IONOSONDE NETWORK ADVISORY GROUP (INAG)*

Ionospheric Station Information Bulletin No. 55**

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

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1. COMMENTS FROM THE CHAIR

The bulk of this bulletin will address issues arising from the Prague URSI General Assembly. This was an important assembly for INAG and many promises of support were offered. These must now be realised as I have limited time for
producing the bulletin and will depend on you, the readers, for articles. Readers must be active participants.
We are living in times of great change. Management texts are written on the subject and medium scale organisations have units of people set aside to expedite change. Science is not immune, but nobody will council us - therefore we must help one another.

Please read this bulletin carefully, note the issues and if you recognise your own problems, share your thoughts with me and let me share them with others through the Bulletin. If you want to remain anonymous, let me know, but don't let that stop you from having your say through me.

2. INAG MEETING – URSI GENERAL ASSEMBLY, PRAGUE 1990.

AGENDA INAG MEETING PRAGUE 1990

1. Election of Officers
2. Report from the outgoing Chairman
3. Address to INAG Meeting by the Chairman.
4. Membership of INAG

5. The Address list
6. Future elections of Officers
7. Terms of reference for INAG
8. Resolutions for URSI
9. Symposia INAG can sponsor
10. Report on the Network
11. Participation in international programs
12. Computer scaling of data
13. Scaling conventions - the "slash" (/)
14. CD-ROM containing ionospheric data
15. The Global network

Attendance.

W. J. Baggaley	**New Zealand. (meeting secretary)**
D. C. Baker	**South Africa.**
K. Bibl	**USA.**
Fr. Blahak	**Czechoslovakia.**
P. A. Bradley	**United Kingdom.**
F. Bremer	**Germany.**
M. Broms	**Sweden.**
J. Buchau	**USA.**
J. Cooper	**Germany.**
R. Hanbaba	**France.**
V. Neble Jensen	**Denmark.**
J.C.Jodogne	**Belgium.**
T. Kelly	**Australia.**
E. V. Nepomrioshaya	**USSR.**
G. M. Pillet	**France.**
A. W. V. Poole	**South Africa.**
S. A. Pulinets	**USSR.**
S. M. Radicella	**Italy.**
B. M. Reddy	**India.**
B. W. Reinisch	**USA.**
H. Rishbeth	**United Kingdom. (Chairman URSI Commission G)**
K. B. Serafimov	**Bulgaria.**
A. J. Smith	**United Kingdom.**
E. P. Szuszczewicz	**USA.**
B. D. Ward	**Australia.**
P. J. Wilkinson	**Australia. (Chairman)**
B. Zolesi	**Italy.**

2.1 Election of Officers.

There will be further comments on the election of INAG officers later in this report.

This was the first Assembly when officers for INAG were elected using a postal vote. Nominations were called in May, 1990 and voting papers were distributed in early June to those who had already requested they remain on the INAG mailing list. The response was very good and all who participated are congratulated on the efforts they made. I realise many could not easily register their vote because I was not able to ensure that voting papers reached you in time. These problems will be overcome in future elections. Fortunately, any deficiencies of this ballot would not have affected the final outcome.

I was elected Chairman. There were two candidates for the position of Secretary and Mr. Ray Conkright was elected to this position. Ray and I have been in close contact for many years and I look forward to working with him on INAG

over the next few years.

2.1.1 Thanks to Ray Haggard - the outgoing Secretary.

At the INAG meeting I proposed a special vote of thanks to the outgoing Secretary, Ray Haggard. Ray has done an excellent job in producing INAG Bulletins over the past 6 years, since the Florence General Assembly, 1984. Producing the bulletin is always a difficult task because so few people contribute regularly. Ray, like those before him, has felt this lack of support. Even though these last few years have been difficult ones, Ray persisted, making it possible for INAG to continue in existence. I think all who have an interest in INAG would join with the meeting in thanking
Ray for the excellent work he has done.

2.1.2 Thanks to Alan Rodger - the election returning officer.

I would like to thank Alan Rodger who agreed to be the returning officer for the INAG election and conveyed the result to the Commission Chairman, Prof Rishbeth.

2.2 Report on Activities of Working Group 1 - The Ionosonde Network Advisory Group, or INAG.

Submitted to URSI General Assembly, 1990.
by the Chairman-designate: Dr Phil Wilkinson.

Each URSI Working Group prepares a report on its work including conclusions and recommendations. The Chairman for Commission G, Prof. Henry Rishbeth in this case, requested that these reports should be delivered at the General Assembly. The text of the report, published in the "URSI Information Bulletin" is reproduced here.

The last three years have not been kind ones for Working Group 1; INAG. Professor Gledhill, the Chairman-elect, died on 19 June 1988 and with his passing much of the working group's momentum was lost. This is reflected in a reduced
number of bulletins being produced; only four in the last three years (February and December 1988 and June and November 1989) and, since the last URSI General Assembly, there has only been one INAG meeting; at Exeter, during the IAGA meeting in 1989.

I was asked by Dr Rishbeth to Chair INAG in the interim period leading up to the Prague General Assembly and during my period as Chairman, I have looked at the issues INAG faces. In my first comment as Chairman, I outlined the areas I felt were important with the most important one being: participation. I believe that INAG cannot be effective if it doesn't have a broader, more vocal membership. The INAG mailing list is the first area to seek serious members and the recent mail voting for INAG offices has reinforced the impression that the revised mailing list for INAG is now an effective core body of interested people. This, I believe, is the most significant development in the past three years and I hope to build on it in the next three years.

Another area addressed in some detail both in the bulletin (No 54) and at the only INAG meeting is the issue of ionosonde data. INAG has a major task ahead of it if it is to offer good advice on how networks are to handle their past records and how they should plan for the future. This was approached in two ways. One was to update the current ionosonde network master list – know where the data are being obtained. Although there have been a number of revisions, there are still stations which report occasional data and which are not on the master fist. Second, comments were sought on the prospect of establishing baseline stations. No comments were returned on this issue although verbal reactions were positive. I have yet to convert people's words into print.

At the last URSI General Assembly, INAG proposed one resolution regarding the operation of the worldwide ionosonde network. It contained three parts, regarding the closure of the New Zealand ionosonde network, the De Bilt ionosonde and the possibility of opening an ionosonde at Easter Island. It is hard to measure the impact of resolutions, but it is a pleasure to acknowledge that Professor W J Baggaley, of the University of Canterbury Physics Department in Christchurch New Zealand, in cooperation with IPS Radio and Space Services in Australia, has continued the collection and distribution of data from Christchurch and the collection of ionograms from Scott Base to support research projects. However, the ionosonde at De Bilt did close, and while many agree Easter Island is a good site, nobody has yet placed an ionosonde there.

The next three years will be critical for INAG. These last three years have seen a further reduction in the number of articles offered for bulletins but, hopefully, this trend can now be reversed.

I stress to all readers that the past three years have not been good years for INAG. For INAG to continue, you must become more involved.

2.3 Address to INAG Meeting by the Chairman - URSI General Assembly, 1990.

The predecessor of INAG, the World Wide Sounding Committee (WWSC), was set up in 1955 to offer guidance during the IGY and was later disbanded. INAG was formed at the URSI General Assembly in Ottawa, August 1969, as a response to a recommendation from URSI-STP that a group was needed to give more effective active guidance to the global ionosonde network.

By the 1975 URSI General Assembly, in Lima (INAG-20, p2) the major tasks - revision of the URSI Handbook of Ionogram Interpretation (UAG-23 and UAG-23A) and preparation of the High Latitude Supplement (UAG-50) were complete. INAG, in 1975 was in the same position as the WWSC had been before its demise. To quote Dr Piggott:

> "It is now generally accepted that the dissolution of the WWSC was, on balance, a mistake that seriously decreased the effectiveness and value of the VI network."

At the Lima meeting, Dr Piggott was appealing to scientists and administrators to put some weight behind INAG and to support it, now that the main jobs had, once more, been completed.

All Dr Piggott's comments at that time, in the May 1975 INAG Bulletin, hold true now, Central to INAG's effectiveness then, as now, is the Bulletin - correctly described by Dr Piggott as, "an essential factor in provoking discussion and getting different groups interested in particular problems."

Never again, as far as I can see, will we have the fortunate situation of possessing an ionospheric trinity - the Bulletin, INAG and the Chairman [Roy Piggott] in one package. Now we must all work that much harder if the Bulletin is to survive, and with it, INAG.

2.3.1 History - c/- Clarrie McCue

In the first Bulletin for this three year period, 1987-90, INAG-51, Clarrie McCue pointed out that he was present at the inception of INAG, in Ottawa, and has observed INAG for many years during its growth.

Clarrie noted several points about INAG, the most important being the unique nature and quality of the INAG Bulletin. His plea - keep producing the good work. To demonstrate the value, he noted the wide range of articles that have appeared in INAG in the past and prefaces his listing of articles with a strong comment on the strengths and deficiencies of the material. Go back now and look again at Clarrie's list. Clarrie's note concluded:

> "I wanted to stress the importance of the Bulletin and to show that everyone has something to contribute to it."

I hope everyone read Clarrie's note and will now go back and re-read it. I feel he told the tale of INAG well and I agree with his perception of it. The Bulletin has been valuable to Australia and, I believe, many other people and groups who otherwise could not attend meetings or express opinions easily. I hope that it can continue as I feel it still has a lot to offer to those new in the field.
But INAG must continue in a different world from 1969. That's what we must consider now. The audience of 1955 may still have existed in 1969, but it isn't there now. Neither the people or motivation for employing the people remains. That could be a loss; but we cannot change it.

2.3.2 Later developments

Even before 1975, material for the Bulletin was scarce - reading the old Bulletins tells that story - and it is still the case - why?

At the Florence URSI General Assembly, 1984, an attempt was made to broaden involvement in the Bulletin by creating "reporters" in a variety of topics.

1. Ionogram interpretation. and scaling rules.
2. Handbooks and training aids.
3. New station coordinator.
4. Coordinator for developing countries.
5. Interchange of ionograms and data, emphasising digital methods.
6. Automatic ionogram analysis methods.
7. Technical developments for ionosondes.
8. N(h) profiling problems.
9. International Reference Ionosphere input and coordination.
10. Low latitude problems.
11. High latitude problems.
12. Developments for the acquisition of ionosondes and their reduction to meaningful echo parameters.
13. Algorithms for extracting aeronomic parameters from ionosonde data.

It failed.

A quick scan of the reporter topics shows the scope people felt INAG should have - but, regrettably, hasn't met.

These last three years have seen only four bulletins appear and only one INAG meeting was held outside URSI General Assemblies. Yet, over 100 people have expressed interest in continuing to receive the Bulletin and well over 50% of those people, when asked for nominations, responded. So there is still a substantial audience who cams.

INAG-51 contained CCIR Communication
Opinion 22-4 from study group 26C/6 that states;

"The CCIR
considering

1. that the routine observations from the existing ground-based ionosonde network together with satellite and oblique sounding programmes provide the bases for continuing improvements in both long- and short-term ionospheric predictions;
2. that the increasing importance of space research and Earth-space communications will require continued collection of such information, derived as a matter of routine, together with possible increases and changes in the quantity and nature of the information,

3. **that URSI Commission G has formed an Ionosonde Network Advisory Group (INAG) which is responsible for advising ionospheric sounding stations on scientific questions and for advising URSI on questions concerning the network,**

is unanimously of the opinion

that administrations should make every effort:

1. to continue the operation of the ionosonde network and the interchange of basic data, for which there is much demand, through the World Data Centres;

2. to establish new ionosondes at, or transfer existing ionosondes to, places recommended by the CCIR in fulfilment of Study Programme 26C/6 or to support the organisations responsible for new and relocated ionosondes;

3. to consult URSI (INAG) on all questions relating to the establishment or closure of stations in the ionosonde network and proposed changes in the programme of operation or analysis of the ionograms;

4. to support the work under Study Programme 26C/6 concerning the use of ionospheric data from satellite programmes and to explore the use of such data as are now available at the World Data Centres, for ionospheric predictions."

So at least one other group has perceived a role for INAG and I feel we should be striving to meet it.

Throughout this Bulletin, we will be considering problems we had to resolve in establishing what INAG is and how it will be maintained in the future. While we should still have goals in common with the INAG of 1969, the role CCIR sees, and in the terms of reference presented at Florence, 1984, we will function differently internally. People, such as yourselves, **the readers**, must offer more because your opinions are valuable to other readers.

2.3.3 Things we should consider

In the rest of this section of the Bulletin, I will enlarge on some points I have already raised in earlier bulletins that I feel should be in your minds as we seek to place INAG on a stable basis for at least the next three to six years.

2.3.3.1 Economics

Monitoring the ionosphere has rapidly become an economic problem. The stresses were present in 1975: it is why IPS became involved in building its own ionosonde. We couldn't afford what was available and we couldn't maintain what we had at an acceptable level of reliability.

The problem is much greater now. Networks of the future will need to have a dedicated purpose.
As applications are found, so networks will increase.

But more ionosondes will not necessarily mean more data. Ionosondes will be used to support various HF applications, but the data will not be collected regularly and will not be archived and almost certainly won't be shared if some
international body doesn't ask for it.

Through a body such as INAG, ionospheric scientists must show how application oriented data can be made more reliable and useful **and how this extra care will make the data more valuable for both the primary application and the scientist.** This is a very important issue and everyone should be thinking about it now.

2.3.3.2 Computer scaling of ionograms

Computer scaling is a reality now.
For some it may seem like an intellectual challenge, but really it is an economic necessity. It is hard to imagine that any ionospheric data will be collected manually 15 years from now.

This means more digital ionosondes. It also may mean some networks will disappear.

IPS is committed to producing computer scaled data from our network. We expect to validate these data manually and, where appropriate, make corrections. We feel validation will be an important step before archiving data for a few years to come - but we probably cannot continue to do it forever. Other screening methods are essential and here we hope numerical and statistical methods will help. We also hope it is possible to determine when the scaling program has had a "hard time" with an ionogram. We need to answer questions such as; are there better options to scaling letters for computer analysed ionograms; are scaled values needed when electron densities can be calculated easily; what additional information can we obtain unambiguously from scaling digital ionograms.

The immediate issue for INAG: **PRACTICAL guidelines must be offered on what to expect from computer scaled data**. If we fail in this, the network will fragment. It is essential that we work together, now, to establish a sensible approach to handling digital scaled data – work with it; discover its problems; help build solutions!

2.3.3.3 Digital ionosondes and data exchange

Computer scaling means there will be more digital ionosondes. We need to promote exchange of ionograms between scientists. URSI WG-4 "Ionospheric Informatics" is concerned with this topic - but it falls in INAG's area also. These working groups must cooperate on this issue.

Why exchange raw data? Without free exchange of data there is no monitoring of standards and standards are essential for maintaining uniformity of interpretation. This will not happen by saying "our program does it correctly" since software is not tested that way. These are complex programs and mistakes are not an issue. After all, digital ionograms can, in principle, be rescaled. Once there were mistakes of interpretation, now we may be faced with more complex departures. Furthermore, while it is possible to reprocess all digital ionograms with a better scaling program, it may not be economically feasible.

INAG must endorse methods for exchanging digital ionograms and seek comparisons between the different scaling programs.

2.3.3.4 The network

Clearly the network will disappear if it is not supported. The topics we have discussed bear on it. Stations should show some immediate economic return and INAG needs to support any processes that lead to a more economically aware
network.

It is too late, regrettably, to complain about the niceties of scaling and the details we will miss; **when what we may lose is an entire global climatological record just when many scientists believe we are entering a critical period for global change.**

That, for me, is the bottom line. That is what INAG is trying to preserve.

During the next few years we must seek to maintain continuity across a changing data set as different instruments and methods are used. In the long term, we are seeking to preserve a climate record. We are the people whom our ancestors will back to. I hope they say we "**succeeded**".

2.4 Membership of INAG.

Several issues were considered briefly before a policy regarding membership was settled on.

Under the URSI Statutes, the Chairman and members of a Working Group are chosen by the parent Commission Chairman (for this Assembly – Prof. Rishbeth) after consultation with the Official Members of the Commission - Commission G, in this case.

Historically, it appears the Chairman of INAG has chosen the members and made recommendations to the Commission Chairman which would generally be acceptable. This occurred partly because INAG is the longest lived of all the Commission G Working Groups and partly for convenience. However, it weakened the relationship between the Commission Chairman and the Working Group and, hence, URSI. The problems encountered at the 1984 Florence INAG meeting, where membership problems arose, probably would not have occurred if the context of the Working Group within URSI was correctly considered.

Many member attributes were considered: members could represent an ionosonde network; or represent a country; are acknowledged authorities in their area of expertise; have an active interest in INAG and have produced some articles for the bulletin, say one every two or three years. The principal problem is who decides whether a person has enough of these attributes - does the Chairman of INAG; do the other members vote on it? And how long does a person remain a member of INAG?

Bearing in mind the comments on URSI above, the nomination of members is the domain of the Commission Chairman. Prof. Rishbeth proposed that members would be those people who have expressed a clear interest in receiving the INAG Bulletin. Your interest in membership will be renewed every three years, when you confirm, in writing, that you wish to continue receiving the INAG Bulletin.

The meeting endorsed the view that members have some obligation to be active and to offer comments to the Bulletin.

2.4.1 Membership Classifications.

To maintain consistency between how INAG has functioned over the years and how it will function in the future, people who were members will remain as members over the next three years. In addition, two other forms of membership *will* be explicitly introduced. All these forms are listed below.

2.4.1.1 Member.

People who request, in writing, to receive the INAG Bulletin are also made members of the Working Group. They will be invited to vote in elections of officers.

Thus, people who receive the Bulletin because they have requested it, become members of INAG. Please share your interest - write about it for the Bulletin.

Under the URSI statutes, all working groups are dissolved at General Assemblies, but if a need still exists, the working group may be reconstituted. To ensure that INAG is a more vital working group, the membership *will* be revised every three years. This will be done through the Bulletin at the same time as nominations for office bearers.

In addition, for the next three years, anyone who was declared a member of INAG at some time will remain a member for the next three years.

2.4.1.2 Honorary Members.

People who have been members of INAG in the past and who have made significant contributions to INAG may be invited by the Chairman to become Honorary Members. The Chairman will renew their membership each three years. They will be invited to vote in elections of officers.

For some years there have been Honorary Members of INAG. Generally, their past contribution to INAG *will* be evident either as a long standing interest in the ionosphere, or they have supported the Bulletin by publishing articles in it. Honorary members have an important role. Their membership is not a way of gracefully bowing out since their knowledge is still valuable and their continued involvement *will* help maintain continuity within INAG.

2.4.1.3 Network Representative.

The "network representative" is a person who has direct contact with an ionosonde network and who will ensure that the INAG Bulletin is distributed to those within that network. The Chairman will confirm their continuing membership every three years. The network representative can vote in elections.

This type of member has been mentioned before in different guises. The issue is that INAG produces a bulletin which we wish to reach ionosonde station operators. However, the majority of people on the ' INAG mailing list do not have direct contact with an ionosonde network and very few people who have scaled ionograms routinely attend INAG meetings. Yet one of the prime objectives of INAG is to assist with forming and supporting uniform scaling laws.

Furthermore, networks have little say in the operation of INAG at present since networks are not represented in INAG. This class is created to give them voting rights and a say in what INAG does. We need the right people here. If you have suggestions of appropriate people, please contact me.

Since it is likely that the people within an ionosonde network will change, the identity of the network representative will need to be confirmed regularly. At present, the Chairman will do this every three years prior to the election of officers.

The Chairman will also seek broader contacts with ionosonde networks to ensure more involvement at this level.

2.5 Address list.

The current address list for the Bulletin now becomes the membership list for INAG. Currently only people who have written to me saying they wish to get the Bulletin will remain on the list. I will contact all the other people on the earlier list personally. Membership will not be restricted.

Three lists will be produced: those who have expressed interest in receiving the INAG Bulletin and who are therefore members of INAG; those people who have accepted the Chairman's request to become Honorary Members and those institutes and networks that also receive the Bulletin.

This will result in a smaller but more functional address list. Remember: the address list is an important resource for INAG as it identifies those people who are actively interested in INAG. If you feel somebody is not on the mailing list and should be, please let me know so I can contact them or, better still, tell them to contact me.

2.6 Election of Officers.

As pointed out above, the Chairman and members of a working group are appointed by the Commission Chairman. Prof. Rishbeth has suggested that the INAG members are the most appropriate group to elect their office bearers. A procedure similar to the last election will be followed in future. In the last election, nominations were called for by post. These were returned to myself. I then posted out ballot papers which were returned to an independent returning officer. In future, there will be at least two elected officers: a Chairman and a Secretary and there will be a postal vote for these positions.

The call for nominations will be by the January prior to the next URSI General Assembly and will probably appear in the Bulletin. Only members can make valid nominations. By this time, the current office bearers will have declared whether they are available to stand for another three year period or not. Ballot papers will be posted out to INAG members. A neutral returning officer will then be appointed by the Chairman and all completed ballot papers will be sent to them. The poll results will be declared at the URSI General Assembly. No late votes will be accepted at the General Assembly.

There was brief discussion on whether INAG would limit the number of terms for which an office bearer could stand, but nothing came of it.

2.7 Terms of Reference for INAG.

There was some discussion about broadening the scope of INAG to include other sounding techniques. While there was vigorous support from the floor, the consensus feeling was that this may deviate effort from the primary objective. It appears better that if a technique is used broadly enough, then an URSI Working Group could be created to support it, if it appeared desirable.

Under the Chairmanship of Dr. Piggott, the Chairman travelled around visiting networks and acted as a calibration standard for scaling and ionosonde operation. This is no longer a realistic prospect for the Chairman of INAG, but the meeting felt that members should endeavour to visit ionosonde stations whenever possible. Data exchange and cross scaling was also endorsed as an important component in maintaining data standards.

The terms of reference proposed at the Florence General Assembly were then endorsed by this meeting as satisfactory, while recognising some overlap between INAG and URSI Commission G Working Group 4 (Ionospheric Informatics).

The Terms of Reference for INAG

INAG is established by URSI to pursue the following objectives through the publication of a bulletin and by meetings.

1. To monitor, maintain and improve the standards of data produced by ionosondes and ionosonde networks.

2. To promote the interchange of data, through the World Data Centres or by direct contact between stations and users, and the archiving of such data.

3. To revise the parameters and the associated rules to match the needs of the users.

4. To evaluate and make recommendations on the international importance of proposed and existing stations as required.

5. To encourage the development of improved ionosonde methods and inform the community about them.

6. To encourage the staff at ionosonde stations by informing them on the use of their data and allied matters.

7. To promote the use of ionosondes in research campaigns.

8. To encourage theoretical studies as an aid to the acquisition and interpretation of the ionosonde data.

2.8 Resolutions for URSI.

There were no resolutions to place before URSI.

2.9 Symposia INAG can Sponsor.

The meeting decided it would be useful if INAG sponsored a meeting at the next General Assembly where some of the problems facing ionosonde networks could be discussed. Commission G already has a large number of symposia suggested for the next Assembly, in Kyoto (1993), but it is probable that INAG can hold a well directed workshop during this meeting.

The workshop would discuss the use of ionosonde data and discuss issues such as how to entice people to supplement the costs of running networks, and also to create pressures to maintain stations in networks. General issues, such as economics will be covered. Other issues that are peripheral to this could be digital ionosondes and their special problems and attributes; computer scaling of ionograms; the analysis of long data sets and the problems of supporting these data sets when major stations close. For instance: how many years of overlap with other stations are needed, how sensitive are the data sets to changes in the environment; can these changes be expressed in terms of "resolution" in the data?

As the next Assembly draws closer, there will be more details about this workshop. In the meantime, if you have any thoughts on the subject: please contact me.

2.10 Report from the Network.

2.10.1 New Zealand Closure.

The New Zealand ionosonde network has officially been disbanded. A note to this effect appeared in INAG-52. Currently, Prof Baggaley, (Physics Department, University of Canterbury, Christchurch, New Zealand) is the contact

person for the Scott Base and Christchurch ionosondes. Ionograms are collected at both locations, but only the Christchurch data is scaled and circulated. The data circulation is currently being carried out by IPS Radio and Space Services, Australia. Dr. J. Titheridge also operates an ionosonde at Auckland, in New Zealand. Regrettably, the ionosonde at Campbell Island has been closed. This was a good location for an ionosonde and possibly the location was not as well exploited as it might have been.

2.10.2 Gough Island Proposal.

Dr. Alan Poole advised the meeting that there was a good possibility that an ionosonde would be placed on Gough Island. He pointed out that this was an important location as it would allow monitoring of the South Atlantic anomaly. A resolution was passed by URSI supporting the opening of an ionosonde station on Gough Island.

2.10.3 The Danish Ionosonde Network.

Many will be aware that the Danish ionosonde network has undergone major changes over the last three years. A more complete report on this network will appear in a later INAG bulletin. At this stage it can be reported that while one station has had to close during the last three years, the other stations are now being significantly upgraded with digisondes.

2.10.4 The Australian Ionosonde Network.

Australia has developed a computer controlled digital ionosonde, called the 5A, and has also produced some computer scaling software. This system is now being deployed in the Australian network. The first ionosonde was placed at
Townsville and is operating in parallel with the 4B ionosonde there. Ionograms and scaled data are returned to Sydney, from Townsville, each night as part of tests to confirm the reliability of the system. The new digital ionosondes and conventional 4B ionosondes will be operated in parallel at all Australian stations until we have confirmed that there is no loss of information in using the new ionosonde.

2.11 INAG Participation in International Programs.

INAG has not played as large a role as it might in major scientific programs over the last few years. Part of the reason for this is that the leaders of these programs have not made INAG aware of their needs. While WITS and STEP could both profit from input from ionosonde networks around the world, none of these groups have made any clear comments on how ionosonde networks can contribute. The SUNDIAL campaigns are a notable exception where large amounts of ionosonde data have contributed to the results of the program.

For its part, INAG also needs to do more. Over the next three years I will endeavour to create a more responsive relationship between INAG and scientific programs that can profit from ionosonde data. These programs will be advertised in the Bulletin.

The meeting also stressed the need for networks to continue to note the advice in the IUWDS World Days Calendar (see the end of this issue) and make additional soundings on the world days. In addition, stations should also make additional soundings on days when campaigns have been advertised. It may also be prudent to contact program organisers and alert them to the availability of your data. If you aren't sure who to contact; contact me.

Remember: if your data isn't being used, it weakens your case when you try to defend the continued operation of your station.

2.12 Computer Scaling of Data.

There was no discussion on this topic. However, it should become an important topic at future INAG meetings as more data is scaled using computers.

To date many different methods are being used with variable effectiveness. In some cases, the data may be rescaled when the programs have "matured", but in the meantime, data scaled by substandard systems will be released. Further, the development of scaling systems is expensive, so the possibility exists that some networks will prefer to

use an older, less reliable, version of the software. INAG needs to be aware of these problems and to help everyone use data with these restrictions.

2.13 A new Scaling Letter.

As mentioned in INAG-54, the Ionospheric Informatics working group has introduced a new scaling letter, the slash (/). The meeting readily appreciated the need for this letter and endorsed its use. A complete description will be supplied for the next Bulletin by Prof Reinisch.

2.14 CD-Rom of Ionospheric Data.

The meeting was advised that the World Data Centres were producing a CD-Rom of all the available digital scaled ionosonde data. This should be available shortly.

During the discussion some comments were made on the possibility of converting analogue scaling records to digital form using optical scanners. Evidently, work on this has not yet been successful, but experiments are taking place at an informal level. In the longer term, it would be excellent if all the available scaled data could be made available in digital format.

2.15 The Global Network.

2.15.1 Station Master List.

A station master list was published in INAG-53 and few significant changes have been suggested since its publication. When the CD-ROM is available it will contain this list.

2.15.2 Data Exchange

There was no discussion on this topic.

2.16 Conclusion.

The meeting closed at about 4 pm, due to the sauna-like temperature in the meeting room.

3. INAG MEMBERS LIST.

The following list contains the names of those people who have written to me and asked to receive the INAG Bulletin. These people are now members of INAG. I will be writing to the other people who previously received the Bulletin advising them that if they wish to remain on the mailing list they must write to me. If you see names missing form this list, please advise me.

ARGENTINA
Dr. A. Giraldez, Victor Padula-Pintos, Dr. S.M. Radicella

AUSTRALIA
Dr. G G Bowman, Dr. B.H. Briggs, Dr D G Cole, Dr. P.L. Dyson, Dr. G.F. Earl, I D Gilbert, Head Radio Wave Propagation Group, Terry D. Kelly, C. McCue, Dr. Bruce Ward, Prof. J.D. Whitehead, Dr. Phil Wilkinson

BELGIUM

URSI Secretariat Dr. J.C. Jodogne, Dr. Lucien Bossy

BRAZIL
Dr. M. A. Abdu, Jose H.A. Sobral,

BULGARIA
Prof. Kiril B. Serafirnov, Hr Spassov

BURMA
Yin Sein

CHILE
Dr Dante Figueroa, Dr. Alberto Foppiano

PEOPLES REPUBLIC OF CHINA
Dr. J. S. Guo, Dr. Z. G. Wang, Prof. Xu Chu Fu

DENMARK
Dr. P. Hoegg, Dr. J.K. Olesen

FIJI
USP/SNR

FINLAND
Juhani Oksman, Hilkka Ranta

FRANCE
Dr. Rudi Hanbaba, Dr. P. Lassudzie-Duchesne, Mlle. G. Pillet, Dr. Paul Vila

GERMANY
Dr. J. Cooper, Dr. T. Dambolt, Prof. G.W. Prolss, Dr. W. Singer, J. Weiss

HONG KONG
G.O. Walker

HUNGARY
Dr. P. Bencze, J. Saiko

INDIA
Dr. A. DasGupta, Dr. C. Jogulu, Dr. Lakshmi, Dr. A.P. Mitra, Dr. Y. V. Ramanamurty, Prof. R.G. Rastogi, Dr. C. M. Reddy, Dr. A.K. Saha

JAPAN
Mr. T. Ishimine, Chief Ionospheric Observation Section, Dr. Nobuo Matuura, Dr. N. Wakai

NEW ZEALAND
Prof W. J. Baggaley, Prof R. L. Dowden, Dr. J.E. Titheridge

NIGERIA
Prof L.B. Kolawole

NORWAY
T. L. Hansen

PERU
R. Woodman

POLAND
Dr. A. Wernik

SOUTH AFRICA
J. M. Archbold, Prof Duncan Baker, A. Delport, R. Haggard, Mr. G.J. Kuhn, Dr. A.W.V. Poole, Rhodes University

SPAIN
Luis F. Alberca, Dr. Beuito A. De La Morena

SRI LANKA
Dr. P.A.J. Ratnasiri

SWEDEN
Inger Arlefjard, Mats Brom, Dr. H. Derblom, Forsvarets Forskningsanstalt, Dr. Ake Hedburg, Ove Klang, Inge Mattala, Asta Pelhnen-Wannburg

SWITZERLAND
CCIR

TAIWAN
Dr. Yinn-Nien Huang, Kang Cheng

UNION OF SOVIET SOCIALIST REPUBLICS
Dr. A.S. Besprozvannaya, Prof. Danilkin, S. G Frolov, Dr. Edward S. Kazimirovsky, S. A. Pulinets, Dr. V. M. Somsikov, A.Yu. Yeliseev

UNITED KINGDOM
Dr. L.W. Barclay, Sir Granville Beynon, CBE Dr. P. A. Bradley, Dr. P. Cannon, Dr. W.R. Piggott, Prof. M.L.V. Pitteway, Prof. H. Rishbeth, A. S. Rodger, Dr. D. M. Willis, World Data Centre C I

UNITED STATES OF AMERICA
Paul R. Albee, Dr. M. Buonsanto, Jurgen Buchau, Dr. H.C. Carlson, Dr. M. Daehler, Dr. Ken Davies, DMI Geophysical Observatory, Dr. John M. Goodman, Goose Bay Ionospheric Observatory, Richard Grubb, Mr. John Klobuchar, Dr. George H. Millman, Prof Millett G. Morgan, Dr. Adolf K. Paul, Mr. C.P. Pike, Prof. Bodo W. Reinisch, David Sailors, Mr. John Schlobohm, Dr. H. Soicher, SRI Incoherent Scatter Radar, Edward Szuszczewicz

YUGOSLAVIA
Dr. L.R. Cander

If your name is not among these names and you wish to continue receiving the INAG Bulletin, contact me **as soon as possible**. My address:

Dr Phil Wilkinson, Chair INAG
IPS Radio and Space Services
P 0 Box 1548
CHATSWOOD NSW 2057

AUSTRALIA.

4. A NEW IONOSONDE – THE KOS-89/2.

The KOS-89/2 ionosonde is a new ionosonde recently developed in Poland.

SPECIFICATIONS.

Frequency range	1.5 - 20 MHz
Number of channels	371 (every 50 kHz)
Frequency generation	digital crystal synthesiser
Sweep configuration	linear
Frequency sweep time	20s (5 pulses per channel)
	30s (8 pulses per channel)
Pulse power	15 kW
Receiver sensitivity	3 μV
Pulse width	100 μs
Pulse interval	12 msec
Sounding cycle	2, 5, 15, 30, 60 mins
Ionogram axes	0-800 km (every 100 km)
	1-20 MHz (every 1 MHz)
	date / time on ionograms
Dimensions	0.45 x 0.50 x 0.56 m
Power consumption	450 W (ionosonde)
	630 W (ionosonde + PC)

The KOS-89/2 ionosonde makes vertical soundings of the ionosphere with high power radio frequency pulses. The ionograms may be used for radio propagation forecasts and long term statistical studies. The KOS-89/2 may also be used as an Al absorption monitor.

The KOS-89/2 sounds over 371 discrete frequencies evenly distributed (every 50 kHz) between 1.5 and 20 MHz. The ionosonde is designed to run under the control of an IBM PC or any compatible computer containing an RS232 port. The ionograms are recorded with the computer on floppy disks. The ionosonde may also operate in an autonomous mode (without computer control) and the ionograms are stored in the buffer register within the ionosonde controller. Eighteen ionograms can be stored in this way. The ionosonde is designed to operate with the travelling wave antenna usually used at ionosonde stations.

The KOS 89/2 uses a temperature stabilised crystal synthesiser. Data processing, display and registration are carried out using computer control - each of the 371 frequencies are digitally selected. Five or eight pulses per frequency channel can be transmitted to increase detection performance in noisy conditions. Options for using these pulses exist. The height resolution is 5 km. The ionosonde can operate automatically, on 2, 5, 15, 30 and 60 minute programs, and there is a programmable frequency range.

Generally, ionograms are displayed and scanned on the monitor incorporated in the computer control system. However, they may also be stored in the ionosonde buffer memory, onto floppy disk or onto the computer hard disk. It is possible to make a hard copy with the printer for archival purposes. The printed ionograms are beaded with the sounding data and time, together with 100 km height markers and frequency markers every 1 MHz.

The receiver is a triple conversion design. Its bandwidth is 20 kHz. High signal detection quality is achieved by using balanced mixers and logarithmic amplifiers at the third IF channel. The receiver input is equipped with an automatically controlled 20 dB attenuator turned on during strong interference conditions (usually at night). The total dynamic range is 80 dB.

The transmitter uses a solid state pre-amplifier driving the transistor power output circuit supplied with 220 V. The peak pulse power is 15 kW.

If you want more information on this new ionosonde, please write to:

Dr. M. Suchanshi

POLSAT Co Ltd
Kasprzaka 96
01-234 Warsaw
POLAND

5. LETTERS.

Here are some thoughts from others on INAG and INAG related matters, If you don't wish to be quoted directly in the Bulletin, let me know so I can incorporate your comments anonymously.

5.1 From Adolph Paul.

These comments come from a letter Adolph sent me in late 1989.

Adolph sees problems in merging the classical analogue ionogram records which, he feels, have only limited information available on diem, with the modem digital ionograms which also have angle of arrival, doppler and echo amplitude. He feels the conventional hourly scalings from ionograms are aliased in time and space with respect to gravity waves and sporadic-E structure. He notes that, in many cases, blanketing and non blanketing sporadic-E is a geometrical rather than optical property of sporadic-E. This leads to the proposition that it would be better (and more scientific) to discontinue some Es parameters, scaling a few key parameters at a more rapid sampling interval, say every 15 minutes. Continuity of well defined parameters is important, provided "well defined" is valid. We should discontinue scaling any parameter that is found to be ambiguous or misleading. Finally, we should encourage the operation of multi-station systems with distances between receivers of the order of 100 km.

Adolph has raised several issues here which require careful thought.

5.2 From Dr. Y. V. Ramanamurty.

Dr. Ramanamurty has offered his own personal thoughts on ionospheric research, both in India and abroad. His particular interest at present is the International Reference ionosphere (IRI).

1. in the context of STEP and IGBP, the need to support long term climate record of the global ionosphere is perhaps self evident.

2. There is a need to establish an Indian ionospheric data archive. In view of my activities, I am interested to participate in such an effort.

3. The past Indian data base, which is mostly on film, has to be transferred to magnetic tape for future scientific as well as application oriented programs.

4. Out of the data collected in the past, reference data sets have to be identified and the original records (in whatever form they exist) have to be archived as far as possible.

The value of original records was illustrated recently when the long term in-situ Langmuir probe experiments were critically examined with theoretical considerations, with ground-to-ground radio propagation observations and rocket propagation experiments (Y.V.Ramanamurty and K.Rawer, A new method of standardising Langinuir probe data, Adv. Space Res., Vol. 10,No.8, 35-38, 1990.).

I am trying to get ionosonde records from Thumba to compare them with the long term in-situ observations over the same place. All the fine structure in the original records should be preserved. The gain sensitive information in long term series could be handled by model/theoretical considerations, similar to those discussed in the above paper.

5. As a modeller and researcher, I feel that there is a good case for New Delhi (28.6°N, 77.2°E) to become one of the baseline ionosonde stations. In the Indian subcontinent, ionosondes are operational at the low latitudes south of New Delhi, in particular the one at Thumba (8.6°N, 76.9°E). The one at Kodaikanal (10.2°N, 77. °E) needs to be modernised.

6. I feel that a lot of attention has to be paid now to computer scaling of ionograms for tomorrow's needs because much of the Physics that we get out of the observations (ionograms) depends on the methodical and scientific attitude of the person behind the computer. The same ionogram has to be scaled by a particular researcher using all the four systems (Artist, CRL, Kel Aerospace and IPS). All the relevant software and hardware information has to be made available easily to the researcher.

Some of Dr Ramanamurty's comments apply directly to India; similar views will apply in other countries - have you a comment to make? I feel the careful analysis required to achieve a scientific understanding of the data being collected is particularly interesting and echoes some of Adolph's views. If you have carried out any analyses that you feel are relevant here, please write a note for the Bulletin.

5.3 From Dr. Ake Hedburg.

Like many of you, IPS received a questionnaire from Dr. Hedburg regarding the use of the Swedish ionospheric data. I asked him at that time if he could make any comments on the questionnaire for INAG. Here is his reply.

We got 84% of the distributed questionnaires in return, which to my mind was a surprisingly high number. We found from these answers that 86% still were very interested to receive data. From these positive answers 62% wanted the data on a monthly basis, (as it has been so far), 14% suggested every third month, 5% on an annual basis and finally 5% only on request.
To the second question regarding contribution towards costs, we got a 100% positive response from those interested in the data representing commercial interests, but, of course, a large majority of the scientific institutions answered that they were not able to contribute towards costs. The latter was a clear case, but we were curious to see what the response would be, As I did state in my letter accompanying the questionnaire, all the scientific institutions will receive such data at no cost (especially those who are within the ionospheric data exchange program).

Our decision is that the Swedish Institute of Space Physics will distribute the ionospheric data in the same manner as it has been done previously. Everybody who answered positively to the questionnaire *will* continuously receive the slightly altered data report starting with the January 1990 data summary. As the commercial part still represents a minor part of our distribution, we do not intend to charge them at the moment but continue the distribution as before.

These types of surveys are very important and I thank Dr. Hedburg for sharing these comments with us. I would be interested to hear from any other groups who have held similar surveys or who have thoughts on these issues.

5.4 From Dr. A. S. Besprozvannaya.

The following comments come from a letter Dr. Besprozvannaya wrote to me in late 1989.

1. There is no doubt that the ground ionospheric network is important and that it should be supported and further developed and I can only hope that we would cooperate doing it. My point is supported by numerous on-going international projects which include ground monitoring. It is my opinion that INAG should actively participate in all such projects as we did during the IGY and JMS. There is a special STEP Programme (Panel-2) which is responsible for coordination of the monitoring centres' activity. I strongly believe that INAG should participate in this programme, for it has already gained a lot of experience in such matters.

2. As well as being an INAG member, I am also the Chairman of the Group of Regular Observations in the Ionospheric Section of the Soviet Interagency Geophysical Committee. We have organised seven workshops during the past 15 years (every 2-3 years), where we discussed scientific methods of ionogram scaling and interpretation; and we summarised major research results of ionospheric studies using the data of the world ionospheric network.

   The last (7th) workshop was held in June 1989 and concentrated on methods of calculating electron density profiles from the ionograms. The participants emphasised the importance of the use of ionosondes for the study of the high-level distribution of electron concentration. A number of modifications of integral methods of calculation were discussed. It thus has become necessary to select the most accurate one by comparison with real profiles. It is in this connection that I would like to ask you to invite INAG members to make the estimation.

To do this an INAG bulletin should publish distinct ionograms recorded at those stations when simultaneous observations were carried out by an ionosonde and radar equipment. These ionograms should be scaled, then used by various groups for profile calculations which would be compared with real profiles obtained by radar equipment. It will also be worth making such comparisons for ionograms with diffuse traces, to estimate the error.

3. The comparison of results may be published in a special INAG Bulletin devoted to the problem of obtaining the vertical electron density distribution from the ionograms. The same INAG Bulletin may publish some other results related to electron density profile characteristics, obtained as a result of the analysis of the profile set by T.M. Gulyayeva program. This program was endorsed by the International Workshop on Programming (Symposium on Informatics, Novgorod,1985). The program envisages calculation of electron density profiles from
ionograms at even hours (UT) in agreed observation periods on Regular World Days of 1976 and 1980. These data are not so numerous. There are about 300 profiles for each observation site, thus we can obtain preliminary information on the global distribution of the geometric parameters of N(h) profiles changing in time (daily and
seasonal changes).

We have already started this job in the Soviet Union. I suggest that INAG invite various ionospheric groups to participate in the program.

The Soviet Union can be responsible for data collection, but we are open for other proposals and will be happy to discuss them. If there are no objections, the calculation results should be sent to Dr. A.S. Besprozvannaya, c/o the WDC-B2, STEP Group, Molodezbaya .3, GSP-I, Moscow 117296, USSR.

The selected periods are:

1976	20-22/January 13-15/April
1976	13-15/July19-21/October
1980	15-17/January 15-17/April
1980	8-10/July 7-9/October

I certainly agree with the comments on INAG participation in major scientific programs. There have been several attempts to obtain agreement on the best method for obtaining electron density profiles from ionograms, I feel INAG has a part to play here, but the part is no simple one. I would be very happy to make up a bulletin containing *profiles for* comparisons. *However, there* appear *to be many* issues *to settle before there is complete agreement on what constitutes a good radar profile for the lower ionosphere; especially the E region. I think there is better agreement on the F region peak height and this could be a fruitful area for work. I would be happy to receive any comments on this topic and will look forward to publishing your them.*

6. INTERNATIONAL GEOPHYSICAL CALENDAR.

The International Geophysical Calendar for 1991 is reproduced on the next two pages. I would draw your attention to two important details.

1 . On the first page of the calendar in the NOTES section, point 5 lists all the "Incoherent Scatter World Days". Most of these periods are associated with various scientific programs when other equipment will be operating. You can expect that these core periods will be studied in detail and should therefore make every effort to record ionograms more frequently during these periods.

2. On the second page (EXPLANATIONS) several important periods are identified. During January and July there are solar eclipses. Ionosonde networks near the eclipse path should make more frequent soundings. Second, under the beading "Ionospheric Phenomena", networks are advised to sound more frequently on Regular World Days (RWD). Please carry out these additional soundings where possible.

If you have any thoughts on what you have read in this Bulletin, or any thoughts on what you think you should be reading here, please write and let me know, or write the article you want to read.

My address:

Dr. Phil Wilkinson - Chairman INAG
EPS Radio and Space Services
P. 0. Box 1548
CHATSWOOD NSW 2057
AUSTRALIA.

International Geophysical Calendar 1991

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

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

	S	M	T	W	T	F	S
		1	2	3	4	5	6
	7	8	9	10*+	11*+	12	13
JULY	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30	31	1	2	3
	4	5	6	7	8	9	10
AUGUST	11	12	13*	14*	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	31
	1	2	3	4	5	6	7
SEPTEMBER	8	9	10+*	11+*	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	1	2	3	4	5
OCTOBER	6	7+	8*+	9*+	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30	31	1	2
NOVEMBER	3	4	5	6	7	8	9
	10	11	12*	13*	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
	1	2	3*	4*+	5+	6+	7+
DECEMBER	8+	9+	10+	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31	1	2	3	4
1992							
JANUARY	5	6	7*	8*	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27+	28+	29+	30	31	
	S	M	T	W	T	F	S

(15) Regular World Day (RWD)

(16) Priority Regular World Day (PRWD)

[13] Quarterly World Day (QWD) also a PRWD and RWD

[2] Regular Geophysical Day (RGD)

[11 12] World Geophysical Interval (WGI)

11+ Incoherent Scatter Coordinated Observation Day

[11] Day of Solar Eclipse

[10 11] Airglow and Aurora Period

15* Dark Moon Geophysical Day (DMGD)

NOTES on other dates and programs of interest:

1. Days with unusual meteor shower activity are: Northern Hemisphere Jan 3,4; Apr 22-23; May 4-5; Jun 8-12; Jul 28-29; Aug 10-14; Oct 21-22; Nov 2-3, 17-18; Dec 12-16, 22-23, 1991; Jan 3-4, 1992. Southern Hemisphere May 4-5; Jun 8-12; Jul 26-30; Oct 21-22; Nov 2-3, 17-18; Dec 5-7, 12-16, 1991.

2. SOLTIP (Solar connection with Transient Interplanetary Processes). Observing Program 1990-1995: solar-generated phenomena and their propagation throughout the heliosphere. (See Explanations.)

3. FLARES22 (FLAre RESearch at solar cycle 22 max). Observing Program 1990-1995: basic physical processes of transient solar activity and its coupling with solar-terrestrial environment. (See Explanations.)

4. Day intervals that IMP 8 satellite is in the solar wind (begin and end days are generally partial days): 29 Dec 1990-5 Jan 1991; 10-18 Jan; 23-31 Jan; 5-13 Feb; 17-25 Feb; 2-10 Mar; 14-22 Mar; 27 Mar-3 Apr; 9-16 Apr; 21-28 Apr; 4-11 May; 17-24 May; 30 May-5 Jun; 11-17 Jun; 24-30 Jun; 6-12 Jul; 19-25 Jul; 31 Jul-7 Aug; 13-20 Aug; 25 Aug-1 Sep; 7-14 Sep; 20-27 Sep; 3-9 Oct; 15-22 Oct; 27 Oct-3 Nov; 9-16 Nov; 21-29 Nov; 4-11 Dec; 16-24 Dec; 29 Dec 1991-5 Jan 1992. Note that there will not necessarily be total IMP 8 data monitoring coverage during these intervals. (Information kindly provided by the WDC-A for Rockets and Satellites, NASA GSFC, Greenbelt, MD 20771 U.S.A.).

5. + Incoherent Scatter Coordinated Observations Days (see Explanations) starting at 1600 UT on the first day of the intervals indicated, and ending at 1600 UT on the last day of the intervals: 11-12 Jan; 14-20 Mar CADITS/MLTCS/SUNDIAL/WAGS; 9-10 Apr; 11-12 Jun; 10-11 Jul; 10-11 Sep; 7-9 Oct GISMOS; 4-10 Dec CADITS/MLTCS/SUNDIAL/WAGS; 27-29 Jan 1992.

where CADITS= Coupling and Dynamics of the Ionosphere-Thermosphere System;
GISMOS= Global Ionospheric Simultaneous Measurements of Substorms;
MLTCS= Mesosphere, Lower-Thermosphere Coupling Study;
SUNDIAL= Coordinated study of the ionosphere/magnetosphere;
WAGS= Worldwide Acoustics Gravity Wave Study.

OPERATIONAL EDITION, September 1990

EXPLANATIONS

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

The **Solar Eclipses** are:

a.) *15-16 January 1991* (annular) begins at S30 E109, crosses southwestern Australia, Tasmania, New Zealand and ends in Pacific Ocean (S00 W114): duration 9 minutes.

b.) *11 July 1991* (total) begins at N13 W175, crosses Hawaii, Pacific Ocean, Mexico, Central and South America, ends at S13 W46; maximum path width 161 miles; maximum duration 6 minutes 54 seconds.

Meteor Showers (selected by P.M. Millman, Ottawa) include important visual showers and also unusual showers observable mainly by radio and radar techniques. These can be studied for their own geophysical effects or may be "geophysical noise" to other experiments. The dates are given in Note 1 under the Calendar.

Definitions:

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

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

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

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

Atmospheric Electricity — Observation periods are the **RGD** each Wednesday, beginning on 2 January 1991 at 0000 UT, 9 January at 0600 UT, 16 January at 1200 UT, 23 January at 1800 UT, etc. Minimum program is **PRWDs**.

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

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

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

Ionospheric Drifts — During weeks with **RWDs.**
Traveling Ionosphere Disturbances — special periods, probably **PRWD** or **RWDs.**

Ionospheric Absorption — Half-hourly on **RWDs**; continuous on solar eclipse days for stations in eclipse zone and conjugate area. Daily measurements during Absorption Winter Anomaly at temperate latitude stations (Oct-Mar Northern Hemisphere; Apr-Sep Southern Hemisphere).
Backscatter and Forward Scatter — **RWDs** at least.
Mesospheric D region electron densities — **RGD** around noon.
ELF Noise Measurements of earth-ionosphere cavity resonances — WGIs.

All Programs — Appropriate intensive observations during unusual meteor activity.

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

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

FLARES22 (FLAre RESearch at the maximum of solar cycle 22) — observations of basic physical processes of transient solar activity and its coupling with the solar-terrestrial environment, including times of the various solar **ALERTS**. Coordinate satellite and ground-based observations. Contact Dr. M. Machado, Dept of Physics, Univ of Alabama, Huntsville, AL 35899 USA. (205)895-6676; SPAN SSL::MACHADO; FAX (205)895-6790.

SOLTIP (SOlar connection with Transient Interplanetary Processes) -- 1990-95 observations and analyses of solar-generated phenomena propagating through heliosphere, including times following the various solar **ALERTS.** Includes Interplanetary Scintillation observations of radio galaxies and telemetry signals to/from interplanetary spacecraft. Also coordination of spacecraft IMP8, ICE, Giotto, Sakigake, Voyager 1/2, Pioneer 10/11, Ulysses, Relict, Wind and SOHO. Contact Dr. M. Dryer, NOAA R/E/SE, 325 Broadway, Boulder, CO 80303 USA. (303)497-3978; SPAN SELVAX::MDRYER; FAX (303)497-3645.

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

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

This Calendar for 1991 has been drawn up by H E. Coffey, of the IUWDS Steering Committee, in association with spokesmen for the various scientific disciplines in SCOSTEP, IAGA, URSI and other ICSU organizations. Similar Calendars are issued annually beginning with the IGY, 1957-58, and are published in various widely available scientific publications.

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

Additional copies are available upon request to IUWDS Chairman, Dr. Richard Thompson, IPS Radio and Space Services, Department of Administrative Services, P.O. Box 1548, Chatswood, NSW 2057, Australia, Fax number (61)(2)414 8331, e-mail richard@ipso.ips.oz..au or IUWDS Secretary for World Days, Miss Helen Coffey, WDC-A for Solar-Terrestrial Physics, NOAA E/GC2, 325 Broadway, Boulder, Colorado 80303, USA, Fax number (303)497-6513, e-mail hcoffey%9555.span@ames.arc.nasa.gov.

CD-ROMS CONTAINING SOLAR-TERRESTRIAL DATA

as of Feb. 20, 1991

NGDC is in the process of producing a series of CD-ROMs containing Solar-Terrestrial Physics Data. The first in the series, NGDC-01, was released in June 1987. It contained mainly geomagnetic data but also had solar and interplanetary data, and a catalog of ionospheric vertical sounding data held in the National Geophysical Data Center and the World Data Center system. The second CD will be released about March 1991. The title of the new CD is "SOLAR VARIABILITY AFFECTING EARTH." It is also identified as NGDC-05/1.

NGDC-05/1 will contain a greatly enlarged collection of geomagnetic hourly values, comprehensive magnetic activity indices, many more types of solar data, satellite-monitored measures of solar variability, satellite anomaly records, all the digital cosmic ray data available in the World Data Centers, selected atmospheric databases, and selected ionospheric vertical sounding parameters (only fof2 data from twelve selected) worldwide stations. Also, the CD will contain a few models for geomagnetic and ionospheric applications.

The next CDs in this series, NGDC-05/2 and 05/3, will be released late in 1991. These will include the comprehensive collection of all ionospheric vertical sounding digital parameters currently at NGDC/WDC-A for STP. Because of the large amount of such data from around the world, it will be necessary to place some records on a second CD together with supplementary data of interest to many diverse communities of scientific research. Anticipated for these supplementary data sets provided by cooperating institutions are digital maps of surface and atmospheric temperature and pressure for a global grid, a comprehensive list of major earthquakes for years overlapping the ionospheric database, and a list of major volcanic eruptions.

Software already developed by NGDC for CD-ROM NGDC-01 provide user display and selection options appropriate to individual databases and data intercomparisons. New software is partially completed for accessing data from NGDC-05/1. One example provides the user a world map on which can be displayed the locations of all data collection points for each of the major data types. These can be listed from the CD catalog, remapped to display sites from which data are available for selected year(s), and listed subsets of stations for particular grid regions and times. Color PC graphics for displaying hourly values of multiple databases for any month on a single screen are operational and have been of great help in quality control of the data now being placed on NGDC-05/1.

Listed below are the stations and years currently in the data base at NGDC/WDC-A for STP for inclusion on the ionospheric CD-ROMs. These data will be on NGDC-05/2 and 05/3 CD-ROMs. Currently the data base contains 141 stations, 2400 station years and 1053 Mbyte of data. We know of digital ionospheric data still in preparation in the USSR, UK and Australia that will increase this number by about 200 MBytes. Requests have been sent to institutions in other countries that are known to hold substantial amounts of digital ionospheric data. If responses to these requests generate more data received at NGDC and checked by the deadline of mid-summer 1991, they will be on the second and third CD-ROMs.

1991/02/20 I O N O S P H E R I C C A T A L O G S U M M A R Y

OBSERVATORY NAME	CODE	TIME	COLAT	LONG	40	45	50	55	60	65	70	75	80	85
ADAK	AD651	180W	038.0	183.3				XXX	XXXXX	X				
AKITA	AK539	135E	050.3	140.1						XX	XXXXX	XXXXX	XXXXX	XXXX
ALMA ATA	AA343	075E	046.7	076.9				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
ANCHORAGE	AN761	150W	028.7	210.1				XXX	XXX X	X				
ARCTICA (NP-06)	XG082	15E	7.7	9.5				XXX						
ARCTICA (NP-07)	XHJ86	45E	3.7	296.6				XXX						
ARGENTINE ISLAND	AIJ6N	60W	155.2	295.7							XXXX	XXXXX	XXXXX	XXXXX
ARKHANGELSK	AZ163	045E	025.5	040.5						X	XXXXX	XXXXX	XXXXX	XXXX
ASHKHABAD	AS237	060E	052.0	058.2				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXX
BARROW	BW771	150W	018.6	203.1				XXX	XXX X	X				
BEKESCSABA	BH147	15E	43.3	21.2					X	XXXXX	XXXX	XXXX	XXX	XXXXX
BOGOTA	BGJ05	075W	085.5	285.8				XXX	X XXX	X				
BOULDER	BC840	000W	050.0	254.6				XX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
BRISBANE	BR52P	000E	117.5	152.9			XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XX
BUDAPEST	BU147	0E	43.0	19.0				XXX						
BYRD STATION	BD88!	120W	170.0	240.0				XXX	XXXXX					
CANBERRA	CB53N	000E	125.3	149.0			XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
CAPE HALLETT	HT67K	165E	162.3	170.3				X						
CAPE KENNEDY	CC929	075W	061.5	279.4				X	X					
CAPE SCHMIDT	CE669	019E	021.1	179.5					XXXXX	XX	XXX			
CAPETOWN	CT13M	30E	124.1	18.3				XXX	XXXXX	XXX	XXXXX	XXX	XXX	XXXX
CHIMBOTE	CM90R	285E	099.0	281.3				XXX						
CHITA	CX452	120E	038.0	113.5				XXX	XXXX					
CHURCHILL	CH958	000W	031.2	265.8							XX XX	XX X	XXXX	XXXX
COLLEGE	CO764	150W	025.0	212.1				XXX	XXX X	XXX	X			
CONCEPCION	CPJ30	075W	126.5	287.0				XXX	XXXXX	XXXXX	XXXXX	XXXXX		
DAKAR	DKA14	000E	075.2	342.6							XXXX	XXXXX	XXXXX	XXXXX
DARWIN	DW41K	000E	102.4	130.9									XXX	XXXXX
DIKSON	DI373	105E	016.5	080.4				XXX					XXX	XX XX
DJIBOUTI	DJ111	045E	078.5	042.8							XXXX	XXXXX	XX	
DOURBES	DB049	000E	039.9	004.5				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
ELLSWORTH	ELA7P	045W	167.6	318.9				XX						
FLETCHERS ICE	XC982	285E	014.0	235.6				XX						
FORT MONMOUTH	FMJ40	075W	049.5	285.9				XXX	XXXXX	X				
GIBILMANNA	GM037	015E	052.4	014.0								XXXX	X XX	X X
GODHAVN	GOJ69	045W	020.6	306.5				XXX	XX X	X XX	XXXXX	X X	X	X
GOOSE BAY	GSJ53	060W	036.7	299.6							X	XXXXX	XXXXX	
GORKY	GK156	045E	033.9	044.2				XX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
GRAND BAHAMA	GB926	075W	063.4	281.8				XXX	XXXXX	XXXXX	XX			
HALLEY BAY	HBA7N	003W	165.5	333.3							XXXX	XXXXX	X	
HOBART	HO54K	000E	132.9	147.2			XXXXX	XXXXX	XXX	XXXXX	XX		XXXX	XXXXX
HUANCAYO	HU91K	075W	102.0	284.6				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
ILO	ILJ1P	075W	107.4	288.7				X						
IRKUTSK	IR352	105E	037.5	104.0				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
JOHANNESBURG	JO120	30E	116.1	28.1				XXX	XXXXX	XXX	XXXXX	XXXXX	XXXXX	XXXXX
JULIACA	JUJ1N	075W	105.5	289.7				X						

1991/02/20 I O N O S P H E R I C C A T A L O G S U M M A R Y

OBSERVATORY NAME	CODE	TIME	COLAT	LONG	40	45	50	55	60	65	70	75	80	85
JULIUSRUH/RUEGEN	JR055	015E	35.4	013.3									XXXXX	XXXXX
KALININGRAD	KL154	015E	035.2	020.6					X	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
KARAGANDA	KR250	075E	040.2	073.0					X	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
KERGUEL	KG24R	75E	139.3	000.2						XXXXX	XXXXX	XXXX	XXXXX	XXXX
KHABAROVSK	KB548	135E	041.5	135.1				X	XXXXX	XXXXX	XXXXX	XXXXX	XXXX	XXXX
KHEYSA IS	BT280	045E	009.4	058.0				XXX						XXXXX
KIEV	KV151	030E	039.5	030.5					X	XXXXX	XXXXX	XX XX	XXXXX	XXXXX
KIRUNA	KI167	0E	22.2	20.4				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
KODAIKANAL	KO310	075E	079.8	077.5										X
KOKUBUNJI	TO535	135E	054.3	139.5						XX	XXXXX	XXXXX	XXXXX	XXXXX
LA PAZ	LPJ10	060W	106.5	291.9				XX	XXXXX	X				
LA REUNION	LR22J	060E	111.1	055.9									XXXX	XXXXX
LANNION	LN047	000E	041.2	356.7							XXXX	XXXXX	XXXXX	XXXXX
LENINGRAD	LD160	030E	030.0	030.7				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
LINDAU	LI050	015E	038.4	010.1						X				
LISBONNE	LE038	000E	051.3	350.7										XXX
LITTLE AMERICA	LA77Q	195E	168.1	197.8				XX						
LONGYEARBYEN	LG178	015E	11.8	015.8				X						
LYCKSELE	LY164	0E	25.4	18.7				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
MACQUARIE	MQ55M	000E	144.5	159.0			XXXXX	XXXX					XX	XXX
MAGADAN	DU560	150E	030.0	151.0						XX	XXXXX	XXXXX	XXXXX	XXXXX
MAUI	MA720	000W	069.1	203.5				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
MAWSON	MW26P	000E	157.6	062.9				XX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XX
MEANOOK	ME855	105W	035.4	246.6				X						
MIEDZESZYN	MZ152	15E	37.9	21.1								XXXX	XXXXX	X
MIRNY	MI360	009E	156.5	093.0				XXX						
MOSCOW	MO155	030E	034.5	037.2				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
MUNDARING	MU43K	000E	122.0	116.2				X	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXX
MURMANSK	MM168	030E	022.0	033.0				XXX	XXXXX	XXXXX	XXXXX	XXX		
NARSSARSSUAQ	NQJ61	045W	028.7	314.5				XXX	XXXXX	X XX	XXXXX	XX X	XXXX	X
NATAL	NLA0N	030W	095.6	324.7				XX						
NORFOLK ISLAND	NI631	000E	119.0	168.0					X	XXXX	XXXXX	XXXXX	XXXXX	XXXXX
NORILSK	NO369	090E	020.5	088.0						XX	XXXXX	XXXXX	XXXXX	XXXX
NOVOKAZALINSK	NK246	060E	044.5	062.0					X	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
NOVOSIBIRSK	NS355	090E	035.4	083.1						X	XXXX	XXXXX	XXXXX	XXXXX
NURMIJARVI	NU159	0E	29.5	246.0				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXX
OKINAWA	OK426	135E	063.7	127.8				XXX	XXXXX	X	XXXXX	XXXXX	XXXXX	XXXX
OTTAWA	OT945	000W	044.5	284.0	XXX	XXXXX	XXXXX	XXXXX	X	XXXX	XXXXX	XXXXX	XXXX	XXXX
OUAGADOUGOU	OU012	000E	077.7	358.5						XXXX	XXXXX	XX XX	XXXXX	X XX
PANAMA	PN909	285E	080.5	280.1				XX						
PARAMARIBO	PMJ06	000E	084.1	304.7				X						
PARIS-SACLAY	SC047	0E	41.9	2.3					XXXX	XXXXX	X			
PETROPAVLOVSK	PK553	165E	037.0	158.6						XX	XXXXX			
PODKAMENNAYA	TZ362	090E	28.4	090.0						XX	XXXXX	XXXXX	XXXXX	XXXXX
POINT ARGUELLO	PA836	000W	054.4	239.4						X	XXXXX	XXXXX	XXXXX	XXXXX
POITIERS	PT046	000E	043.4	000.3					X	XXX	XXXXX	XXXXX	XXXXX	XXXXX
PORT MORESBY	PY50R	150E	99.4	147.1						XXX	XXX			

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OBSERVATORY NAME	CODE	TIME	COLAT	LONG	40	45	50	55	60	65	70	75	80	85
PORT STANLEY	PSJ5J	60W	141.7	302.2				X		XXX	XXXXX	XXXXX	XXXXX	XXXXX
PROVIDENIYA	PD664	180E	025.5	186.6				XXX	XXXXX	XXXXX	XX	XXX	XXXXX	
PRUHONICE	PQ052	0000	040.0	014.6				XX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XX
PUERTO RICO	PRJ18	060W	071.5	292.8				XXX						
RESOLUTE BAY	RB974	000W	015.3	265.0							X XX		XXX	XXXX
REYKJAVIK	RKA64	015W	025.9	338.2				XXX	XXX X					
ROME	RO041	015E	048.2	012.5				XX	XXXXX	XXXXX	XXX	XXXX	XXXXX	X
ROSTOV	RH149	045E	042.7	039.7				XXX	XXXXX	XXXXX	XXXXX	XXXXX	X	
SALEKHARD	SD266	060E	023.5	066.5				XXX	XXXXX	XXXXX	XXXXX			XX
SAO PAULO	SPJ2L	045W	113.5	313.5				XX						
SCOTT BASE	SB67Q	165E	167.8	166.8				X						
SEOUL	SU437	135E	052.7	126.5										X
SIMFEROPOL	SF144	003E	045.2	326.0				XXX	X					
SLOUGH	SL051	0	38.5	359.4		X	XXX X	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
SODANKYLA	SO166	30E	22.6	26.6				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
SOFIA	SQ143	30E	47.3	23.4					X	XXXXX	XXXXX			
SOUTH GEORGIA	SGA5M	003W	144.3	323.5							XXXX	XXXX		
SOUTH POLE	PO09!	000E	180.0	000.0				XXX	XXXXX					
SOUTH UIST	US057	0	32.8	352.9										XXXXX
ST JOHNS	SJJ47	060W	042.4	307.2				XXX			X XX			
ST. PETER-ORDING	PE054	000E	36.0	9.3									XX	XXXXX
STANFORD	ST837	120W	052.5	237.8				XXX						
SVERDLOVSK	SV256	060E	033.5	058.5				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
SYOWA BASE	SW16R	045E	159.4	039.5					XX	XXXX	XXXXX	XXXXX	XXXXX	X
TAHITI	TT71P	210E	107.7	210.7							XXXX	XXXXX	XXXXX	XXXXX
TAIPEI	TP424	120E	65.1	121.2				X	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
TALARA	TA90M	075W	094.5	278.6				XXX	XXXXX	X				
TASHKENT	TQ241	075E	048.7	069.5					XXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
TBILISI	TB142	045E	048.2	044.7					XX	XXXXX	XXXXX	XXXXX	XXXXX	XX
TERRE ADELIE	DU560	135E	156.7	140.0									XXX	XX
THULE/QANAQ	THJ77	075W	012.5	290.8				XXX	XXX X	X	XXXX	X X		X
TIKSI BAY	TX471	135E	018.4	128.9				XX	X	XXXXX	XX X	XX		X
TOMSK	TK356	090E	033.5	084.9				XXX	XXXXX	XXXXX	XXXXX	XXXXX	X XXX	XXXX
TOWNSVILLE	TV51R	000E	109.3	146.7			XXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
TRELEW	TWJ4L	060W	133.1	294.6				X						
TROMSO	TR169	015E	020.3	019.0				X						
TUCUMAN	TUJ2D	060W	116.9	294.5				X						
UPPSALA	UP158	0E	30.2	17.6				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXX
VANIMO	VA50L	000E	092.7	141.3					X	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
VICTORIA	VI848	120W	041.5	236.5				X						
VOSTOK	VO47P	105E	168.3	106.9				X						
WAKKANAI	WK545	135E	044.6	141.7						XX	XXXXX	XXXXX	XXXXX	XXXX
WASHINGTON	WA938	075W	051.2	282.9				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXX
WATHEROO	WT43!	120E	120.3	115.9			XXXXX	XXXXX						
WHITE SANDS	WS832	105W	057.7	253.5				XXX	XXXXX	X XX	XXX	XXXX	X	
WILKES/CASEY	WL460	000E	156.3	110.5				XXX	XXXXX	XXXXX	XXXXX	X		
WINNIPEG	WI949	090W	040.2	265.5							X XX	X		

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OBSERVATORY NAME	CODE	TIME	COLAT	LONG	40	45	50	55	60	65	70	75	80	85
YAKUTSK	YA462	135E	028.0	129.6				XXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
YAMAGAWA	YG431	135E	058.8	130.6						XX	XXXXX	XXXXX	XXXXX	XXXX
YUZHNO SAKHALINS	SA547	150E	043.0	143.0				XXX	XXXXX	XXXXX				

Data at WDC-A for STP but not added to data base as of 2/20/91

Scott base	70-83	all parameters
Campbell is	70-86	all parameters
Auckland	70-78	all parameters
Christchurch	70-86	all parameters
Rarotonga	70-80	all parameters
Salisbury	71-73, 83-88	all parameters
Camden	80-84	all parameters
Cocos Is	61-74	all parameters
Mundaring	89	all parameters
Pt Moresby	61-66	all parameters
Hobart	61, 72-80	all parameters
Norfolk Is	65	all parameters
Wallops Is	87-91	all parameters

Ionospheric Stations whose foF2 data is on CD NGDC-05/1

Station	Co-Lat	E. LONG	data coverage
ALMA ATA	46.7	76.9	57-89
BOULDER	50.0	254.6	58-89
CANBERRA	125.3	149.0	50-88
HUANCAYO	102.0	284.6	57-89
IRKUTSK	37.5	104.0	57-88
KOKUBUNJI	54.3	139.5	68-89
MAUI	69.1	203.5	57-89
Moscow	34.5	37.2	57-89
POINT ARGUELLO	54.4	239.4	69-89
SLOUGH	38.5	359.3	67-87
WALLOPS IS	52.2	284.5	68-87
WASHINGTON	51.2	282.9	57-67

We encourage those responsible for operation of ionosondes at the sites listed above or other systematic observing locations to see whether the holdings at NGDC/WDC-A for STP are comprehensive. Anyone who has other data from those locations that is already in digital format or that could be made digital in time to meet our deadline for further CD publication is invited to send a copy to R. 0. Conkright or J. H. Allen at NOAA/NGDC, WDC-A for STP, E/GC2, 325 Broadway, Boulder, Colorado 80303, USA. For correspondence about such data or any other questions, please write or use any convenient electronic means of communications, e.g.

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