Bulletin No 242 Septembre 1987

U.R.S.I.

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OBITUARY

GIORGIO BARZILAI

1911-1987

It is with deep regret that we announce the death, on 1 June 1987, of Professor Giorgio Barzilai, President of the Italian URSI Committee from 1976 to 1985.

Giorgio Barzilai was born in Rome, Italy, on 23 June 1911. He obtained the Doctor Degree in Industrial Engineering from the University of Rome in October 1935. From 1936 to 1938 he was at the Radio Laboratory of the Italian Ministry of Communications; from 1938 to 1940 he was appointed Vice-Director of the Experimental Centre G. Marconi of the Italian National Council of Research, where Marconi himself was working. During the Second World War he was at the Radio Laboratory of the Italian Air Force in Guidonia, Rome, mainly interested in research on radar.

In 1946 he went for one year to the University of Birmingham, England, obtaining the Degree of Master of Science in Electrical Engineering. From 1949 to 1954 he was associated with the Polytechnic Institute of Brooklyn, N.Y., as assistant professor and then as associate professor.

From 1954 to 1986 Giorgio Barzilai was associated with the Faculty of Engineering of the University of Rome, Italy, where in 1958 he became full professor, teaching Applied Electronics and then Electromagnetic Fields and Circuits. For twelve years he was Director of the Institute of Electronics of the University of Rome.

He was engaged in various research activities, giving numerous significant contributions and publishing over forty scientific papers. Linear antennas, electromagnetic propagation in magnetized ferrites, fast liquid crystal cells and statistical aspects of tropospheric propagation were his principal interests.

Anyone who, like me, has had the privilege of interacting with him has had the opportunity of appreciating his pleasant human personality. His memory will be kept alive by a large number of colleagues in our country and abroad.

G. Gerosa

XXII General Assembly of URSI

A Summary of Activities

Introduction

The XXII General Assembly was held in Tel Aviv, Israel, from 22 August to 4 September 1987. The scientific programme ran from 25 August to 2 September. The Assembly was attended by some 750 scientists belonging to 40 countries, accompanied by more than 100 persons. The local organization was in the hands of a Committee chaired by Dr. J. Shapira, assisted by Kenes Tours, a professional organizer of meetings led by Mr. and Mrs Rivlin. The organizers spared no effort to make the meetings as pleasant as possible for the participants.

The administrative part of the Assembly had a very heavy agenda, strongly influenced by the discussions which took place in Corsendonk in March 1987. The official texts of recommendations, resolutions and other actions which resulted from these efforts will be published later either in the *URSI Information Bulletin* or in Volume XXI of the *Proceedings of URSI General Assemblies*. A summarized account of the activities is given here, as the Member Committees should be informed without delay about the main decisions reached in Tel Aviv by the various URSI official bodies.

Newly Elected Officers of the Union

The Council elected the following officers for the 1987-1990 triennium:

Board of Officers

President:	Prof. A.L. Cullen (UK)
Past President:	Dr. A.P. Mitra (India)
Vice-Presidents:	Dr. H.J. Albrecht (FRG)
	Prof. R.L. Dowden (New Zealand)
	Prof. E.V. Jull (Canada)
	Prof. V. Zima (Czechoslovakia)
Secretary General:	Prof. J. Van Bladel (Belgium)

The new Board appointed Prof. P. Delogne (Belgium) as Assistant Secretary General. Mrs Y. Stevanovitch will continue as Executive Secretary, a function which she has held with great distinction for almost thirty years.

Chairmen and Vice-Chairmen of Commissions

Commission A on Electromagnetic Metrology

Chairman: Prof. S. Leschiutta (Italy)
Vice-Chairman: Dr. J. Vanier (Canada)

Commission B on Fields and Waves

Chairman: Prof. T.B.A. Senior (USA)
Vice-Chairman: Prof. F. Gardiol (Switzerland)

Commission C on Signals and Systems

Chairman: Prof. R. Saal (FRG)
Vice-Chairman: Prof. P.A. Matthews (UK)

Commission D on Electronic and Optical Devices and Applications

Chairman: Prof. T. Okoshi (Japan)
Vice-Chairman: Mrs J. Hénaff (France)

Commission E on Electromagnetic Noise and Interference

Chairman: Dr. H. Kikuchi (Japan)
Vice-Chairman: Dr. J. Hamelin (France)

Commission F on Wave Propagation and Remote Sensing

Chairman: Prof. R.K. Crane (USA)
Vice-Chairman: Dr. G. Brussaard (Netherlands)

Commission G on Ionospheric Radio and Propagation

Chairman: Dr. H. Rishbeth (UK)
Vice-Chairman: Dr. A. Wernik (Poland)

Commission H on Waves in Plasmas

Chairman: Prof. H. Matsumoto (Japan)
Vice-Chairman: Dr. D. Jones (UK)

Commission J on Radio Astronomy

Chairman: Prof. R.H. Frater (Australia)
Vice-Chairman: Dr. R. Ekers (USA)

The composition of the various URSI Committees, and the names of the URSI Representatives to other scientific organizations, will appear in the December 1987 issue of the *URSI Information Bulletin*.

The Commissions

The Commissions reviewed their terms of reference, which were subsequently approved by the Council. Commissions G (Ionospheric Radio and Propagation) and H (Waves in Plasmas), in particular, have confirmed their former terms of reference, and consequently postponed discussion on a possible fusion to a later date. The Commissions have also formed several joint Working Groups, inter-commission Working Groups and inter-Union Working Groups, which were approved by the Council. Data on these developments will be published in the *URSI Information Bulletin* and in Volume XXI of *Proceedings of URSI General Assemblies*.

The Council decided to modify the rules of sponsorship for meetings. The procedure will be simplified, while more responsibilities will be given to the Commission Chairmen. Each Commission, in particular, will have a separate budget, to be used for the financial backing of selected meetings. The latter must, in principle, belong to the URSI-generated family. The Commissions submitted to the Council lists of meetings to be sponsored. Of particular interest is the proposed URSI Symposium on Signals, Systems and Electronics, which Commissions C and D want to launch according to a pattern similar to that used by Commissions B and F in their triennial series. The first of these Symposia is scheduled for the end of 1988.

Commission G decided to maintain its support of the recurrent Symposia on Artificial Modification of the Iono-

sphere, as organized initially in Suzdal, USSR. The Council, recognizing the merits of Prof. V.V. Migulin as a motor of these Symposia, resolved to appoint him as Honorary Chairman of the series.

The Young Scientists Programme

The Union was able to invite 38 Young Scientists to its General Assembly. Eleven of these young colleagues came from developing countries, and the remaining twenty-nine (including the two Booker Fellows) from developed countries. Inviting a young scientist from the first group represents an important financial effort, for which URSI fortunately enjoyed the support of ICSU, UNESCO, COSTED, the Royal Society and the Israeli Organizing Committee. Prof. A.L. Cullen organized two very successful scientific sessions for these young colleagues, which were held on 24 August, from 5 to 7 PM, and encompassed a total of some twenty communications. After the sessions, Tel Aviv University invited the participants to a most pleasant reception, hosted by Prof. Levanon, Dean of the College of Engineering.

Membership

Three new types of membership had been proposed at the Corsendonk meeting. Only one of these has been adopted by the Council, namely the Associate Membership. An Associate Member Committee

(a) may join URSI by decision of the Board of Officers, subject to ratification by the Council;

(b) may not stay in the associate category for more than six years;

(c) has no voting rights in URSI matters;

(d) receives limited URSI materials and publications;

(e) pays no fees;

(f) is subject to the ICSU rules on the free circulation of scientists.

A more precise formulation of the associate status will be given in later publications. A decision about the possible introduction of the other two categories, i.e.

(1) the affiliate status, reserved for professional societies and/or industries,

(2) the individual membership

was postponed until the Standing Committee on Membership has a chance to examine the problem in its full implications.

Publications

The participants to the Corsendonk meeting recommended a careful expansion of the publishing programme of URSI. "Careful" means, in particular, that URSI should not duplicate the efforts of the various professional societies, which have extensive publishing activities. A first effect of this new policy was felt in Tel Aviv, where the following publications were available:

(1) the *Review of Radio Science 1984-86* (RRS), very ably edited by Dr. G. Hyde, who kindly agreed to perform the same task in 1987-1990. The Council made a few decisions concerning the mechanism of producing the RRS, and agreed, in particular, to an increase in the number of pages, budgetary constraints permitting. It also confirmed the policy requiring that articles in all languages, and not simply those published in French or in English, should be taken into consideration for reporting in RRS.

(2) *Modern Radio Science*. This new publication contains the text of the General Lectures and Tutorials presented at the General Assembly. It is, in a way, a companion volume to the more encyclopedic RRS. *Modern Radio Science* was well received, and will be published again in 1990.

(3) The *Handbook on Radio Propagation for Tropical and Subtropical Countries*. The first copies of this remarkable work, written entirely by scientists from developing countries, were made available in Tel Aviv. Dr. Mitra intends to produce a whole series of such Handbooks. This project is of considerable interest for Third World Countries, the CCIR, Young Scientists and, more generally, the entire radio community.

New initiatives, already discussed in Corsendonk, were examined in Tel Aviv. Prof. Dowden took the responsibility of launching a *Newsletter*, starting with a 2-3 page section in

the *URSI Information Bulletin*, and eventually culminating with a separate letter.

The possibility of launching an URSI-sponsored "Journal on Signals, Systems and Electronics", to be published under the material responsibility of one of the URSI Member Committees, was further discussed. The Member Committee involved wishes to devote further study to the implications of the project.

The Council decided, in order to give a new impetus to the publications programme, to convert the Publications Committee into a Standing one, chaired by Prof. R.L. Dowden. One of its responsibilities will be to increase the impact of the URSI publications programme by expanding the distribution scheme to world-wide dimensions. This could be done through a professional publishing firm, directly or with the cooperation of the ICSU Press.

Finances

The Council decided to keep the US dollar as the basic currency for URSI financial operations. The unit contribution has been constant at the $610 level from 1984 to 1987. The (fortunately low) rate of inflation since 1984 would already be sufficient to justify a small increase. The drastic drop of the value of the dollar, however, requires stronger measures. The Council therefore decided to maintain the unit contribution at $610 in 1988, but to increase it to $740 in 1989 and $860 in 1990. Such a move gives a yearly average of about $740 for the triennium, as compared with $610 in 1985-1987. Thanks to this relatively modest increase, the drain on URSI reserves, which will have to occur if the dollar remains at its present level of 38 Belgian francs, will be kept within reasonable bounds.

The Title of the Union

The desire of URSI to develop its telecommunications image, one of the results of the Corsendonk discussions, led to several proposals to modify the title of the Union by including words such as Electronics or Telecommunications. There was, however, a general consensus to keep the URSI logo in its present form. A strong majority in the Council decided

to go farther, and also to keep the present title unchanged. This title is fairly concise (an advantage), but does not perfectly reflect the scope of URSI's activities. To define this scope more accurately, the Council decided to modify Article 1 of the Statutes, which describes the object of URSI. The modification consists in adding words such as "telecommunication and electronic sciences" to "radio", and the sentence "the generation and detection of these waves, and the processing of the data they carry" to the last paragraph. The official wording of these modifications will be proposed by the Drafting Committee.

The Secretariat

The Secretary General stated that the Secretariat would be maintained in its present form until 1990, but that its composition, and possibly even its location, should be modified in 1990. A suitable solution might not be found in Belgium, although several Committees would prefer that solution. It is therefore prudent to seek alternative proposals by consulting the Member Committees. President Cullen intends to write a letter to that effect to the Member Committees, asking them to make proposals before the Board meeting in 1988, which will be held in the late spring or the early summer.

The XXIII General Assembly

The Council accepted the invitation of the URSI Committee in Czechoslovakia to hold the XXIII General Assembly in Prague in the second half of August 1990. Dr. P. Bauer accepted to coordinate the scientific programme of the Assembly. He will be helped by Prof. J. Bach Andersen. The programme in Tel Aviv, which consisted of three Open Symposia totalling about 78 papers, 19 Joint Scientific Sessions totalling about 145 papers and 59 Commission Scientific Sessions with a total of 378 papers, was very well received, and the Steering Group, chaired by Dr. Bauer, was warmly congratulated for its efforts. Attendance at the meetings was very high. The General Lectures and Tutorials were, on the whole, quite successful, and there is every intention to repeat that aspect of the programme in Prague. Some modifications to the philosophy of the programme are contained in the guidelines worked out by Dr. Bauer. The main points are:

(a) the Open Symposia will be suppressed. Their original "raison d'être" has disappeared as quite a few Commissions accept contributed papers, and organize poster sessions;

(b) the deadline for abstracts, which was about ten months ahead of the General Assembly in 1987, will be shifted to a later date (March 1990) in Prague;

(c) the need for a Steering Group has disappeared, as the finances of the Union have improved in the last triennium and allow the Commission Chairmen to meet ahead of the General Assembly to discuss the programme. This meeting is scheduled for the Spring of 1989.

A Word of Thanks

The organization of an event such as the General Assembly, which lasts two weeks, represents a major undertaking. It would be impossible to thank in detail all those who contributed to the success of this effort, from the spiritual fathers of the scientific programme to the members of the staff in charge of the welfare of the participants. It is nevertheless appropriate to express the particular thanks of the URSI community to the Israeli organizers, who were confronted with the traditional organizational challenges, and managed to rise to them with energy and efficiency.

J. Van Bladel
Secretary General.

News from Member Committees

URSI COMMITTEE IN THE GERMAN DEMOCRATIC REPUBLIC

An International Symposium on "Physical Processes in the Trough Region during Disturbances" was held, from 30 March to 4 April 1987 as part of the multilateral cooperation of the Academies of Sciences of the Socialist Countries. It has been organized by the Central Institute for Astrophysics of the Academy of Sciences of the GDR, and was cosponsored by the National Committee for Radio Physics and Radio Techniques (GDR URSI Member Committee). The topic is of special interest for URSI Commissions G (Ionospheric Radio and Propagation) and H (Waves in Plasmas).

The following topics have been discussed during the symposium:

- Large-scale variations of the thermal plasma density and composition; magnetosphere-ionosphere coupling in auroral and subauroral latitudes;
- Variations of the electron, ion, and neutral temperatures; energetic aspects.
- Waves in the trough region.
- Inhomogeneities and medium-scale variations of the thermal plasma density; plasma physical processes.

The majority of the papers presented at the Symposium will be published in a Proceedings Volume. Some of these books are available on request. Interested scientists or organizations should contact:

Prof. Dr. C.-U. Wagner
Central Institute for Astrophysics
Rosa-Luxemburg-Strasse 17a
DDR-1590 Potsdam
German Democratic Republic.

7TH INTERNATIONAL ZURICH SYMPOSIUM AND TECHNICAL EXHIBITION ON ELECTROMAGNETIC COMPATIBILITY

The 7th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility, held on 3-5 March 1987 in Zurich has proven that this biennial event is becoming the most significant international meeting in EMC science, trade and industry. Its growth demonstrates the world-wide increasing interest in EMC (930 participants from 28 countries) and the EMC market (64 exhibitors this year, compared to 43 in 1985).

As in 1985, the Symposium was held under the auspices of Mr. R. Trachsel, Director-General of the Swiss PTT and was sponsored by the Swiss Electrotechnical Association (SEV/ASE). The organization of the conference was with the Institute for Communication Technology of the Swiss Federal Institute of Technology Zurich (ETHZ). The President of the Symposium was Prof. Dr. P. Leuthold (Zurich), the Chairman Prof. Dr. T. Dvorak (Zurich) and the Programme Chairman Prof. Dr. R.M. Showers (USA).

A number of international and national organizations cooperated including URSI, EUREL and IEEE. The traditional cooperation and sponsorship of URSI had the future of EMC in view: it promoted young authors and tutorial lectures.

The ample variety of the technical programme may be one of the reasons of the large success of the EMC 1987. The programme featured 116 papers (originating from 22 countries), 3 tutorial lectures, 3 workshops, an exhibition and 2 technical excursions. A welcome cocktail party, a dinner, an authors lunch and a ladies programme offered further opportunities for professional and personal contacts.

The sessions were entitled: "Nonlinear effects in EMC/EMP", "Antennas and EMC", "Systems Compatibility", "Lightning EMP", "Testing and measurements", "EMC analysis", "HEMP: Field system impact", "Standards and sources", "Power and data line transients", "EMP effects on power system", "Correlating open-area EMI data", "Suppression", "EMC in power

transmission", "ESD test methods", "Spectrum use", "Shielding, grounding and inter-unit wiring", "Statistical theory of EMC".

The tutorial lectures and workshops featured "Crosstalk", "Shielding of interconnect systems", "Digital design for EMC", "Theoretical and practical NEMP problems of protective constructions", "Lasting effects of transients on communication equipment performance" and "Application of computers to EMC education".

The following outstanding papers received certificates of honour and monetary awards totalling SWF 5,000: A.H. Paxton, R.L. Gardner: Application of transmission line theory to networks with a large number of component wires; F. Heidler: E dot measurement by video type recorder; B. Daout, H.Ryser, A. Germond, P. Zweiacker: The correlation of rising slope and speed of approach in ESD tests; D.M. Parkes, P.D. Smith: The generation of fast transient fields and the coupling to systems; A.B. Tsaliovich: Anechoic room vs open area test site: A case for EMC study; A.S. McLachlan: Radio frequency heating apparatus as a valuable tool of industry and a potential source of radio interference; F.D. Martzloff, P.F. Wilson: Fast-transient tests - trivial or terminal pursuit?".

Further information and the 658-page conference proceedings "Electromagnetic Compatibility 1987" (price: Swiss francs 100.-, incl. mailing) is available from:

EMC Symposium
ETH Zentrum-IKT
CH-8092 Zurich
Switzerland phone:(+411) 256 2790.

The 8th International Zurich Symposium and Technical Exhibition on EMC is planned for March 1989. The Call for papers will be mailed in December 1987.

EUROPEAN GEOPHYSICAL SOCIETY

The XII General Assembly of the European Geophysical Society, co-sponsored by URSI, was held at Strasbourg over 9-14 April 1987. It was the first occasion when the Society met in the spring, and there was a full programme of symposia and workshops in each of the three Sections of the EGS. Despite the fact that this Assembly was held only seven months after the preceding one, some 550 abstracts were received. Within the Section devoted to external geophysics, open sessions were held on "Magnetosphere and Ionosphere of the Earth", "Dynamics and Chemistry of the Middle and Upper Atmosphere" and "Sun, Cosmic Rays and Interplanetary Physics"; symposia on "Contributions from VIKING and PROMIS to progress in Magnetospheric Physics", "Active Experiments in Space Plasmas" and "Progress in the Solar Terrestrial Physics Programme", and a Workshop on "Atmospheric Gravity Waves and Tides".

Within the magnetosphere/ionosphere sessions the stress was on coupling between regions, thermosphere-ionosphere coupling, magnetosphere-solar wind coupling, and even coupling between the ionosphere and the solid earth mantle. Results presented included long term studies, modelling papers, and case studies, using data from ground-based and in-situ measurements.

The PROMIS campaign occurred during the period March-June 1986, and work has only just started in combining data from more than seven satellites and ground-based instruments. Despite the very short preparation time there were seven papers on PROMIS-related topics, and thanks to good support by various groups and agencies there is real promise of interesting results to follow. A session on the polar cusp/cleft was primarily focussed on VIKING results. The VIKING orbit was such that it frequently passed over the dayside auroral oval near its apogee ($\sim$ 4500 km) and it was therefore particularly well suited for cusp and cleft studies. In fact, VIKING had several hundred traverses of the cusp during the three months of the PROMIS campaign. The symposium contained many good presentations of new and interesting features observed in the cusp/cleft by the VIKING satellite.

EGS General Assemblies draw scientists from almost every

country in Europe, and increasingly also from many non-European countries. It has always been the policy of the Society to encourage attendance by the younger scientists and students. The next (XIII) General Assembly will be held in Bologna, Italy, over 21-25 March 1988, and the XIV General Assembly will be in Barcelona, Spain, in March 1989.

G.M. Brown

ANNOUNCEMENTS OF MEETINGS AND SYMPOSIA

INTERNATIONAL NON-IONISING RADIATION WORKSHOP

An International Non-Ionising Radiation Workshop will be held in Melbourne at the National Science Centre, Clunies Ross House between 5 and 8 April 1988. This Workshop will precede the International Radiation Protection Association Congress "IRPA-7" to be held in Sydney 10-17 April 1988.

The Workshop is a project of the International Non-Ionising Radiation Committee of IRPA and will comprise a series of educational lectures and demonstrations intended to give a comprehensive overview of non-ionising radiation. It will include physical characteristics, sources of concern, levels of exposure, mechanisms of interaction and reported effects of these fields and radiations on biological tissues, human studies, health risk assessment, national and international standards and protective measures. Special lectures and expert panels will discuss current topics of particular concern, e.g. epidemiological studies, VDT radiation and non-ionising radiation from electric power lines and medical equipment.

The aims of the Workshop are:

1. Intended as an educational workshop where participants will be provided information on the established scientific literature so that informed discussion can take place on confirmed and unconfirmed reports and hypotheses.
2. Provide interaction with experts who are involved in the development of international standards.
3. Keep lectures at a level so that participants with only a basic science knowledge will understand, yet ensure that each topic is covered with comprehensiveness and depth.
4. Publish a workshop proceedings of all lectures which will form a basic, up-to-date text of non-ionising radiation protection.

The Registration Fee of $A200 covers attendance at all lectures and panel discussions, lunches, coffee, icebreaker and copy of the workshop proceedings. Participation is not

restricted to registrants of the IRPA-7 Congress.

Registration forms can be obtained from:

Dr. C. ROY
NIR Section
Australian Radiation Laboratory
Lower Plenty Road
Yallambie VIC 3085
Australia.

8th INTERNATIONAL ZURICH SYMPOSIUM AND TECHNICAL EXHIBITION ON ELECTROMAGNETIC COMPATIBILITY

Call for Papers

The Symposium and Technical Exhibition will be held from 6 to 9 March 1989 at the Federal Institute of Technology in Zurich, Switzerland. It is sponsored by the Swiss Electrotechnical Association and organized by the Institute for Communication Technology of the above university. The President of the Symposium is Prof. Dr. P. Leuthold, the Symposium Chairman is Prof. Dr. T. Dvorak and the Programme Committee is chaired by Prof. Dr. R.M. Showers. The conference has the cooperation of URSI and other international and national bodies.

The main emphasis in the technical programme will be on radiation and immunity measurements, electrostatic discharge testing and radiofrequency hazards to biological material. Contributions to other EMC topics as well as practical case studies are, however, also invited.

English abstracts and summaries of up to 5 pages in 11 copies must be received not later than 14 March 1988 by the Technical Programme Committee EMC 1989, ETH Zentrum - IKT, CH-8092 Zurich, Switzerland. For anonymity of reviewing quote addresses, affiliations, telephone and telex numbers of all authors on a separate sheet. Summaries should clearly describe work done, including results and conclusions and should

preferably be accompanied by graphs and key figures. Only papers not published or submitted elsewhere will be considered. Authors will be notified by 24 June 1988, authors' kits will be enclosed. Photo-ready manuscripts will be due by 31 October 1988.

Limited funds for authors of less than 35 years of age as well as for authors unable to fully cover the expenses of their attendance will be provided by the URSI and the Symposium. Applications should be enclosed with the submission.

For further information contact:

Prof. T. Dvorak
ETH Zentrum - IKT
CH-8092 Zurich, Switerland

phone: (..411) 256-2790)

or in the USA:

Prof. R.M. Showers
University of Pennsylvania
The Moore School of Electrical Engineering D2
Philadelphia, PA 19104, USA

phone: (215) 898-8123.

43th ALL-UNION SCIENTIFIC SESSION OF THE A.S. POPOV SOCIETY

The Central Administration of the A.S. Popov Scientific Technical Society for Radio Engineering, Electronics and Telecommunications is planning to organize the 43th All-Union Scientific Session devoted to the Radio Day in the second half of May 1988 in Moscow.

The Session will last for three days.

It is suggested to discuss at plenary sessions and in sections papers delivered by scientists and engineers on the main branches of radio techniques, electronics and telecommunications, to consider the ways of introducing advanced

scientific research and engineering experience and their effective use in the national economy.

The following subjects will be discussed at the Conference:

1. Automated control systems
2. Automatic switching and communication networks
3. Analogue-digital computer technique and machine modelling
4. Computer technique
5. Information management systems and telemechanics
6. Operation research
7. Cybernetics
8. Methods for computer-oriented solutions of marginal problems
9. Multichannel communication
10. Scientific and technical information
11. Scientific organization of work and management of communication enterprises
12. Radio broadcasting, electroacoustics and magnetic recording
13. Mail communication
14. Production communication
15. Data transmission and teleprocessing
16. Television
17. Teletraffic theory
18. Theory and technique of discrete signals transmission
19. Information storage systems.

CALL FOR PAPERS

December 15, 1987: Final date for submission of papers
(Please point out the section)

Time for presentation: 20 minutes.

Conferenee language: Russian.

Authors are invited to submit 2 copies of their papers.

All persons interested in participating in the Session are kindly requested to make arrangements through one of the Intourist accredited agencies.

For further information please contact:

Central Administration
The A.S. Popov Society
Kuznetskij Most 20
103897 Moscow Centre GSP-3, USSR.

Phone: 221-71-08
924-80-84

CCIR DISCUSSES POTENTIALLY DETRIMENTAL ACTIVITIES IN THE RADIO FIELD

Note: The Report reproduced below has been prepared by Prof. K. Rawer, in response to a request made at the Florence General Assembly (1984). It summarizes the relevant Reports of CCIR on this question.

x x x

Potentially detrimental activities in the radio field might be dangerous to

(i) human and/or animal life,
(ii) technical devices,
(iii) telecommunications,
(iv) scientific activities.

During the last decade, CCIR has taken up several problems in this context. In the following, relevant CCIR reports will be summarized in this order. The first two items, however, shall be discussed together.

1. Potential hazard to life and/or technical devices

Powerful transmissions are seen as potential sources of such hazards. Typical subjects in danger are human or animal life, apparatus and flammable or explosive materials.

Quite generally, the problems are discussed in Report 671 (to Question 52/1) *Safety aspects of radio-frequency radiation*. Hazards may prevail in the neighbourhood of high power transmitting antennas. They are due to the large hf-field-strength. However, the geometry of (metallic) structures and ambient conditions may present indirect hazards, e.g. by induction of dangerous contact voltages or by extraction of high power from the wave field. Up to frequencies of about 1 GHz the notion of "effective height" of a structure can be used as a suitable means to estimate the effects. On frequencies above 1 GHz, however, the power flux density should be used. The danger to living beings is assessed by the "specific absorption rate (SAR)" i.e. the absorbed power per kg. As a consequence operational precautions are specified, in particular: entrance restrictions - temporary reduction of power - shielding. Steerable antennas should have a device for

automatic power reduction when approaching dangerous positions. Waveguides might become dangerous radiators when cut. Standards are existing in a few countries, international safety standards are desirable. Quite generally, areas where the radiation flux exceeds 100 W/m^2 should be restricted to personnel; at no time should inflammable or explosive materials (or devices) be stored in such areas (see Report 385-1).

A particular source of dangerous hazards are space research (and communication) earth stations. These are considered in Report 543* (to Question 15-1/2, *Research in space systems technology*). In this Report flux densities near a giant (64 m) dish fed on 2.12 GHz with 400 kW CW are shown to reach 400 W/m^2 on the reflector and 300 in the tubular beam. The danger of resonances in metallic structures (e.g. eyeglass frames, key rings) must be taken account of additionally.

A particular hazard refers to personnel within aircraft when this latter erroneously enters the safety area (Report 682* to the same Question). Such cases have in fact occurred with small (private) aircraft. Slipping out of air traffic control is more frequent with low altitude flights. Nevertheless the probability of meeting the "hot spot" is poor. Even so for the given power flux the exposure time remains well below the USA safety limit (which considers heating only).

Transmissions from space are still far from being dangerous by lack of power. There are, however, plans (or at least studies) to collect solar energy in space (with giant photovoltaic arrays) and transfer it to ground by microwave links comprising dishes in space of about 1 km and antenna arrays on ground of 10*13 km^2. Report 679-1 (to Questions 20/2 & 31/9*) considers potential hazards.

There are two conversions and one power transfer needed in order to realize the so-called "Solar Power Satellite (SPS)". The first conversion is DC to radio frequency. The re-entrant beam, crossed field device achieves an 80 to 90% efficiency. As for the radio transfer efficiency it can be supposed to reach almost 100%. The rectification efficiency might, however, be below 80%. Overall efficiency is estimated to be as high as 68%.

With a transmitted power of about 6.5 GW and (at 2.45 GHz)

a (half power) beamwidth of 0.008 the flux density in the middle of the collecting area would be as high as 200 W/m^2. A 10 km radius guard area would encompass flux densities in excess of about 0.5 W/m^2.

The potential danger of wrong pointing of the transmitting antenna in space is not discussed in this Report but retro-directive beaming technique with a pilot signal from ground is mentioned in Report 853*.

2. Interference with radio systems

This is one of the major problems with which the international telecommunication agencies are engaged. Before the advent of transmitting satellites frequency sharing was an extremely helpful means allowing multiple use of the same frequency in different radio links on earth. The *Feasibility of frequency sharing between systems in the fixed-satellite service and terrestrial radio services* is discussed in Report 385-1 (to Question 2..).

Interference is expected when terrestrial stations use the same band as a satellite system, but also from harmonics of RADAR systems and trans-horizon radio relays and in adjacent bands when used by such or radio-location systems. (For specific coordination distances see Report 382, for interference assessment see Report 448). When an aircraft crosses the main beam of an earth-to-satellite link re-radiation of energy from the aircraft can cause interference in terrestrial radio links on the same frequency. Siting precautions are also indicated in Report 385-1. Terrain shielding plays an important role therein. Precipitation scatter is mentioned but not (yet) assessed in the same Report; a few logistic factors are noted.

In case energy should be transported from space to ground by microwave beams the transmitted power will be so high that even a high degree of supression may not eliminate harmful interference to other services. Note that interference to a safety service like radionavigation could cause serious consequences even if such interference is momentary (see Report 679-1). "Spillover" into adjacent frequency bands might be difficult to avoid. For example if the space transmitter power spectrum is spread evenly over the band 2.54 +-0.01 GHz

attenuation as large as 104 dB would be needed in the 40 MHz to the edge of the adjacent ISM (industrial, scientific and medical) band.

The said Report mentions some "current unknowns in the conceptual design": levels of harmonic transmissions - scattered and reflected radiations from the antennas - beam pointing capability. The possibility is mentioned that in the future the harmonic bands of the energy transfer frequency might be allocated to less sensitive services.

3. Interference with radio astronomy

This type of service is, of course, particularly sensitive to interference. Apart from some general reasonings referring to the techniques of radio astronomy, two particular problems have been discussed in CCIR: SPS-systems and microwave ovens.

The general Report 697-1* (to Question 5/2) refers to the earlier Reports 696 and 224 where harmful interference and protection criteria for frequency sharing were indicated. The present Report discusses in more detail the following causes of interference:

- terrestrial UHF television transmissions;
- band-edge interference from these into the 608-614 MHz bands;
- harmonic and intermodulation interference;
- interference from satellite transmissions;
- angular regions excluded by transmissions from geostationary satellites;
- unwanted emissions from broadband modulation.

After detailed discussion of these items the dangers of interference from other services are summarized and problems discussed which could be avoided by more specific allocations of frequency bands such that harmonics and, in particular, interference from adjacent bands could be minimized. Radiolocation and aeronautical radionavigation are judged to be particularly dangerous. Mobile services, particularly when using links with satellites, are another source of concern.

Finally, non-linear effects within the receiver and the attainable performance of practical receivers are discussed.

Requirements for intermediate and signal frequency filtering are specified. In concluding, it is stressed that not only actions on the radioastronomers' side are needed, but also output filtering and reduction of out-of-band emission on the side of other radio services. As examples measurements of out-of-band radiation of two geostationary satellites are communicated in the annexes.

Report 853* (to Question 5/2) discusses expected effects of Solar Power Satellites. For a site 100 km distant from the energy receiving antenna the input power on the main frequency could be well above the overload threshold (35 dB for a parametric, 10 dB for a FET amplifier). Even the second harmonic could produce overloading. Tube noise from only one satellite is estimated to be 40 dB below the harmful threshold. Higher noise levels of transient type are expected from switching operations aboard. Thermal noise from the collector areas in space could become harmful if really a 60 satellite system would be installed. Reflection of radio signals from earth-based transmitters on the large structures in space might become annoying if the transmitted power exceeds 1 kW. It is concluded that new protecting devices would be needed on the radio astronomy sites but even with these precluded zones centred on the satellite would result.

Report 854* (to Question 5/2) discusses interference from microwave ovens. It is concluded that these are a potential source of interference, particularly in the 2.7 GHz band. Reliable measurements under realistic conditions are asked for.

INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS

During the General Assembly of IUGG, held in Vancouver, Canada, in August last, the Council of the Union adopted a series of Resolutions. The following ones are of interest to URSI.

Resolution 1

The International Union of Geodesy and Geophysics

noting that the improved determination of the Earth's orientation parameters resulting from the MERIT and COTES programmes of observation and analysis is highly significant;

considering the importance for scientific research and operational purposes of regularly monitoring the Earth's orientation and of establishing and maintaining a new conventional terrestrial frame of reference;

approving the replacement of the International Polar Motion Service (IPMS) and of the Bureau International de l'Heure (BIH) by the International Earth Rotation Service (IERS) which will be responsible both for earth rotation and for the associated conventional frames of reference, and

recognizing that organizations in many countries have indicated their willingness to participate in such a new service,

endorses the recommendations of its Provisional Directing Board on the terms of reference, structure and composition of the new service;

decides to establish, in cooperation with the International Astronomical Union, the International Earth Rotation Service within the Federation of Astronomical and Geophysical Data Analysis Services (FAGS) as from 1 January 1988, and

thanks all organisations and individuals who have helped to develop and implement the MERIT and COTES programmes, all who have operated IPMS and BIH in the past and all who have indicated their willingness to participate in the new Service.

Resolution 2

The International Union of Geodesy and Geophysics

noting that:

1. International Atomic Time (TAI) and Coordinated Universal Time (UTC) are at present established by the Bureau International de l'Heure (BIH), and

2. the parent Unions of the BIH are the International Union of Geodesy and Geophysics (IUGG), the International Astronomical Union (IAU) and the International Union of Radio Science (URSI), and

recognizing that:

1. atomic time scales have numerous and important scientific, technical and public applications,

2. TAI is based solely on physical measurements independent of the motions of the Earth,

3. there is an Intergovernmental Organisation, with the Bureau International des Poids et Mesures (BIPM) as its executive body, charged with unifying the units of measurement of the major physical quantities, and

4. UTC is based both on TAI and on the astronomical time scale designated as Universal Time (UT1), and

considering the URSI Recommendation A.1, 1984 and the IAU Resolution B1, 1985, on the transfer of TAI to the BIPM,

approves TAI becoming solely the responsibility of the BIPM, under the authority of the Comité International des Poids et Mesures (CIPM) and of the Conférence Générale des Poids et Mesures,

recommends that:

1. the determination and publication of the leap seconds of the UTC system and of the DUT1 corrections should be by the new International Earth Rotation Service (who have been charged by the IAU and IUGG with monitoring earth rotation) as soon as they are able to fulfill this function, and

2. a permanent committee with IUGG representation should be created, with CIPM as sponsor, to protect the interests of TAI users, and

expresses its thanks to the Paris Observatory for their service to the international community in supporting the BIH.

Resolution 6

The International Union of Geodesy and Geophysics

noting the successes of the World Data Centres founded during the IGY, which continue to provide collection and analysis services, the success of the FAGS Centres in maintaining their work, and of CODATA in organizing special data conferences on technical and other problems concerning various physical and chemical constants, and more recently the time-varying geophysical data,

recognizing that new technologies, such as CD-ROMs and computer-based digital networking, are continuing to revolutionize the collection, processing, archiving and distribution of data and information, and

noting that the new ICSU programme on Global Change will require extending the World Data Centre concept to entirely new disciplines relating to the biosphere,

urges ICSU to re-examine the role and operation of its various data-related bodies with a view to devising the most appropriate mechanism for data managements to support ICSU programmes.

BUREAU INTERNATIONAL DE L'HEURE (BIH)

SAUTS DE TEMPS DE UTC

le 1er janvier 1988

Une seconde intercalaire positive sera introduite à la fin de décembre 1987. La séquence des dates des repères de secondes de UTC sera:

1987 décembre 31, $23^h\ 59^m\ 59^s$
1987 décembre 31, $23^h\ 59^m\ 60^s$
1988 janvier 1, $0^h\ 0^m\ 0^s$

La différence entre UTC et le Temps atomique international TAI est:

de 1985 juillet 1, Oh UTC, à 1988 janvier 1, Oh UTC:

UTC-TAI = - 23 s

de 1988 janvier 1, Oh UTC, jusqu'à nouvel avis:

UTC-TAI = - 24 s

UTC TIME STEP

on the 1st of January 1988

A positive leap second will be introduced at the end of December 1987. The sequence of dates of the UTC second markers will be:

1987 December 31, $23^h\ 59^m\ 59^s$
1987 December 31, $23^h\ 59^m\ 60^s$
1988 January 1, $0^h\ 0^m\ 0^s$

The difference between UTC and the International Atomic Time TAI is:

from 1985 July 1, Oh UTC, to 1988 January 1, Oh UTC:

UTC-TAI = - 23 s

from 1988 January 1, Oh UTC, until further notice:

UTC-TAI = - 24 s

Report from the Incoherent Scatter Working Group G/H.1 1984-1987

Working Group Meetings

The Working Group has had several meetings, formal and informal, at several national and international meetings during the last three years: one at the San Francisco, American Geophysical Union, in December 1984, to establish WAGS (Worldwide Acoustic Gravity Wave Study); one at the GTMS (Global Thermospheric Mapping Study) Workshop in Cambridge, MA, USA, in July 1985 to discuss the distribution of one-day and multi-day campaigns; one at the IAGA Meeting in Prague, in August 1985, to exchange information on the facilities, the data base at NCAR, and the multi-day campaigns; one at the CEDAR (Coupling, Energetics, and Dynamics of Atmospheric Regions) Workshop at Boulder, CO, USA, in July 1986, to discuss multi-day campaigns and the World-Day schedule; and one at the URSI-sponsored International Symposium on Large-Scale Processes in the Ionospheric-Thermospheric System in Boulder, CO, USA, in December 1986, to exchange information on the facilities.

Meetings Sponsored

A proposal from the Working Group to sponsor a meeting was approved. The result was the International Symposium on Large-Scale Processes in the Ionospheric-Thermospheric System, held at NCAR (National Center for Atmospheric Research) in Boulder, CO, USA, between 2 and 5 December 1986. The convenors were Vincent Wickwar and Art Richmond. In addition to URSI, the Symposium was sponsored by SCOSTEP, NSF, AFGL, and NCAR-HAO. The meeting was attended by about 100 researchers from 9 countries.

World-Day Schedule

The first multi-day World Day period was scheduled in the summer of 1982, however, the intended scientific purpose of that experiment was not decided until December, 1983, at the San Francisco AGU meeting. Thus GISMOS (Global Incoherent-

Scatter Measurements of Substroms) was born. At that same meeting it was decided that there should be one or two scientific coordinators for each long campaign. Since then GISMOS has had five more campaigns and several workshops. Since then GTMS (Global Thermospheric Mapping Study) has had several campaigns and has evolved into GITCAD (Global Ionosphere-Thermosphere Coupling and Dynamics), WAGS has had one campaign, LTCS (Lower Thermosphere Coupling Study) will have its first campaign next month, and a hydrogen exosphere campaign is planned for early 1989. GTMS, GITCAD, and WAGS have already had workshops and LTCS has had an organizing meeting. These multi-day campaigns have become the basis for most of the observing campaigns in the US CEDAR programme and, similarly, have become the basis for most of the observing campaigns in WITS (Worldwide Ionosphere-Thermosphere Study).

Thus the multi-day campaigns have proved very successful. It is now essential that they be planned significantly in advance. The scheduling has become more difficult because these periods have become a scarce resource. At the moment there are three of these campaigns a year ranging in length from 3 to 5 days and there is pressure for a fourth. At the same time, there is an effort to maintain about 5 24-hr periods distributed throughout the year.

Incoherent-Scatter Data Base at NCAR

At the General Assembly in Washington, DC, in 1981, a strong desire was expressed for an incoherent-scatter data base. Prior to the General Assembly in Florence, in 1984, it had been established at NCAR. It is now operational and has a considerable amount of data from the Coordinated World Days and other long experiments. The head of the data base is Dr. Art Richmond; the person to contact for data is Dr. Barbara Emery.

News Relevant to the ISWG

The MU radar is operating in both MST and incoherent-scatter modes. In the latter mode, it is best able to obtain density and velocity data. It operated in the incoherent-scatter mode for some of the Coordinated World Days in 1987 and is planning to operate for all of them in 1988. The person to contact is Dr. Shoichiro Fukao of the Radio Atmo-

spheric Science Center at Kyoto University, Gokanosho.

The Japanese and the Indonesians have been discussing building a radar similar in concept to the MU radar, but ten times as big, on the equator. It would be roughly the size of Jicamarca.

A workshop has been proposed by Dr. Wickwar for December 1987 to examine the possibility of building an incoherent-scatter radar in Antarctica. The workshop is to consider the scientific benefit, optimum location, technical and logistical challenges, implementation and operational costs, and expected timetable. Because of the challenges of establishing and operating this facility, the global nature of the science, and the special status of Antarctica, it may be appropriate to make it an international facility.

25 August 1987

V.B. Wickwar, Chairman
K. Schlegel, Vice-Chairman

INTERNATIONAL GEOPHYSICAL CALENDAR 1987

The International Ursigram 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. It adheres to the Federation of Astronomical and Geophysical Services (FAGS) of the International Council of Scientific Unions (ICSU). The IUWDS coordinates the international aspects of the world days programme and rapid data interchange. One of its tasks is the annual publication of the *International Geophysical Calendar*.

The Calendar reproduced on pp. 36-37 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 IUWDS with the advice of spokesmen for the various scientific disciplines. For some programmes, greater detail concerning recommendations appears from time to time published in *IAGA News*, *IUGG Chronicle*, *URSI Information Bulletin* or other scientific journals or newsletters.

The definitions of the designated days remain as described on previous Calendars. Universal Time (UT) is the standard time for all world days. Regular Geophysical Days (RGD) are each Wednesday. Regular World Days (RWD) are three consecutive days each month (always Tuesday, Wednesday and Thursday near the middle of the month). Priority Regular World Days (PRWD) are the RWD which fall on Wednesdays. Quarterly World Days (QWD) are one day each quarter and are the PRWD which fall in the World Geophysical Intervals (WGI). The WGI are fourteen consecutive days in each season, beginning on Monday of the selected month, and normally shift from year to year. In 1988: March, June, September, December.

The Solar Eclipses are:

a) *** 17-18 March (total) *** beginning in Indonesia

(totality lasts 3 minutes 46 seconds in parts of Indonesia, the Southern Philippines, and a track 109 miles wide across the N. Pacific Ocean ending off the south coast of Alaska), moving across E. Asia, N.W. Australia, New Guinea, Micronesia, W. Hawaiian Islands and ending in the extreme NW of N.America.

b) 11 September (annular) beginning in extreme E. Africa (Somalia), moving across S. Asia, Indonesia, Australia (except extreme NE), New Zealand and part of Antarctica.Annular eclipe path over Indian Ocean lasts 7 minutes.

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 21-22; May 3-4; Jun 8-12; Jul 27-29; Aug 10-13; Oct 20-21; Nov 1-4, 16-18; Dec 12-15, 21-22, 1988; and Jan 2-4, 1989. The dates for Southern Hemisphere meteor showers are: May 3-4; Jun 8-12; Jul 27-30; Oct 20-21; Nov 1-4, 16-18; and Dec 5-7, 12-15 1988.

The occurrence of unusual solar or geophysical conditions is announced or forecast by the IUWDS through various types of geophysical ALERTS (which are widely distributed by telegram and radio broadcast on a current schedule). Stratospheric warmings (STRATWARM) are also designated. The meteorological telecommunications network coordinated by WMO carries these worldwide Alerts once daily soon after 0400 UT. For definition of Alerts see IUWDS *Synoptic Codes for Solar and Geophysical Data, Third Revised Edition 1973* and its amendments. Retrospective World Intervals are selected and announced by MONSEE and elsewhere to provide additional analyzed data for particular events studied in the ICSU Committee on Solar-Terrestrial Physics (SCOSTEP) programmes.

RECOMMENDED SCIENTIFIC PROGRAMMES

PLANNING EDITION

(The following material was reviewed in 1987 by spokesmen of IAGA, WMO and URSI as suitable for coordinated geophysical programmes in 1988).

Airglow and Aurora Phenomena. Airglow and auroral observatories operate with their full capacity around the New Moon periods. However, for progress in understanding the mechanism

of many phenomena, such as low latitude aurora, the coordinated use of all available techniques, optical and radio, from the ground and in space is required. Thus, for the airglow and aurora 7-day periods on the Calendar, ionosonde, incoherent scatter, special satellite or balloon observations, etc., are especially encouraged. Periods of approximately one week's duration centered on the New Moon are proposed for high resolution of ionospheric, auroral and magnetospheric observations at high latitudes during northern winter.

Atmospheric Electricity. Non-continuous measurements and data reduction for continuous measurements of atmospheric electric current density, fields, conductivities, space charges, ion number densities, ionosphere potentials, condensation nuclei, etc.; both at ground as well as with radiosondes, aircraft, rockets; should be done with first priority on the RGD each Wednesday, beginning on 6 January 1988 at 0000 UT, 13 January at 0600 UT, 20 January at 1200 UT, 27 January at 1800 UT, etc. (beginning hour shifts six hours each week, but is always on Wednesday). Minimum programme is at the same time on PRWD beginning with 20 January at 1200 UT. Data reduction for continuous measurements should be extended, if possible, to cover at least the full RGD including, in addition, at least 6 hours prior to indicated beginning time. Measurements prohibited by bad weather should be done 24 hours later. Results on sferics and ELF are wanted with first priority for the same hours, short-period measurements centered around the minutes 35-50 of the hours indicated. Priority Weeks are the weeks which contain a PRWD; minimum priority weeks are the ones with a QWD. The World Data Centre for Atmospheric Electricity, 7 Karbysheva, Leningrad 194018, USSR, is the collection point for data and information on measurements.

Geomagnetic Phenomena. It has always been a leading principle for geomagnetic observatories that operations should be as continuous as possible and the great majority of stations undertake the same programme without regard to the Calendar.

Stations equipped for making magnetic observations, but which cannot carry out such observations and reductions on a continuous schedule are encouraged to carry out such work at least on RWD (and during times of MAGSTORM Alert).

Ionospheric Phenomena. Special attention is continuing on particular events which cannot be forecast in advance with reasonable certainty. These will be identified by Retrospective World Intervals. The importance of obtaining full observational coverage is therefore stressed even if it is possible to analyze the detailed data only for the chosen events. In the case of vertical incidence sounding, the need to obtain quarter-hourly ionograms at as many stations as possible is particularly stressed and takes priority over recommendation (a) below when both are not practical.

For the vertical incidence (VI) sounding programme, the summary recommendations are: (a) All stations should make soundings on the hour and every quarter hour; (b) On RWDs, ionogram soundings should be made at least every quarter hour and preferably every five minutes or more frequently, particularly at high latitudes; (c) All stations are encouraged to make f-plots on RWDs; f-plots should be made for high latitude stations, and for so-called "representative" stations at lower latitudes for all days (i.e., including RWDs and WGIs) (continuous records of ionospheric parameters are acceptable in place of f-plots at temperate and low latitude stations); (d) Copies of hourly ionograms with appropriate scales for QWDs are to be sent to WDCs; (e) Stations in the eclipse zone and its conjugate area should take continuous observations on solar eclipse days and special observations on adjacent days. See also recommendations under Airglow and Aurora Phenomena.

For the incoherent scatter observation programme, every effort should be made to obtain measurements at least on the Incoherent Scatter Coordinated Observation Days, and intensive series should be attempted whenever possible in WGIs or the Airglow and Aurora Periods. The need for collateral VI observations with not more than quarter-hourly spacing at least during all observation periods is stressed. Dr. V. Wickwar, SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025 (USA), URSI Working Group G/H.1, is coordinating special programmes.

For the ionospheric drift or wind measurement by the various radio techniques, observations are recommended to be concentrated on the weeks including RWDs.

For travelling ionosphere disturbances, propose special

International Geophysical Calendar
1988

(See other side for information on use of this Calendar)

	S	M	T	W	T	F	S
						1	2
	3	4	5	6	7	8	9
JANUARY	10	11	12+	13+	14+	15+	16+
	17	18	19	20*	21*	22	23
	24	25	26	27	28	29	30
	31	1	2	3	4	5	6
FEBRUARY	7	8	9	10	11	12	13
	14	15	16	17*	18*	19	20
	21	22	23	24	25	26	27
	28	29	1	2	3	4	5
MARCH	6	7	8	9	10	11	12
	13	14	15	16*+	17*+	18+	19*
	20+	21	22	23	24	25	26
	27	28	29	30	31	1	2
	3	4	5	6	7	8	9
APRIL	10	11	12+	13+	14	15	16
	17	18	19*	20*	21	22	23
	24	25	26	27	28	29	30
	1	2	3	4	5	6	7
MAY	8	9	10	11	12	13	14
	15	16	17*	18*	19	20	21
	22	23	24	25	26	27	28
	29	30	31	1	2	3	4
JUNE	5	6	7	8	9	10	11
	12	13+	14*+	15*	16	17	18

	S	M	T	W	T	F	S
						1	2
	3	4	5	6	7	8	9
JULY	10	11	12+	13*+	14*	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
	31	1	2	3	4	5	6
AUGUST	7	8	9	10	11	12	13
	14	15	16*	17*	18	19	20
	21	22	23	24	25	26	27
	28	29	30	31	1	2	3
SEPTEMBER	4	5	6	7	8	9	10
	11	12+	13*+	14*	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	1
	2	3	4	5	6	7	8
OCTOBER	9	10	11*	12*	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
	30	31	1	2	3	4	5
NOVEMBER	6	7	8	9*+	10*+	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30	1	2	3
DECEMBER	4	5+	6+	7+	8+	9+	10+
	11	12	13*	14*	15	16	17

(19) Regular World Day (RWD)

(20) Priority Regular World Day (PRWD)

◇16 Quarterly World Day (QWD) also a PRWD and RWD

6 Regular Geophysical Day (RGD)

14 15 World Geophysical Interval (WGI)

12+ Incoherent Scatter Coordinated Observation Day and Coordinated Tidal Observation Day

JANUARY

15	16	(17)	(18)	(19)	20	21
22	23	24	25	26	27	28
29	30	31				
S	M	T	W	T	F	S

11 Day of Solar Eclipse

13 14 Airglow and Aurora Period

20* Dark Moon Geophysical Day (DMGD)

NOTES:

1. Days with unusual meteor shower activity are: Northern Hemisphere Jan 3,4; Apr 21-22; May 3-4; Jun 8-12; Jul 27-29; Aug 10-13; Oct 20-21; Nov 1-4, 16-18; Dec 12-15, 21-22, 1988; Jan 2-4, 1989. Southern Hemisphere May 3-4; Jun 8-12; Jul 26-30; Oct 20-21; Nov 1-4, 16-18; Dec 5-7, 12-15, 1988.

2. Middle Atmosphere Cooperation (MAC) began 1 Jan 1986 and runs through 1988.

3. Day intervals that IMP 8 satellite is in the solar wind (begin and end days are generally partial days): 30 Dec 1987-5 Jan 1988; 11-18 Jan; 24-31 Jan; 6-13 Feb; 19-25 Feb; 2-9 Mar; 15-21 Mar; 27 Mar-3 Apr; 9-16 Apr; 21-28 Apr; 3-11 May; 16-24 May; 29 May-6 Jun; 11-18 Jun; 24 Jun-1 Jul; 6-14 Jul; 18-26 Jul; 31 Jul-7 Aug; 12-20 Aug; 25 Aug-1 Sep; 6-14 Sep; 19-27 Sep; 2-10 Oct; 14-22 Oct; 26 Oct-4 Nov; 8-16 Nov; 20-28 Nov; 3-11 Dec; 16-24 Dec; 29 Dec-5 Jan 1989.

   There will not be total IMP 8 data monitoring coverage during these intervals. (Information kindly provided by the WDC-A for Rockets and Satellites, NASA GSFC, Greenbelt, MD 20771 U.S.A.).

4. + Incoherent Scatter programs start at 1600 UT on the first day of the intervals indicated, and end at 1600 UT on the last day of intervals.

5. Incoherent Scatter world days: 880112-16 GISMOS (GITCAD, WAGS); 880316-20 GITCAD (SUNDIAL, WAGS); 880412-13 WAGS; 880613-14 WAGS; 880712-13; 880912-13; 881109-10 WAGS; 881205-10 LTCS (SUNDIAL, GITCAD).

   GISMOS = Global Ionospheric Simultaneous Measurements of Substorms;
   GITCAD = Global Ionosphere–Thermosphere Coupling and Dynamics;
   LTCS = Lower Thermosphere Coupling Study;
   SUNDIAL = Coordinated study of the ionosphere/magnetosphere;
   WAGS = Worldwide Acoustics Gravity Wave Study.

OPERATIONAL EDITION, September 1987

periods for coordinated measurements of gravity waves induced by magnetospheric activity, probably on selected PRWD and RWD.

For the ionospheric absorption programme half-hourly observations are made at least on all RWDs and half-hourly tabulations sent to WDCs. Observations should be continuous on solar eclipse days for stations in eclipse zone and in its conjugate area. Special efforts should be made to obtain daily absorption measurements at temperate latitude stations during the period of Absorption Winter Anomaly, particularly on days of abnormally high or abnormally low absorption (approximately October-March, Northern Hemisphere; April-September, Southern Hemisphere).

For back-scatter and forward scatter programmes, observations should be made and analyzed on all RWDs at least.

For synoptic observations of mesospheric (D region) electron densities, several groups have agreed on using the RGD for the hours around noon.

For ELF noise measurements involving the earth-ionosphere cavity resonances any special effort should be concentrated during the WGIs.

It is recommended that more intensive observations in all programmes be considered on days of unusual meteor activity.

Meteorology. Particular efforts should be made to carry out an intensified programme on the RGD -- each Wednesday, UT. A desirable goal would be the scheduling of meteorological rocketsondes, ozone sondes and radiometer sondes on these days, together with maximum-altitude rawinsonde ascents at both 0000 and 1200 UT.

During WGI and STRATWARM Alert Intervals, intensified programmes are also desirable, preferably by the implementation of RGD-type programmes (see above) on Mondays and Fridays as well as on Wednesdays.

Middle Atmosphere Cooperation (MAC). MAC runs from 1 January 1986 through 1988. Techniques for observing the middle atmosphere should concentrate or center their observations on the RGDs, PRWDs, and QWDs. It is recommended that observing

runs for studies of planetary waves and tides be at least 10 days centered on the PRWDs and QWDs. Non-continuous studies of stratospheric warmings and the effects of geomagnetic activity on the middle atmosphere must be initiated by STRATWARM and MAGSTROM alerts, respectively.

Solar Phenomena. Observatories making specialized studies of solar phenomena, particularly using new or complex techniques, such that continuous observation or reporting is impractical, are requested to make special efforts to provide to WDCs data for solar eclipse days, RWDs and during PROTON/FLARE Alerts. The attention of those recording solar noise spectra, solar magnetic fields and doing specialized optical studies is particularly drawn to this recommendation.

Study of Travelling Interplanetary Phenomena (STIP). Coordination of solar, interplanetary, and cometary activity is particularly desired. Revised STIP Intervals: STIP XV 12-21 Feb 1984 solar GLE; STIP XVI 20 Apr - 4 May 1984 Forbush decreases; STIP XVII 24 Apr - 30 Jun 1985 alignment of Venus magnetotail with satellites VEGA 1, VEGA 2, MS-T5, PVO, and ICE; STIP XVIII Sep 1985 Giacobini-Zinner Comet fly-by by ICE; STIP XIX Mar 1986 International Halley Watch.

STIP (now in COSPAR's Commission D.1) is reorganizing into disciplinary subgroups. New Intervals will be chosen in cooperation with other international programmes (e.g. the International Heliospheric Study (IHS) and the Study of the Transfer of Energy in Plasmas (STEP)).

Space Research, Interplanetary Phenomena, Cosmic Rays, Aeronomy. Experimenters should take into account that observational effort in other disciplines tends to be intensified on the days marked on the Calendar, and schedule balloon and rocket experiments accordingly if there are no other geophysical reasons for choice. In particular it is desirable to make rocket measurements of ionospheric characteristics on the same day at as many locations as possible; where feasible, experimenters should endeavour to launch rockets to monitor at least normal conditions on the Quarterly World Days (QWD) or on RWDs, since these are also days when there will be maximum support from ground observations. Also, special efforts should be made to assure recording of telemetry on QWD and Airglow and Aurora Periods of experiments on satellites and of experiments on spacecraft in orbit around

the Sun.

For URSI/IAGA Coordinated Tidal Observations Programme (CTOP) contact Dr. R.G. Roper (School of Geophysical Sci., Georgia Inst. of Tech., Atlanta, GA 30332, USA) for the 1988 Calendar.

x x x

This Calendar for 1988 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. It is published for the International Council of Scientific Unions and with financial assistance of UNESCO.

Additional copies are available upon request to

Dr. R. Thompson
IUWDS Chairman
IPS Radio and Space Services
Department of Science
P.O.Box 702
Darlinghurst, NSW 2010
Australia,

or

Miss H.E. Coffey
IUWDS Secretary for World Days
WDC-A for Solar-Terrestrial Physics
NOAA E/GC2
325 Broadway
Boulder, CO 80303
USA.