IONOSPHERIC NETWORK ADVISORY GROUP (INAG)*
Ionosphere Station Information Bulletin No. 25 **

* Under the auspices of Commission G Working Group G.1 of the International Union of Radio Science (URSI).

** 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 reverse direction) as their data ultimately flow to WDC-A. Others wishing to be on the distribution list should notify WDC-A.

I. Introduction

by

W. R. Piggott, Chairman

I must apologize to INAG members and the users of the INAG Bulletin for the long delay in publishing this Bulletin. Unfortunately I have been fully occupied with administration in recent months. However, Dr. Dudeney and Mr. A. Rodger have combined to help sort the material , thus enabling me to complete this Bulletin. I hope that this mechanism will be successful in producing future Bulletins with less delay. If not, it will be necessary for INAG to consider appointing a new chairman who could be more active.

I wish to draw your attention to an ad hoc INAG meeting to be held in conjunction with the IAGA General Assembly at Seattle (22 August to 3 September) and a full INAG meeting to be held in conjunction with the CCIR meeting in Geneva (*5 and 6 January 1978).* I hope that as many as possible of INAG members and consultants will attend at least the latter meeting where we should discuss the future of the ionospheric network and action on the Handbook. It is hoped that an interim report of Dr. Rishbeth's URSI/IAGA Joint Working Group on "Needs for Ionosondes after the IMS" will be presented at IAGA.

The INAG meeting at Cambridge was held to try to follow up the recommendations made at the meeting held in Boulder. In fact, the small working group has been very active and has completed the work on revising the Handbook, UAG-23. We now need to know how strong is the request for preparing a simplified Handbook. We also need guidance on whether any of the parameters or letter symbols can be withdrawn in order to simplify the analysis technique. *Please send us your views.* We need to judge the extent to which the latter are used at present and are likely to be used in the future. Unfortunately the long gap since the last Bulletin has allowed the debate on these matters to die. In practice, of course, there can be no solution satisfactory to everyone. A possible compromise might be to relax some of the rules at low and temperate latitudes where abnormal patterns are comparatively rare, while keeping them in difficult zones. For example, many high latitude workers would argue that the loss of Es types would be a serious omission whereas workers elsewhere might come to the opposite conclusion.

While Dr. Rishbeth's working group has restricted itself to considering the scientific needs for ionospheric soundings in the future, there have been some signs of renewed interest in such observations from the practical point of view (see minutes of the Boulder Meeting). *INAG would like to know how extensive this is.* If you are aware of Administrations who are reconsidering this point, please let us know. There appears little doubt that ionospheric communications can have economic advantages when mobility is important and in developing countries. However, the decision whether to use these or the usually more expensive, more modern techniques is political. INAG can only make a case for the practical use of sounding data if Administrations really intend to adopt the applications.

Part of the difficulty in preparing this Bulletin has been due to the large number of points which have been raised with me by members of the community. Most of these need some thought and discussion to solve satisfactorily. Thus the gap in publication has been due more to an abnormally large interest in INAG matters than to any falling off in this respect !. I have been very surprised by the large number of people who have expressed the view that a relatively large ionospheric network will be needed after the end of the IMS. In view of the shortage of money for science in most of the world this suggests that we network people tend to underestimate the value of our work. May I wish you all success in the future.

II. Minutes of the INAG Meeting, June 11, 1976, Boulder, Colorado

Participants:

A. H. Shapley, Honorary Member, Chairman for Meeting	U.S.A.
J. Virginia Lincoln, Vice Chairman and Secretary, INAG	U.S.A.
J. R. Dudeney, Alternate member for W. R. Piggott	U.K.

R. 0. Conkright, Alternate member for J. V. Lincoln	U.S.A.
G. M. Brown	U.K.
D. B. Bucknam	U.S.A.
J. 0. Cardus	Spain
F. E. Cook	Australia
A. Giraldez	Argentina
J. A. Gledhill	South Africa
T. R. Hartz	Canada

Participants (Continued)

V. Neble Jensen	Denmark
T. Ondoh	Japan
S. Radicella	Argentina
B. M. Reddy	India
M. Sylvain	France
H. Perez de Tejada	Mexico
P. Triska	Czechoslovakia

In an effort to save space the main points discussed at the meeting are summarized.

History of INAG

The Chairman, A. H. Shapley, reviewed the history behind INAG beginning in about 1950 when CCIR and URSI requested the standardization of ionospheric data especially from high latitudes. In 1954 the f-plot was invented and suggested as a useful tool for interpreting high latitude ionograms. In preparation for the IGY, URSI appointed the World-wide Sounding Committee, which led to the rules that became the Handbook of Ionogram Interpretation and Reduction, and which was instrumental in bringing together Network people. In 1969 a special meeting was organized by the URSI-STP Committee to consider the future of the network, which eventually led to the formation of INAG.

Status of Networks

Statements by the participants can be summarized as follows:

(a) Stations now operating:-

Argentina - Buenos Aires, Ushuaia, Tucuman
Australia - Brisbane. Canberra, Hobart, Mawson, Mundaring, Norfolk Island, Townsville, Vanimo
Canada - Churchill, Kenora, Ottawa, Resolute Bay, St. John's
Czechoslovakia - Pruhonice
Greenland - Godhavn, Narssarssuaq, Sonderstrom (Rocket campaigns), Thule
India - Up to 10 ionosondes would be needed for the future Indian network.
Japan - Akita, Syowa, Tokyo, Wakkanai, Yamagawa
Mexico - Mexico City
South Africa - Grahamstown, Johannesburg, Hermanus, Marion Island, Sanae, Tsumeb
Spain - Tortosa, El Arenosillo (Rocket Range)
U.K. - Aberystwyth (special experiments), Argentine Islands, Halley Bay, Port Stanley, Slough, South Georgia, South Uist (Rocket campaigns)
U.S.A. - Wallops Island, Boulder, Maui, Point Arguello, White Sands

(b) Possible changes:

Trelew should be operational by the end of 1976. Belgrano may operate from June 1976 onwards, subject to disruption if the base is moved. Argentina would like to set up an ionosonde at San

Juan.* An experimental digital ionosonde is under test at Pruhonice and may be put into routine operation within the next two years to replace the old ionosonde which is inadequate for N(h) profile work.

The Okinawa station is being relocated and should start again in 1977 (Ed. Note: Reopened on Feb. 1, 1977, see p. 13.) The ionosonde at Almeria, Spain, closed in 1976. A station on the Canary Islands is being considered and may open within the next two years. The ionosonde at College continues to operate but data are only analyzed for special purposes.

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* The National Geophysical and Solar-Terrestrial Data Center, EDS, NOAA, Boulder, CO, is in process of lending a C4 ionosonde to San Juan.

(c) Stations at risk:

Discussions on the future of the Canadian network would be held on June 15th, 1976. If part of this network continues, the apparent priority order is Churchill , Ottawa, Resolute Bay, St. John's, Kenora* (Chairman's note: the possibility that the Canadian Stations might be closed was raised in INAG 23, p. 23. The Canadians are again asking for the value of operating their stations at the end of 1977.)

A formal resolution from INAG (see INAG 24, p.4) was drafted and sent to the Canadian Authorities along with several testimonials from individual INAG members.

Port Stanley will close at the end of IMS which is now scheduled for December, 1979.

The future of the Greenland Stations is under discussion. *INAG stresses the need for users to write either directly to the groups involved or to the Chairman of INAG if they wish their views on the continuation of these stations to be considered.*

Future Needs for Ionospheric Monitoring

Although the Joint URSI/IAGA Study Group is seeking opinions about the future of the ionosonde network (see p.7 for more details), the INAG facilities should be made available to make known the requests of this committee. Dr. Rishbeth, the Chairman of the Working Group should be invited to appoint an INAG representative to it. (Chairman's note: Dr. Dudeney has been invited to take part in this.) *INAG invites and urges all four ionospheric World Data Centers as well as INAG users of data to make suitable reports to Dr. Rishbeth.* It was clear that the future of many ionospheric observatories after the IMS is in doubt. It was suggested that an ad hoc working group should be set up to present the INAG viewpoint and the Chairman should write to the station Administrators indicating the wide uses of vertical incidence data.

Complication of the Scaling Rules

There was considerable concern expressed by many INAG members over the increasing complexity of the scaling rules. Spread-F scaling and Lacuna are just two of the recent additions to the rules, but the value of Es typing, was also questioned. It was decided that the Chairman of INAG should appoint a working group to assess the present rules and to provide clarification and corrections to the Handbook (UAG-23). This work may result in rewriting or reprinting of the Handbook.

Responses to INAG Questions

Italics are used in the INAG Bulletin to bring to the attention of readers the items for which some comments or replies would be greatly appreciated.

Interpretation of Rules

There was a brief discussion on the uses and meanings of certain rules within the Handbook. It was decided that these should be referred to the working group to be set up.

Monitoring of the Auroral Oval

It was suggested that INAG should explore the possibilities of accumulating ionograms for a given month from stations near the auroral oval at World Data Centre C2 where one or two invited scientists could determine whether auroral oval phenomena can be identified and followed using conventional ionosonde techniques.

Index to UAG-23 and INAG Bulletins

World Data Center A for Solar-Terrestrial Physics is preparing an index to UAG-23 that will be circulated through INAG. The index to the INAG Bulletins was updated. (See INAG-24, P. 24-30.)

Ionospheric Data

Publication of the *Ionospheric Data* books by NOAA have ceased as a result of financial constraints. These data were used widely by INAG members and considerable regret was expressed. NOAA has not decided whether this or a similar publication should be resumed. *INAG wishes to receive comments from users so as to help resolve the problem of how much demand actually exists.*

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* Kenora closed December 31, 1976

It was noted that the use of digital ionosondes would be likely to increase in the future. This will no doubt lead to modification of the existing interpretation rules.

Dr. Dudeney reported he had received 20 replies from 13 countries to his questionnaire about the future of the British Antarctic Survey's ionosondes at Halley Bay, Argentine Islands and South Georgia after IMS. There was extremely strong support that at least one station, preferably Halley Bay, should remain open to continue studies in geophysics and monitoring secular changes. However, Halley Bay is by far the most expensive station to maintain.

Mr. Shapley pointed out the need for ionosondes on islands and again stressed the need for one on Ascension Island (Chairman's note: the advantages of an ionosonde on Easter Islands have already been stressed by ASHAY).

Status of New Ionosondes

Dr. Giraldez stated that the ASHAY ionosonde (INAG-23, p. 6 Item 5) had not "died" but its construction has been delayed. The error was due to translation difficulties. The expected cost of this ionosonde will be between $10,000 and $15,000.

The United States is proceeding with the modern digital ionosonde (ref INAG-23, p. 24). The cost for this research instrument will be about $150,000. NOAA has given approval in principle for such ionosondes to be built over a period of years. Funds for these are not yet available.

South Africa has reported that they are now sending ionograms digitally from Antarctica via their communications network using a pattern recognition technique without human intervention. They are also

currently involved in building a sounder with transmitter and receiver operating for half cycles out of phase. It will cost about $10,000.

The Australian ionosonde on loan to the British Antarctic Survey is under evaluation at Slough. It is hoped to deploy it at Argentine Islands at the beginning of 1978 for field trials. There have also been inquiries from Saudi Arabia about this ionosonde.

Advantages of HF Communications at Low and Middle Latitudes

Dr. Reddy submitted a brief report stressing the advantages of HF communications at low latitudes and pointed out that some of these also applied at middle latitudes.

His main points were:

1. Energetic particle precipitation causing blackouts of long duration are extremely rare at low latitudes.

2. Blackouts caused by electromagnetic radiation do cause disruption to communications. These are very short lived events.

3. Values of foF2 are large, consequently provide a wider choice of usable frequencies.

4. The effects of magnetic storms are small, at low latitudes increases in the value of foF2 are compensated by increases in hmF2 leaving the MUF values practically unaffected.

5. The cost of an HF network is at least two orders of magnitude cheaper than any other viable method.

The advantages of maintaining ionospheric observatories were stressed. These provided useful training and helped keep the HF communications efficient,

The need for ionosondes for HF telecommunications, particularly by developing nations, was also supported by Cook, Giraldez and Gledhill.

It was suggested that the Chairman should prepare a report to be sent to Administrators to emphasize these points and the importance of keeping ionospheric observatories open.

III. Minutes of the Informal INAG Meeting, 19th July, 1976, Cambridge, U.K.

Attendees: W. R. Piggott (Chairman)
J. R. Dudeney (Alternate to W. R. Piggott)
A. S. Rodger (B.A.S.)
R. W. Smith (WDC—C1)
R. 0. Conkright (WDC-A, Alternate to J. V. Lincoln)

1. The minutes of the meeting in Boulder were reviewed and discussed. The main points needing consideration and action by INAG concerned the best way of removing ambiguities and errors in the Handbook (UAG-23) and its supplement (UAG-50), and the question of whether a simplified Handbook should be produced.

The Chairman pointed out that UAG-23 differed from the first Handbook as a result of two types of pressure: -

(a) requests by scalers to cover particular points which were not clear.

(b) changes in parameters called for by new applications of ionospheric data.

In general , the most advanced scalers are more vocal than the average, with the result that the rules tend to get more complicated. There appears to be a reaction to this which is probably overdue. Unless some parameters or letter symbols could be ignored, simplification would really involve a rewrite of the Handbook. This inevitably would mean that many of the finer distinctions called for by the advanced scalers would be omitted. Possibly a good solution would be to prepare an elementary Handbook suitable for novice scalers, keeping the corrected UAG-23 as a reference guide for the difficult cases. It was felt that the usefulness of the new parameters, fxI, Lacuna and Spread-F types should be reviewed, together with the question of whether Es types should continue. Similarly the value of the qualifying T and M, and the descriptive letters M, 0, T and X should be considered. It was also noted that there are still some major inconsistencies in scaling between ionospheric groups, mostly with Es parameters. *INAG should start a discussion of procedures in the Bulletin.*

It was decided that some revision of UAG-23 was necessary but the extent of this revision has yet to be determined. Two alternatives are to reprint it with corrections duly made or to rewrite it completely. If the latter option is adopted it was suggested that the technique employed in the High Latitude Supplement (UAG-50) should be used, whereby ionograms, line drawings and scalings should be used to illustrate the rules.

The first step necessary for either a revision or a rewriting is to note all corrections and sections requiring clarification or alteration. This would be done most effectively if as many people as possible submitted their suggestions to the Chairman. R. Conkright, A. Rodger and
R. Smith were invited to serve on a working group to initiate this work and held a meeting for this purpose. They should also supply a list of characteristics and rules to the Chairman for possible addition, deletion and modification, after discussion through the INAG Bulletin and at INAG meetings.

The group would collect all corrections and proposed clarifications in a document which would be published as a special INAG Bulletin, and will also collect sample ionograms either for publication in a new simplified Handbook, or as a further supplement to the present one.

2. Action on the URSI/IAGA Working Group

A note on this group will be found on page 4. The Chairman reported that he had informed Dr. Rishbeth of the views of the INAG meeting at Boulder and that Dr. Rishbeth had agreed to invite an INAG representative to serve on this working group and to keep the Chairman informed of its actions and conclusions. The meeting felt that Dr. Dudeney would be a suitable candidate. (Chairman's note: this proposal was accepted by Dr. Rishbeth and Dr. Dudeney has been active on the project.) The Chairman had previously submitted a list of users of ionospheric data and discussed Dr. Rishbeth's proposals with him.

3. New Ionosondes

Even though a new breed of digital ionosondes is on the horizon it was felt that the scaling rules should NOT be modified to accommodate the considerable differences they will create in data analysis.

Some visitors to WDC-C1 have expressed the desire to acquire a modern ionosonde. Details of the availability of new equipment have been provided to representatives from Iran and Syria.

Some technical problems have arisen with the Australian ionosonde on loan to B.A.S., thus comparative studies with the Slough equipment have been delayed.

4. UAG-23 Index

An index for UAG-23 has been prepared by Conkright and submitted to the Chairman. It will be published in the special INAG Bulletin after it is reviewed by Smith and Rodger.

5. Administrators' Meeting

There was strong feeling that an Administrators' meeting should be held to discuss the structure and support of the network in the future. This should consider Dr. Rishbeth's report and make recommendations regarding the revision of the Handbook.

IV. Report on the I.P.S. Operators Conference 18-20 August 1976

Every two years the Australian Ionospheric Prediction Service conducts a short conference for its station operators, at which they can discuss their own problems, meet some of the scientists that use their data and undergo some training. On this occasion the training was limited to the scaling of ionograms, and the installation and maintenance of the type 4A ionosonde.

The solid state techniques used in the type 4A are considerably different from those employed in the older ionosondes and require a more sophisticated approach to fault finding and maintenance.

Before the conference, the station operators had all scaled one complete day of ionograms from each of the Australian stations. Comparison of the results was used to highlight the problem areas of scaling. Generally the scaling was consistent from operator to operator with only minor differences in interpretation. Further analysis of the scaled values is under way and will be used to establish the reliability of published data.

These conferences continue to be an excellent means of stimulating the I.P.S. network and keeping contact between all its members. This year's conference was enlivened by the presence of Mr. L. Lailai from Port Moresby, Mr. P. Vila from the Centre National d'Etudes des Telecommunications, Paris, and Mr. J. Butler of Weapons Research Establishment, Adelaide.

V. URSI/IAGA Working Group: Study Group on Needs for Ionosondes after the IMS

A Joint URSI/IAGA Working Group has been set up under the chairmanship of Dr. H. Rishbeth on the Structure and Dynamics of the Thermosphere, Ionosphere and Exosphere. Within its terms of reference it is to examine the future needs for ionosondes.

A small group of scientists who have specialist knowledge of the ionosphere and in particular users of ionograms has been formed to study the needs for ionosondes after the IMS (i.e., the 1980s). The group will principally study the scientific justification for ionosondes rather than their use for radio communications predictions. The type of questions that will be considered are:

1. Will there be a real need for routine ionospheric monitoring to continue, if so for what purposes? In particular:

   (1a) The geographical distribution of ionosondes after the IMS

   (1b) The future need for routine ionosonde operation

   (1c) The future need for routine hourly scaling and publication of parameters

(1d) What parameters derivable from ionograms are most important to geophysics and communications

2. Should the classical simple ionosonde be replaced by a small number of extremely sophisticated machines? In particular:

   (2a) Is a large number of simple ionospheric sounders more or less valuable than a small number of very sophisticated devices?

   (2b) Should unmanned sounders with suitable telemetry be used in remote regions?

3. Is ground-based ionospheric sounding likely to be needed in conjunction with future satellite experiments? (The case for associating sounders with facilities like rocket ranges and incoherent scatter radars is fully accepted.)

4. To what extent should other types of instrument supplement or re lace ionosondes for routine monitoring: e.g. oblique incidence sounders; polarimeters using satellite transmissions; polarimeters using cosmic radio noise; HF doppler sounders? (Other ground-based instrumentation - riometers, airglow photometers, drifts measurements, etc. - can be considered but, for present purposes, only within the context of routine monitoring of the ionosphere above 100 km.)

This is by no means a complete list of questions but designed to indicate the range of questions which the working group will be covering.

Dr. Rishbeth is very anxious to obtain the views of the users of ionospheric data rather than those producing it. The Chairman of INAG therefore requests users to reply to his inquiry.

VI. Training Corrections to INAG-24

It has been brought to the attention of the Editor by S. M. Radicella that there are some inaccuracies in the report which appeared in INAG-24, p. 23 concerning R. Conkright's visit to Argentina. Mr. Conkright's visit was organized by the National Radio Propagation Program of Argentina and supported by the Solar-Terrestrial Physics Committee of the Panamerican Institute of Geography and History (PAIGH).

The greatest problem which is experienced by South American scalers is keeping up-to-date with all the changes in scaling rules, many of which are not easily applicable to the peculiar ionospheric conditions over the South American stations, rather than difficulties with the English of UAG-23 as previously suggested. A report on actions initiated following the course is being translated into English and will appear in a future Bulletin.

A post graduate summer school , which was attended by 42 people from five countries, was held in Bolivia in 1976, again under the sponsorship of PAIGH. The topics discussed were aeronomy and radio propagation. This is just one example of how ionospheric research workers in South America are trying to increase its effectiveness. It was therefore incorrect to say that research in South America is very dependent upon the generosity of other countries for station supplies, education and training (INAG-24, p. 23).

Professor Radicella would like to emphasize that, like other regions of the world, cooperation and exchange of information with other countries is greatly appreciated and would like to thank Mr. Conkright for his lectures and discussions during his visit.

VII. Uncle Roy's Column

I have received several queries about the distinction between Es-r and Es-k. The usual evidence which is used to differentiate these types is:

1. retardation at the low frequency end of the F layer.

2. multiple traces extending to near foE. The latter is especially important in the cases of total blanketing.

Figure 1 shows three ionograms submitted by D. G. Cole, Australia, taken at 1701, 1715 and 1130 UT, 15th July 1976, at Mawson (67^0S, 62^0E). This illustrates both changes in absorption and Es-type. See P. 10—11.

1701

This is a high gain run showing significant absorption (fmin = 2.8MHz). From close inspection it appears as if the ordinary and extraordinary are separated by the normal amount (0.8MHz). The retardation at foEs is not well marked, thus making this a borderline case between Es-k and Es-r. My own experience would suggest that this is a particle E trace but if it is a retardation trace, fbEs would not be significantly below 8MHz. However both Es-r and Es-k would be an acceptable scaling.

1715

I believe that both Es type r and Es type k are present here. I would have scaled foE = 410-K and foEs 044. I don't think there is sufficient doubt to justify a U in either entry. The retardation Es is superposed but clearly at a slightly greater height than the main particle E trace. This interpretation would give hE at 110-K and h'Es at 120-A. This is a fine point and I would feel the average operator would prefer to use 110 for each value.

Note: Comparing the ionograms at 1701 and 1715, the traces are at essentially the same height. This supports the conclusion that the 1701 ionogram was particle E.

1730

This is a very complicated pattern. The line drawing shows no turn up at the high frequency end, the ionogram has perhaps the very slightest indication of a turn up at 6.0MHz and 6.8MHz. If this is the case, then it is clearly retardation Es. However, I think the additional spurs in the Es pattern would imply Es-a was more appropriate. The presence of a second order below 2MHz would suggest that a particle E trace is present.

VIII. Reports from World Data Centers

World Data Center A for Solar-Terrestrial Physics, Boulder, CO. contributed by J. V. Lincoln

The center has just been host to a most productive working visit by a USSR delegation from WDC-B2 in Moscow. The principal participants were Dr. A. Powsner, Dr. E. Kharin and Dr. Y. Tiupkin. Details of our operations were thoroughly covered. Ways to standardize catalogs, to improve data exchange and fill data gaps, and to improve techniques of filling data requests were thoroughly discussed.

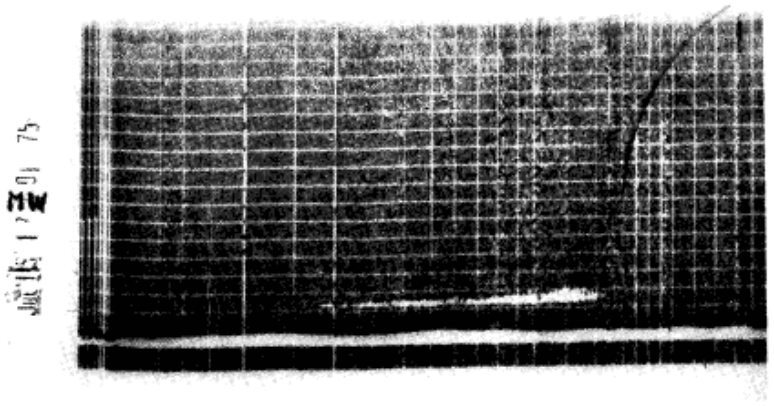
World Data Centre B?, Moscow, USSR, contributed by A. N. Sokhodolskaya

The High Latitude Supplement has now been translated into Russian and circulated to the appropriate Russian observatories.

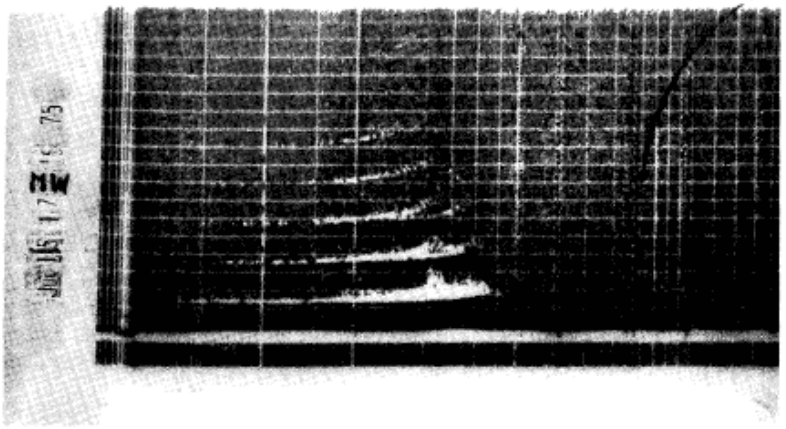
The URSI Handbook (UAG-23) and INAG Bulletins No. 13-21 have been translated and sent out. Work has now begun on the more recent issues. Input and requests for data in the period 1st July 1975 to 30th June 1976 to the centre are summarized below:

Project	Data Arriving	Requests Completed
Vertical Incidence	1533 Station/Months	9333 Station/Months
Vertical Incidence Ionograms	355	329
N(h) Profile)		319
Absorption A2 Method	355	212
Others		2

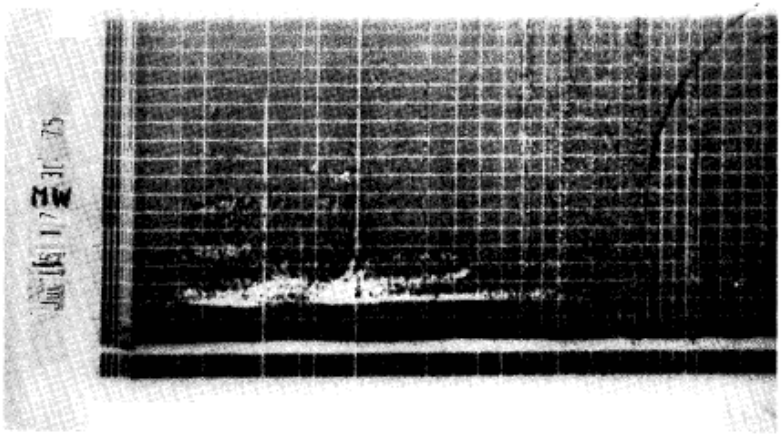
Mawson
July 15, 1976
1701 UT



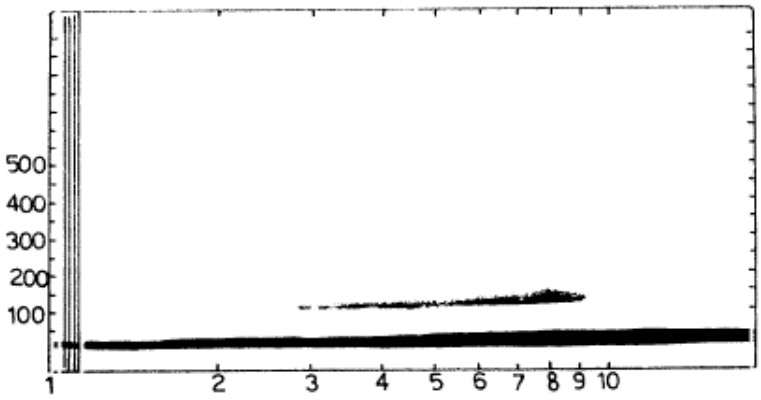
1715 UT



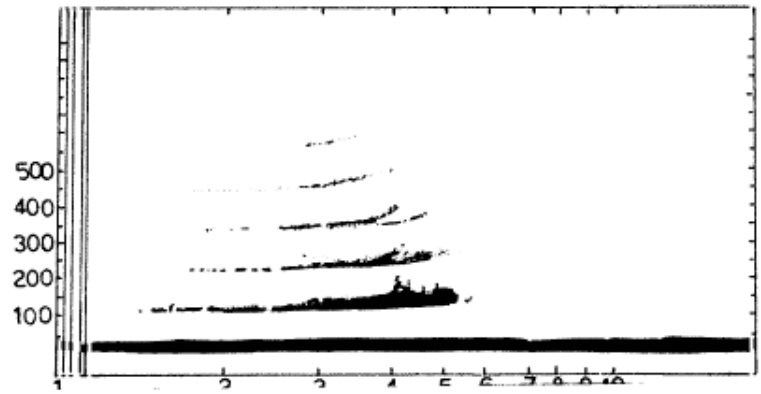
1730 UT



Mawson
July 15, 1976
1701 UT
2101 LT

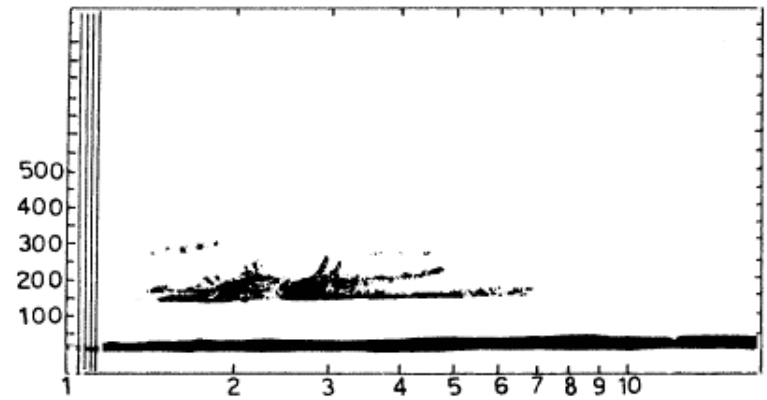


July 15, 1976
1715 UT
2115 LT



fmin	h'E	foE	h'Es	foEs	fbEs	type Es
12	110K	U420K	120K	U42K	U42K	K
h'F	foF1	M3000F1	h'F1	foF2	M3000F2	fxI
A	A	A	A	A	A	A

July 15, 1976
1730 UT
2130 LT



World Data Centre C1 for Ionosphere, Appleton Laboratory, Ditton Park, Slough 5L3 9JX, England, contributed by Richard Smith

Requests from outside sources for ionospheric data during the period October 1975 to March 1976 inclusive are as follows:

Vertical incidence tables	7240 station parameter months
A1 absorption tables	64
A2 absorption tables	57
Ionograms	44190
K, Dst, AE indices	17
Ionospheric predictions	41 months
Catalogues and reports	36

Data used by scientists working in the data centre are not included.

The 22nd Catalogue of Ionospheric Data, which includes data received through December 1976, was issued in March 1977. It contains concise summaries of years for which data are available and detailed lists by month and year.

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

Activities for the Period April 1976-March 1977

1. Data received from WDCs A, B2, C1 and Ionospheric Stations:

Booklets and Sheets	1800	
Microfilms	21	rolls of 1000 feet each
	34	" " 100 " "

Data sent to WDCs A, B2 and C1

Booklets and Sheets	391
Microfilm (roll)	96
Magnetic Tape (roll)	2

2. Data Services

Vertical incidence tables	1497 station months
Absorption tables	161
Drift tables	81
Whistlers tables	24
Others	536
Ionograms	997 Frames

3. Adjustment and compilation of microfilm data in office:

Microfilm from WDC-A	Ionograms	7 reels (1000 feet each)
	Others	11 " (100 " ")
Microfilm from WDC-B2	Ionograms	24 " (1000 " ")
	Others	19 " (100 " ")
Microfilm from WDC-C1	Ionograms	3 " (1000 " ")
Microfilm from WDC-C2 region	Others	120 " (1000 " ")
		60 " (100 " ")

4. WDC-C2 Catalogue of Data for Ionosphere:

Cumulative catalogue of ionospheric data for the period 1 July 1957-31 March 1977 will be available in August 1977.

5. Daily hourly values of Japanese ionospheric data are stored on magnetic tape since June 1968.

IX. Station Notes

Okinawa Station (Japan)

The ionospheric sounding station at Okinawa has been reopened on February 1, 1977.

Location:

Geographical:	26°16.9' N, 127°48.4' E
Geomagnetic:	15.3° N, 196.0° E

Name: Okinawa Radio Wave Observatory
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Publications of data:

1. "IONOSPHERIC DATA IN JAPAN" on a regular basis beginning at Vol. 29, No. 4 for April, 1977.
2. "IONOSPHERIC DATA AT OKINAWA", special issue to be published later for February and March, 1977.

Gibilmanna

A new ionospheric station, in Sicily at N37.59, E14.O1, began operations April 1976, code number 037. It is under direction of the Istituto Nazionale di Geofisica, Osservatorio Geofisico Centrale, Monte Porzio Catone, Roma.

Narssarssuaq

For information purposes the ionosonde location has been N61.16 E314.55 since October 4, 1975. It was moved from the former site as of September 28, 1975. The observatory also operates a magnetometer, an all-sky camera and riometers on 20, 30, 32 and 40 MHz.

X. Catalog of Vertical Incidence Data

World Data Center A again reminds you of the publication of Report UAG-54, Catalog of Vertical Incidence Sounding Data.
INAG requests all readers to check it carefully and submit corrections to WDC-A.

XI. Availability of Ionospheric N(h) Data Computed at the Cavendish Laboratory, Cambridge, U.K.

Ionospheric data analyzed at the Cavendish Laboratory, Cambridge, have been deposited in the World Data Center C1 at Slough. They comprise of F-region electron density data (namely NmF2, hmF2, N(h) and N(E) curves and some sub peak electron centered) mainly for IGY (1957-58) in the American sector but also

include data from other stations such as Slough. Graphs of ionospheric parameters vs. latitude, magnetic dip, etc., are included. Parts of these data have been used by J. 0. Thomas *et al.* for papers published in the period 1956-63. A list of the 31 individual files can be obtained on request from WDC-C1 and are readily available for study by visitors to the centre.