Bulletin nº 156 Mai-Juin 1966

URSI

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PUBLICATIONS DE L'URSI

Progress in Radio Science 1960-1963

(Extrait du *Journal des Télécommunications*, Vol. 33, nº 3)

Volume VI : Radio Waves and Circuits (Tome VI : Ondes et circuits), par F. L. H. N. STUMPERS. [1]

Cette monographie contient un rapport du président de la Commission VI de l'Union Radio Scientifique Internationale sur les activités de cette commission durant la période 1960-1963 ainsi que la plupart des communications présentées au cours des sept séances scientifiques tenues lors de l'Assemblée de Tokyo. Ces communications sont accompagnées d'un avant-propos et d'une discussion.

Le mandat de la Commission VI de l'URSI englobe un vaste champ de recherches. En vue de fournir aux participants des renseignements récents sur une base aussi large que possible, on a groupé plusieurs sujets ou traité de la même question (par exemple, les voies à variation dans le temps et l'aspect stochastique du rayonnement) de plusieurs points de vue différents. Etant donné son objet très étendu, cet ouvrage intéressera particulièrement les ingénieurs électriciens et électroniciens ainsi que les physiciens et les mathématiciens.

A. El-ZANATI.

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[1] Un volume relié. VI, 325 p., illustr., tabl., diagrs. 23 × 15 cm. Publié par Elsevier Publishing Company, P. O. Box 211, Amsterdam, Pays-Bas, 1966. Prix : 67,50 florins hollandais.

URSI PUBLICATIONS

Progress in Radio Science 1960-1963

(Reprint from *Telecommunication Journal*, Vol. 33, n° 3)

Volume VI : Radio Waves and Circuits, by F. L. H. N. STUMPERS [1].

This monograph contains a report of the Chairman of Commission VI of URSI on the activities of the Commission during the years 1960-1963, and most of the invited papers presented during the seven scientific sessions of the Tokyo Assembly, with a foreword and a discussion.

Commission VI covers a very wide field of research. To keep the participants up to date on as broad a front as possible, topics were chosen to bring together more than one area, or to present the same subject (for example time-varying channels and stochastic aspect of radiation) from more than one side. With its wide scope this volume will appeal to electronic and electrical engineers, physicists and mathematicians alike.

A. El-ZANATI.

[1] One bound volume : VI + 325, illustrations, tables, diagrams, 23 × 15 cm. Published by Elsevier Publishing Company, P. O. Box 211, Amsterdam, Netherlands, 1966. Price 67.50 Dutch florins.

COMITES NATIONAUX

Espagne

NECROLOGIE

Nous avons le regret d'annoncer le décès à Madrid, le 27 mars 1966, du Professeur Dr. Jose Maria Albareda, Secrétaire Général du Consejo Superior de Investigaciones Cientificas.

France

MEMBRES OFFICIELS

Les présidents des commissions du Comité national français de radioélectricité scientifique ont été désignés par ce Comité comme membres officiels des commissions correspondantes de l'URSI. Nous en rappelons la liste ci-après :

Commission 1 : M. R. WERTHEIMER, Faculté des Sciences, 50, rue Gauthier-de-Chatillon, 59 Lille.

Commission 2 : M. P. MISME, CNET, 196, rue de Paris, 92 Bagneux.

Commission 3 : M. F. du CASTEL, CNET, 3, avenue de la République, 92 Issy-les-Moulineaux.

Commission 4 : M. J. DELLOUE, Laboratoire de Physique de l'Ecole normale supérieure, 24, rue Lhomond, 75 Paris V.

Commission 5 : M. E. J. BLUM, Observatoire de Paris-Meudon, 92 Meudon.

Commission 6 : M. E. ROUBINE, 10, avenue Pierre Larousse, 92 Malakoff.

Commission 7 : M. M. Y. BERNARD, 229, avenue Victor Hugo, 92 Clamart.

CHANGEMENT D'ADRESSE

Le Secrétariat du Comité National Français de Radioélectricité Scientifique a été transféré à l'adresse suivante : 3 avenue de la République, 92 Issy-les-Moulineaux, France.

Toute la correspondance destinée au CNFRS est à adresser à cette nouvelle adresse.

Hungary

SECOND COLLOQUIUM ON MICROWAVE COMMUNICATION

BUDAPEST, 12-15 JUNE, 1962

At the second International Colloquium on Microwave Communication organized by the Department of Technical Sciences of the Hungarian Academy of Sciences and the Scientific Society of Telecommunication, thirty two contributors from nine countries, representing Czechoslovakia, France, German Democratic Republic, German Federal Republic, Poland, United Kingdom United States, USSR and Hungary expounded their views on the over-growing demands on microwave radio-links. The contributions dealt with subjects concerning microwave communication in the areas of system analysis, microwave circuits and antennas, microwave electronics, electronic circuits and systems measurements.

The papers presented at the meeting have been published in the « Proceedings of the Second Colloquium on Microwave Communication » issued by the Publishing House of the Hungarian Academy of Science — Budapest V, Alkotmany u. 21. The book is available by Kultura, Budapest 62, P. O. B. 149 at the price of $ 8.50.

USA

SEMINAR ON THE CAUSE AND STRUCTURE OF TEMPERATE LATITUDE SPORADIC E

A seminar on the cause and structure of temperate latitude sporadic E has been organized on June 9-11, 1965 in Colorado, under the auspices of the Central Radio Propagation Laboratory

and the National Center for Atmospheric Research, both of Boulder, Colorado.

The following papers discussed during the seminar are published in a *Special issue of Radio Science*, Vo . 1, N° 2, February 1966.

Some introductory and background comments on our state of knowledge of sporadic E. E. K. Smith.

The structure of the sporadic E layer detected from VHF ionospheric propagation. Kazuhiko Tao.

Experimental study of the structure of sporadic E (Summary). A. Spizzichino and A. Giraud.

Characteristics of ionospheric sporadic E signal. K. Miya.

Space and time correlations of ionospheric winds. N. W. Rosenberg and C. G. Justus.

Observed characteristics of ionospheric winds. J. F. Bedinger and H. B. Knaflich.

Prevailing and tidal wind shears in the E region. C. O. Hines.

Some rocket results on sporadic E. M. Aubry, M. Blanc, R. Clauvel, C. Taieb, P. J. Bowen, K. Norman, A. P. Willmore, J. Sayers, J. H. Wager.

Rocket observations of sporadic E and related features of the E region. L. G. Smith.

A rocket experiment on the structure of sporadic E. S. A. Bowhill.

The wind-shear theory of temperate zone sporadic E. W. I. Axford and D. M. Cunnold.

Mixtures of ions in the wind-shear theory of sporadic E. J. D. Whitehead Sporadic E and ionospheric currents. S. Matsushita.

Formation of sporadic E layers at temperate latitudes due to vertical gradients of charge density. Takao Tsuda, Tetsuya Sato, and Ken-ichi Maeda.

Theoretical basis of the formation of sporadic E due to wind motion in the ionosphere. S. Kato.

Some problems associated with midlatitude sporadic E. Keith, D. Cole and Richard B. Norton.

Summary and conclusions from the Estes Park sporadic E seminar :

1. Radio measurements. Kenneth L. Bowles.
2. Rocket measurements. L. G. Smith.
3. Ionospheric wind patterns. N. W. Rosenberg.

4. Theories. S. A. Bowhill.

5. Future plans. C. O. Hines.

A note on the influx of extraterrestrial dust as an energy source in the E region. Giorgio Fiocco.

CONJUGATE POINT SYMPOSIUM

Boulder, Colorado, June 13-16, 1967

A Conjugate Point Symposium is arranged by the High Altitude Observatory of NCAR and the Institute for Telecommunication Sciences and Aeronomy of ESSA.

The general programme of the Symposium is as follows :

I. — *Magnelospheric Environment.*

Steady state and disturbance features of the environment of the earth's magnetic field which define and alter the conjugate point phenomena.

II. — *Guided Waves and Particles.*

Phenomena whose principal characteristics are determined by transit within the earth's dipole field.

III. — *Ionospheric Effects.*

Changes within the ionosphere imposed by the precipitating particles at conjugate field sites.

IV. — *Research Notes.*

Contributed papers on results from related current research programs.

For additional information apply to : Aeronomy Laboratory (540.03), ESSA-ITSA, Boulder, Colorado 80302, USA.

Yugoslavia

MEMBERSHIP

President : Dipl. Ing. Djordje Kovačević, Director of the Institute Mihailo Pupin, Belgrade, POB 906.

Secretary : Prof. Dr. Dejan Bajić, Belgrade, POB 356.

Chairman of Comm. I : Dr. Ing. Bogosav KOVAČEVIĆ, Institute Mihailo Pupin, Belgrade, POB 906.

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Chairman of Comm. III : Dr. Mirjana VUKIČEVIĆ-KARABIN, Institute Mihailo Pupin, Belgrade, POB 906.

Chairman of Comm. IV : Dipl. Ing. Radomir TURAJLIĆ, Director Geomagnetski Institut, Grocka.

Chairman of Comm. V. : Prof. Dr. Ivan ATANASIJEVIĆ, Belgrade, POB 356.

Chairman of Comm. VI : Prof. Ing. Radoslav HORVAT, Elektrotehnički Fakultet, Belgrade, Bul. Revolucije 73.

Chairman of Comm. VII : Dipl. Ing. Dr. Ferdinand IVANEK, Zavod za automatizaciju, Tržaška 2, Ljubljana.

Members :

Dipl. Ing. Milenko ARGIROVIĆ, Belgrade, Birčaninova 18.

Dr. Djordje NIKOLIĆ, Belgrade, Mije Kovačevića 5.

Dipl. Ing. Miomir KOVAČEVIĆ, Zajednica JPTT, Belgrade, Palmotićeva 2.

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Dipl. Ing. Pantelija OBRADOVIĆ, Belgrade, POB 356.

Dipl. Ing. Streten NEDELJKOVIĆ, Zajednica JPTT, Belgrade, Palmotićeva 2.

Dipl. Ing. Zivorad PAVLOVIĆ, Institute Mihailo Pupin, Belgrade, POB 906.

COMMISSIONS AND COMMITTEES

Commission I on Radio Standards and Measurements

INTERNATIONAL MEASUREMENT CONGRESS 1967

WARSAW, POLAND, 3-8 JULY 1967

The International Measurement Congress IMEKO IV, organized by the International Measurement Confederation will be the fourth in a series of congresses previously held in Budapest (1958 and 1961) and in Stockholm (1964). The scope of the 4th IMEKO 1967 has been broadened so as to give proper attention to progress in the application of instrumentation in science, industry or in public service. Special attention will be given to study its impact on automation. Thus IMEKO IV will review progress in measurement science, instrument design development and manufacture, and in application technology.

The International Measurement Confederation expects to bring about within the framework of IMEKO IV, an exchange of experiences and opinions of those responsible for the research and development of new methods, techniques and means of measurement, with those manufacturing instruments and putting them to use in the actual scientific and industrial practice.

Information available by writing to : IMEKO Secretariat, Budapest 5, POB 457, Hungary.

EMISSION DE SIGNAUX HORAIRES

L'Assemblée Générale tenue le 1er février 1966 par le Comité National Français de Géodésie et Géophysique a adopté le vœu reproduit ci-dessous concernant l'émission de signaux horaires du poste suisse HBG.

VOEU

Le Comité National Français de Géodésie et Géophysique a pris connaissance avec grand intérêt du programme d'émissions de signaux horaires continus diffusés par l'émetteur suisse HBG sous contrôle de l'Observatoire Cantonal de Neuchâtel. La poursuite de ces émissions serait de la plus grande importance tant pour les stations séismologiques fixes que pour les travaux de séismologie expérimentale. Le Comité souhaite que des marques d'identification de l'heure soient ajoutées au programme d'émissions.

JOINT COMMUNICATION BY CANADIAN, UNITED KINGDOM AND UNITED STATES COMMISSION I

In accordance with a recommendation of Commission I of URSI, an international intercomparison of dielectric measurement was made by the National Bureau of Standards (NBS), National Physical Laboratory (NPL) and the National Research Council (NRC). Three stable vitreous materials were used, glass, fused silica, and alumina. The specimens, furnished by NBS, were not exchanged in round robin fashion because of differences in dimensions of test cells. However, the homogeneity and isotropy of the original stock were carefully studied, and were estimated to give less than 0.1 per cent variation between specimens.

The results for the real part of the permittivity, K', from the three laboratories in the range 10^3 to 10^{10} Hz agreed, in general, to about 0.4 per cent for glass and silica and 0.2 per cent for alumina. The disagreement on loss tangent was usually of the order of 0.0001. The results are published by H. Bussey, J. Gray, and E. Bamberger of NBS, E. Rushton, G. Russell, and B. Petley of NPL, and D. Morris of NRC, in IEEE Transactions on Instrumentation and Measurement, IM-13, 305-311, 1964.

(*sgd*) Charles F. PATTENSON, *Chairman Canadian Commission I*

John M. RICHARDSON, *Chairman United States Commission I*

L. ESSEN, *Chairman United Kingdom Commission I.*

Commission III — Ionosphère

INDICES D'ACTIVITE SOLAIRE POUR LA PROPAGATION IONOSPHERIQUE

(Extrait du *Journal des Télécommunications*, Vol. 33, n° 2, février 1966)

Les tableaux ci-après, contenant les valeurs des indices fondamentaux de la propagation ionosphérique, ont été établis par le Secrétariat spécialisé du Comité consultatif international des radiocommunications (CCIR), conformément à la Résolution 4, l'Avis 371 et le Rapport 246 du CCIR.

Remarque : De nombreux détails sur les indices ionosphériques sont contenus dans une publication récente : *Advances in radio research*, volume 2, éditée par J. A. Saxton (Academic Press, Londres et New York, 1964). Il s'agit de la contribution de C. M. Minnis, intitulée *Ionospheric indices*, pages 1-36, de l'ouvrage en question.

VALEURS OBSERVÉES :

● R_{12} (moyenne glissante sur douze mois du nombre de taches solaires) :

Année \ Mois	1	2	3	4	5	6	7	8	9	10	11	12
1964	19	18	15	13	11	10	10	10	10	10	10	11
1965	12	12	12	13	15	15	16					

● I_{F_2} (indice ionosphérique) :

Mois (année 1965).

1	2	3	4	5	6	7	8	9	10	11	12
7(1)*	5(1)*	20(1)*	18(1)*	10(1)*	15(1)*	17(1)*	12(1)*	9(1)*	6(1)*	6(1)*	–1(1)*

Mois (année 1966).

1
15(1)

(*) Les chiffres entre parenthèses indiquent le nombre de valeurs de foF_2 qui ne sont pas encore parvenues au secrétariat du CCIR et dont on n'a donc pas tenu compte dans le calcul de l'indice I_{F_2}. Pour plus de détails, voir *Journal des Télécommunications* (avril 1964, page 119).

Par rapport aux données contenues dans le Rapport 246 du CCIR, une station de sondages ionosphériques a cessé de fonctionner — celle de Porto Rico (en juin 1963). Les valeurs de I_{F_2} contenant entre parenthèses le chiffre (1) sont donc depuis le mois de juin 1963 les valeurs définitives de l'indice I_{F_2}. En outre, la station de Fairbanks (College) n'a pas fonctionné pendant la période août-octobre 1963. Pour cette période les valeurs définitives de l'indice I_{F_2} sont celles contenant le chiffre (2) entre parenthèses.

● Φ (flux de bruit solaire moyen mensuel) ** :

Année \ Mois	1	2	3	4	5	6	7	8	9	10	11	12
1965												
1966	78	75	74	72	78	77	74	75	76	80	76	76

(**) Renseignements obligeamment fournis par le « National Research Council », Ottawa.

PRÉVISIONS POUR LES MOIS A VENIR (1er FÉVRIER 1966) *** :

● R_{12}

Année \ Mois	2	3	4	5	6	7
1966	24	25	26	28	30	32

(***) Renseignements obligeamment fournis par le professeur Waldmeier, Observatoire fédéral de Zurich.

Estimation de l'erreur sur les prévisions de R_{12} : $\pm$ 10.

● I_{F_2} ****

Année \ Mois	2	3	4	5	6	7
1966	25	28	31	34	37	(40)

(****) Renseignements obligeamment fournis par le « Department of Scientific and Industrial Research, Radio and Space Research Station » Slough.

La valeur prévue six mois à l'avance est donnée entre parenthèses.

Estimation de l'erreur sur les prévisions de I_{F_2} :

Mois (1966)	1	2	3	4	5	6	7
Maximum	+10.5	+20.3	+21.5	+21.7	+22	+21.5	+20.5
Minimum	—8.5	—11.5	—13.5	—15.5	—17.4	—19.4	—20.5

SOLAR INDICES FOR IONOSPHERIC PROPAGATION

(Reprint from *Telecommunication Journal*, Vol. 33, n° 2, February 1966)

The following tables, giving values of the basic indices for ionospheric propagation have been prepared by the Specialized Secretariat of the International Radio Consultative Committee (CCIR) in accordance with CCIR Resolution 4, Recommendation 4, Recommendation 371, and Report 246.

Note : A considerable amount of information on ionospheric indices will be found in an article by C. M. Minnis, entitled *Ionospheric indices* on pages 1-36 of the recent publication *Advances in radio research*, volume 2, edited by J. A. Saxton (Academic Press, London and New York, 1964).

PARAMETERS :

● R_{12} (smoothed mean, over twelve months, of the number of sunspots observed) :

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1964	19	18	15	13	11	10	10	10	10	10	10	11
1965	12	12	12	13	15	15	16					

● I_{F_2} (ionospheric index).

Month (year 1965).

1	2	3	4	5	6	7	8	9	10	11	12
7(1)*	5(1)*	20(1)*	18(1)*	10(1)*	15(1)*	17(1)*	12(1)*	9(1)*	6(1)*	6(1)*	–1(1)

Month (year 1966).

1
15(1)

(*) The figures in brackets represent the number of values of foF_2 which have not yet reached the CCIR Secretariat, and which have not therefore been taken into account in the calculation of I_{F_2}. For further details, see the *Telecommunication Journal*, April 1964, page 119.

With regard to the data contained in CCIR Report 246, one ionospheric sounding station has ceased to operate Puerto Rico (in June 1963). The values of I_{F_2}, that include the figure (1) in brackets are therefore, as from the month of June 1963, definitive values for I_{F_2}. Furthermore the sounding station Fairbanks (College) did not operate during the period August-October 1963. For this period the definitive values of I_{F_2} are those including the figure (2) in brackets.

● Φ (monthly mean value of solar noise flux) ** :

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1964												
1965	78	75	74	72	78	77	74	75	76	80	76	76

(**) Data kindly supplied by the National Research Council, Ottawa.

FORECASTS FOR THE NEXT FEW MONTHS (FEBRUARY 1966) *** :

● R_{12}

Year \ Month	2	3	4	5	6	7
1966	24	25	26	28	30	32

(***) Data kindly supplied by Professor Waldmeier, Federal Observatory, Zurich.

Estimated error in forecasts of R_{12} : $\pm$ 10.

● I_{12} ****

Year \ Mont	2	3	4	5	6	7
1966	25	28	31	34	37	(40)

(****) Data kindly supplied by the Department of Scientific and Industrial Research, Radio and Space Research Station, Slough.

The figure in brackets is the value forecast six months in advance.

Estimate of the error in I_{F_2} predictions :

Month	1	2	3	4	5	6	7
Maximum	+10.5	+20.3	+21.5	+21.7	+22	+21.5	+20.5
Minimum	—8.5	—11.5	—13.5	—15.5	—17.4	—19.4	—20.5

Commission V — Radioastronomie

SURFACE LUNAIRE

L'Union Astronomique Internationale a créé un nouveau sous-comité de sa Commission 17; ce sous-comité a pour objet l'étude de la surface lunaire et est placé sous la présidence du Professeur D. H. Menzel.

L'UAI a demandé la collaboration de l'URSI et accepté que celle-ci soit représentée par le Prof. W. Christiansen et M. J. Voge, respectivement Présidents des Commissions V et II de l'URSI.

* * *

SURFACE OF THE MOON

The International Astronomical Union has established a new sub-committee of its Commission 17; the sub-committee will deal with the study of the surface of the moon and is under the chairmanship of Prof. D. H. Menzel.

IAU asked the collaboration of URSI and agreed that our Union be represented by Prof. W. Christiansen and Mr. J. Voge, respectively Chairmen of URSI Commissions V and II.

Commission VII on Radioelectronics

LASERS

Nous signalons à nos lecteurs l'apparition d'une nouvelle revue : « Lasers et Optique non conventionnelle », éditée par P. M. L. Banque Européenne d'Informations, 38, avenue George V, Paris 8e.

* * *

Le numéro 1, qui vient de paraître, contient entre autre les articles ci-après :

— Recherche d'applications des lasers à l'aide d'une théorie générale de la circulation de l'information, M. Locquin.
— Action du rayon laser sur la matière non biologique.
— Mesures par laser.

Chaque article est accompagné d'une importante bibliographie.

Comité pour les Recherches Radioélectriques dans l'Espace

SERVICE DE DOCUMENTATION SPATIALE

Nous annonçons à nos lecteurs la mise en œuvre du Service de Documentation Spatiale ESRO-ELDO (SDS).

L'Organisation Européenne de Recherches Spatiales (ESRO) et l'Organisation Européenne pour la mise au point et la Construction des Lanceurs d'Engins Spatiaux (CECLES-ELDO), avec la coopération de la National Aeronautics and Space Administration (NASA) ont mis sur pied un vaste programme d'information technique visant à diffuser les résultats des efforts techniques et scientifiques accomplis dans le domaine aéro-spatial.

Des renseignements complémentaires peuvent être obtenus en s'adressant à : ESRO, Bureau de Documentation, 46, rue La Pérouse, Paris 16e, France.

Space Radio Research Committee

SPACE DOCUMENTATION SERVICE

We are announcing that the ESRO/ELDO Space Documentation Service (SDS) is now in operation.

The European Space Research Organization (ESRO) and the European Space Vehicle Launcher Development Organization (ELDO), with the cooperation of the National Aeronautics and Space Administration (NASA), aim to provide an effective system of machine retrieval of scientific and technical information in the aerospace field.

For further information write to : ESRO, Documentation Office, 36, rue la Pérouse, Paris 16e, France.

INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE IUWDS

Synoptic Codes for Solar and Geophysical Data

ERRATA AND ADDITIONS TO THE 1965 Edition

IUWDS has issued a list of corrections to the 1965 edition of the Code booklet which can be obtained from the IUWDS Secretaries or from the Regional Warning Centres. Addresses are as follows:

IUWDS Secretary : Mr. P. SIMON, Observatoire de Paris, Meudon (Seine et Oise), France.

IUWDS Deputy Secretary : Miss J. V. LINCOLN, Environmental Science Services Administration, Boulder, Colorado 80301, USA.

REGIONAL WARNING CENTRES :

Western Europe : Radio Receiving Station NERA
Nederhorst den Berg
The Netherlands

Service des Ursigrammes et Jours Mondiaux
Observatoire de Paris
Meudon (Seine et Oise)
France.

FTZ
Rheinstrasse 110
61 Darmstadt
Federal Republic of Germany.

Eurasia : Institute of Terrestrial Magnetism
Ionosphere and Radio Propagation
(IZMIRAN)
Leninskii r-p, P/O Vatutenki
Moscow, USSR.

Western Pacific : Radio Research Laboratories
Ministry of Posts and Telecommunications
Kokubunji P. O. Koganei-shi
Tokyo, Japan.

Western Hemisphere : IUWDS World Warning Agency
Environmental Science Services Administration
Box 178, Ft. Belvoir 22060
Virginia, USA.

WMO GEOALERT DISTRIBUTION

The following is quoted from WMO letter n° 3.501/T/WD Annex : 1 to Permanent Representatives (or Directors of Meteorological Services) of members of WMO (PR-1395) :

« I wish to invite your attention to Resolution 8 (EC-XVII) — « World Days Programme » — which is contained in the Abridged Report of the seventeenth session of the Executive Committee.

In accordance with this resolution you are invited to continue the distribution arrangements for GEOALERT messages on WMO meteorological telecommunications networks on a permanent basis. Earlier requests concerning the distribution of the messages related to the period of the International Years of the Quiet Sun which has now ended ».

The IUWDS greatly appreciate the assistance of the WMO in the use of their worldwide telecommunications networks for the dissemination of the daily GEOALERT decisions.

A JOINT LETTER ON THE SUBJECT OF SUNSPOT OBSERVATIONS AND THEIR INTERPRETATION

Howard L. De Mastus [1] and Patrick S. McIntosh [2]

March 1, 1966

(Appendix to *UWDS circular letter* RWC-90)

The recent commencement of serious efforts to forecast solar activity has created a greater demand for high quality solar obser-

[1] Sacramento Peak Observatory, Sunspot, New Mexico.

[2] Institute for Telecommunication Sciences and Aeronomy, Environmental Science Services Administration, Boulder, Colorado.

vations on a rapid reporting schedule. Among the most useful indices for use in making solar forecasts are sunspot numbers and sunspot areas. In the United States rapid reporting of these data come from ESSA-Boulder, US Naval Observatory, and the Sacramento Peak Observatory.

The Sacramento Peak observations have been determined as the most complete and most consistent, and the recent commencement of observations from ESSA-Boulder appears to provide data of similar quality. Naval Observatory is plagued by poor observing conditions. The comparison of Naval Observatory data with the other two is poor, whereas ESSA-Boulder and Sacramento Peak report similar values on a given day. Furthermore, the measurement of Sacramento Peak sunspot photographs by a measuring engine gives data in agreement with the visual measures by Sacramento Peak and ESSA-Boulder. However, there are many days where there are large differences between any two observatories. We hope that the following comments concerning these differences will be helpful to those individuals interested in sunspot data but who are not involved in the observation or computation of that data.

The precise measurement of sunspot areas is one of the more difficult tasks encountered, especially for the less experienced observer. In addition to many pitfalls involved in actual measurement there is also the tendency for reported areas to be taken far too literally.

Where measurements of a high order of precision are desired, measuring engines are used to best advantage; however, since this is time consuming and prohibits rapid schedule reporting, other methods of measurement suggest themselves.

The optical system employed is of prime importance for good observations. An image resolution of the order of 1" arc is required for the observation of the fine detail encountered when observing sunspots. This corresponds to a theoretical limit of resolution of a 5-inch telescope and to 0.1 mm on a 20 cm diameter sunspot drawing. Although many telescopes of 5-inch and larger aperture are employed, the limit of resolution is rarely attained. There is image degradation introduced chiefly by telescope heating and local thermal convection currents.

Sunspot observations are obtained either by making a pencil tracing of the projected image of the sun or by short-exposure

photographs. Sunspot drawings require very simple equipment and consume the least amount of time to produce sunspot data; therefore, most sunspot data reported on a rapid schedule are obtained in this way. However, the drawings are prone to more errors than photographs. Neither system has yet produced perfectly reliable and consistent sunspot measures. Below are some of the sources of variations.

(1) Much of the variation among reported sunspot observations on a given day is due to observer error. Sunspot drawings require a measure of care and patience which few observers possess. It requires practice to make an accurate tracing of sunspots from an image that is seldom clear and seldom free of random motion. Provided that the observer is experienced and patient and the seeing conditions are at least as good as average, it is possible to compare the finished sunspot drawing with the «live» sun on the projection board and correct errors in the size of spots to less than 50 %. Under favorable conditions areas can be measured on a drawing to less than a 20 % error.

(2) The standard scale of sunspot drawings is 20 cm to the sun's diameter. Many sunspots are so small on even this scale that measurement of their area is difficult. Often the pencil point is much larger than a spot. Studies of high resolution photographs at Sacramento Peak show that sunspots may be as small as 0.2 millionths of the solar hemisphere. On drawings all spots less than 5 millionths in area tend to appear of equal size. Observers differ in the areas they assign to the very small spots. In small groups this can mean differences of a factor of two or more in total areas. On the other hand, for groups with large penumbrae the observer can ignore the measurement of small attendant spots without seriously affecting the total area.

(3) A common method of measuring sunspot areas is the use of a transparent grid of small squares laid over the spots. The number of squares covering the sunspot group are counted. This method suffers both from the errors made in the drawing (or poor exposure and poor seeing on a photograph) and from the accumulated errors in estimating the size of fractions of squares included at the edge of spots. Further, the quality

of the grid is often overlooked as being unimportant. The density and width of the line (often photographic) forming the grid can greatly affect the accuracy of the measurements. If the squares are too large with respect to the scale of the drawing or photograph, rather large errors can result; therefore, the grid overlay method is not ideally suited for use with the 20 cm image diameter of sunspot drawings.

(4) At the Sacramento Peak Observatory an assumption has been made to provide a basis for rapid and relatively accurate measurement of sunspot areas using sunspot drawings. All sunspots are considered to be uniformly circular. This asumption removes the difficult foreshortening correction by allowing computation of areas from the diameter of spots measured perpendicular to the solar radius vector. At the Sacramento Peak Observatory the area of a sunspot is given :

$$A = 1.25D^2,$$

where D is the measured diameter of the spot in millimeters on a 20 cm diameter sunspot drawing, perpendicular to the radius vector. The value obtained is in tens of millionths of the hemisphere.

In the case of irregular spots one must mentally divide the spot into a number of circles of varying sizes tangent to each other. There is bound to be considerable variation in the manner different observers use to compensate for this irregularity.

(5) Adverse seeing tends to give a diffuse edge to spots. In some cases this gives an apparent area larger than actual. In other cases the edge of the spot diffuses so much as to blend in with the surrounding bright solar surface and one then sees only the core of the spot, and this results in a smaller area than actual. Photographs are particularly prone to give too large an area if they are exposed during poor seeing and if the exposure is too short. An overexposure can give too small an area by recording only the darkest parts of the sunspot groups.

(6) Even though two observatories use photographs to obtain sunspot areas they may differ in their results because of different scales on the measured image and because one may have exposed

during better seeing conditions than the other. Even with a projected solar image of 50 cm, some sunspots still appear smaller than a millimeter in diameter, so that there again may be differences in how much area is attributed to very small spots. In the case of photographic reductions, a sunspot is not assumed to be uniformly circular, and, therefore, the grid overlay method is used to measure areas.

(7) Penumbra can be broken and « splotchy » instead of a solid area concentric to the umbra. Differences in seeing will cause differences in measured area where one observer sees a solid feature and another resolves the « holes » in this fractured penumbra. Since penumbra contributes the greatest amount to the total area, these differences can account for large variations among observatories.

We feel that good absolute measures of sunspot areas are rare. This ideal is attained only with careful measurement of high quality photographs projected to a large scale. It is usually more important that there be an accurate measure of area changes. In this case the consistency and homogeneity of observations is more important than absolute values. This requires identical measuring techniques and identical scales to the projected sun or photograph. When using a projected image we recommend the measurement of sunspot diameters on a millimeter scale from a 20 cm diameter drawing made with care by an experienced observer. This method is most likely to give consistent results that can reflect the correct trends in the growth and decay of sunspots. The comparison of Sacramento Peak and ESSA-Boulder sunspot areas has been reasonably good because of the use of this technique by both observatories.

Sunspot numbers suffer from some of the same errors as areas.

(1) There is a poor correspondence between sunspot group area and sunspot group count since small spots add little to the area but often account for the majority of spots.

(2) Spot count is more dependent on seeing than is spot area since small spots « disappear » with even slight image degradation.

(3) With excellent seeing the spot count can be higher than actually exists on the sun. Short-lived, faint pores are often included

in the count under such conditions. Pores can be identified by observing which features disappear after 5 or 10 minutes.

The users of sunspot numbers and sunspot areas must not concern themselves with reported data that differ by less than a factor of two. At a time of low solar activity the reported areas and sunspot numbers will often vary by large percentage amounts among different observatories. Most of these variations are without meaning. As larger regions appear on the sun we might reasonably expect better percentile comparison among the observations.

The observers can possibly improve the consistency of the data by an awareness of these sources of error in making sunspot observations. The application of more care in observing is needed. The advancement of photographic patrols to rapid reduction by measuring engines may soon initiate a new era in sunspot observing, provided that the care exercised in visual observations is also applied to the film measurements.

INTER-UNION COMMISSIONS

IUCAF

Doc. IUCAF/88 — Four contributions from US Committee to the Xth Plenary Assembly of CCIR — Oslo 1966.

(1) *CCIR/USPC IV*/129

Revisions for CCIR Report L-8-b(IV) Radio Astronomy — « Characteristics and factors affecting frequency sharing with other services ».

(2) *CCIR/USPC IV*/130

CCIR Question 244 (IV)
« Line frequencies of interest to Radio Astronomy, lying in or near bands identified with Radio Astronomy by EARC 1963 ».

(3) *CCIR/USPC IV*/131

Revisions for CCIR Report 223
« Line frequencies or bands of interest to Radio Astronomy and related sciences, in the 30 to 300 Gc/s range arising from Natural Phenomena ».

(4) *CCIR/USPC IV*/132

Revisions for CCIR Report 226
(L.9-Radar Astronomy) « Factors affecting the possibility of frequency sharing between radar astronomy and other services ».

CONSEIL INTERNATIONAL DES UNIONS SCIENTIFIQUES CIUS

Comité pour les Données pour la Science et la Technologie

La XIe Assemblée Générale du CIUS (Bombay, janvier 1966) a décidé d'instituer un Comité pour les Données pour la Science et la Technologie, dans le but d'établir une direction aux efforts de collaboration tendant à améliorer la compilation des données numériques et quantitatives choisies de façon critique.

M. B. Decaux, Vice-Président de l'URSI, a été désigné comme représentant de l'URSI au sein de ce nouveau Comité.

ICSU

Committee on Data for Science and Technology

At its XIth General Assembly (Bombay, January 1966) ICSU resolved to establish a Committee on Data for Science and Technology to provide leadership in international collaborative efforts to improve the compilation of critically selected numerical and other quantitative data.

Mr. B. Decaux, Vice-President of URSI, has been appointed as representative of URSI on the Committee.

COSPAR

Information Bulletin

N° 30 (February 1966) of the *COSPAR Information Bulletin* has been issued. We quote the following papers published in this issue :

— Réalisations récentes dans les techniques d'observation optique des satellites, P. MULLER.

— A survey of satellites and space probes, 1 November 1965 — 31 January 1966.

— Detailed experiments :

Meteorological Satellite : 1966-51A;
Meteorid Detection Satellite : 1965-60A;
Dummy Surveyor Model : 1965-64A;
Manned Gemini Spacecraft : 1965-68A.

Activities of the ICSU Abstracting Board during the year 1965

SUMMARY

The ICSU A. B. General Assembly and Executive Committee were held in Moscow in July 1965.

Statutes of the Board have been changed and the Executive Committee renewed.

Professor G. A. BOUTRY (France) remains to the Presidency of the Board. Professor H. W. THOMPSON (U. K)., Past President of ICSU and ICSU representative to the Board was elected Vice President of the ICSU A. B.

The membership of the Board has been conferred on the International Astronomical Union.

Regarding technical activities of the Board, the service of exchange of proof copies of primary scientific periodicals has been reorganized and enlarged. As usual ICSU A. B. helped its Member-

Services to gather original scientific literature all over the world. Actions aiming at the general improvement of scientific literature have been reenforced.

The Board has started to implement ICSU recommendations aiming at helping ICSU in problems retated to scientific information.

In this respect, two publications have been issued :

— « Tentative List of Publications of ICSU, Scientific Unions Special and Scientific Committees and Commissions of ICSU, Year 1964 and corrections and additions to the 1953-1963 list ».

— « Preliminary Survey of the Activities of ICSU, Scientific Unions, Special and Scientific Committees and Commissions of ICSU in the field of Scientific Information ».

These publications are available free of charge at the ICSU A. B. Secretariat. Annual issues will be published on a regular basis from now on.

Important studies are going on at the Secretariat. One may quote :

— A statistical study on Abstracting Periodicals in Physics for the year 1964. Four reports will be issued in the course of 1966 giving an overall view of the primary literature in Physics all over the world, as seen by the Abstracting Periodicals studied.

— A detailed study on « Major Journals » in Physics, which will be published during the 2nd quarter of 1966. A similar study of Major Journals in Chemistry and Biology is going on.

ICSU A. B. wants to remind all ICSU bodies that it is at their disposal to help them in their problem of Scientific Information.

For complementary information, apply to the ICSU A. B. Secretariat, 17 rue Mirabeau, Paris 16, France.

February 25, 1966.

CCIR

XIe Assemblée plénière

La XIe Assemblée Plénière du CCIR se tiendra à Oslo, Norvège, du 23 juin au 12 juillet 1966.

Toute correspondance destinée à l'Assemblée doit être envoyée à XIth Plenary Assembly CCIR, Postboks, Skøyen, Oslo, 2.

CCIR

XIth Plenary Assembly

The XIth Plenary Assembly of the CCIR will be held in Oslo, Norway, from June 23th to July 12th 1966.

All correspondence directed to the Plenary Assembly should be addressed to : XIth Plenary Assembly, CCIR, Postboks, Skøyen, Oslo, 2.

INTERNATIONAL ASTRONAUTICAL FEDERATION

Elections

We have been informed that the following personalities have been elected as Corresponding Members of the Basic Sciences Section of the International Academy of Astronautics :

Prof. Emil BUCHAR, Czechoslovak Technical University, Prague (Czechoslovakia).

Prof. W. DIEMINGER, Max-Planck Institut für Aeronomie, Lindau (German Fed. Rep.).

Prof. Charles FEHRENBACH, Observatoire de Marseille, Marseille (France).

Prof. G. L. GALPERIN, Institute of Atmospheric Physics, USSR Academy of Sciences, Moscow (USSR).

Prof. Vitali L. GINZBURG, P. N. Lebedev Physical Institute, Moscow (USSR).

Prof. Bengt K. G. HULTQVIST, Kiruna Geophysical Observatory, Kiruna (Sweden).

Prof. K. Y. KONDRATIEV, University of Leningrad, Leningrad (USSR).

Prof. Reimar LÜST, Max-Planck Institut für Extraterrestrische Physik, München (German Fed. Republic).

Prof. A. B. SEVERNY, Crimean Astrophysical Observatory (USSR).

Prof. Hans THIRRING, University of Vienna, Vienna (Austria).

Sir George PAGET THOMSON, Imperial College, London (United Kingdom).

Prof. Georg von HEVESY, University of Stockholm, Stockholm (Sweden).

Prof. Max WALDMEIER, Swiss Federal Observatory, Zurich (Switzerland).

Dr. Alan Tower WATERMAN, Consultant to NASA Administrator, Washington, D. C. (USA).

Prof. Francesco ZAGAR, Astronomical Observatory, Milan (Italy).

UNESCO

L'Enseignement de la Physique dans les Universités

Chronique de l'Unesco, Vol. XII; n° 3, mars 1966

Dans le cadre de son programme d'études comparatives sur l'enseignement des sciences de base au niveau universitaire, l'Unesco a effectué depuis 1962, en coopération avec l'Union internationale de physique pure et appliquée, une enquête sur l'enseignement de la physique dans les universités de six pays : République fédérale d'Allemagne, Etats-Unis d'Amérique, France, Royaume-Uni, Tchécoslovaquie, URSS.

Le rapport de cette enquête vient d'être publié sous le titre : *A survey of the teaching of physics at universities* (l'édition française paraîtra prochainement).

Cette publication répond à un double objectif : aider les pays en voie de développement à mettre au point des programmes pour l'enseignement de la physique dans les universités en leur proposant certains modèles; permettre aux pays scientifiquement développés de se renseigner sur les meilleures réalisations, et aussi sur les problèmes d'autres pays dans ce domaine.

Une importante partie documentaire (programme d'études, listes d'expériences, listes de livres), présentée sous forme d'appendices, permet une étude comparative détaillée de l'enseignement de la physique dans les six pays considérés.

The Teaching of Physics at Universities

Unesco Chronicle, Vol. XII, n° 3, March 1966

As part of its programme of comparative studies on the teaching of basic sciences at university level, Unesco has since 1962 conducted a survey in collaboration with the International Union of Pure and Applied Physics on the teaching of physics in universities in six countries : Czechoslovakia, France, Federal Republic of Germany, United Kingdom, United States of America, USSR.

A report on this survey has just been published under the title : *A survey of the teaching of physics at universities.*

The publication has two principal aims : to assist newly developing countries to launch programmes in university physics by suggesting various approaches, and to enable scientifically established countries to learn what other countries are doing and to compare educational practices in physics.

A mass of detailed information (syllabuses, lists of experiments, book lists, etc.) presented in a series of appendixes provides a basis for a detailed comparative study of physics in the six countries surveyed.

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— Influences particulières sur certaines irrégularités ionosphériques — Part. II — Sur certaines perturbations itinérantes observées dans l'ionosphère inférieure et supérieure, J. M. FAYNOT, Space Research V et Groupe de Recherches Ionosphériques (France), n° 42.

— Morphologie diurne de la couche F aux basses latitudes africaines par calme magnétique, F. du CASTEL, J. M. FAYNOT, G. VASSEUR et P. VILA, *C. R. Acad. Sc., Paris*, t. 261, 4184-4186, 15 nov. 1965, et Groupe de Recherches Ionosphériques (France), n° 43.

— Observations de perturbations ionosphériques itinérantes à des latitudes sub-aurorales, F. du CASTEL, J. M. FAYNOT et G. VASSEUR, *C. R. Acad. Sc., Paris*, t. 261, 3443-3446, 27 octobre 1965, et Groupe de Recherches Ionosphériques (France), n° 44.

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— Influences particulières sur certaines irrégularités ionosphériques. Part. I. Sur certains échos guidés observés par sondages ionosphériques en satellite, F. du CASTEL, Space Research V, North-Holland Publishing Company, Amsterdam.

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— Some Aspects of the Lower Auroral Ionosphere at Mawson, R. C. SCHAEFFER, B. Sc., Australian Prediction Service.

Abstract : An investigation was made of many properties of the lower ionosphere over Mawson, Antarctica. A general survey of the different Es types was conducted and several diurnal and seasonal dependences are revealed. In particular, the influence of the geomagne-

tic field is demonstrated. Certain special aspects were examined. It is concluded that Esf at Mawson consists of two separate types, one type closely preceding auroral storms. Some features of Esc were studied and properties common to Esf and Esewere examined. Inspection of night-time transitions between these types reveals that the change of E-layer ionisation is the basic difference between them. Investigation of ionograms in conjunction with riometer-absorption records reveals an anomalous winter peak of « no-echo » occurrences around 1800 hours, L. M. T. An explanation is offered in terms of the lack of sufficient ionisation of the E and F regions rather than absorption. The annual variations of the times of sunrise and sunset and of goemagnetic noon and midnight are given as a basis for comparing the rules of solar and geomagnetic influences.

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Union Internationale des Télécommunications.

— Nomenclature des stations de contrôle international des émissions, 2e édition 1965 (Liste VIII).

Cet ouvrage contient les parties suivantes :

Partie I : Bureaux centralisateurs.

Partie II : Etat signalétique des stations de contrôle, divisé en cinq sections :

A. Stations qui effectuent des mesures de fréquence.

B. Stations qui effectuent des mesures d'intensité de champ.

C. Stations qui effectuent des mesures radiogoniométriques.

D. Stations qui effectuent des mesures de largeur de bande.

E. Stations qui effectuent des relevés automatiques du degré d'occupation du spectre.

Le prix de vente d'un exemplaire de cette publication trilingue (français, anglais et espagnol), qui compte environ 100 pages, a été fixé à 5,20 francs suisses; ce prix comprend les frais de port pour envoi par la poste ordinaire dans le monde entier, l'emballage et l'abonnement aux suppléments qui paraîtront jusqu'à la prochaine édition.

Les commandes peuvent être adressées à la Section des Ventes de l'UIT, Place des Nations, 1211 — Genève 20, Suisse.

International Telecommunication Union.

— List of International Monitoring Stations, Second Edition, 1965 (List VIII).

The List comprises the following parts :

Part I : Centralizing offices.

Part II : Particulars of monitoring stations. This part is divided into five sections :

A. Stations carrying out frequency measurements.

B. Stations carrying out field-strength measurements.

C. Stations carrying out direction-finding measurements.

D. Stations carrying out bandwidth measurements.

E. Stations carrying out automatic spectrum occupancy surveys.

The price per copy of this trilingual document (French, English and Spanish), which runs to some 100 pages, is 5.20 Swiss francs: this is inclusive of the cost of packing and postage by surface mail to any address, and the subscription for supplements issued prior to the next edition.

Orders may be sent to the Sales Section of the ITU, Place des Nations, 1211 — Geneva 20, Switzerland.