IONOSPHERIC NETWORK ADVISORY GROUP (INAG)

Note: page numbers are incorrect because, among other things, the page and font sizes were changed.

Ionosphere Station Information Bulletin No. 11

* Under auspices of the Solar—Terrestrial Physics Committee of the International Union of Radio Science (URSI/STP Committee).

** Issued on behalf of INAG by World Data Center A for Solar—Terrestrial Physics, National Oceanic and Atmospheric Administration, Boulder, Colorado 80302, U.S.A. The bulletin is distributed to stations by the same channels (but in the reverse direction) as their data ultimately flow to WDC—A. Others wishing to be on the distribution list should notify WDC—A.

Comments by Chairman, W. R. Piggott
(Received after INAG—11 to press)

The INAG was set up at the last URSI General Assembly, three years ago and will hold its first formal meeting at the URSI General Assembly in Warsaw, August 21—29, 1972. This gives you, through your National representatives, a chance to say whether you think this has been a useful organization, whether it should continue and, if so, whether you wish the policy to be changed. It also gives an opportunity for debate on the many controversial points raised in the past ten issues of this Bulletin.

Most international efforts, whether organized by URSI, TAGA, STP, COSPAR, or by local initiative are basically short lived. Thus most international organizations prefer to dissolve working groups at fairly frequent intervals, replacing them by new groups directed to new objectives. Experience shows that this philosophy can have serious disadvantages where it is desired to produce synoptic measurements. These are partly due to the fact that a long sequence of observations can lose more by a change of rules which cause a break in continuity than is gained by the improvement; partly because experience is valuable in writing rules which are to be used on a worldwide basis.

The main objectives of a synoptic programme are to show when and where particular phenomena occur. It often can also provide data showing how and why but where these questions demand special experiments they normally fall outside the objectives of the networks. Thus the network is essentially a long—term project. If INAG is proved to be successful it should probably also be a continuing body. The decision should be based on an appreciation of the need for synoptic work and should be considered at Warsaw.

Enquiries made by our parent body, the URSI/STP Committee, showed that there was no demand on the part of the administrations responsible for our stations for a review of the policy of maintaining a network roughly similar to the current network. In practice many stations are maintained for local reasons, their contribution to the network is a valuable scientific bonus at little marginal additional cost.

We are always willing to organize another meeting for administrations if there is adequate support for the proposal; there will be an opportunity at Warsaw to raise this matter. It seems sensible to keep to the policy agreed at the London meeting and confirmed by URSI/STP until it is altered by another representative meeting. These were given in detail in Bulletin No. 1, pp. 4—13. We may note that the main requirements have been met, at least in part, by the UNESCO sponsored visits to Africa and South America, the production of this Bulletin and by the meetings in Leningrad, Brussels and now Warsaw at which many V.I. problems have been discussed in some detail, There have also been several regional or national meetings to discuss V.I. problems and others are planned, for example in Australia, South America and U.S.S.R. Thus there appears to be a more widespread understanding of our problems and more consideration of them than has occurred in the past. There has been inadequate or no progress with three problems:

(a) Aid to stations in financial difficulties.
(b) Monitoring data accuracy and improving it.
(c) Improving the training of operators.

These represent the real challenge to our present voluntary organization and need discussion at Warsaw.

The possibility of setting up a Government backed organization, or joining W.M.O., has been much discussed but does not appear to be promising for solving our problems. There are considerable difficulties in both making any government money available for our needs, and in making sure that it is wisely spent if made available. Thus, on item (a), while the costs of providing film and consumable stores for a year's operation is small, the cost of overhauling the station and training operators could be ten or more times greater. Would the provision of the smaller amount be effective in providing adequate data? Where only one group appears to be involved in the request for data the natural response is “if you want these data you must pay for them

yourselves", which, while logical, is often not practical. Another difficulty is that good data from suitably placed stations has lasting value and is used by groups with no direct contact with the stations. This problem is, of course, common to all synoptic disciplines. It appears that we shall not get much further without making responsible appreciations of what is needed and its cost effectiveness. Unfortunately even evaluating the probable value of the data is a skilled and time consuming job. Similar difficulties arise in attempting to monitor the reliability of the data. Several times the idea of designating 'key stations' which would guarantee to maintain a high quality and rapid data interchange has been put up to solve the problem. In practice the stations have not been willing to volunteer for this role, many because of doubts about whether they know when the data are reliable. Thus we depend on voluntary effort which is inadequate to solve the problem. We shall need the support of an informed public opinion. These are probably the most important points of general policy which need discussing at Warsaw.

Turning to more detailed problems, we have had relatively few comments on the proposals made in past INAG Bulletins. Judging from our Leningrad and Brussels experiences, this is more due to your inertia than to lack of interest. We, therefore, propose to review all these proposals at Warsaw, discuss them with those present, probably by establishing some working groups where detailed discussion appears to be possible.

The general programmes of V.I. recording analysis and data interchange were last reviewed some ten years ago, in preparation for the I.Q.S.Y. 1964—5. It is desirable that we reconsider these programmes both from the point of view of the changing needs of the scientists using the data and from the point of view of economy in operating the networks. The former can be sampled at Warsaw, for the latter we propose to circulate a questionnaire to all stations to find your views. Final decisions will be taken when we see what is the consensus of opinion:

- (a) whether 5—minute recording is worthwhile,
- (b) the electron density profile programmes.

The main preoccupation of our collaborators has been the interpretation and use of high latitude ionograms. This will be reviewed at Warsaw and plans made for any necessary future work. The new edition of the Handbook has been extensively revised in the light of the discussions at Leningrad and in Brussels and it is now timely to try to settle some of the outstanding points.

There has never been a wide international discussion of the interpretation of low frequency ionograms at frequencies below the gyrofrequency. The I.Q.S.Y. recommendations reproduced in INAG—8 were intended to provide a start on this problem but there has been little detailed comment on their value. The main change since they were published is a significant use of fzE at night. This usually falls below the lower frequency limit of the broadcast band and is thus often free of interference when foE and fxE are unobservable. Some stations have used the approximation foE = (fzE + fB/2). In this case though it can cause serious errors in foE. The theoretical relation is $(foE)^2 = (fzE)^2 + (fzE)fB$.

INAG badly needs views on the contents of the Bulletins. Do you want a different emphasis? If the Bulletin has to be cut for financial reasons which parts should be left out? Do you want comments on new ionosondes, new attachments to ionosondes or new ways of handling data? Do you approve of including comments on other techniques, drifts, absorption, whistlers, incoherent scatter, etc? Is the Bulletin too conservative in outlook?

At URSI, the scientific community should express a view on whether INAG and its Bulletin are worthwhile and should continue. INAG should discuss the matters raised in the past, come to some decisions and, if it is to continue, plan for the future.

I. Introduction

by

J. Virginia Lincoln, INAG Secretary

Our chairman Mr. W. R. Piggott has found it impossible to provide material for this issue of the Ionosphere Station Information Bulletin. This quarterly, INAG—11, was due for publication in May. However, as many of you know, Mr. Piggott suffered a fall while on the Antarctic cruise and was hospitalized for several weeks in March upon his return to England. He then had to prepare for the SCAR Symposium on Technical and Scientific Problems of Arctic Telecommunications in Norway during May.
The press of his usual work plus preparation of manuscript for the revision of the URSI Handbook of Ionogram Interpretation and Reduction has prevented the submission of his usual input for our Bulletin.

Therefore your Secretary has made the decision to issue a shorter than usual version before the XVII General Assembly of URSI in Warsaw. I shall carry copies of it to Warsaw for the use of the INAG members and representatives present.

The next issue of the Bulletin, INAG—12, we will hope to issue in late September, or early October, giving details of many of the year's activities.

In late April when I saw Mr. Piggott in London, he had planned to issue an agenda for an INAG meeting during the Warsaw Assembly. Among the probable items to be raised are: (1) Membership of INAG; (2) High latitude problems; (3) Lacuna (4) Tilted ionosphere; and (5) Data flow.

II. XVII General Assembly of URSI

Prof. Karl Rawer, President of Commission III, has written Dr. Matsushita, Boulder, Colorado, that the following five "workshop meetings" are planned for Sessions 111.4 and 111.7 at the Warsaw General Assembly, August 1972:

1. The International Reference Ionosphere,
2. Incoherent Scatter,
3. Cooperation in and with IMS,
4. Sporadic—E,
5. Radio Wave Diffraction by the Ionosphere.

INAG participation is being requested at these workshop meetings.

Our chairman, W. R. Piggott, has also been asked to report on the May 1970 Leningrad Symposium, "On High Latitude Ionograms" during Session 111.2 "Reports of Recent Symposia."

III. Membership of INAG

Excerpts from letter of Glenn M. Stanley to W. R. Piggott:

"It is with some regret that I must tender my resignation as a member of the Ionospheric Network Advisory Committee. Press of duties at the Institute and lack of supporting funds make it necessary for me to do so. I would not have you think that I believe that INAG is not a useful organization, but rather that its importance deserves more attention than I am able to give to it...

"I am involved in several major programs in biomedical communications and ionospheric scintillation studies that are taking almost all of my time. I shall be available to INAG to help in any way that I can, however, and will continue as time permits to submit information to your INAG bulletin that seems pertinent...

"I hope you have had time to read the thesis by Dr. Lee Snyder. He has, I think, made an important contribution to the knowledge of the high latitude ionosphere and points the way to measurements that will be of considerable significance. I am presently proceeding towards implementing a measurement program which would include the operation of a number of ionosondes along the magnetic meridian across the auroral oval through Alaska. I can only estimate when such a program will be funded ...

"Again, let me assure you of my regrets of having to resign from INAG and assure you that I wish that I could have met with the entire group this August at Warsaw."

This leaves a vacancy for Northern Hemisphere representation in the American sector as well as the vacancy in Southern Hemisphere representation created a year ago by Dr. G. A. M. Kings s resignation.

IV. Decisions of COSPAR Madrid May 1972

The following Decisions from the COSPAR meeting are of interest to INAG:

Decision No. 10 proposed by the Executive Council on the proposal of Working Group 4

COSPAR,

considering the great potential importance of coordinated simultaneous observations of travelling ionosphere disturbances (TID's), associated with auroral heating events, as they propagate towards the equator,

asks URSI to repeat the coordinated campaign of simultaneous observations with ionosonde and incoherent scatter stations as organized by its Commission III in 1970,

and requests IUCSTP to consider further coordination of such experimental projects, in which appropriate observations of such phenomena are made using ground—based, rocket and satellite techniques, as part of the proposed IUCSTP programme on the energetics, dynamics and structure of the thermosphere.

Decision No. 11 proposed by the Executive Council on the proposal of Working Group 4

COSPAR,

recognizing the increasing importance of coordinated measurements in the polar ionosphere by means of satellite, sounding rocket, aircraft, balloon and ground—based techniques, particularly for the IMS, and the importance of space observations for the calibration of ground—based techniques for ionospheric, auroral and magnetospheric studies,

recommends the encouragement of coordinated space activities in the auroral and polar cap regions.

V. IUCSTP Commission Meeting March 1972

At the London meeting it was agreed that the present 12 IUCSTP projects and their accompanying groups will be phased out in the coming year. The composition of the Commission, itself, will also change. The "new look" will consist of interdisciplinary or union areas, each with a designated leader and with a small steering committee. Under these will be a few interdisciplinary projects which require special or specially coordinated observing efforts or, alternatively, study programs to cover important interdisciplinary scientific problems which require further study and discussion before an observing program cam be recommended. The systematic monitoring and data area under the program name "MONSEE" —— Monitoring of the Sun—Earth Environment, specifically includes the guide for data exchange and coordination of the WDCs in solar—terrestrial physics. The tentative proposed reorganisation is given on the following block diagram (on page 4). The final version is hoped to be adopted in early 1973 after the Madrid COSPAR meeting ad hoc working meetings, followed by review and comment by the Unions, COSPAR, national STP committees, and others.

VI. Status of Revision of URSI Handbook of Ionogram Interpretation and Reduction

All chapters, but those concerned with N(h), have been received by World Data Center A for Solar—Terrestrial Physics. The chapters which have been received have been typed. A few questions still need resolution by the editors. As soon as the Last chapters are received, the manuscript will be sent very promptly to the printer for reproduction. As the chapters have been completed they have been sent to Mlle. G. Pillet for translation into French and to Mine. N. Mednikova for translation into Russian. We have also received an offer for translation into Spanish from L.I.A.R.A. in Buenos Aires, Argentina. The decision as to whether to accept Mr. Mesterman' s offer has not yet been made.

Mr. Piggott's illness following his trip to Antarctica has postponed completion of the revision before the Warsaw XVII General Assembly of URSI. However, an electrostatic copy of the completed chapters will be available for inspection by attendees in Warsaw.

VII. Notes from Stations Boulder

On 1 May 1972 the identification letters on the Boulder ionograms were changed to BC. Previous to that time the identification read BL.

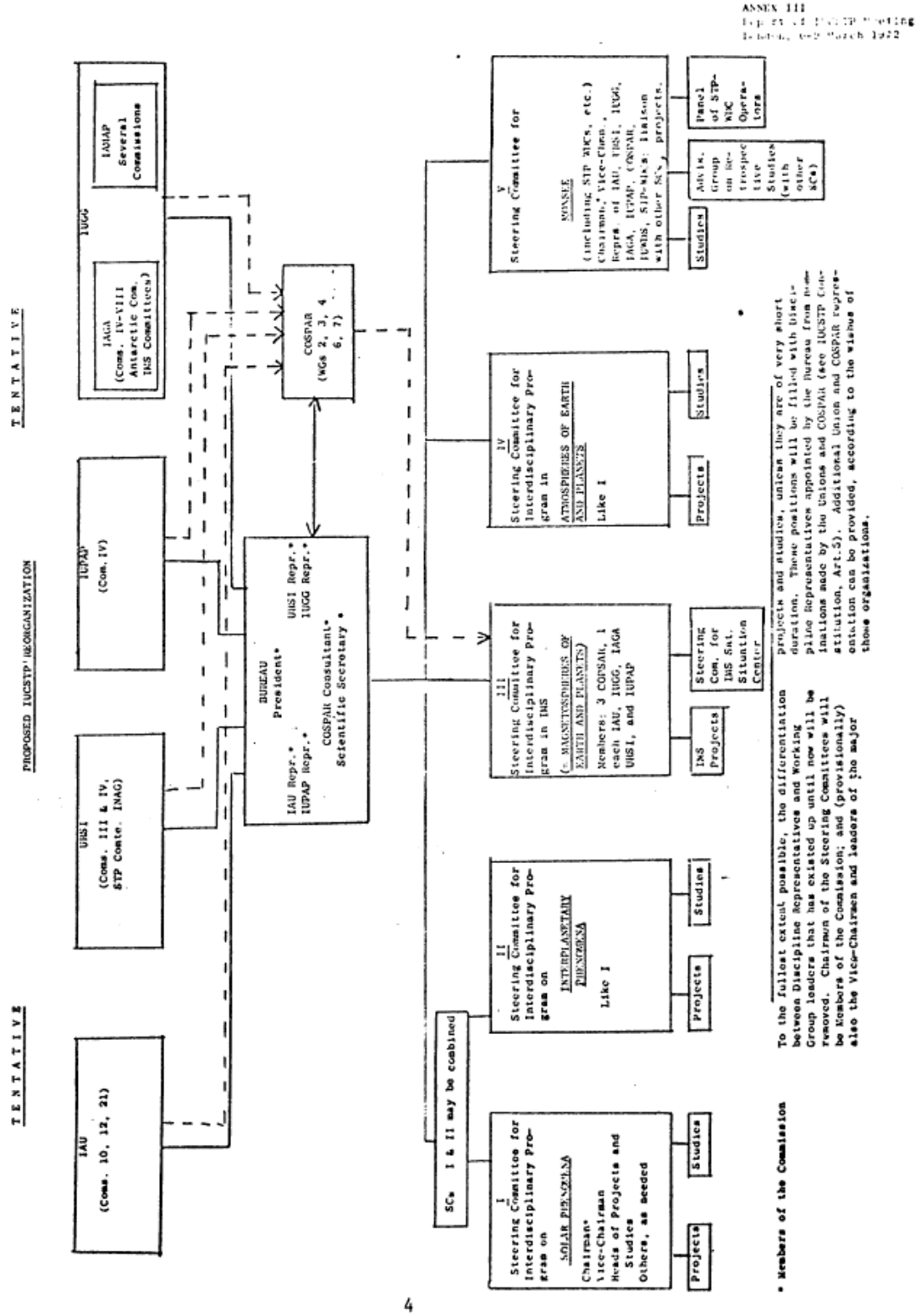
It should also be pointed out to users of the Boulder ionograms that care should be taken to refer to the "scaling notes" in order to ascertain the times when ionosphere modification experiments by very high power, high frequency ground—based transmission were being conducted at the Erie Site. These intermittent experiments (starting in September 1970) have produced spread F conditions on the Boulder ionograms as reported by W. F. Utlaut, E. J. Violette and A. K. Paul (see INAG—7, p. 20) and William F. Utlaut and Robert Cohen (see INAG—1O, p. 24).

Okinawa

Japan wishes to announce that since June 15, 1972, the Okinawa station, which had been maintained by the U.S.A. for many years, is being operated by their Radio Research Laboratories. The data will be provided on the basis of exchange to the World Data Centers as are the other Japanese data.

Scott Base

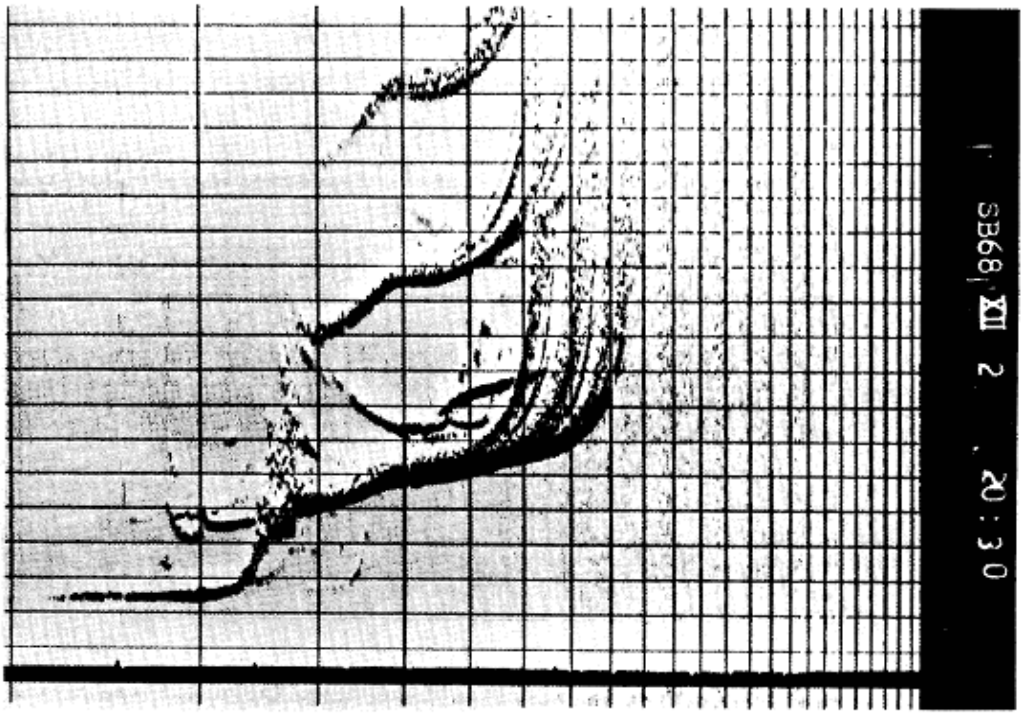
Mr. Roper of the Geophysical Observatory, Christchurch, commented in a recent letter: "It is a great pity that the Atlas of Ionograms was published before we could send new prints taken from our rebuilt displays. We feel that the quality of the ionograms shown in the atlas may mislead people into thinking that data from Rarotonga, Christchurch and Scott Base may not be as good as we claim. I enclose a print taken from a Scott Base ionogram which will indicate how much improved our records are."


TENTATIVE
PROPOSED IUCSTP ORGANIZATION
TENTATIVE
IAU
(Coms. 10, 12, 21)
URSI
(Coms. III & IV, STP Comte. INAG)
IUPAP
(Com. IV)
IAGA
(Coms. IV-VIII Antarctic Com. INS Committees)
IUGG
IAMAP
Several Commissions
COSPAR
(WGs 2, 3, 4 6, 7)
BUREAU
President*
IAU Repr.*
IUPAP Repr.*
URSI Repr.*
IUGG Repr.*
COSPAR Consultant*
Scientific Secretary *
SCs 1 & II may be combined
I
Steering Committee for Interdisciplinary Program on
SOLAR PHENOMENA
Chairman
Vice-Chairman
Heads of Projects and Studies
Others, as needed
II
Steering Committee for Interdisciplinary Program on
INTERPLANETARY PHENOMENA
Like I
III
Steering Committee for Interdisciplinary Program in INS
(= MAGNETOSPHERES OF EARTH AND PLANETS)
Members: 3 COSPAR, 1 each IAU, IUGG, IAGA URSI, and IUPAP
IV
Steering Committee for Interdisciplinary Program in
ATMOSPHERES OF EARTH AND PLANETS
Like I
V
Steering Committee for
MONSEE
(including STP SSCs, etc.)
Chairman, Vice-Chmn., Repres. of IAU, URSI, IUGG, IAGA, IUPAP, COSPAR, IAMAP, SIP-WGs; liaison with other SSCs, projects.
Projects
Studies
INS Projects
Steering Com. for INS Sat. Situation Center
Advis. Group on Prospective Studies (with other SSCs)
Panel of STP-NSC Operators
* Members of the Commission
To the fullest extent possible, the differentiation between Discipline Representatives and Working Group leaders that has existed up until now will be removed. Chairmen of the Steering Committees will be Members of the Commission; and (provisionally) also the Vice-Chairmen and leaders of the major projects and studies, unless they are of very short duration. These positions will be filled with discipline Representatives appointed by the Bureau from nominations made by the Unions and COSPAR (see IUCSTP Constitution, Art.5). Additional Union and COSPAR representation can be provided, according to the wishes of those organizations.

ANNEX III

4

The sample ionogram from Scott Base is reproduced below.



Mr. Roper further stated: "You may be interested to know that the Observatory has become involved in a satellite data acquisition programme. We are now processing data from the Alouette II, Isis I and II satellites acquired through the N.Z. facility at Lauder in the Central Otago region of the South Island. We hope to do some topside—bottomside sounding correlations with the data from our 6 stations."

VIII. Notes from WDCs

World Data Center A for Solar—Terrestrial Physics, Boulder, Colorado, U.S.A.

The data from stations operated by the National Oceanic and Atmospheric Administration (NOAA) have now been summarized on microfiche directly from magnetic tape without the preparation of the usual computer printout tabulations. These will be sent to WDC—C1 and C2. Shipping costs are greatly reduced as well as the storage space necessary to archive them.

The "Catalog of Data on Solar—Terrestrial Physics" is in process of updating and will be issued in the UAG—Report series.

World Data Center C2 for Ionosphere, Radio Research Laboratories, Tokyo, Japan

Dr. Kasuya has sent the floor plan of their data center and pictures of their booklet and film rooms. They are reproduced below.

Room 1: Booklet

INAG-11 August 1972

Room 2: Film

Room 3: Film

7

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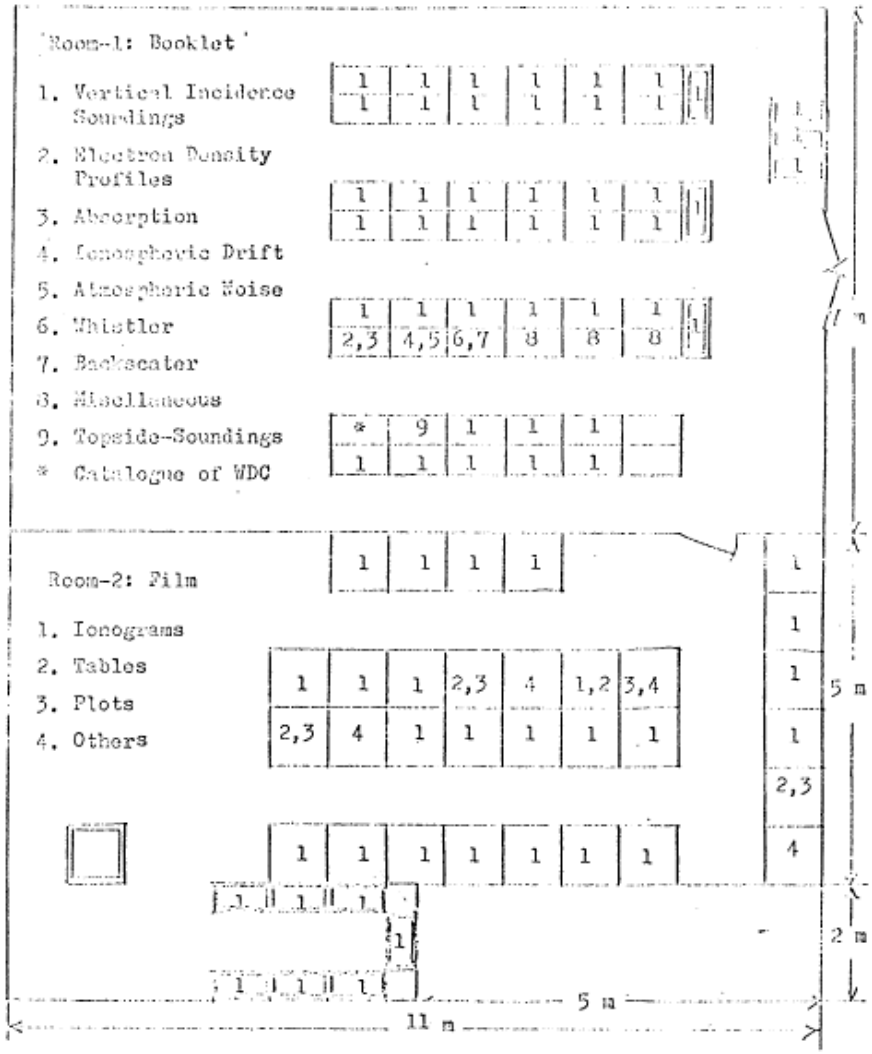
World Data Center C2 for Ionosphere (as of 1972)

International Data

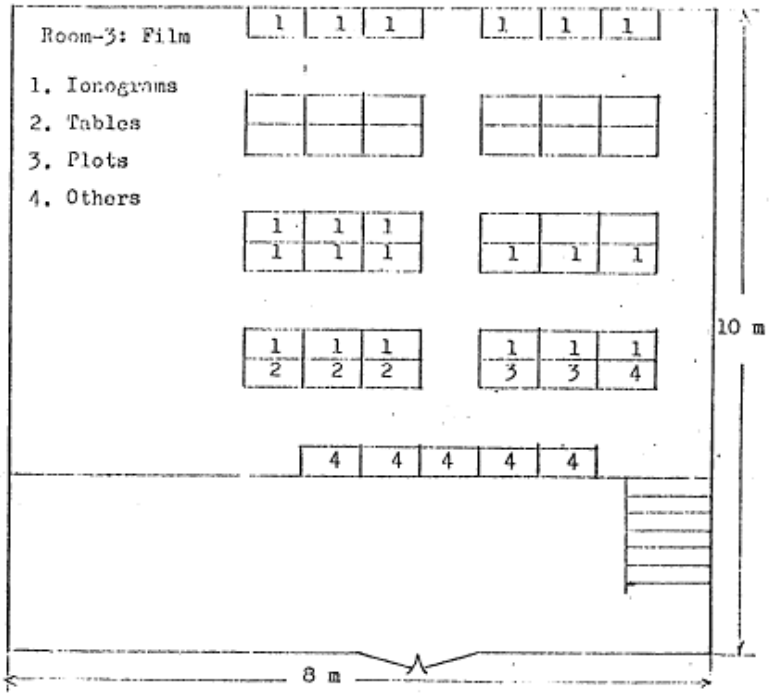


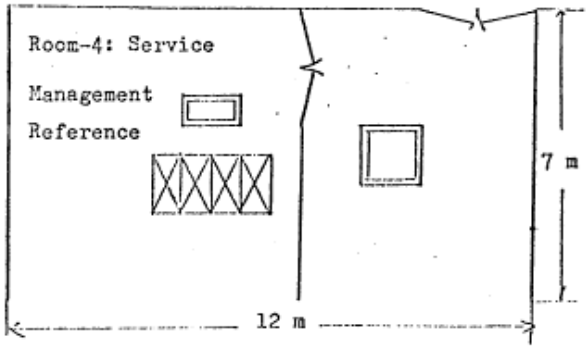
Symbol	Name	Set
	... Bookshelf.....	105
	... Filing Cabinet.....	7
	... Film Cabinet.....	3
	... Visible Recorder.....	4
	... Microfilm or Fiche..... Reader Printer	2

INAG-11 August 1972

World Data Center C2 for Ionosphere (as of 1972)

Domestic Data





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Electrostatic
Copying Machine.....1 (")

IX. Spanish Translation of INAG—1O

Again, thanks to Professor Maria Cristina Bustos of the Seccion Aeronomia, Instituto de Fisica, Universidad de Concepcion, Concepcion, Chile, INAG—1O has been translated into the Spanish language. WDC—A printed the Spanish version and distributed it to the Spanish speaking stations. Additional copies are available from Miss J. Virginia Lincoln, INAG Secretary.

X. Literature Citations

We request your comments on the usefulness of this section of the bulletins. It is not possible to cover all journal articles involving the use of vertical incidence sounding data. The inclusion of these abstracts adds to the printing costs, and evidence of their usefulness to you is necessary to justify their continuation.

FAYNOT, J. M., P. VILA and J. WALTER 1971 Upward-moving irregularities in the subequatorial ionosphere, J. Atmos. and Terr. Phys., 33, 1621-1627.

Upward-rising equatorial strata, differing from other h'(f) structures, are described. The rising motion, analyzed by N(h) profiles, can be explained at F2-region levels by Hall drift from the daytime west-east electric field. Day-to-day and seasonal variations are discussed.

(Ft. Archanbault, Ougadougou)

ECCLES, D., J.W. KING, H.KOHL and R.J. PRATT 1971 The semi-annual variation in the height of the F2-layer peak, J. Atmos. and Terr. Phys., 33, 1641-1646.

Noon values of hmF2 have been calculated for two mid-latitude stations for the fifteenth day of each month in 1958. The theoretical variations of the layer height during the year are found to be similar to those observed only when the semi-annual variation of exospheric temperature and the effects of neutral-air winds are taken into account in the calculations. The calculated and observed foF2 variations are, however, completely different, indicating that some mechanism exists which exerts a controlling influence on the electron concentrations without seriously affecting the height of the layer peak.

(Lindau, Port Stanley)

KANTARIZIS, E. 1971 Measurement of the thickness of a sporadic E-layer, J. Atmos. and Terr. Phys., 33, 1651-1656.

A method is described for measuring the thickness of a sporadic E-layer from records obtained when using a Phase Ionosonde. The method involves the measurement of the phase advance, caused by the presence of a sporadic E-layer, on echoes from the F-region. One example is analyzed in detail and it was found that the sporadic E-layer was a sharp-peak layer, and its thickness at a plasma frequency equal to 90 per cent of its critical frequency was 5 km. The thickness of the same sporadic E-layer was also measured independently by performing a true-height reduction, by a polynomial method, using the phase of the echoes from the E-region of the ionosphere. The results obtained from the two methods were consistent.

(Brisbane)

BELIKOVICH, V. V., YE. A. BENEDIKTOV, V.A. VASIN and L. V. GRISHKEVICH 1971 An Unusual Ionospheric Disturbance, Moscow, Geomagnetizm i Aeronomiva, Vol. XI, No. 6, 1117-1118.

On the nighttime side of the northern hemisphere during the period of the magnetic storm of 2 December 1967 in the temperate-latitude zone the ionograms showed the appearance of powerful diffuse reflections from the F2 layer and a considerable increase in foF2 critical frequencies. At Gor'kiy during this time foF2 increased from 2 to 4.25 Mc/sec and the altitudes hp increased by more than 100 km. At the same time at Gor'kiy there was a decrease in the cosmic radio emission intensity levels at frequencies 9, 13 and 25 Mc/sec. The greatest weakening of the cosmic radio emission level at these frequencies was 1.2, 0.4 and 0.1 dB. Since during this period the fmin values of the ionograms did not change, such a decrease in signal levels on the riometer records was caused by processes in the F region. Analysis of numerous results of observations indicate that at f ≥9 Mc/sec the intensity of nighttime absorption of radio waves in the ionosphere at Gor'kiy when foF2 ≤3-5 Mc/sec is extremely small. Therefore, the above-mentioned decrease in the intensity of cosmic radiation at f = 9 Mc/sec during the nighttime hours is an unusual event. This phenomenon cannot be attributed exclusively to the usual mechanism of radio wave absorption in the ionosphere since it must be assumed that during the period of the disturbance the electron temperature in the F2 layer decreased by more than half in comparison with the values characteristic for a quiet state of the ionosphere during this time of day and year. However, such an assumption is scarcely justified. The intensity decrease began immediately upon the appearance of diffuse reflections when the foF2 values were ~2 Mc/sec. In this case it would be natural to assume that an appreciable and possibly the predominant part of weakening of the intensity of cosmic radio emission was related to the back-scattering of radio waves by small-scale ionization inhomogeneities in the F region. One of the principal arguments for such an assumption is that for ordinary radio wave absorption in the F2 layer the exponent for the frequency dependence n = 2, whereas due to the effect of radio wave scattering by small-scale inhomogeneities the n values increase. For this unusual phenomenon the n values during the period of the disturbance maximum fall in the range $2 < n < 4$.

(Gor 'kiy)

OVEZGEL'DYYEV, 0. and A.KHYDYROV 1971 Latitude Dependence of PEs, Diurnal Variation, Seriya Fiziko-Tekhnicheskikh. Khimicheskikh i Geologicheskikh Nauk, No. 5, 51-57.

On the basis of the diurnal and seasonal variations PEs, PEs > 3 Mc/sec and PEs > 5 Mc/sec the earth can be divided into three latitude zones: equatorial, middle latitude, and high latitude. In a study of the dependence of the diurnal variation of PEs on latitude and longitude of the observation site the authors used experimental data from 70 ionospheric stations in the northern hemisphere. The diurnal variation PEs was determined by seasons of the year. The computations for expanding PEs into a Fourier series were made at the Computation Center of Tomsk State University. Computations were made for n = 8. It was found that the use of high harmonics yields no significant improvement in the approximations. Only the first two harmonics need be used. The dependence of the harmonic components of PEs on latitude and the dynamics of the ionospheric E region and the Es layer are fully discussed. It was found that for both PEs and for the drift velocity the principal components are the constant components AO and harmonics with periods of 24 and 12 hours. PEs and the zonal component of velocity in many respects have an identical dependence on latitude: a) the latitude dependence of the amplitude of the diurnal component A1 of the zonal component of drift velocity, V_{EW} and PEs is completely similar. In the middle latitudes (approximately 15-5O°Φ), A1, like PEs and V_{EW}, is not dependent on latitude. But in the middle and high latitudes, on the other hand, A1 is essentially dependent on latitude; b) for both parameters PEs and V_{EW} the nature of the latitude dependence of the ratio A1/A2 completely coincides; c) the amplitude of the semidiurnal component A2 for both parameters is not essentially dependent on latitude at latitudes approximately below 55°Φ. The harmonic components of PEs are virtually not dependent on the season of

the year. The observed seasonal dependence of PEs is caused for the most part by a seasonal change in the constant component.

(Tomsk)

NELSON, G. J, and L. L. COGGER 1971 Dynamical behaviour of the nighttime ionosphere at Arecibo, J. Atmos. and Terr. Phys., 33, 1711-1726.

A survey of 130 nights of incoherent scatter data collected at Arecibo between October 1965 and June 1969 has revealed the presence of two persistent dynamical features in the nighttime ionosphere. The first general characteristic is a downward motion of the F-layer which commences near midnight on 85 per cent of the nights and results in a height change of typically 50 to 100 km. A study of ionograms from other stations showed that the local time of commencement increases linearly with magnetic latitude in both hemispheres; however, it occurs less frequently with increasing latitude. The second dynamical feature is an upward motion which follows the downward motion and occurs on 60 per cent of the nights. The timing of the two events is unrelated and the rise sometimes begins simultaneously over large areas in both hemispheres. It does not occur at the geomagnetic equator. Possible mechanisms for these events are discussed briefly. Changes in the intensity of the 6300°A night airglow emission are related to the variations in recombination rate resulting from these motions.

(Ottawa, Wallops Island, White Sands, Mexico City, Arecibo, Huancayo)

DELAND, R. J. and R. N. FRIEDMAN 1972 Correlation of fluctuations of ionospheric absorption and atmospheric planetary scale waves, J. Atmos and Terr. Phys., 34, 295-304.

The values of f-mm reported by 12 ionosonde stations between 40° and 60° north geographic latitude, for the 5 hr centered on local noon, during the period 1 November 1964-30 April 1965, were subjected to zonal Fourier analysis. The first two zonal harmonics, zonal wave-numbers 1 and 2, were correlated with the corresponding harmonics of the atmospheric pressure fields for the stratosphere. The fluctuations of the f-mm harmonic of wave-number 1 are shown to be in phase with approximately simultaneous fluctuations of the same harmonic of the height of the 50 and 10 millibar constant pressure surfaces and the thickness of the 50-10 millibar layer. The observed relationship is tentatively explained as due to approximately vertical planetary-scale disturbances of the temperature field which are associated with the fluctuations of the planetary-scale waves in the constant pressure surfaces.

(Sverdlovsk, Tomsk, Moscow, DeBilt, Slough, Adak, Winnipeg, St. Johns, Yuznoskhali, Wakkanai, Ottawa, Ft. Monmouth)

HARNISCHMACHER, E. and K, RAWER 1972 A summary description of ionospheric absorption measured at Freiburg since 1956, J. Atmos. and Terr. Phys., 34, 947-951.

Apart from explanations in terms of physical models, the average results of multi-frequency absorption measurements may be described by empirical expressions. These can be rather simple in the variables f (frequency) and foE, the latter being used as a parameter characterizing both, solar activity and season together. Summer conditions are described by a sum of three terms, two of which give the overall behaviour with f and foE as coordinates while the third one is the selective peak near foE. In winter a fourth contribution characterizing the winter anomaly must be added.

(Freiburg)

XI. INAG Members

The following are the current members of INAG:

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