanding of the coupled ionosphere magnetosphere and solar wind system will come from the integration of in situ satellite observations and measurements from spatially related networks of ground observatories and recognizing that Antarctica provides a unique platform upon which to deploy an optimum network of ground observatories from which to make such measurements and noting that several nations plan to deploy unmanned experimental facilities in Antarctica urges national administrations through the ICSU Scientific Committee for Antarctic Research to support the development of an optimum international network of observatories

by coordinating the siting of new unmanned and manned facilities with existing facilities to optimise the spatial coverage;

by ensuring that, as a minimum, measurements of the geomagnetic field and of the absorption of cosmic noise by the riometer technique be made at each site under their control; and

by establishing an international database of these basic measurements to be freely available to all contributing nations.

AIGA reconnaissant que l'intégration entre des mesures in situ à bord de satellites et des mesures au sol en un réseau coordonné d'observatoires permettra des avancées fondamentales dans la compréhension du couplage au sein du système ionosphère/magnétosphère/vent solaire; et que l'Antarctique constitué un domaine approprié au déploiement de tels réseaux d'observatoires, à partir desquels de telles mesures peuvent être effectuées notant que de nombreuses nations envisagent d'installer des stations autonomes d'observation en Antarctique; demande instamment aux agences responsables de favoriser, par l'intermédiaire du Comité Scientifique pour la Recherche en Antarctique, l'installation d'un réseau international d'observatoires aussi bien configuré que possible:

en coordination l'implémentation de nouvelles stations, autonomes ou non, permettant d'obtenir une bonne couverture spatiale;

en s'assurant que, au minimum, en chaque station, de mesures du champ géomagnétique et de l'absorption des rayons cosmique à l'aide de riometres;

et en établissant une base de données internationale permettant à chaque nation participante d'avoir accès librement aux données.

## Résolution No.5

AIGA notant le grand nombre de relèvements magnétiques qui ont été effectués afin d'obtenir des informations sur la lithosphère arctique, et notant l'intérêt international considérable de la géologie arctique par suite de sa contribution à l'accroissement de notre compréhension de l'évolution tectonique des continents et océans nordiques, recommande fortement que tous les pays ayant un intérêt dans les recherches géophysiques en arctique contribuent à la production de cartes des anomalies magnétiques de la région arctique.

IAGA noting the great number of magnetic surveys that have been carried out to obtain information about the arctic lithosphere and noting the considerable international interest in arctic geology because of its contribution to the enhancement of our understanding of the tectonic evolution of the northern continents and oceans recommends that all countries having geoscience research interests in the arctic contribute to the production of a magnetic anomaly map of the arctic region.

## Resolution No.6

IAGA recognizing that reliable data from geomagnetic observatories in all parts of the world are important for geomagnetic science and also for the development of technologies and noting that some observatories are experiencing considerable difficulties in securing funding and maintaining operation strongly urges the responsible institutes to work with the IAGA to develop alternative solutions prior to taking a final decision to close an observatory.

AIGA reconnaissant que les données fiables, issue des observatoires magnétiques dans toutes les parties du monde sont importantes pour la science du géomagnétisme ainsi que pour le développement de technologies, et notant que quelques observatoires ont à faire face à des difficultés considérables pour assurer leur financement et maintenir leurs opérations, recommande fortement que les instituts responsables étudient avec l'AIGA le développement de solutions alternatives avant de prendre la décision finale de fermer un observatoire.

## Résolution No.7

AIGA notant l'importance de rendre les indices magnétiques  $D_{st}$  et AE disponibles pour la communauté scientifique aussi rapidement que possible, et reconnaissant que la production de ces indices à des échelles de temps courtes peut être grandement assistée par la transmission des données au moyen de liaisons par satellite, recommande l'utilisation d'un tel système et encourage ceux des observatoires magnétiques qui fournissent des données au Centre Mondial de Données C2 pour le géomagnétisme pour le calcul de ces indices à utiliser un système de transmission de données en temps réel tel que celui envisagé dans le cadre du projet INTERMAGNET.

IAGA noting the importance of making the  $D_{st}$  and AE magnetic indices available to the scientific community as promptly as possible and recognizing that the production of these indices on short time scales can be greatly assisted by transmitting data via satellite links recommends the use of such a system and encourages those magnetic observatories providing data to the World Data Center C2 for Geomagnetism for the calculation of these indices to use real-time data transmission systems such as that planned under the INTERMAGNET project.

## Resolution No.8

IAGA noting the contributions made by the World Data Center C2 for Geomagnetism in the production and distribution of the  $D_{st}$  and AE indices and recognizing their immense value to the scientific community expresses deep appreciation of the effort being made by the World Data Center C2 for Geomagnetism, Kyoto, and requests the Center to continue these important activities.

AIGA notant la contribution affortée par le Centre Mondial de Données C2 pour le géomagnétisme à l'élaboration et à la diffusion des indices  $D_{st}$  et AE, et reconnaissant l'intérêt immense de ces indices pour la communauté scientifique, exprime sa profonde reconnaissance pour les efforts consentis par le Centre Mondial de Données C2 pour le géomagnétisme de Kyoto, et demande au Centre de poursuivre cette importante activité.

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Résolution No.9

AIGA notant l'interêt que présentent des indices géomagnétiques fiables et de très bonne qualité pour la communauté scientifique, reconnaissant le rôle unique du Service International des Indices Géomagnétiques [SIIG] dans la derivation, la publication, et la diffusion de ces indices, exprime sa profonde reconnaissance pour les efforts consentis par l'Institut de Physique du Globe de Paris et le Centre de Recherches en Physique de l'Environnement pour l'édition des bulletins mensuels du SIIG et la publication de la serie No.32 des Bulletins de l'AIGA, et recommande fermement à la Federation des Services de données Astronomiques et Géophysiques de continuer à soutenir le SIIG.

IAGA noting the value to the scientific community of high quality reliable geomagnetic indices and recognizing the unique role of the International Service of Geomagnetic Indices [ISGI] in the derivation, publication, and dissemination of these indices expresses deep appreciation of the efforts made by the Institut de Physique du Globe de Paris and the Centre de Recherches en Physique de l'Environnement in editing ISGI monthly bulletins and assuring the publication of IAGA Bulletin No.32 series and strongly recommends the Federation of Astronomical and Geophysical Data Analysis Services to continue their support to the ISGI.

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Resolution No.10

IAGA recognizing that time scales of directly observable geomagnetic main field changes range from years to centuries and that measurement of changes over the entire range of periods is crucial for the study of properties of the Earth's core and lower mantle and of the coupling between the two; recognizing that high resolution measurements of the geomagnetic anomaly field can provide significant information about the lithosphere and its tectonic structure in a detail never before achieved; recognizing that the acquisition of satellite magnetic field data of high accuracy is a crucial part of such measurements and noting that ten years have passed since the acquisition of suitable satellite magnetic field data urges again most strongly that plans for satellite

measurements of the geomagnetic field at both low altitude and of long duration be given the highest priority for implementation.

AIGA reconnaissant que les variations temporelles du champ magnétique principal qui sont directement observables ont des constantes de temps allant de quelques années à quelques siècles, et qu'il est crucial de disposer de mesures de ces variations sur toute la gamme de périodes pour l'étude des propriétés du noyau et du manteau inférieur, et pour celle de leur couplage, et reconnaissant que les mesures à haute résolution des anomalies géomagnétiques peuvent fournir des informations significatives sur la lithosphère et sa structure tectonique, à un niveau de détail jamais atteint, et reconnaissant que les données magnétiques de grande précision à bord de satellites constituent une partie essentielle de ces mesures et notant que dix ans se sont maintenant écoulés depuis les dernières mesures magnétiques effectuées à bord de satellites, demande de nouveau instamment que la plus haute priorité soit donnée à la réalisation des programmes de mesures pour les basses altitudes et pour la grande durée du champ magnétique à bord de satellites.

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Résolution No.11

AIGA reconnaissant l'importance de l'électrojet équatorial qui concerne le géomagnétisme, la dynamique de la haute atmosphère et les processus ionosphériques, notant que l'électrojet traverse de nombreux pays en voie de développement, définit la période Septembre 1991 - Mars 1993 comme l'Année Internationale de l'Electrojet Equatorial (AIEE) durant laquelle devront être menées, aux basses latitudes, des campagnes intensives et coordonnées de mesure de l'électrojet équatorial et des phénomènes aéronomiques associés, mettant en oeuvre de nombreuses techniques d'observation, et demande instamment à toutes les communautés scientifiques concernées d'y participer activement.

IAGA recognizing the importance of the equatorial electrojet in geomagnetism, upper atmosphere dynamics and ionospheric processes, noting the fact that the equatorial electrojet encompasses geographic regions of many developing countries, designates the period September 1991 - March 1993 as

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the International Equatorial Electrojet Year (IEEY), during which intensive and coordinated campaigns on the equatorial electrojet and related aeronomic phenomena should be conducted using a variety of observational techniques at low latitudes, and urges all concerned scientific communities to participate actively in this programme.

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Resolution No.12

IAGA considering in particular the short notice for the organization of this Assembly, places on record its sincere gratitude to the Royal Society of London and to the University of Exeter for inviting the Association to hold its Assembly in what have proved to be almost ideal surroundings and thanks the Local Organizing Committee, under the chairmanship of Professor David Southwood, and in particular Dr Roy Jady and his assistant Mrs Marilyn Webb for their heroic efforts in achieving a successful outcome.

AIGA considérant en particulier le court délai pour l'organisation de cette Assemblée, exprime par écrit sa profonde gratitude de vis-à-vis de la Société Royale de Londres et de l'Université d'Exeter pour inviter l'Association à tenir son Assemblée dans un lieu qui s'est démontré être presque idéal remercie le Comité Local d'Organisation, sous la présidence du Professeur David Southwood, et en particulier de Dr Roy Jady et sa assistante Madame Marilyn Webb pour leur efforts heroiques pour aboutir à un succès remarquable.

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DRAFT

EXECUTIVE COMMITTEE MEETING

Exeter (UK): 22nd July - 4th August, 1989

President: Roger E Gendrin  
Vice-Presidents: Ulrich Schmucker  
Don J Williams  
Secretary-General: Michael Gadsden  
Members: D Ian Gough  
Mike W McElhinny  
M Sugiura  
Jens Taubenheim  
Oleg L Vaisberg  
Juan F Vilas

I. Minutes of the previous meeting

These have been published in IAGA News No.27, pages 3-15. Adoption without change proposed by Williams, seconded by McElhinny: Carried.

II. Matters arising from the Minutes

Minute II, paragraph 6: The Secretary General reported that W Schroder, chairman of the InterDivisional Commission on History, had prepared a most valuable and comprehensive guide to the preservation of historical material. This had been circulated to all National Correspondents.

Minute IV, paragraph 1: Division V had requested that ByLaw No.1 be amended to read "Division V: Observations, Instruments, Surveys and Analysis".

The decision to propose this change at the Conference of Delegates had been passed nemine contradicente. Later on in the Assembly, before this resolution could be placed before the Conference of Delegates, the Division V leaders asked that the proposal be held over. This was agreed.

III. Report from the Secretary-General

Publications: The Secretary General reported that IAGA News No.27 had been published and distributed in November 1988. The Transactions of the 5th Scientific Assembly [Prague, CSSR: 1985] were at long last in print and 200 copies were to be distributed to those registrants at the current Assembly who had been at the Prague Assembly. [The mailing of all copies of the Transactions was completed late in September, 1989.]

Financial report, 1988: The accounts which have been forwarded to the Treasurer of the Union are shown on page 24.

Ledger account, 1989: The Secretary General laid before the Executive Committee a summary of the ledger account to a statement date of 16 June 1989. This is reprinted on page 23.

Acceptance of the accounts was proposed by the Secretary General, seconded by Gough, and passed nemine contradicente. On the motion of Williams, seconded by Gendrin, it was decided to discontinue publishing Transactions of each Scientific Assembly. The preparation takes a significant amount of time but, more importantly, the costs of printing and distributing [close to \$10,000] had risen over the years to the point where it was felt the monies could be more usefully employed in helping scientists to attend Assemblies rather than to read about having attended. In place of the Transactions, the Secretary General was charged with assembling from the Division and InterDivisional Commission leaders a collection of moderately-brief reports of scientific highlights from the scientific sessions. This collection would be submitted for publication in the IUGG Chronicle.

#### IV. IAGA Internal Structure

Honorary Membership of IAGA: The Executive Committee decided unanimously to recommend to the Conference of Delegates election to Honorary Membership of K D Cole, N Fukushima and J G Roederer.

Review of the Assembly programme and related problems: McElhinny noted that the number of contributions to the Division I programme had increased markedly. This was a good thing, showing vigour and expanding activity, but the sheer number of papers to be accommodated leads to administrative problems. Division I regularly schedules three parallel sessions and this was beginning to be not enough. He noted that Working Groups I-5 and I-6 [palaeomagnetism and rock magnetism] accounted for almost half the Division I papers [232 out of 521]. M Kono, the chairman of Division I, had sent the Secretary General copies of correspondence dealing with these matters, and these had been laid before the EC. There appeared to be two practical and possible solutions; first, that Division I should split into two or more (smaller) Divisions or, second, that Working Groups I-1 and I-4 should be relocated within Division V. [Using the statistics of the current Assembly, 127 papers would disappear from the 521 submitted to Division I, to reappear as an addition to the 151 submitted to Division V.] Gough proposed, seconded by Sugiura, that the Executive Committee support the second alternative and appoint McElhinny to discuss such a change with the leaders of Divisions I and V, and other interested parties, and to report back to the EC. Agreed.

Williams and Vaisberg raised the question of whether Division IV should explicitly include "solar physics" as a subject study. The topics of flare formation, release of material into the solar wind, and solar oscillations are all of particular and immediate concern to the research studies covered by Division IV interests.

Williams suggested that a principal theme of the 1993

Scientific Assembly should be "comparative planetology"; it was agreed to postpone in-depth discussion of this until the next [1990] meeting of the EC.

Discussion with Division and InterDivisional Commission Chairmen: The Executive Committee met with the chairmen at the end of the Assembly for an unminuted round-table discussion of arrangements and effectiveness. The results of the discussion will show, it is hoped, in an improved programme at the Union General Assembly in Vienna [1991].

V. IAGA Sponsorship

International Workshop on Reconnection in Space Plasmas (Potsdam, GDR): The Secretary General reported that he had heard from J Buchner that this workshop had been successful and met a broad international resonance.

Workshop on Ionospheric Informatics and Empirical Modelling (Espoo, Finland): Lucien Bossy has submitted a report on this meeting [page 27].

COSPAR: In response to a number of comments at and following the 1988 COSPAR meeting in Helsinki, the Secretary General had asked the COSPAR Secretariat to involve IAGA in discussion of sponsorship covering all parts of the 1990 meeting. This had been agreed most willingly, and the Executive Committee had before it a complete schema for the XXVIIIth COSPAR meeting (Netherlands Congress Centre, The Hague, The Netherlands; 25 June - 7 July, 1990). After detailed discussion, sponsorship by IAGA was approved for the following meetings;

- S.3: Latest Results on Mars and Phobos Studies
- S.4: Neptune after Voyager
- S.5: Magnetospheres of the Outer Planets
- S.6: Role of Plasma Waves in the Physics of Planetary Atmospheres
- S.9: Space Observations of the Solar Corona and the Origin of the Solar Wind
- MA.5: Coupling of Dynamical, Radioactive and Chemical Processes in the Middle Atmosphere
- MB.1: The Magnetic Fields of the Planets
- MB.4: Cometary and Asteroidal Interactions with Planetary Atmospheres
- MB.6: Energy Transfer Processes in Planetary Exospheres and Extended Neutral Clouds
- MC.1: Recent results on Venus
- MC.2: Extension of CIRA Models including Models of Trace Species of the Middle and Upper Atmosphere and Data
- MC.3: Equatorial Thermosphere and Aeronomy
- MC.4: Global Ionosphere/Thermosphere Coupling and Dynamics
- MC.5: Enlarged Space and Ground Data Base for Ionosphere Modelling
- MC.6: Mesosphere/Thermosphere Coupling
- MC.8: Numerical Modelling in the Thermosphere and Ionosphere

MC.9: Thermosphere Composition Changes during Magnetic Storms  
 MD.1: Martian Plasma Environments  
 MD.2: Particle Populations in Magnetospheric Currents Sheets  
 MD.3: Active Experiments in Space  
 MD.4: Parallel Shocks  
 MP.2: Equatorial Electrojet

SCOSTEP VIIth International Symposium on Solar Terrestrial Physics: Sponsorship agreed.

The President reported that he had had further correspondence with Liu Qingling of the National Committee of Geomagnetism and Aeronomy of China concerning IAGA sponsorship of a symposium on Geomagnetism [Minute V, paragraph 5, of the 1988 Executive Committee meeting refers]. Originally scheduled for April 1989, the symposium date had been moved to a date, to be determined, in 1990 [IAGA News No. 27, page 52]. The President reported that he had, therefore, withdrawn his original agreement of IAGA sponsorship and that sponsorship would be granted when there was an acceptable level of international representation on the organizing committee. This action was approved by the EC.

A request was received from the chairman of the InterDivisional Commission on Developing Countries for sponsorship of a training school of 2-3 weeks duration in the latter half of 1990 or the early part of 1991. The location could possibly be Brazil or Trieste. The Executive Committee decided to hold over consideration of this request until more definite proposals were available.

S-E Hjelt had written to the President requesting sponsorship of the 10th Induction Workshop to be held in Ensenada, Baja California (Mexico) from 22-29 August, 1990. Approved.

Rock Magnetism, Palaeomagnetism and Databases Usage (New Trends in Geomagnetism 2): McElhinny noted that the first meeting in this series had been most successful and the participants had at that time recommended that the meeting be the first of a series. Sponsorship was approved.

Inverse Problems for Potential Fields: A request from the Bulgarian Academy of Sciences for sponsorship of this international symposium, to be held in Sofia 8-13 October 1990, was approved.

VI. IUGG

Review of IAGA by the Union Bureau: The President stated that he had been invited by the Bureau to present an oral report, followed by discussion, of the Association's activities. This was part of the Union's continuing programme of review of the individual

Associations' operations and was scheduled to be held on the afternoon of 11 August 1989. The President laid before the Executive Committee a draft of a written presentation that he intended to circulate to the members of the Bureau before the meeting. The Executive Committee made a number of suggestions for alterations in emphasis and content and in general approved the President's proposal.

Union symposia for the General Assembly, 1991: The President reported that the final decision on topics for the Union symposia was expected to be made at the Union Executive Committee meeting in Edinburgh, 14-15 August 1989. Proposals from C Harrison for a symposium "The Influence of Solar Cycle Variations on the Earth" and from L Vanyan for a scientific session on "Electrical and Seismic Properties of the Lower Crust" were received by the Executive Committee and were to be kept in mind by the President and the Secretary General during the discussions at the Union Executive Committee meeting.

International Council of Scientific Unions Committee on Teaching of Science: The President reported that he had been appointed as Union representative on this committee. He had attended a meeting of the committee held in Paris on April 22 and laid before the Executive Committee a copy of his report.

#### VII. Cooperation with other bodies

GLOBMET: The Executive Committee received a copy of a resolution emerging from the second GLOBMET symposium (Kazan, USSR; 11-16 July 1988) recommending the formation of a working group to coordinate international activities in the areas of meteor geophysics and meteor astronomy. The Executive Committee agreed to recommend to the Union the formation of an InterUnion Working Group involving IUGG and IAU, with IAGA and IAMAP jointly covering the Union interests.

International Space Year: The President reported on correspondence he had had with Richard M West of the European Southern Observatory. No action from IAGA is called for because it is now clear that the Associations of the Union are not involved in the International Space Year.

International Service of Geomagnetic Indices: The Secretary General laid before the Executive Committee a comprehensive report that he had received from the Director, M Menvielle. The Executive Committee accepted with satisfaction the report that publication of the IAGA Bulletin No.32 series was now well in hand and that the data up to and including those of 1988 were expected to be published before the end of 1989.

InterDivisional Working Group on Antarctic Research: A proposal had been received from John R Dudeny to establish an ad hoc study group to work in close association with the upper atmosphere working group of the International Council of Scientific Unions Special

Committee on Antarctic Research. The Executive Committee was receptive to this proposal and requested the President to discuss the matter further with Dudeney.

VIII. 7th Scientific Assembly, 1993

The Executive Committee had invitations from three National Committees to hold the Seventh Scientific Assembly of IAGA in July/August 1993.

In order of receipt, the first was from Argentina for the Assembly to be held in Cordoba and each member of the Executive Committee had been sent a package of material giving details of the meeting rooms available, the hotel accommodation etc. The second invitation was from Ivan T Berend and Istvan Lang, respectively President and Secretary-General of the Hungarian Academy of Sciences for the Assembly to be held in Budapest. The Secretary General had been sent an offer of help in organizing the meeting by IBUSZ, the Hungarian Travel Company. Finally, a letter was received during the Assembly from V V Belousov transmitting an invitation from the Soviet Geophysical Committee of the USSR Academy of Sciences to hold the Assembly in Moscow. A spirited discussion of the three invitations led to their being put to the vote and the Argentinian invitation received approval by a clear majority. The Executive Committee therefore recommended to the Conference of Delegates acceptance of this invitation.

IX. International Programme and Projects

International Equatorial Electrojet Year: Recognizing the fact that equatorial electrojet processes represent an important area of geosciences of major interest to IAGA and that the equatorial electrojet spans wide geographic regions of many developing countries, the InterDivisional Commission on Developing Countries proposes to organize an International Equatorial Electrojet Year during the period March/April 1990 to September/October 1991. The Executive Committee welcomed this initiative. The President suggested that Divisions II and V might share responsibility with the InterDivisional Commission on Developing Countries for pressing forward with this proposal and Gough proposed that the central coordinating committee should consist of Abdu, Ogunade, Vallance Jones and Coles. Agreed.

InterMagnet: The Executive Committee had before it a prospectus for modernization of the global network of geomagnetic observatories. The Executive Committee congratulated W F Stuart on bringing this matter forward in such a timely and effective manner. The President reported that an application for a grant had been forwarded to the Union Secretary General [P Melchior] for onward transmission to International Council of Scientific Unions.

Fund-Raising Committee: A report from W F Stuart on the activities of an ad hoc subcommittee of the Executive

Committee contained the following proposal:

"3. In view of the long term ongoing nature of geomagnetic observation, and recognising that the major international funding agencies support projects which have a finite duration and fixed costs, I have concluded that the commercial exploitation of the products derived from geomagnetic data which IAGA has established as fundamental synopses of global geomagnetism is the most promising approach to fund raising. This apparently radical suggestion is no more than the international rationalisation of what many institutes have been doing for many years, with only the added condition that funds raised shall be used to provide and maintain geomagnetic observatories in developing countries and otherwise inaccessible areas to improve the global data set on which the synoptic products are based."

This suggestion was discussed at great length. As a result, the Executive Committee directed the Secretary General to intimate to Stuart that the Executive Committee has discussed this suggestion and cannot see how a data set can be both free to bona fide scientists and sold in confidence to commercial organizations. It therefore thanks Stuart for his valuable suggestion but is unable to support the suggestion.

Decade for Natural Disaster Reduction: The Executive Committee felt that IAGA was but marginally involved in this programme and therefore made no recommendation for the establishment of special working groups.

X. Any Other Competent Business

McElhinny and Vilas asked for a decision on the location of the next Executive Committee meeting; they pointed out that they will have to come a long way to attend the meeting and suggested that it would help their schedules for 1990 were the meeting to be held adjacent in time to the New Trends in Geomagnetism meeting scheduled for 24-29 September at Bechnye Castle in Southern Bohemia. Agreed.

There being no other business, the President declared the meeting closed and expressed the thanks of the Executive Committee members to the Local Organizing Committee of the Assembly (and particularly to Dr Roy Jady and Mrs Marilyn Webb) for their generous assistance in helping to make the Executive Committee meeting effective.

LEDGER ACCOUNT

1 January through 16 June 1989

[Amounts are in pounds sterling]

Cash in hand and at bank	28106.95	
Receipts	18654.82	46761.77
Expenditures:		
<u>Administration</u>		
Personnel	0.00	
Supplies and Equipment	202.84	
Communications	643.32	
Travel	0.00	
Miscellaneous	0.00	846.16
<u>Association</u>		
Publications	5682.04	
Assemblies	3141.06	
Meetings & Symposia	400.00	
Grants	288.53	
Contracts	0.00	
Miscellaneous	0.00	9511.63
Deposit account	34696.98	
Current account	1707.00	36403.98
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		46761.77
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INTERNATIONAL ASSOCIATION OF GEOMAGNETISM AND AERONOMY  
 Financial Report for the year 1988  
 Amounts in US Dollars Exchange rate \$1.831 = £1.000

RECEIPTS	IUGG	GRANTS & CONTRACTS	EXPENDITURES	IUGG	GRANTS & CONTRACTS
15 IUGG ALLOCATION	25700.00	x	11 ADMINISTRATION	2510.82	x
2 UNESCO GRANTS	x	x	12 PUBLICATIONS	14911.57	x
3 OTHER GRANTS	x	x	13 ASSEMBLIES	1208.48	x
4 CONTRACTS WITH UNESCO, etc	x	x	14 SYMPOSIA & SCIENTIFIC MEETINGS	12828.39	x
5 SALES OF PUBLICATIONS	x	x	16 GRANTS (Permanent Services etc)	x	10489.27
6 MISCELLANEOUS	5058.21	x	17 CONTRACTS WITH UNESCO etc	x	x
7 TOTAL RECEIPTS	30758.21	x	18 MISCELLANEOUS	19.36	x
8 CASH ON HAND AND IN BANKS Jan 1, 1988	11960.45	x	19 TOTAL EXPENDITURE	31478.62	10489.27
9 INVESTMENTS & RESERVES Jan 1, 1988	37799.16	12921.11	20 CASH ON HAND AND IN BANKS Dec 31, 1988	2582.02	x
10 TOTAL	80517.82	12921.11	21 INVESTMENTS & RESERVES Dec 31, 1988	46457.18	2431.84
			22 TOTAL	80517.82	12921.11
23 ACCOUNTS RECEIVABLE	January 1, 1988		December 31, 1988		
24 ACCOUNTS PAYABLE	0.00		0.00		
	0.00		0.00		

## SOLAR ACTIVITY FORCING OF THE MIDDLE ATMOSPHERE

Castle of Liblice, Czechoslovakia  
3-8 April 1989

The symposium "Solar Activity Forcing of the Middle Atmosphere" held on 3-8 April 1989 in the Castle of Liblice, Czechoslovakia was organized by the IAGA Working Group II.D "External Forcing of the Middle Atmosphere" (co-chairmen J. Laštovička and R.F. Donnelly) and by the Geophysical Institute of the Czechoslovak Academy of Sciences (director Prof. V. Bucha, past Vice-president of IAGA), and co-organized by the ICMUA/IAMAP Working Group on Solar-Terrestrial Relations. 80 scientists from 12 countries took part in the symposium. All facilities, including accommodation and board, were provided at the Castle.

52 papers were presented at the symposium. Extended abstracts appear in Handbook for MAP, Vol. 29. The symposium consisted of 8 blocks: 1. "Related" papers. 2. Influence of Quasi-Biennial Oscillation. 3. Influence of solar electromagnetic radiation variability. 4. Solar wind and high energy particle influence. 5. Circulation. 6. Atmospheric electricity. 7. Lower ionosphere. 8. "Solar" posters.

Donnelly showed that for solar cycle 21, the maximum of the soft X-ray and ultraviolet solar flux, of the He I 1083 nm equivalent width and the net line-of-sight magnetic flux magnitude was attained in the second half of 1981, in R it was attained in late 1979, F10.7 displayed both peaks and the total solar irradiance appeared to decline since early 1979. Bucha demonstrated the effects of geomagnetic activity on tropospheric processes by implications to meteorological processes in Europe.

Chanin used an extended set of data and demonstrated the opposite correlation of stratospheric (but not mesospheric) parameters with the solar cycle for west and east phases of QBO. This conclusion was confirmed by the analysis of rocket temperature profiles from Thumba, Volgograd and Molodezhnaya (Mohana kumar) and by the analysis of rocket and ionospheric observations by Taubenheim and Entzian, who also showed a direct solar-cycle control above 55 km (mesosphere). The 3-D model results of Dameris and Ebel show significant differences of the dynamical response of the middle atmosphere to weak external (solar) forcing for west and east phases of QBO.

A systematic depletion of ozone related to 27-day UV-variation is detected near 70 km, which is attributed to Lyman-alpha photodissociation of water vapour and to unexpectedly strong temperature/UV response (Keating). Chandra claims that the solar induced perturbations in temperature between 2-70 mb are too weak to be detected against the background dynamical temperature variations. Hood presented correlative evidence of the stratospheric ozone and temperature responses to observed short-term solar ultraviolet variations at tropical latitudes where planetary wave amplitudes are relatively small. Krivolutsky found strong evidence for the solar origin of the 27 day wave in the 30-mb level height. Krivolutsky and Loshkova found invariance of phase of the 27-day wave with height.

The proposed physical mechanisms of solar induced variations in the middle atmosphere are often controversial in their physical consequences, which is among other things due to the complexity and non-linearity of the atmospheric response to comparatively weak solar activity forcing (Ebel). Zadorozhny et al. presented results of 1-D photochemical model studies of atmospheric response to solar forcing for clean versus anthropogenically polluted atmosphere.

Solar wind and corpuscular effects in the middle atmosphere were reviewed by Laštovička. He considers the role of highly relativistic electrons to be the most important recent finding and the geomagnetic storm to be the most important disturbing factor of solar wind origin. Model computations by Jackman et al. indicate fairly good agreement with ozone data for the solar proton event-induced ozone depletion caused by NO<sub>y</sub> species. Kudela claims that the main components of corpuscular radiation contributing to the energy deposition in the middle atmosphere are cosmic ray nuclei (galactic and solar) and high energy electrons, mainly of magnetospheric origin. The model calculations by Sosin and Skryabin yield an ozone content increase near 80 km about 3 days after an intense electron precipitation event, which coincides with observations.

The best detected effects of solar activity in winds at heights of about 80-100 km are those of geomagnetic storms (short-term) and of solar cycle (long-term), as shown by Kazimirovsky. Gaidukov et al. observed interrelated solar and meteorological control of lower thermospheric winds near Irkutsk (Eastern Siberia).

The effects of solar activity on atmospheric electricity were reviewed by Reiter including historical development of this problem. Tyutin and Zadorozhny found a distinct dependence of the height profile of the electric field in the mesosphere at high latitudes on the magnitude of geomagnetic disturbance.

Danilov claimed the direct positive influence of solar activity to be at least partly compensated by the indirect one through the effect of solar activity on the middle atmosphere as a whole. The lower ionospheric plasma appears to be markedly controlled by the structure of IMF at high, auroral and sub-auroral latitudes (Bremer), the effect being less important in middle latitudes. A considerable part of the 27-day oscillations in radio wave absorption in the lower ionosphere seems to be of meteorological (= neutral atmosphere) origin after Pancheva and Laštovička. Morozova proved the parameters of the statistical model of the SID occurrence to be dependent on the phase of the solar cycle. Murzaeva suggested a method of diagnostics of solar flare X-ray flux by means of multifrequency ground-based VLF measurements. On the basis of ionospheric data, Boška and Pancheva found the equatorward boundary of the auroral zone to have been shifted to geomagnetic latitudes below 50°N during and just after the extremely severe geomagnetic storm of February 1986.

J Lastovicka

The Proceedings of the Symposium have been published as Handbook for MAP, Volume 29; Part I, pages 1 - 244.

IONOSPHERIC INFORMATICS AND EMPIRICAL MODELLING

Espoo, Finland  
 XXVII COSPAR General Assembly  
 18-29 July 1989

The main purpose of the Workshop was the release of the new IRI model. IRI-88 includes the fully analytical description of the middle ionosphere developed by K. Rawer with contributions by T. Gulyaeva and S. Radicella. For the determination of the F peak plasma frequency and density the user of IRI-88 has the option to apply either the old CCIR coefficients or the new URSI coefficients proposed by an URSI panel.

In the tradition of earlier Workshops the session talks and posters highlighted analytical representation of profiles, comparisons of IRI and measurements, and applications of IRI of different kind.

In connection with the Workshop business meetings of the Task Group on IRI and of URSI-G4 were held.

The following recommendations were accepted by the Task Group on IRI:

to COSPAR ISC C :

Considering that  
 the existing ionospheric data obtained by space techniques have shown  
 to be inadequate for inclusion into the ground-based data systems,  
 and that the latter data suffer from reduced coverage of the globe,

recommends that  
 by international co-operation a system of three topside-sounding  
 satellites using comparable techniques be installed, in a way to obtain  
 best coverage in time and space (for example, two satellites of variable  
 longitude, in hemispherical opposition, and one in a polar orbit).

internal recommendations :

The working group recommends that highest priority should be given to  
 the following tasks (project coordinator(s) in parenthesis) :

Direct mapping of the ionospheric peak altitude including data from  
 different sources (Anderson, Reinisch)

Data base for top- and bottomside half-density- thicknesses  
 (excluding the polar cap) (Bilitza, Gulyaeva, Reinisch)

Continued effort to resolve the valley problem by critical discussion  
 and new sources of information (reliable in-situ measurements and  
 incoherent scatter profiles) (in collaboration with URSI-G4)

Study of the possibility to make a combined ionosphere-thermosphere  
 model (in collaboration with WITS) (Ivanov-Kholodny, Serafimov)

New effort to rebuild the ion-composition model using the large  
 amount of rocket and satellite data accumulated during the last decade  
 (Bilitza, Dachev)

Preparation of an IRI-88 to be published as a printed report of NSSDC  
 (USA) (Bilitza).

The Workshop was held in Espoo, Finland during the XXVII COSPAR General Assembly (July 18-29, 1988). The two-day session was accompanied by parallel poster sessions.

The papers will be published in Advances in Space Research (editors : K. Rawer and P. Bradley)

Authors of partial models who had promised to send their models in computerized shape to the IRI group (address : Dr. D. Bilitza, NSSDC) are urged to do so (Chasovitin, Rycroft, Smilauer).

L Bossy

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WORKSHOP ON MAGNETOTELLURICS AND  
RELATED ELECTROMAGNETIC SOUNDING METHODS

European Geophysical Society General Assembly  
Barcelona, Spain  
13-17 March 1989

IAGA Working Group I-3 [Electromagnetic Induction and Electrical Conductivity - Earth and Moon: Chairman S-E O Hjelt] sponsored this workshop, introducing rather a new theme into EGS Assemblies. The organizers were uncertain how much interest there would be and just one quarter-day session was planned initially. However, this had to be extended to a full day and there was an audience of approximately 50 for the session, which covered

- Regional Studies [J T Weaver]
- Methods, Techniques, Instruments [G Fischer]
- Theory, Inversion, Topography [L B Pedersen]
- Theory, Modelling [M Mareschal]

The success of the workshop was made manifest at a simple supper at a pleasant restaurant off the Ramblas in Barcelona, where almost all the participants decided to prolong the stimulation and pleasure of the day.

G Fischer

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9TH WORKSHOP ON ELECTROMAGNETIC INDUCTION  
IN THE EARTH AND MOON

Dagomys, USSR  
24-31 October 1988

The 9th Workshop on Electromagnetic Induction in the Earth and Moon was held at the the Black Sea in the Dagomys tourist complex near Sochi, USSR from October 24 to 31 1988. The meeting was generously sponsored by IUGG, IAGA, the Academy of Sciences of the USSR , the Soviet Geophysical Committee and IZMIRAN.

Despite doubts concerning the unconventional timing of our workshop, both the number of attendants, 197 and the number of scientific papers (99 oral and 83 posters) broke all earlier records. The number of papers made the time schedule rather hectic and it was almost impossible to study in detail all posters. Following workshop traditions, discussions were vivid during the breaks, in the evenings and during the excursion. No language barriers seemed to exist. Most of the participants enjoyed very much the unique opportunity to meet so many of the eminent Soviet colleagues during the workshop and after it at various institutes in Moscow. Many new ideas and co-operative efforts saw again daylight during the workshop. The 10th Workshop was decided to be held in Ensenada, Mexico in August 1990.

The local arranging committee under supervision of prof. Michael Zhdanov made a superb job for the success of the meeting. The workshop was honoured by the presence of Academician A.N. Tikhonov, one of the legendary fathers of the magnetotelluric method. He took part in intensive scientific discussions during the sessions and one of the highlights of the meeting was the beginning of the last morning session, when his 82th birthday was duly celebrated with speech, flowers and music.

The program was divided into 10 sessions, 7 of them starting with invited review papers. As always, the reviewers had made a thorough job, and several informative and up-to-date summaries were presented. The reviews will be published in Surveys in Geophysics as a special issue to be edited by Gaston Fischer and Michael Zhdanov. An informal evening session was devoted to semantic problems mainly in relation to forms of presenting data.

The scientific content of the meeting was as high as ever showing an intensive stage of development of electromagnetic induction methods and their use both in East and West, in South and North. The working group 1/3 once again showed its vitality and productiveness.

Three of the sessions dealt with theoretical aspects of modelling, inversion and field transformation methods. 39 oral presentations and 26 posters reflected the great improvements in modelling and analysing theoretical EM fields. The progress in 3D modelling is substantial both for time and frequency domain methods. Hybrid techniques, thin sheet approximations to combine surface and buried inhomogeneities, analytical and laboratory modelling were all discussed. Several new fast algorithms to reduce computing time, increase numerical stability and to improve handling of the boundary conditions were described. The final results of the six years' activity in the COMMEMI project comparing various numerical techniques were presented and they will have a great impact on the future of EM field calculations.

The combined interpretation of amplitude and phase data has had its definite breakthrough since the last workshop. New techniques to speed the convergence of inversion procedures were emerging. Genuine 3D inversion techniques are not yet available. New techniques in data processing showed also an increasing level of sophistication: *ao.* migration in time and frequency domain, hybridization, eigenvector decomposition for EM fields, robust statistical methods to remove outliers in data and a regularization approach to recover a transient signal from noise. A project to compare and evaluate data processing methods was prepared.

Three sessions with totally 21 oral and 32 poster papers discussed new techniques, controlled source methods and effects of nonuniform source fields and near-surface inhomogeneities. Experiments with powerful sources, such as the "Khibiny" MHD generator, the large "Volga" experiment used a DC power line and the use of electrical railway nets in combination with advanced data processing and modelling methods have increases the amount of new information about the deep structures of complicated regions. Promising results were reported from the use transient techniques for seafloor studies, in borehole EM tomography and in the EMAP profiling method.

New 3D numerical results and the experience of the Soviet colleagues with handling near-surface distortions and normalization of magnetotelluric sounding curves open up new aspects of the interpretation strategies in magnetotellurics. The effect of electrojets on MT and MV measurements was also modelled in detail.

Crustal and mantle conductivity structures, global sounding, oceanic EM investigations as well as results from ELAS and Transect projects were covered by 38 oral and 35 poster communications. A large interest was devoted to the study of crustal anomalies of electroconductivity. Deep electromagnetic studies were succesful in structural mapping, plate tectonic stu-

dies and geothermal investigations. The joint interpretation of several EM methods and the combined use of EM data together with other geophysical methods have significantly improved the models for the resistivity distribution at the depth. The construction of a map of the electrical conductivity of the crust in the USSR has been initiated in the frame of the ELAS Programme.

The number of reports of petrological and rheological studies was small to the disappointment of those who wish to understand the origin of crustal anomalies: fluids due to dehydration and/or the presence of graphite and sulphide bearing rocks. Papers on global sounding data showed that the spherically symmetric Earth model is supported by most data coinciding in the long period band, but models with regional anomalies in the electrical conductivity distribution of the mantle were also proposed.

Oceanic electromagnetic induction investigations covered the study of the uppermost kilometers of the crust by means of controlled source soundings and the study of the oceanic crust and upper mantle by means of deep electromagnetic soundings as well as physical oceanography (study of oceanic currents). Large arrays have been possible through international cooperation such as the EMSLAB and BEMPEX experiments. The quality of the oceanic EM induction results is very high. Limitations of the resistivity models of the oceanic crust and upper mantle were vividly discussed.

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### **Acknowledgements**

The well formulated reports of the summarizers of the workshop sessions, Drs P. Kaikkonen, P. Tarits, L. Szarka, E. Takacs, R.D Kurtz, A.A. Zhamaletdinov, E.B. Fainberg, M. Menvielle, A.D. Chave, A. Adam and A. Duba formed the backbone upon which it was easy to build this summary.

S-E Hjelt

SECOND VIKING WORKSHOP

La Londe-les-Maures, France  
2-6 May 1988

The meeting was attended by 67 scientists from 9 countries. They came from 22 laboratories in Europe and North America.

The Workshop concentrated mainly on substorm onset mechanisms. Ground-based and satellite observations were correlated, with particular emphasis on the measurements of the Viking satellite and of the EISCAT Incoherent Scattering Radar, for 21 selected orbits of Viking. Before tackling the problem of substorm onsets, preliminary studies were proposed. A first session was dedicated to coordinated studies of the plasma convection and its analysis at and beyond the auroral latitudes for weakly disturbed conditions. Then, a study on the magnetospheric boundary signatures was proposed to the experimenters. The analysis of substorm onsets followed a session devoted to the aurora morphology. Related to the observation of small-scale acceleration structures, studies on microscopic wave-particle interactions were the object of two sessions, for ions (related to low frequency waves) and electrons (related to high frequency waves).

A preliminary session (session 0) consisted in an overview of the recent results obtained by the Viking experimenter teams. The research orientations of each group were presented, they gave a dynamic picture of the scientific activity of the Viking community.

A conclusive last session consisted in a panel discussion, relying on a synthesis of the content of the six main sessions of the workshop.

Seven invited papers introduced each session. 26 contributed papers and 6 posters were presented. In addition, 9 informal working groups were formed, they mainly dealt with detailed Viking and EISCAT observations related to the topics of the sessions.

The connection between the IMF orientation and the convection cell pattern in the auroral and polar ionosphere was discussed. It was shown that multiple cells ( $>2$ ), or possibly strongly distorted 2 cell patterns, were observed while  $B_Z$  was northward. The observations of the Viking imager were used to infer the shape of the Field Aligned Current (FAC) regions and of the convection cells. The luminosity of the UV emissions was correlated to the upward FACs observed on board Viking. The aurora images and the observations of the Viking DC Electric Field experiment were used in a model which lead to a consistent convection configuration. This model illustrated the role of the terms of the ionospheric conductivity tensor. It was suggested that the

contribution of several ground based Radars should be used in this model together with the UV imager pictures to derive global patterns even under non-stationary conditions.

In the study of the mapping of magnetospheric boundaries and aurora morphology, emphasis was put on the dayside observations. Several papers concentrated on the identification of the Cusp / Mantle / Entry Layer / LLBL. It was underlined that these regions deserved detailed studies. The importance of a correct mapping of these regions, downward to the ionosphere and upward to the geomagnetic tail, was stressed.

A definition of substorms in terms of driving and unloading systems was discussed. The Rayleigh - Taylor and Kelvin - Helmholtz instabilities were proposed for their triggering. It was insisted that the onset location, which needs a correct mapping, should be included in studies on substorm morphology.

Viking crossed many acceleration structures. It was noticed that, in the past, much was told on wave generation in these regions, conversely, few quantitative studies were made on the role played by the waves in the particle acceleration and heating. Such studies should be made with the Viking measurements. Observations of weak double layers were presented together with their plasma environment. Within inverted V regions, the importance of quasi - linear diffusion was discussed. Several kinds of powerful high frequency waves (mainly Bursts of Electrostatic Noise and AKR) were shown to be generated in acceleration regions, and in their close vicinity. The consistency of proposed generation mechanisms and observed electron velocity distributions was discussed.

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Advances in Geophysics: Selected papers from the IDC on History sessions at Exeter "Geomagnetism and Aeronomy" and "Problems of Uncertainties in Geophysical Time Series". Edited by W Schroder; ISSN 0179-5658 (1989) pp 350, figs+tables; price DM 26.00 from W Schroder, IDC History, Hechelstrasse 8, D-2820 Bremen-Roennebeck (Federal Republic of Germany).

THE SVERDLOVSK MAGNETIC OBSERVATORY:  
THE OLDEST IN THE USSR

V A Shapiro  
Institute of Geophysics  
Sverdlovsk, USSR

The Sverdlovsk Magnetic Observatory is one of the oldest not only in the USSR but in the whole world. Recently it celebrated its 150th anniversary. The foundation of the magnetic observatories network in Russia was connected with the name of an outstanding German scientist and traveller of the XIXth century - Alexander Humboldt. When he returned from his famous trip through the Urals and Siberia, there was a meeting of Russian Academy of Sciences on November 16 1829, where A.Ya.Coopfer, the famous physicist, said:"As Mr.Humboldt proved us that the magnetism of the Earth is really a very important problem, we say now that we must pay the magnetism and meteorology as much attention as we did the astronomy and we should organize magnetic observatories everywhere together with the astronomic ones in order to study the Earth at last as well as the Sun and the planets".

And thus, within the next few years several magnetic observatories were built in Russia. Besides the Central Observatory in St.Petersburg the project included seven more observatories in other cities of the country. On January 1st 1836 they started to make measurements at the Ekaterinsburg Magnetic Observatory and in 1837 the first volume of "Russian Meteorological and Magnetic Observations" appeared.

Herman F.Abels had stood at the head of the Observatory since 1885. After graduating from the University of Tartu in 1870, he had been working as a teacher of Mathematics in Moscow, then in the Main Physical Observatory in St.Petersburg and in Pavlovsk Magnético-Meteorological Observatory.

#### SVERDLOVSK MAGNETIC OBSERVATORY

Herman Abels became the Director of Ekaterinsburg Observatory at a very difficult time, when the mining industry at the Urals was in depression, as well as the Mining Department of the Academy, which financed the Observatory. He left it in a difficult position too - it was in 1925, when the country was in ruin after hard Civil War. The work had not been easy during those forty years either - they had little money, few specialists and instruments. But Herman Abels was sure that the Observatory should work under any circumstances.

Herman Abels's education level and breadth of interests were astonishing. Here are only a few titles of his works published in the magazine of the Amateur Society of Natural Science of the Urals (ASNSU): "The notes about Shartash Lake Level", "The Influence of the Urals Mountains upon the Meteor Precipitations Distribution", "About the African Dust Fall in Perm Region on March 12th 1901". In the lists of the ASNSU he was the first not only in alphabetical order. One of the first he began to explore the nature of the Urals. But still geomagnetism remained the main subject of his work. In 1917 he finished the big manuscript entitled "The Magnetic Anomaly of Ekaterinsburg" at which he had been working for thirty years over. The main conclusions of the investigation were published in the "Magazine of Geophysics and Meteorology" in 1926. And the abridged book itself was published ten years later by his son - Robert H. Abels in connection with the 100th anniversary of the Observatory. The work is quite valuable nowadays too.

Herman Abels discovered the Ekaterinsburg Magnetic Anomaly when he just started his work at the Observatory. It turned out that the Observatory itself was situated inside the anomaly and later he studied virtually every corner of the region to find the places with the normal magnetic field. Practically it was the very beginning of the systematic magnetic survey at the Urals. Every year they published the "Observations of the Magnético-Meteorological Observatory" - it was the collection of the unique geophysical data about the Urals.

contribution of several ground based Radars should be used in this model together with the UV imager pictures to derive global patterns even under non-stationary conditions.

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## SVERDLOVSK MAGNETIC OBSERVATORY

of the Faculty of Physics and Mathematics. However, Robert did not give up his work at the observatory either. In 1912 in the same magazine of ASNSU he published the article "Magnetic Observations in Ekaterinsburg region in Summer 1912". It was the result of his work done during the last summer vacation. And then - up to the middle of the 60th he published a number of articles in different scientific geophysical journals.

Robert Abels became the Director of the Observatory after his father retired. He kept an excellent observations order in the Observatory and later it turned to a very high culture of the work. The Observatory veteran, T.N.Panov, remembers quite well how he was surprised by the highest quality of the work when he first came to the Observatory in 1937 after graduation from Leningrad University. By that time the Observatory was transported to Vysokaya Dubrava - out of town because of the great artificial magnetic interference. Panov was surprised by the contrast - a country road through the forest, modest wooden buildings of the Observatory and a very pleasant-looking and intellectual Director - Robert Abels for whom the work was everything in his life, the presence of the special style and manner of work. Panov called that the style of the Observatory worker, which was formed first by Herman and then - by Robert Abels.

Robert H. Abels had been the Director of the Observatory for many years. Then he led its magnetic department. In 1942 he had to leave the Observatory, but still kept the connection with it for the rest of his life. The collaboration was especially successful when the Observatory became a department of the Institute of Geophysics of the Urals Science Centre of the USSR Academy of Sciences. Robert gave pieces of advice to the employees of the Institute, published several scientific articles. And till the last days of his life he investigated the magnetic field of the Earth - he supposed it to be the main task of his life.

dies and geothermal investigations. The joint interpretation of several EM methods and the combined use of EM data together with other geophysical methods have significantly improved the models for the resistivity distribution at the depth. The construction of a map of the electrical conductivity of the crust in the USSR has been initiated in the frame of the ELAS Programme.

The number of reports of petrological and rheological studies was small to the disappointment of those who wish to understand the origin of crustal anomalies: fluids due to dehydration and/or the presence of graphite and sulphide bearing rocks. Papers on global sounding data showed that the spherically symmetric Earth model is supported by most data coinciding in the long period band, but models with regional anomalies in the electrical conductivity distribution of the mantle were also proposed.

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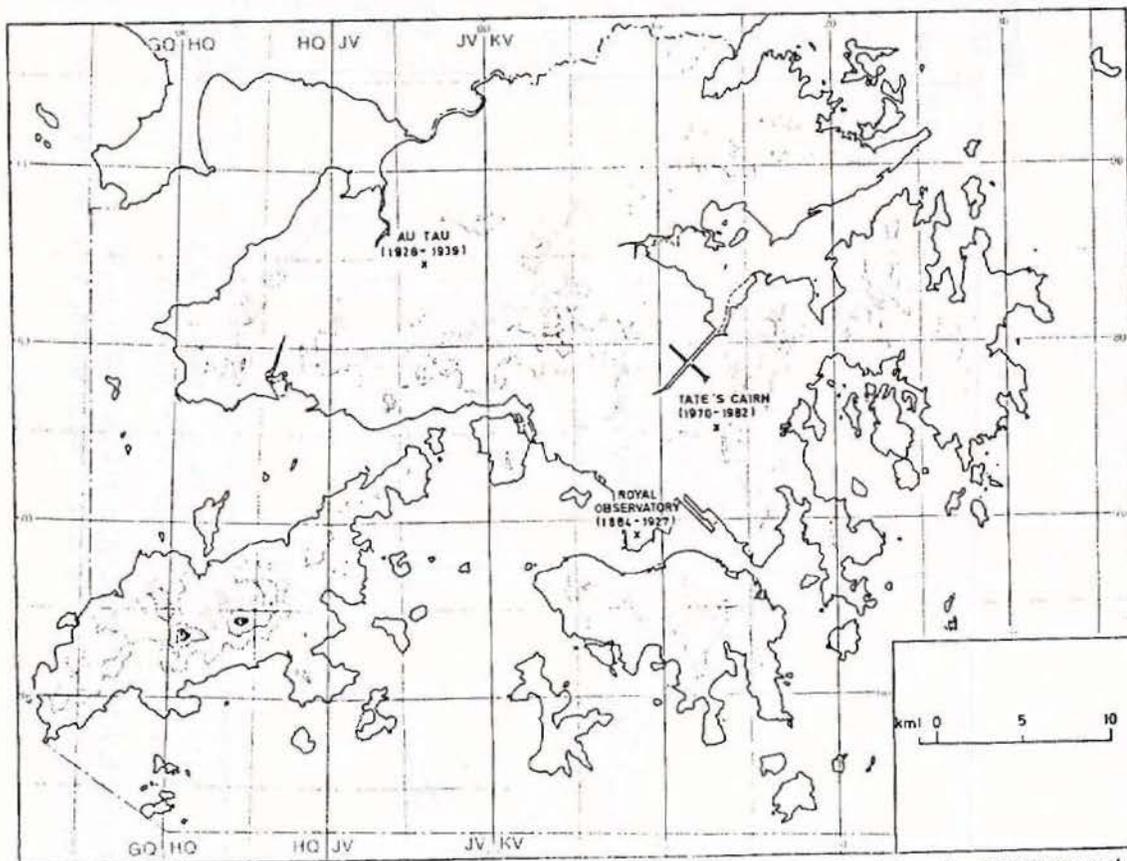
### **Acknowledgements**

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S-E Hjelt

## GEOMAGNETIC MEASUREMENTS IN HONG KONG

### The Royal Observatory, Hong Kong



Map of Hong Kong showing the location of magnetic observatories, and the dates when they were used.

**INTRODUCTION:** The earth's magnetic field at any location can be described in terms of the horizontal component (H), the vertical component (Z) and the declination (D).

The instrument for measuring a magnetic field is called a magnetometer, and variometers are magnetometers that record the variations in the three components of the earth's magnetic field. The records are called magnetograms.

Short term fluctuations recorded by variometers may be caused by:

- (i) Distortion of the earth's magnetic field by energetic particles from the sun.
- (ii) The formation of a ring current of charged particles around the earth at a distance of several earth's radii.

- (iii) Irregular electric currents in the ionosphere which may be caused by charged particles entering the earth's atmosphere in the Polar regions or by electro-magnetic induction.

- (iv) Earth movement.

Studies of the secular variation of the earth's magnetic field can increase our understanding of the processes occurring inside the earth and the effect of the sun's activity upon earth's environment.

**GEOMAGNETIC MEASUREMENTS IN HONG KONG:** Regular geomagnetic measurements in Hong Kong were started by the Royal Observatory in 1884 and continued without break until 1939. Observations were made at three sites, two inside the compound of the Royal Observatory and one at Au Tau. The sites at the Royal Observatory were used from 1884 to 1927,

9TH WORKSHOP ON ELECTROMAGNETIC INDUCTION  
IN THE EARTH AND MOON

Dagomys, USSR  
24-31 October 1988

The 9th Workshop on Electromagnetic Induction in the Earth and Moon was held at the the Black Sea in the Dagomys tourist complex near Sochi, USSR from October 24 to 31 1988. The meeting was generously sponsored by IUGG, IAGA, the Academy of Sciences of the USSR , the Soviet Geophysical Committee and IZMIRAN.

Despite doubts concerning the unconventional timing of our workshop, both the number of attendants, 197 and the number of scientific papers (99 oral and 83 posters) broke all earlier records. The number of papers made the time schedule rather hectic and it was almost impossible to study in detail all posters. Following workshop traditions, discussions were vivid during the breaks, in the evenings and during the excursion. No language barriers seemed to exist. Most of the participants enjoyed very much the unique opportunity to meet so many of the eminent Soviet colleagues during the workshop and after it at various institutes in Moscow. Many new ideas and co-operative efforts saw again daylight during the workshop. The 10th Workshop was decided to be held in Ensenada, Mexico in August 1990.

The local arranging committee under supervision of prof. Michael Zhdanov made a superb job for the success of the meeting. The workshop was honoured by the presence of Academician A.N. Tikhonov, one of the legendary fathers of the magnetotelluric method. He took part in intensive scientific discussions during the sessions and one of the highlights of the meeting was the beginning of the last morning session, when his 82th birthday was duly celebrated with speech, flowers and music.

The program was divided into 10 sessions, 7 of them starting with invited review papers. As always, the reviewers had made a thorough job, and several informative and up-to-date summaries were presented. The reviews will be published in Surveys in Geophysics as a special issue to be edited by Gaston Fischer and Michael Zhdanov. An informal evening session was devoted to semantic problems mainly in relation to forms of presenting data.

The scientific content of the meeting was as high as ever showing an intensive stage of development of electromagnetic induction methods and their use both in East and West, in South and North. The working group 1/3 once again showed its vitality and productiveness.

and the one at Au Tau from 1928 to 1939. Data recorded were published by the Royal Observatory in the Magnetic Results 1884-1939.

During the Second World War, the station at Au Tau was destroyed.

In 1968, the possibility of re-establishing a geomagnetic station in Hong Kong was investigated by the Physics Department, University of Hong Kong in conjunction with the Royal Observatory. A consultant of the World Magnetic Survey Mission visited Hong Kong and recommended a site at Tate's Cairn where there is little magnetic interference from man-made sources.

With the provision of a research grant by the Nuffield Foundation in 1971, the following instruments were obtained from the Meteorological Institute, Charlottenlund, Denmark:

- (i) Quartz Horizontal Magnetometers (QHM)
- (ii) Magnetic Zero Balance (BMZ)
- (iii) a set of La Cour variometers consisting of a declinometer, a variometer and a Godhavn balance together with a 15mm/h recorder.

The Geomagnetic Station was established at Tate's Cairn in February 1971. It was jointly operated by the Royal Observatory and the Physics Department of the University of Hong Kong until the end of 1982 when it was decided that because of lack of funds and staff the operation should cease.

The data collected were published in 'Magnetic Results' (for 1972 to 1976) and 'Geomagnetic Data' (from 1977 onwards) and were also sent to the World Data Center A, Boulder, Colorado, U.S.A.

IONOSPHERIC INFORMATICS AND EMPIRICAL MODELLING

Espoo, Finland  
 XXVII COSPAR General Assembly  
 18-29 July 1989

The main purpose of the Workshop was the release of the new IRI model. IRI-88 includes the fully analytical description of the middle ionosphere developed by K. Rawer with contributions by T. Gulyaeva and S. Radicella. For the determination of the F peak plasma frequency and density the user of IRI-88 has the option to apply either the old CCIR coefficients or the new URSI coefficients proposed by an URSI panel.

In the tradition of earlier Workshops the session talks and posters highlighted analytical representation of profiles, comparisons of IRI and measurements, and applications of IRI of different kind.

In connection with the Workshop business meetings of the Task Group on IRI and of URSI-G4 were held.

The following recommendations were accepted by the Task Group on IRI:

to COSPAR ISC C :

Considering that  
 the existing ionospheric data obtained by space techniques have shown  
 to be inadequate for inclusion into the ground-based data systems,  
 and that the latter data suffer from reduced coverage of the globe,

recommends that  
 by international co-operation a system of three topside-sounding  
 satellites using comparable techniques be installed, in a way to obtain  
 best coverage in time and space (for example, two satellites of variable  
 longitude, in hemispherical opposition, and one in a polar orbit).

internal recommendations :

The working group recommends that highest priority should be given to  
 the following tasks (project coordinator(s) in parenthesis) :

Direct mapping of the ionospheric peak altitude including data from  
 different sources (Anderson, Reinisch)

Data base for top- and bottomside half-density- thicknesses  
 (excluding the polar cap) (Bilitza, Gulyaeva, Reinisch)

Continued effort to resolve the valley problem by critical discussion  
 and new sources of information (reliable in-situ measurements and  
 incoherent scatter profiles) (in collaboration with URSI-G4)

Study of the possibility to make a combined ionosphere-thermosphere  
 model (in collaboration with WITS) (Ivanov-Kholodny, Serafimov)

New effort to rebuild the ion-composition model using the large  
 amount of rocket and satellite data accumulated during the last decade  
 (Bilitza, Dachev)

Preparation of an IRI-88 to be published as a printed report of NSSDC  
 (USA) (Bilitza).

Optical calibrations:  
Airglow low light level sources

Hans Lauche writes that he continues to offer a service of calibration of photometric standards, specifically those for use in nightglow instruments. Everybody who needs calibration of an airglow low-light-level source is invited to bring his (or her) source to Lindau. Lauche plans to offer an international cross-calibration facility (similar to the one at Saskatoon in August 1987) in two years' time at Vienna, during or adjacent to the Union General Assembly. Please prepare for the transport of sources, starting now.

Information: Hans Lauche, Max-Planck-Institut fuer Aeronomie, Postfach 20, D-3411 Katlenburg-Lindau (Federal Republic of Germany).  
Telephone 055 56 41-1 Fax 055 56 4 12 40 Telex 965527/AERLI D

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Solar Indices Bulletin

Daily solar radio flux; current sunspot cycle (sunspot numbers)

Geomagnetic Indices Bulletin

Daily aa indices; onset times of storms; global and hemispheric K and A values (Ap, An, Asd and Am); most quiet and most disturbed days.

These monthly bulletins cost \$21 per year and are issued by the National Geophysical Data Center, Department 807, Solar-Terrestrial Physics Division (E/GC2), 325 Broadway, Boulder CO 80303 (USA).  
Phone (303) 497 6346: Visa, MasterCard, American Express will do nicely.

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Note that there is also an extensive range of data published on a regular basis by the NGDC, covering magnetic, gravity, seismology, geochemistry, geothermic, topography and seismic reflection data. For more information:

National Geophysical Data Center, NOAA/NESDIS E/GC4,  
325 Broadway, Department 735, Boulder CO 80303 (USA).  
Phone (303) 497 6958

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## SOLAR ACTIVITY FORCING OF THE MIDDLE ATMOSPHERE

Castle of Liblice, Czechoslovakia  
3-8 April 1989

The symposium "Solar Activity Forcing of the Middle Atmosphere" held on 3-8 April 1989 in the Castle of Liblice, Czechoslovakia was organized by the IAGA Working Group II.D "External Forcing of the Middle Atmosphere" (co-chairmen J. Laštovička and R.F. Donnelly) and by the Geophysical Institute of the Czechoslovak Academy of Sciences (director Prof. V. Bucha, past Vice-president of IAGA), and co-organized by the ICMUA/IAMAP Working Group on Solar-Terrestrial Relations. 80 scientists from 12 countries took part in the symposium. All facilities, including accommodation and board, were provided at the Castle.

52 papers were presented at the symposium. Extended abstracts appear in Handbook for MAP, Vol. 29. The symposium consisted of 8 blocks: 1. "Related" papers. 2. Influence of Quasi-Biennial Oscillation. 3. Influence of solar electromagnetic radiation variability. 4. Solar wind and high energy particle influence. 5. Circulation. 6. Atmospheric electricity. 7. Lower ionosphere. 8. "Solar" posters.

Donnelly showed that for solar cycle 21, the maximum of the soft X-ray and ultraviolet solar flux, of the He I 1083 nm equivalent width and the net line-of-sight magnetic flux magnitude was attained in the second half of 1981, in R it was attained in late 1979, F10.7 displayed both peaks and the total solar irradiance appeared to decline since early 1979. Bucha demonstrated the effects of geomagnetic activity on tropospheric processes by implications to meteorological processes in Europe.

Chanin used an extended set of data and demonstrated the opposite correlation of stratospheric (but not mesospheric) parameters with the solar cycle for west and east phases of QBO. This conclusion was confirmed by the analysis of rocket temperature profiles from Thumba, Volgograd and Molodezhnaya (Mohana kumar) and by the analysis of rocket and ionospheric observations by Taubenheim and Entzian, who also showed a direct solar-cycle control above 55 km (mesosphere). The 3-D model results of Dameris and Ebel show significant differences of the dynamical response of the middle atmosphere to weak external (solar) forcing for west and east phases of QBO.

A systematic depletion of ozone related to 27-day UV-variation is detected near 70 km, which is attributed to Lyman-alpha photodissociation of water vapour and to unexpectedly strong temperature/UV response (Keating). Chandra claims that the solar induced perturbations in temperature between 2-70 mb are too weak to be detected against the background dynamical temperature variations. Hood presented correlative evidence of the stratospheric ozone and temperature responses to observed short-term solar ultraviolet variations at tropical latitudes where planetary wave amplitudes are relatively small. Krivolutsky found strong evidence for the solar origin of the 27 day wave in the 30-mb level height. Krivolutsky and Loshkova found invariance of phase of the 27-day wave with height.

FORTHCOMING MEETINGS

INTERNATIONAL SYMPOSIUM ON GEOMAGNETISM

Shanghai, China  
17-20 April 1990

Information: Professor Liu Qingling, National Committee of Geomagnetism and Aeronomy of China, PO Box 8701, Beijing (China)

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17th INTERNATIONAL SYMPOSIUM ON  
SPACE TECHNOLOGY AND SCIENCE

Tokyo, Japan  
20-25 May 1990

The symposium will offer fine opportunities for participants to exchange information and views on various technical and scientific topics as well as on the general status of national and international programs. It will consist of invited papers in the National Space Program session and contributed papers in the Technical sessions.

Inquiries to: Ms H Sakurai, 17th ISTS Secretariat, c/o Institute of Space and Astronautical Science, 3-1-1 Yoshinodai, Sagamihara-shi, Kanagawa 229 (Japan)

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COSPAR  
XXVIII PLENARY MEETING AND ASSOCIATED ACTIVITIES

The Hague, The Netherlands  
25 June - 6 July 1990

15 of the sessions are sponsored by IAGA [see the Executive Committee minutes, page 18]

Contact: Executive Secretary of COSPAR (Z Niemirowicz), 51 Boulevard de Montmorency, 75016 Paris (France).

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LEDGER ACCOUNT

1 January through 16 June 1989

[Amounts are in pounds sterling]

Cash in hand and at bank	28106.95	
Receipts	18654.82	46761.77
Expenditures:		
<u>Administration</u>		
Personnel	0.00	
Supplies and Equipment	202.84	
Communications	643.32	
Travel	0.00	
Miscellaneous	0.00	846.16
<u>Association</u>		
Publications	5682.04	
Assemblies	3141.06	
Meetings & Symposia	400.00	
Grants	288.53	
Contracts	0.00	
Miscellaneous	0.00	9511.63
Deposit account	34696.98	
Current account	1707.00	36403.98
		<hr/>
		46761.77
		<hr/>

MEETINGS

10th Workshop on  
ELECTROMAGNETIC INDUCTION

Ensenada, Mexico  
22-29 August 1990

There will be sessions on

- Developments in EM instrumentation, data acquisition and processing
- Modelling and inversion
- Removal, correction and decomposition of the effect of local near-surface inhomogeneities
- Interpretation of conductivity models of the Earth
- Long-period induction studies
- Oceanic induction studies
- Induction studies of volcanic and geothermal belts
- Deep probing controlled source methods: theory, results and correlation with natural source results
- General contributions

Information and registration:

Dr Mario Martinez, CICESE, PO Box 4843, San Ysidro, California  
92073 (USA)

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XXIII GENERAL ASSEMBLY  
of the  
INTERNATIONAL UNION OF RADIO SCIENCE (URSI)

Prague, Czechoslovakia  
28 August - 5 September 1990

The scientific activity of the Union is conducted via nine scientific commissions. The commissions are composed of official members designated by each of the member committees:

- Electromagnetic metrology
- Fields and waves
- Signals and systems
- Electronic and optical devices and applications
- Electromagnetic noise and interference
- Wave propagation and remote sensing
- Ionospheric radio and propagation
- Waves in plasmas
- Radio astronomy

Each commission holds scientific symposia and joint symposia and workshops organised by two or more commissions.

Information: Professor V Zima, Institute of Radio Engineering and Electronics, Czechoslovak Academy of Sciences, Lumumbova 1, CS 182 51 Praha 8 (Czechoslovakia).

Committee on Antarctic Research. The Executive Committee was receptive to this proposal and requested the President to discuss the matter further with Dudeney.

VIII. 7th Scientific Assembly, 1993

The Executive Committee had invitations from three National Committees to hold the Seventh Scientific Assembly of IAGA in July/August 1993.

In order of receipt, the first was from Argentina for the Assembly to be held in Cordoba and each member of the Executive Committee had been sent a package of material giving details of the meeting rooms available, the hotel accommodation etc. The second invitation was from Ivan T Berend and Istvan Lang, respectively President and Secretary-General of the Hungarian Academy of Sciences for the Assembly to be held in Budapest. The Secretary General had been sent an offer of help in organizing the meeting by IBUSZ, the Hungarian Travel Company. Finally, a letter was received during the Assembly from V V Belousov transmitting an invitation from the Soviet Geophysical Committee of the USSR Academy of Sciences to hold the Assembly in Moscow. A spirited discussion of the three invitations led to their being put to the vote and the Argentinian invitation received approval by a clear majority. The Executive Committee therefore recommended to the Conference of Delegates acceptance of this invitation.

IX. International Programme and Projects

International Equatorial Electrojet Year: Recognizing the fact that equatorial electrojet processes represent an important area of geosciences of major interest to IAGA and that the equatorial electrojet spans wide geographic regions of many developing countries, the InterDivisional Commission on Developing Countries proposes to organize an International Equatorial Electrojet Year during the period March/April 1990 to September/October 1991. The Executive Committee welcomed this initiative. The President suggested that Divisions II and V might share responsibility with the InterDivisional Commission on Developing Countries for pressing forward with this proposal and Gough proposed that the central coordinating committee should consist of Abdu, Ogunade, Vallance Jones and Coles. Agreed.

InterMagnet: The Executive Committee had before it a prospectus for modernization of the global network of geomagnetic observatories. The Executive Committee congratulated W F Stuart on bringing this matter forward in such a timely and effective manner. The President reported that an application for a grant had been forwarded to the Union Secretary General [P Melchior] for onward transmission to International Council of Scientific Unions.

Fund-Raising Committee: A report from W F Stuart on the activities of an ad hoc subcommittee of the Executive

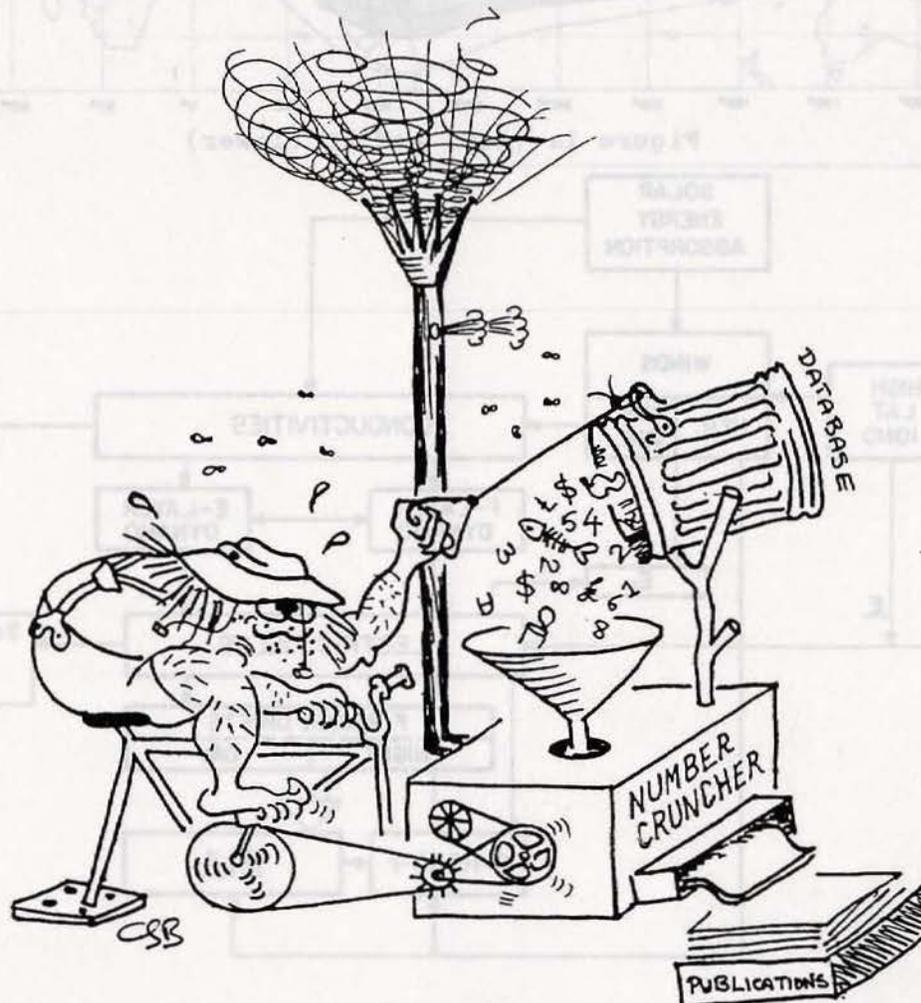
International Symposium  
INVERSE PROBLEMS FOR POTENTIAL FIELDS

Sofia, Bulgaria  
8-13 October 1990

Applications to geopotential fields - geomagnetism,  
gravimetry, geothermics and geoelectricity.

Information from: Professor P Kenderov, Institute of  
Mathematics with Computer Center, Bulgarian Academy of  
Sciences, PO Box 373\*, 1090 Sofia (Bulgaria).

How the processes of data analysis, paper writing, and  
publication are handled in the deep south?



Suggestion, courtesy of CEB .....

MC.9: Thermosphere Composition Changes during Magnetic Storms  
 MD.1: Martian Plasma Environments  
 MD.2: Particle Populations in Magnetospheric Currents Sheets  
 MD.3: Active Experiments in Space  
 MD.4: Parallel Shocks  
 MP.2: Equatorial Electrojet

SCOSTEP VIIth International Symposium on Solar Terrestrial Physics: Sponsorship agreed.

The President reported that he had had further correspondence with Liu Qingling of the National Committee of Geomagnetism and Aeronomy of China concerning IAGA sponsorship of a symposium on Geomagnetism [Minute V, paragraph 5, of the 1988 Executive Committee meeting refers]. Originally scheduled for April 1989, the symposium date had been moved to a date, to be determined, in 1990 [IAGA News No. 27, page 52]. The President reported that he had, therefore, withdrawn his original agreement of IAGA sponsorship and that sponsorship would be granted when there was an acceptable level of international representation on the organizing committee. This action was approved by the EC.

A request was received from the chairman of the InterDivisional Commission on Developing Countries for sponsorship of a training school of 2-3 weeks duration in the latter half of 1990 or the early part of 1991. The location could possibly be Brazil or Trieste. The Executive Committee decided to hold over consideration of this request until more definite proposals were available.

S-E Hjelt had written to the President requesting sponsorship of the 10th Induction Workshop to be held in Ensenada, Baja California (Mexico) from 22-29 August, 1990. Approved.

Rock Magnetism, Palaeomagnetism and Databases Usage (New Trends in Geomagnetism 2): McElhinny noted that the first meeting in this series had been most successful and the participants had at that time recommended that the meeting be the first of a series. Sponsorship was approved.

Inverse Problems for Potential Fields: A request from the Bulgarian Academy of Sciences for sponsorship of this international symposium, to be held in Sofia 8-13 October 1990, was approved.

VI. IUGG

Review of IAGA by the Union Bureau: The President stated that he had been invited by the Bureau to present an oral report, followed by discussion, of the Association's activities. This was part of the Union's continuing programme of review of the individual

THE INTERNATIONAL EQUATORIAL ELECTROJET YEAR (IEEY):  
A PLANNING DOCUMENT

(Part-I: Scientific Objectives and suggested experiments)

Prepared by the Inter-Divisional Commission on  
Developing Countries - IAGA

(Chairman: M.A. Abdu-INPE São José dos Campos, SP, Brazil)

ABSTRACT

This document presents a brief account of the present status of planning of the International Equatorial Electrojet Year (IEEY) proposed by the IAGA IDCDC for the years 1991-93. It presents the outstanding scientific objectives of the IEEY, the experiments and observational plans needed to achieve these objectives and the existing proposals for deployment of instruments, and experiments planned, for the different longitude sectors of the EEJ, as also the possibility of some rocket and satellite borne experiments during the IEEY. This will be subject to updating or modification depending upon additional proposals of experiments and definition of plans that should be forthcoming from the international EEJ study community in the coming months. Part II of this document to be published in another issue will concern with the existing proposals and plans of experiments for the IEEY.

1 INTRODUCTION

During the past two years, since the IAGA Vancouver Assembly, the IDCDC has taken initiatives to give shape to a plan, even if of a tentative nature, for the realization of the IEEY during the 1991-93 time frame. More precisely, as it is proposed, the IEEY is scheduled to take place from September 1991 to March 1993. The IEEY is planned to be an International Cooperation project aimed at improving our understanding of the different geophysical, aeronomic, electrodynamic and plasma processes that control the Equatorial Electrojet (EEJ) current, especially its spatial structure and space and time variations, its instabilities and induced effects. Extensive observational and experimental campaigns with this objective are being planned to be conducted at equatorial and low latitude regions of the earth. The IEEY offers interesting opportunities for the EEJ study group all over the world to intensify their activities in a coordinated way and to generate unprecedented data sets on the electrojet and related phenomena, so that intensified investigations of

Acceptance of the accounts was proposed by the Secretary General, seconded by Gough, and passed nemine contradicente. On the motion of Williams, seconded by Gendrin, it was decided to discontinue publishing Transactions of each Scientific Assembly. The preparation takes a significant amount of time but, more importantly, the costs of printing and distributing [close to \$10,000] had risen over the years to the point where it was felt the monies could be more usefully employed in helping scientists to attend Assemblies rather than to read about having attended. In place of the Transactions, the Secretary General was charged with assembling from the Division and InterDivisional Commission leaders a collection of moderately-brief reports of scientific highlights from the scientific sessions. This collection would be submitted for publication in the IUGG Chronicle.

#### IV. IAGA Internal Structure

Honorary Membership of IAGA: The Executive Committee decided unanimously to recommend to the Conference of Delegates election to Honorary Membership of K D Cole, N Fukushima and J G Roederer.

Review of the Assembly programme and related problems: McElhinny noted that the number of contributions to the Division I programme had increased markedly. This was a good thing, showing vigour and expanding activity, but the sheer number of papers to be accommodated leads to administrative problems. Division I regularly schedules three parallel sessions and this was beginning to be not enough. He noted that Working Groups I-5 and I-6 [palaeomagnetism and rock magnetism] accounted for almost half the Division I papers [232 out of 521]. M Kono, the chairman of Division I, had sent the Secretary General copies of correspondence dealing with these matters, and these had been laid before the EC. There appeared to be two practical and possible solutions; first, that Division I should split into two or more (smaller) Divisions or, second, that Working Groups I-1 and I-4 should be relocated within Division V. [Using the statistics of the current Assembly, 127 papers would disappear from the 521 submitted to Division I, to reappear as an addition to the 151 submitted to Division V.] Gough proposed, seconded by Sugiura, that the Executive Committee support the second alternative and appoint McElhinny to discuss such a change with the leaders of Divisions I and V, and other interested parties, and to report back to the EC. Agreed.

Williams and Vaisberg raised the question of whether Division IV should explicitly include "solar physics" as a subject study. The topics of flare formation, release of material into the solar wind, and solar oscillations are all of particular and immediate concern to the research studies covered by Division IV interests.

Williams suggested that a principal theme of the 1993

also by penetrating electric field of magnetospheric origin and changes in conductivities, that occur during solar, - inter planetary, -magnetosphere, -ionosphere disturbances. The figure serves to show further that, intimately associated with EEJ, (namely, controlled by the same electric field as that of EEJ) are two wellknown processes of the low latitude region: Equatorial Ionization Anomaly (EIA) and Spread F. In other words the EEJ and the aeronomic processes within a latitude belt of  $15^{\circ}$  centered on it, (Figure 1b), have the same electric field as their dominant driving force. Thus aeronomic study campaign in these regions (Figure 1b) should also be of great value for improvement of our understanding of the EEJ processes.

The first explanation for the EEJ eastward current was based on the premises of total inhibition of vertical currents and build up of vertical polarization field, in a thin conducting E-layer, that resulted in enhanced Cowling conductivity. However the present theories are all consistent on the need of vertical-meridional current loops to fully explain the magnitude of the field variations observed in the ionosphere. The westward return currents associated with eastward EEJ also need to be studied. Influences of local winds, of atmospheric waves and of the different tidal wind components, versus the effects from imposed electric fields originating in the magnetosphere need to be understood better. Typical manifestations of these different influences become evident on occasions of current reversals widely known as Counter Electrojet (CEJ). The precise causes of CEJ as also the shape of the corresponding current systems need to be clarified.

For a better understanding of the EEJ processes it is therefore important to know the three - dimensional structure of the EEJ current, namely, the height and latitude dependence of the zonal, vertical and meridional currents, associated plasma instability processes and the background conditions that sustain them. Thus the observational and experimental investigations of the EEJ should aim at conducting measurements on its four main aspects.

- i - Magnetic field variations on the ground and in space
- ii - Spatial distribution of currents, namely, the EEJ three dimensional structure
- iii - Plasma irregularity processes in the EEJ
- iv - Ambient electron densities and electric fields, and neutral air densities and dynamics

The measurements of the magnetic field variations, the most basic attribute of the EEJ, on the ground, by means of ground based magnetometer arrays to be deployed at different longitude sectors of the equator will constitute the core of the observational system during the IEEY. New

RESOLUTIONS (1989)

the International Equatorial Electrojet Year (IEEY), during which intensive and coordinated campaigns on the equatorial electrojet and related aeronomic phenomena should be conducted using a variety of observational techniques at low latitudes, and urges all concerned scientific communities to participate actively in this programme.

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Resolution No.12

IAGA considering in particular the short notice for the organization of this Assembly, places on record its sincere gratitude to the Royal Society of London and to the University of Exeter for inviting the Association to hold its Assembly in what have proved to be almost ideal surroundings and thanks the Local Organizing Committee, under the chairmanship of Professor David Southwood, and in particular Dr Roy Jady and his assistant Mrs Marilyn Webb for their heroic efforts in achieving a successful outcome.

AIGA considérant en particulier le court délai pour l'organisation de cette Assemblée, exprime par écrit sa profonde gratitude de vis-à-vis de la Société Royale de Londres et de l'Université d'Exeter pour inviter l'Association à tenir son Assemblée dans un lieu qui s'est démontré être presque idéal remercie le Comité Local d'Organisation, sous la présidence du Professeur David Southwood, et en particulier de Dr Roy Jady et sa assistante Madame Marilyn Webb pour leur efforts heroiques pour aboutir à un succès remarquable.

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Experiments:

- a) Magnetometer arrays across the equator with sufficient extension and appropriate spacing to permit determination of high resolution latitude profile of the current. It is desirable to operate such arrays at three or more longitude sectors.
- b) Rocket experiments to measure current height profiles at small latitude separations covering the EEJ.
- c) wind measurements using radars or vapour trail releases from rockets.

3.2 Separation of the internal and external contribution to the observed magnetic field variation, and evaluation of subsurface conductivity anomalies

Experiments: Same as in 3.1(a) and 3.1(b), but mainly that of 3.1(a).

3.3 Causes of regional and longitude differences in the EEJ strength

It is necessary to identify possible effects on EEJ strength from regional and longitude differences in ground conductivities, in wind systems and in magnetic field intensities. Is the EEJ strength a global maximum in Peru or in Brazil, or in-between locations, or elsewhere?.

Experiments:

- a) Magnetometer arrays as in 3.1(a) at different longitude sectors, especially in Brazil, Peru, East and West Africa.

3.4 Causes of Counter (or reverse) Electrojet (CEJ):

It is necessary to investigate into possible association of CEJ with: a) global tidal wind pattern particularly the antisymmetric tidal modes; b) vertical and horizontal winds of local nature or associated with atmospheric gravity waves, and (c) solar wind and interplanetary magnetic field conditions.

Experiments: Regarding (a) it is necessary to have a longitudinal chain of magnetometers covering from  $\sim 40^{\circ}\text{N}$  to  $\sim 40^{\circ}\text{S}$  and spaced at  $10^{\circ}$  interval including one at the equator. Several chains of magnetometers at different longitude will be preferred. The magnetometer array of 3.1(a) could complement these chains.

Regarding both (a) and (b) it is necessary to conduct measurements of winds using radars or vapour trail releases as in 3.1(c).

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Résolution No.9

AIGA notant l'interêt que présentent des indices géomagnétiques fiables et de très bonne qualité pour la communauté scientifique, reconnaissant le rôle unique du Service International des Indices Géomagnétiques [SIIG] dans la derivation, la publication, et la diffusion de ces indices, exprime sa profonde reconnaissance pour les efforts consentis par l'Institut de Physique du Globe de Paris et le Centre de Recherches en Physique de l'Environnement pour l'édition des bulletins mensuels du SIIG et la publication de la série No.32 des Bulletins de l'AIGA, et recommande fermement à la Fédération des Services de données Astronomiques et Géophysiques de continuer à soutenir le SIIG.

IAGA noting the value to the scientific community of high quality reliable geomagnetic indices and recognizing the unique role of the International Service of Geomagnetic Indices [ISGI] in the derivation, publication, and dissemination of these indices expresses deep appreciation of the efforts made by the Institut de Physique du Globe de Paris and the Centre de Recherches en Physique de l'Environnement in editing ISGI monthly bulletins and assuring the publication of IAGA Bulletin No.32 series and strongly recommends the Federation of Astronomical and Geophysical Data Analysis Services to continue their support to the ISGI.

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Resolution No.10

IAGA recognizing that time scales of directly observable geomagnetic main field changes range from years to centuries and that measurement of changes over the entire range of periods is crucial for the study of properties of the Earth's core and lower mantle and of the coupling between the two; recognizing that high resolution measurements of the geomagnetic anomaly field can provide significant information about the lithosphere and its tectonic structure in a detail never before achieved; recognizing that the acquisition of satellite magnetic field data of high accuracy is a crucial part of such measurements and noting that ten years have passed since the acquisition of suitable satellite magnetic field data urges again most strongly that plans for satellite

Experiments: Ionosonde/Digisonde, Photometers/Imagers, VHF polarimeters, Radars, and Magnetometers as in 3.1(a) and 3.3(a). Valuable information on the day-to-day development of TEC as also height profiles of electron densities in the EIA region can be obtained from tomography technique (Austen et al. Radio Science, 1989) that utilizes a meridional chain of receivers monitoring dual frequency signals from the TRANSIT satellites.

### 3.9 Plasma irregularity processes in EEJ

It is necessary to investigate in further details the plasma instability characteristics under EEJ and CEJ conditions as well as the mechanism of blanketing type Es layer formation during CEJ events. Particular attention is to be given to the possibility of obtaining neutral atmosphere parameters like density, winds and temperatures from suitable analyses of the type I and II EEJ irregularity characteristics.

Experiments: Rocket borne measurements of irregularities and electric fields, VHF radar diagnostics of the irregularities and measurements using Ionosondes and Digisondes. Magnetometers as in 3.1(a).

### 3.10 Changes in the shape of the E-layer electron density profile and their effects on the EEJ intensity and structures.

Experiments: Lower thermosphere dynamics to be measured by Meteor Radar, partial reflection radar, incoherent scatter radar and vapour release experiments; precise measurements of E-layer density profile using rockets and ionosondes. It must be emphasized that the measurements of the lower thermosphere (preferably, including mesosphere) dynamics and densities and monitoring of the ambient ionosphere and its dynamics are important complements for investigation into the problems in 3.3-3.10.

## 4 OBSERVATIONAL NETWORKS AND EXPERIMENTS: EXISTING ONES AND THOSE TENTATIVELY PLANNED FOR THE IEEY

In the world map (within  $\pm 45^\circ$  Lat.) of Figure 3 we have shown by solid circles the existing magnetic observatories which will continue operation into the IEEY period. The locations of the existing ionosonde and VHF radar stations are also shown.

A number of tentative plans for deployments of instruments at different longitude sectors, (African, American, Asian and Indian) of the equatorial region are being actively

## Résolution No.5

AIGA notant le grand nombre de relèvements magnétiques qui ont été effectués afin d'obtenir des informations sur la lithosphère arctique, et notant l'intérêt international considérable de la géologie arctique par suite de sa contribution à l'accroissement de notre compréhension de l'évolution tectonique des continents et océans nordiques, recommande fortement que tous les pays ayant un intérêt dans les recherches géophysiques en arctique contribuent à la production de cartes des anomalies magnétiques de la région arctique.

IAGA noting the great number of magnetic surveys that have been carried out to obtain information about the arctic lithosphere and noting the considerable international interest in arctic geology because of its contribution to the enhancement of our understanding of the tectonic evolution of the northern continents and oceans recommends that all countries having geoscience research interests in the arctic contribute to the production of a magnetic anomaly map of the arctic region.

## Resolution No.6

IAGA recognizing that reliable data from geomagnetic observatories in all parts of the world are important for geomagnetic science and also for the development of technologies and noting that some observatories are experiencing considerable difficulties in securing funding and maintaining operation strongly urges the responsible institutes to work with the IAGA to develop alternative solutions prior to taking a final decision to close an observatory.

AIGA reconnaissant que les données fiables, issue des observatoires magnétiques dans toutes les parties du monde sont importantes pour la science du géomagnétisme ainsi que pour le développement de technologies, et notant que quelques observatoires ont à faire face à des difficultés considérables pour assurer leur financement et maintenir leurs opérations, recommande fortement que les instituts responsables étudient avec l'AIGA le développement de solutions alternatives avant de prendre la décision finale de fermer un observatoire.

considered by the international scientific community. Observational campaigns involving coordinated measurements by radars, rockets and satellites are also being planned.

A clearer definition and a more complete picture of these plans as also of the IEEY organization structure is emerging shortly. A detailed presentation of these aspects including also an updated version of the Figure 3 will be the subject of another communication.

#### ACKNOWLEDGEMENTS

In preparing this document the author has been benefited and helped by suggestions received from several colleagues and experts on the EEJ and related problems. I would like to thank all of them for their sincere collaborations. I would like to specially mention here the names of colleagues who were very kind enough to send me valuable written suggestions that were helpful in defining the scientific objectives in section 3 of the text. They are: Drs. Jeffrey M. Forbes, Naoshi Fukushima, Jack Klobuchar, R. Raghavarao, G.K. Rangarajan, Ulrich Schmucker, R.G. Rastogi, Robert Stening and A. Zaitzev.

RESOLUTIONS (1989)

AIGA reconnaisant la nécessité de savoir discriminer entre les modifications d'origine naturelle et anthropogénique dans l'atmosphère pour pouvoir évaluer plus précisément les signes avant-coureurs de ces dernières, notant l'effort croissant de compréhension des effets de la variabilité intra-annuelle, inter-annuelle et décennale du soleil sur l'atmosphère moyenne, reconnaisant qu'il y a maintenant des observations mettant en évidence l'existence dans la basse stratosphère d'effets liés à la variabilité solaire, recommande que des études plus intensives sur les réponses de l'atmosphère à l'activité solaire ainsi que des processus de couplage vers le bas, soient menées comme l'une des contributions de l'AIGA aux objectifs de l'IGBP, en coopération avec l'AIMPA.

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Résolution No.3

AIGA notant que les mesures magnétiques du vent solaire constituent une part indispensable de la synergie des programmes SOHO/CLUSTER qui sont ensemble considérés comme la mission "pierre angulaire" dans le domaine de la physique du système Soleil-Terre, constate avec inquiétude la décision prise par les autorités compétentes des agences concernées de supprimer du programme SOHO le magnétomètre et les instruments de mesure du vent solaire, et recommande que cette décision soit reconsidérée.

IAGA noting that the magnetic and solar wind measurements contribute an indispensable part of the synergistic aspects of SOHO/CLUSTER which are jointly considered as the cornerstone mission in solar-terrestrial physics views with concern the decision by the managing authorities of the agencies involved to remove the magnetometer and solar wind instruments from the SOHO payload and recommends that this decision be reconsidered.

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# INTERNATIONAL GEOPHYSICAL CALENDAR

## EXPLANATIONS

This Calendar continues the series begun for the IGY years 1957-58, and is issued annually to recommend dates for solar and geophysical observations which cannot be carried out continuously. Thus, the amount of observational data in existence tends to be larger on Calendar days. The recommendations on data reduction and especially the flow of data to World Data Centers (WDCs) in many instances emphasize Calendar days. The Calendar is prepared by the International Uranium and World Days Service (IUWDS) with the advice of spokesmen for the various scientific disciplines.

### The Solar Eclipses are:

a.) 26 January 1990 (annular) beginning in Antarctica and ending in the South Atlantic. Partial phases visible on the South Island of New Zealand and much of South America.

b.) 22 July 1990 (total) begins in Finland, then along northern coasts of Europe and Asia. Totality path 130 miles wide at maximum, duration 2 min 33 s; Sun at about 40 degrees altitude. Totality crosses Alaska's Aleutian Islands. Partial phases in northeastern Europe, northwestern North America, northern Asia, and Hawaiian Islands.

**Meteor Showers** (selected by P.M. Millman, Ottawa) include important visual showers and also unusual showers observable mainly by radio and radar techniques. The dates for Northern Hemisphere meteor showers are: Jan 3-4; Apr 22-23; May 4-5; Jun 8-12; Jul 28-29; Aug 10-14; Oct 21-22; Nov 2-3, 17-18; Dec 12-16, 22-23, 1990; and Jan 3-4, 1991. The dates for Southern Hemisphere meteor showers are: May 4-5; Jun 8-12; Jul 26-30; Oct 21-22; Nov 2-3, 17-18; and Dec 5-7, 12-16, 1990.

### Definitions:

Time = Universal Time (UT);  
Regular Geophysical Days (RGD) = each Wednesday;  
Regular World Days (RWD) = Tuesday, Wednesday and Thursday near the middle of the month (see calendar).  
Priority Regular World Days (PRWD) = the Wednesday RWD;  
Quarterly World Days (QWD) = PRWD in the WGI;  
World Geophysical Intervals (WGI) = 14 consecutive days each season (see calendar);  
**ALERTS** = occurrence of unusual solar or geophysical conditions, broadcast once daily soon after 0400 UT;  
**STRATWARM** = stratospheric warmings;  
Retrospective World Intervals (RWI) = intervals selected by MONSEE for study.

For more detailed explanations of the definitions, please see one of the following or contact H. Coffey (address below): *Solar-Geophysical Data*, November issue; *URSI Information Bulletin*; *COSPAR Information Bulletin*; *AGA News*; *IUGG Chronicle*; *WMO Bulletin*; *IAV Information Bulletin*; *Solar-Terrestrial Environmental Research in Japan*; *Journal of the Radio Research Laboratories (Japan)*; *Geomagnetism and Aeronomy (USSR)*; *Journal of Atmospheric and Terrestrial Physics (UK)*; *EOS Magazine (AGU/USA)*.

Priority recommended programs for measurements not made continuously (in addition to unusual ALERT periods):

**Aurora and Airglow** — Observation periods are New Moon periods, especially the 7 day intervals on the calendar;

The International Uranium and World Days Service (IUWDS) is a permanent scientific service of the International Union of Radio Science (URSI), with the participation of the International Astronomical Union and the International Union of Geodesy and Geophysics. IUWDS adheres to the Federation of Astronomical and Geophysical Data Analysis Services (FAGS) of the International Council of Scientific Unions (ICSU). The IUWDS coordinates the international aspects of the world days program and rapid data interchange.

This Calendar for 1990 has been drawn up by H.E. Coffey, of the IUWDS Steering Committee, in association with spokesmen for the various scientific disciplines in SCOSTEP, IAGA and URSI. Similar Calendars are issued annually beginning with the IGY, 1957-58, and are published in various widely available scientific publications.

Published for the International Council of Scientific Unions and with financial assistance of UNESCO.

Additional copies are available upon request to IUWDS Chairman, Dr. R. Thompson, IPS Radio and Space Services, Department of Administrative Services, P.O. Box 1548, Chatswood, NSW 2057, Australia, or IUWDS Secretary for World Days, Miss H.E. Coffey, WDC-A for Solar-Terrestrial Physics, NOAA E/GC2, 325 Broadway, Boulder, Colorado 80303, USA.

**Atmospheric Electricity** — Observation periods are the RGD each Wednesday, beginning on 3 January 1990 at 0000 UT, 10 January at 0600 UT, 17 January at 1200 UT, 24 January at 1800 UT, etc. Minimum program is PRWDs.

**Geomagnetic Phenomena** — At minimum, need observation periods and data reduction on RWDs and during MAGSTORM Alerts.

**Ionospheric Phenomena** — Quarter-hourly ionograms; more frequently on RWDs, particularly at high latitude sites; f-plots on RWDs; hourly ionograms to WDCs on QWDs; continuous observations for solar eclipse in the eclipse zone. See Airglow and Aurora.

**Incoherent Scatter** — Observations on Incoherent Scatter Coordinated Days; also intensive series on WGI or Airglow and Aurora periods. Special programs: Dr. V. Wickwar, Utah State Univ., Center for Atmospheric and Space Sciences, Logan, UT 84322-4405 U.S.A., URSI Working Group G.5 (801)750-3641.

**Ionospheric Drifts** — During weeks with RWDs.

**Traveling Ionosphere Disturbances** — special periods, probably PRWD or RWDs.

**Ionospheric Absorption** — Half-hourly on RWDs; continuous on solar eclipse days for stations in eclipse zone and conjugate area. Daily measurements during Absorption Whistler Anomaly at temperate latitude stations (Oct-Mar Northern Hemisphere; Apr-Sep Southern Hemisphere).

**Backscatter and Forward Scatter** — RWDs at least.  
**Mesospheric D region electron densities** — RGD a round noon.

**ELF Noise Measurements of earth-ionosphere cavity resonances** — WGIs.

**All Programs** — Appropriate intensive observations during unusual meteor activity.

**Meteorology** — Especially on RGDs. On WGIs and STRATWARM Alert Intervals, please monitor on Mondays and Fridays as well as Wednesdays.

**Solar Phenomena** — Solar eclipse days, RWDs, and during PROTON/FLARE ALERTS.

**Solar Interplanetary Variability (SIV)** — observations of transition phenomena solar minimum to solar maximum (1988-1989), with in-depth analysis in 1990. Contact Dr. E.J. Smith, JPL, MS169/506, 4600 Oak Grove Dr., Pasadena, CA 91109 U.S.A.

**Transient Interplanetary Phenomena (TIP)** — 1990-95 observations and analyses of solar-generated phenomena propagating through heliosphere. Includes IPS observations of remote radio galaxies and telemetry signals to/from interplanetary spacecraft. Also coordination of spacecraft IMP8, ICE, Glotie, Sakigake, Voyager 1/2, Pioneer 10/11, Ulysses, Relict, Wind and SOHO. Contact Dr. M. Dryer, NOAA R/E/SE, 325 Broadway, Boulder, CO 80303 USA.

**Space Research, Interplanetary Phenomena, Cosmic Rays, Aeronomy** — QWDs, RWD, and Airglow and Aurora periods.

MINUTES (CONF. DELEGATES)

Accordingly, Vilas presented a world map showing locations of IAGA and IUGG Assemblies and noted that 1979 was the last time that a IAGA/IUGG Assembly had been held in the Southern hemisphere. In answer to questions from Delegates who were concerned about the relatively high cost of travel to Argentina, Vilas said that there would be travel grants for scientists from developing Countries and that, although airline costs were high, the cost of local accommodations would be very modest: the total cost of attending the Assembly would therefore be not out of line with what was usually involved.

Vero, in urging that Budapest (Hungary) was the best place for the Assembly referred to the advantages of Budapest's central position for travelling by IAGA scientists and reminded the Delegates that geomagnetism and aeronomy had long-lasting and proud places in Hungarian-based science.

Oraevsky proposed that the Assembly should be in Moscow, USSR, and announced that Delegates could feel confident that all arrangements and facilities would be available at that location with full support from the Soviet geophysical community.

Upon the question being put, that the recommendation of the Executive Committee to accept the invitation of the Argentinian National Committee be accepted, the motion was passed 14 for, 3 abstentions, nemine contradicente.

9. Any other competent business There being no other business, the President closed the Conference of Delegates at 4 pm.

Chief Delegates, duly accredited to the Assembly:

China:	X-R Kong
Finland:	E Kataja
FRG:	H Soffel
Hungary:	J Vero
Ireland:	A Brock
Italy:	F Mariani
Japan:	Takesi Yukutake
Kenya:	J P Patel
Mexico:	A Orozco
New Zealand:	E M Poulter
RSA:	G J Kuhn
Sweden:	C-G Falthammar (vice G Marklund)
Switzerland:	F Heller
UK:	D Southwood
USA:	C G A Harrison
USSR:	V N Oraevsky
Zimbabwe:	D L Jones

JAMES ROY BARCUS  
1930 - 1988

Jim Barcus was above everything an experimental physicist; a good companion on expeditions, an incisive thinker, his death at an early age was a shock.

Born in Kansas City, Missouri, he served in the US Navy before commencing his academic career. His bachelor's degree and doctorate both came at the University of New Mexico; his postdoctoral research career started at University of California in Berkeley.

At Berkeley, he continued the research started in his days at New Mexico and went enthusiastically into studies of auroral X-rays using high-altitude balloon-borne detectors. He quickly recognized the advantages to research of conjugate measurements, as well as the incorporation of auroral photometers into the balloon package. One of his successes was the recognition of the spatial structure of microbursts in electron precipitation.

Barcus went to the University of Denver in 1965 and became a full professor there in 1970. He became involved in cooperative work with New Zealand scientists in his Antarctic studies which (Jim could not be kept away, if anyone had wanted to) took him to Antarctica and the special problems of flying balloons from sites at low temperatures.

His international collaboration expanded greatly in the 1970s with rocket-borne studies of the middle atmosphere response to auroral X-radiation, and of the electrodynamics of the middle atmosphere. These took him to launch sites all over the world. His researches during these fruitful years are published extensively in the scientific literature. To adopt Wren's epitaph "Si Monumentum requiris, praelege!"

Barcus served in the National Science Foundation, and was a member of the Scientific Committee on Antarctic Research.

MINUTES (CONF. DELEGATES)

The Executive Committee had met five times during the Assembly and from these deliberations [the minutes of which are given on pages 16-24], three matters were brought forward for discussion by Delegates:

1. Division I had had a total of more than 570 papers in its sessions, outweighing the other components by a considerable margin. To ease the pressure on the programme, the Executive Committee proposed to reassign the current working groups I-1 and I-4 to Division V. Leading the discussion, M Kono (the Chairman of Division I) noted that there had been 23 separate symposia (580 papers) in three parallel sessions. Under the new structure, he expected there would be less than 400 papers in the Division I sessions and that this number would be a great deal more manageable. R Coles (Chairman of Division V) welcomed the proposal on behalf of Division V members. C G A Harrison pointed out that moving working groups does not of itself get rid of programme conflicts and that the chairmen of both Divisions must now work closely together to avoid overlapping and conflicting sessions. The Secretary-General assured Delegates that the programme committee would take all possible care to see to this.

2. The International Geosphere/Biosphere Program [IGBP]. The Executive Committee agreed on full support for the Solar-Terrestrial Energy Program [STEP] and noted that studies of the response of the middle atmosphere to changes in Solar-Terrestrial input would be carried forward in close collaboration with IAMAP. K D Cole welcomed the news that no matter how the programme for the IGBP develops, IAGA will support STEP.

3. International Geomagnetic Reference Field [IGRF]: proposal to charge for commercial use of geomagnetic data and models. The President announced that a proposal from W F Stuart had come before the Executive Committee in which it was proposed that charges should be made for the use by non-scientific organizations (especially oil companies and commercial geo-exploration organizations) of the data and models currently developed by IAGA scientists and published in IAGA Bulletins. While recognizing the generous nature of the proposal to raise money to support geomagnetic observatories, the Executive Committee felt that there were technical and legal difficulties in setting up such an arrangement. Furthermore, the Executive Committee was worried lest such an arrangement could be regarded as being consonant with the basic principles of IAGA, in particular with the concept of open publication of the results of researches. Stuart pointed out that free data exchange is not compromised because it is a product (not the data) that will be sold. He requested that the Conference of Delegates approve his arranging a two-year trial of the proposal, with a report back to the Conference of Delegates at the General Assembly in 1991. In response to a question whether oil companies could not make a donation *ex gratia* in lieu of purchasing and holding enforceable rights in the IGRF,

EDWARD MICHAEL FOURNIER D'ALBE  
1922 - 1988

Dr Fournier d'Albe died suddenly at his home in Normandy (France) on 19 August 1988; he was aged 66.

He graduated from Wadham College at Oxford University (UK). To geophysicists, he is known for the major contributions he made to seismology as the first Director of the Earth Science Division of UNESCO. His early training and research, however, was in the field of atmospheric physics. In 1951, he was recruited into a three-man team to help the Pakistan Meteorological Service to initiate work on seismology, geomagnetism, and atmospheric physics. (The team set up headquarters at Quetta on the site of a brewery which had been ruined in the disastrous earthquake of 1935.)

Upon going to UNESCO headquarters in 1955, his efforts were concentrated on seismology but in the 1960s he contributed considerably to the success of IAGA missions to Africa, South America and Asia. Together with the World Magnetic Survey Board, the missions were organized to assess the situation of geomagnetic observatory and survey work in developing countries, to calibrate observatory standards, and to enhance the flow of data to World Data Centres. Advice and encouragement were given to workers at new observatories who in most cases were novices.

All those who have known Michael Fournier will mourn the loss of an agreeable colleague, and an amiable friend. He leaves his wife, Wanda, and two children, John and Christine.

H I S T + K A W

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6TH SCIENTIFIC ASSEMBLY

Exeter, UK  
24 July - 4 August, 1989

MINUTES  
of  
Conference of Delegates

9 am Monday, 24 July  
2 pm Friday, 4 August

1. Introduction The President, R E Gendrin, welcomed the Delegates to the Assembly and spoke of the activities since 1987 of the Executive Committee, the Divisions and InterDivisional Commissions. [The full text of his address will be published as part of the Transactions of the Assembly in the Chronicle of the IUGG.]

A Ashour spoke about the forthcoming review of the Association's activities by the Bureau of the Union and pointed out that the Associations are autonomous bodies within the Union and should be left the final decision as to the arrangement of their activities.

Ashour agreed with the President that more encouragement should be given to the activities of the ICSU Committee for the Teaching of Science. This Committee (on which Ashour is the Union representative and President Gendrin is a member) meets biennially, the most recent meeting being in Paris in 1989.

2. Minutes of the previous meeting [published in IAGA News No.26, pages 3-27; December, 1987]. The Secretary General reported that P Melchior [Union Secretary General] had requested that it be made clear in the Minutes that the draft resolutions printed on pages 26 and 27 (which were resolutions discussed by the Conference of Delegates in 1987 and approved for forwarding to the Union for consideration) had failed to be accepted by the Union and therefore had no force. The Conference of Delegates accepted this gloss to the Minutes without discussion.

3. Matters arising from the Minutes There were no matters arising from the Minutes.

4. Report from the Secretary-General

1. Publications. IAGA News Nos.26 and 27 have been published. The long-expected Transactions of the 5th Scientific Assembly, held in Prague (Czechoslovakia) in 1985, are finally printed and are in process of distribution. The Secretary-General was glad to note that regular publication of IAGA Bulletin 32 has resumed, under the inspiration of Michel Menvielle, Institut de Physique du Globe de Paris, and Annick Berthelie, CRPE-CNRS in Saint-Maur; this is the work of the International

GUNTHER LANGE-HESSE  
1917 -1988

Dr Lange-Hesse was born in 1917 in Gottingen, where he also started his study of electric engineering. Later he studied geophysics in Gottingen. Julius Bartels influenced his education profoundly and the methods derived by him were applied successfully by Lange-Hesse. In February 1952 he obtained his doctor's degree and joined the Max-Planck-Institute for Aeronomy. He worked there for 30 years as a scientist with great devotion and success with his interest concentrated on ionospheric and related phenomena.

Lange-Hesse had a special interest in auroral phenomena and their influence on radio propagation in higher latitudes. During the IGY, he organized systematic auroral observations, including those made from German merchant ships. In addition, he urged German radio amateurs to record systematically the occasions when communication via auroral reflection was possible at a wavelength of 2 metres. Valuable information about temporal and spatial variations of auroras was obtained by a careful analysis of a large number of reports. In all of this work, he was very helpful to amateurs, including amateur astronomers, in developing special observational programmes, both visual and radio. In this case, he was a kindly scientist who helped by lecturing, writing letters, and using any possibility to stimulate amateur interest in aurora, and later on in airglow as well.

Another aspect of his interest was the correlation between VLF phase recordings on transpolar propagation paths and the precipitation of solar cosmic rays over the polar cap. These observations contributed substantially to solving the problem of substorms.

Lange-Hesse was for many years the national reporter for aurora and he worked actively for IAGA. His cooperation with the URSI National Committee for the Federal Republic of Germany was highly appreciated by the wider scientific community.

Lange-Hesse died on 28 June 1988; in the years 1952 to 1973, he published 77 papers.

W D + W S

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## FOREWORD

The Sixth Scientific Assembly has come and gone: it is always a surprise to see how quickly an Assembly dissolves after the final Conference of Delegates. Your Secretary-General has to stay on after everyone else has gone, to clear out pigeon holes, to pack up the office, to say goodbye to the porters, to make sure that all that should be done has been done. Believe me, the Saturday morning is a desert - just me and the mice.

The 1989 Assembly appears to have been another good one - most people seem to have been happy with the arrangements and the weather was excellent. The University campus seemed to fit well with the needs of the many hundreds who worked away at their favourite occupations (talking, meeting colleagues, expounding, thinking). For most of this contentment, the local organizers must take the credit; while the scientific programme is the result of a couple of years' work by the Division and InterDivisional Commission leaders, the framework for the meeting and the atmosphere that surrounds a meeting are the creation of the local people, in this case led by Dr Roy Jady, ably backed up by Dr Derek Stone, and the university organization inspired by them.

Now (and for the last few months) it is "away with what's gone and let's get what's coming organized". Each Assembly gives rise to a few complaints and I try to take account of these in arrangements for the next. This coming Assembly, for example, the problem of polypresentation is to be tackled [see page 70] and the difficulty at General (Union) Assemblies of overlap of similar sessions is to be watched and guarded against, as well I can.

Meantime, this issue of IAGA News comes to you with hopes that our research endeavours will each and everywhere prosper, with increased knowledge of geomagnetism and aeronomy, and to each of us bring intellectual fulfilment and satisfaction.

*Michael Gadsden*

Michael Gadsden  
IAGA Secretary-General

M RAKOTONDRAINIBE  
1937 - 1988

The news that the Director of the Geophysical Observatory at Antananarivo (Madagascar) had suffered a fatal heart attack at the age of 50 came as a blow to the geomagnetic community at large and to his colleagues and friends as a sharp loss.

Born at Antananarivo on 14 January 1937, he received his education there before travelling to France for study at the Ecole Nationale Supérieure d'Electrotechnique, d'Electronique Industrielle, et d'Hydraulique at Toulouse where he gained his Diplôme d'Ingénieur in 1965 and Diplôme de Docteur-Ingénieur in 1968. He obtained his Diplôme de Docteur en Sciences in 1977.

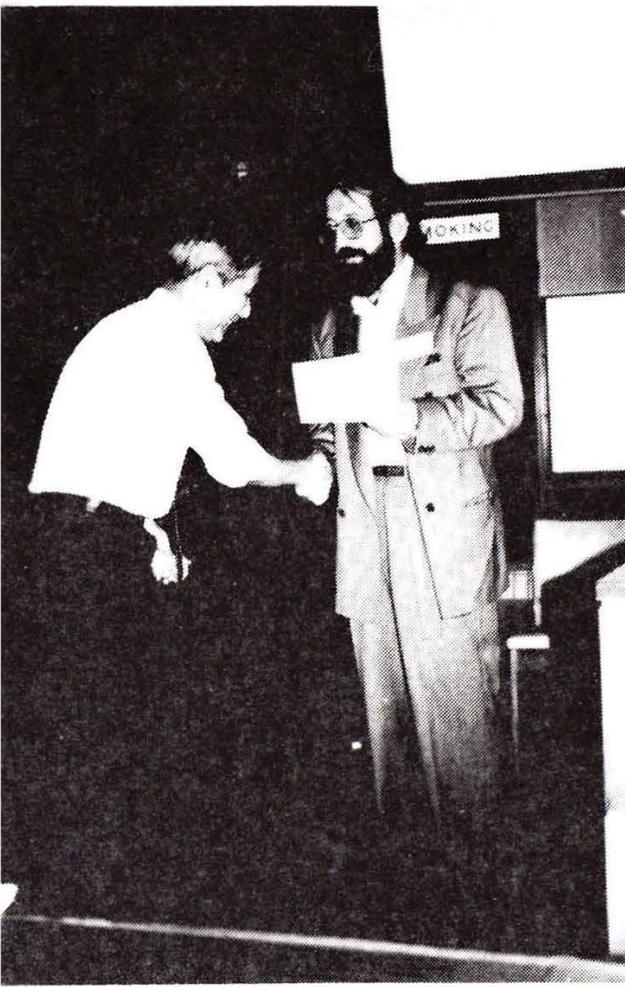
In 1968 he was appointed to be Master Assistant of Physics at the EES Sciences of Antananarivo and Director of the Observatory, with the title of Professeur Titulaire from 1985. He was made Rector of the University of Madagascar in November 1986. He was member of several scientific organizations, both national and international. He was Permanent Secretary of the Malagasy National Committee for Geodesy and Geophysics, Member of the Malagasy Academy of Sciences, Member of the Administrative Council for the Association of Universities using the French language, National Correspondent for IUGG and for IASPEI. He was Chevalier of the National Order of Madagascar and posthumously was made an Officer of the Order.

He is survived by his wife, a Professor of Biology at Madagascar University, and by three sons. The sympathy of the community goes to them in their untimely loss.

DG

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MOMENTS AT EXETER IN 1989:



Naoshi Fukushima receives his scroll of Honorary Membership from President Gendrin

Keith Cole says a few well-chosen words after receiving the Honorary Membership.

