

RECOMMENDATION ITU-R P.313-8

**EXCHANGE OF INFORMATION FOR SHORT-TERM FORECASTS
AND TRANSMISSION OF IONOSPHERIC DISTURBANCE WARNINGS**

(Question ITU-R 213/3)

(1951-1959-1966-1974-1978-1982-1986-1990-1992-1995)

The ITU Radiocommunication Assembly,

considering

- a) that some radiocommunication services would benefit from having the earliest possible warnings of the probable onset of disturbances to ionospheric propagation;
- b) that Annex 1 contains the most recent information on the availability and exchange of basic data for radio propagation forecasts,

recommends

- 1** that each country participating in radio propagation research should designate an official agency for the reception, coordination and exchange of information required for the preparation of short-term forecasts, and for liaison with corresponding agencies in other countries;
- 2** that such information should be forwarded to the above agencies by the most direct means of telecommunication (e.g. E-mail);
- 3** that data needed for short-term forecasting within 48 hours should be disseminated in accordance with the International Ursigram and World Days Service (IUWDS) decisions by suitable available communication channels, while other data should be disseminated by ordinary post or airmail, or, if requested, by radio or other rapid means of communication, and that short regular transmissions giving short-term warnings of ionospheric disturbances should be effected by long-range radio stations;
- 4** that codes to be used for the above communication and dissemination should be fully standardized in accordance with IUWDS decisions and actions;
- 5** that administrations and operating agencies using the above services should be invited to compare the forecasts with the actual behaviour of radio circuits, to evaluate the accuracy of the forecasts, and to provide records and make any suggestions which might assist the studies undertaken to improve the methods used;
- 6** that it is desirable that a common method, based on the work on Question ITU-R 213/3 be adopted to describe ionospheric perturbations and variations, for correlation with forecasts and the behaviour of operating radio services;
- 7** that, where administrations have provided facilities for the rapid interchange of information in connection with the IUWDS, these facilities should be maintained, and, if necessary, extended in the future.

ANNEX 1

**Availability and exchange of basic data
for radio propagation forecasts****1 Introduction**

Propagation of radio signals in the range 3 to 30 MHz is practicable over any but the shortest distances, mainly because of the possibility of obtaining ionospheric and ground reflections which result in small values of attenuation. Satisfactory communications for a given circuit can generally be obtained if the operating frequency lies between a lower (LUF) and

an upper (operational MUF) frequency limit. These are determined by ionospheric characteristics. The operational range of frequencies has been found to be even more restricted with some forms of high capacity communication systems.

Since only a limited range of frequencies can be used, it is desirable to have, as far in advance as possible, information on the probable values of these upper and lower limits, as well as short-term forecasts and disturbance warnings. Collectively, these predictions (long-term) and forecasts (short-term) and disturbance warnings provide information for planning and operating personnel, that can be utilized in making the most economical use of the limited resources of equipment and frequency spectrum. The long and medium-term predictions are indicative of representative ionospheric conditions, so that it is extremely useful to operating personnel to be warned of impending ionospheric disturbances in order that traffic can be re-routed, instructions can be issued in advance to cover temporary adjustments in the normal operating frequency, and the performance of other systems affected by the ionosphere can be assessed.

2 Available data for radio-propagation forecasts

2.1 Long-term predictions

Organizations in several countries prepare predictions of ionospheric conditions and ionospheric indices from 1 month up to 12 months in advance (see Table 1); for general planning purposes, predictions for a complete solar cycle are also made by some organizations. These predictions are for representative ionospheric conditions. The information which is applicable to any part of the world, is available for interchange between the organizations undertaking this service.

2.2 Forecasts of disturbances

Organizations in several countries prepare forecasts of ionospheric disturbances from a few hours to 27 days in advance (see Table 1). These forecasts are supplemental to the long-term predictions, since the occurrence of ionospheric disturbances, which cannot be forecast for long periods in advance, may modify considerably the frequency range within which satisfactory operation can be maintained on a particular circuit. Operating organizations have shown interest in these short-term forecasts to such an extent that they are now being regularly transmitted by radio at scheduled times (see Table 1).

2.3 Working documents for long-term predictions

Recommendation ITU-R P.434 is the source of basic MUF and FOT for use with predicted 12-month running mean sunspot numbers R_{12} in making long-term predictions for any part of the world.

3 Exchange of basic data used in short-term forecasts

3.1 For many years, scientific information of direct interest to those concerned with ionospheric forecasts and disturbances has been broadcast by certain countries, in programmes known as Ursigrams. Since 1962, through the International Ursigram and World Days Service (IUWDS) (a Permanent Service of URSI in association with IAU and IUGG adhering to the Federation of Astronomical and Geophysical Services), these data are collected, coordinated and exchanged by rapid means through suitable interchange synoptic codes. These programmes provide a means of exchange of summary information required within 48 hours, after its collection, for the preparation of short-term forecasts and similar urgent purposes. These exchanges are made through regional networks, composed of observatories, laboratories, communication agencies and regional centres. The regional centres in turn exchange, once a day, summaries of information on solar flares, sudden ionospheric disturbances, solar corona and radio emission, sunspots, ionospheric and magnetic activity, as well as forecasts. The regional warning centres (RWC) in Australia, France, the Federal Republic of Germany, Japan, and the Russian Federation, plus associate regional centres in the Czech Republic, India and the Republic of Poland, collect data in their regions and forward them by the most suitable means of telecommunication to the IUWDS World Warning Agency (at Boulder, Colorado, United States of America), which has also collected data from its region. The IUWDS World Warning Agency makes the final decisions, having advice

available from the other centres, whether or not to declare a worldwide GEOPHYSICAL ALERT (issued shortly after an exceptional solar or geophysical event has occurred or started) – a period during which many geophysical stations carry out special observing programmes. These decisions are distributed throughout the world to scientific stations participating in the programme by various rapid means, in particular over the meteorological teleprinter networks coordinated by the WMO.

3.2 Types of data exchanged among the various regional centres are those concerning solar flares, solar corona, solar radio emission, cosmic rays, critical frequencies of the ionosphere, ionospheric disturbances, terrestrial magnetism and radio-propagation quality. Data are collected and transmitted in simple synoptic codes. Code booklets are available from Dr. R. Thompson, Chairman, IUWDS Steering Committee, IPS Radio and Space Services, P.O. Box 5606, West Chatswood, NSW 2057, Australia, or Mr. G. Heckman, Secretary for Ursigrams, IUWDS Steering Committee, NOAA, Boulder, Colorado 80303, United States of America. The regional centres from which details may be obtained concerning data and schedules of broadcasts and reports are listed in Part E of the IUWDS Synoptic Codes for Solar and Geophysical Data, Third Revised Edition, 1991.

3.3 Table 1 lists the centralizing agencies, which have been designated for the reception, coordination, liaison and exchange of information relating to radio propagation.

TABLE 1

List of organizations concerned with the exchange of data and the issuing of forecasts of propagation conditions and ionospheric indices

- A: an agency for the general exchange of information on propagation.
- RC: a regional centre of the IUWDS for the rapid exchanges of data required for short-term forecasts of disturbances.
- L: the organization issues long-term predictions. The period ahead for which predictions are made as shown (in months).
- S: the organization issues short-term forecasts of disturbances.
- I: the organization issues long-term predictions of ionospheric indices. The period ahead for which predictions are made is as shown (in months)

Country	Organization	Address	A	RC	L	S	I
Germany (Federal Republic of)	University of Rostock	Institute for Atmospheric Sciences Schlossstr. 4-6 D-0-2565 Ostseebad-Kuehlungsborn Telefax: +49 38293 212	x				
Argentina	LIARA	LIARA Av. Libertador No. 327 1638 Vicente López (B.A.)	x		6		
Australia	IPS	IPS Radio and Space Services P.O. Box 5606 West Chatswood, NSW 2057 Telefax: +61 2 414 8340		x	3	x	12
Belgium	Observatoire royal de Belgique	Sunspot Index Data Centre (SIDC) Observatoire royal de Belgique, 3, avenue Circulaire, Uccle, Brussels, B-1186 Telefax: +32 2 373 0224			6		
	Institut royal météorologique	Chef du Département géophysique, Institut royal météorologique, 3, avenue Circulaire, Uccle, Brussels, B-1186 Telefax: +32 2 374 6788	x				

TABLE 1 (continued)

Country	Organization	Address	A	RC	L	S	I
Brazil	CTA/ITA	Centro Tecnológico da Aeronáutica/Instituto Tecnológico da Aeronáutica Jacareí – São José dos Campos São Paulo CEP: 12300-000 Telefax: +55 12 321 1311	x		1		
	I.P9.M.	Instituto de Pesquisas da Marinha Rua Ipuru, s/n – Jardim Guanabara Ilha do Governador – Rio de Janeiro CEP: 21931-000 Telefax: +55 21 396 2240			1		
Canada	Department of Industry	Telecommunications Regulatory Service Engineering Support Division 1241 Clyde Avenue Ottawa, Ontario K2C 1Y3 Telefax: +1 613 952 1088	x				
China (People's Republic of)	CRIRP	China Research Institute of Radiowave Propagation P.O. Box 138 Xinxiang, Henan Telefax: +86 1 821 6857	x			x	12
Spain		Dirección General de Telecomunicaciones, Madrid	x				
United States	NOAA Environmental Research Laboratories	Space Environment Services Center NOAA R/E/SE2 325 Broadway Boulder, Colorado 80303 Telefax: +1 303 497 7392	x	x		x ⁽¹⁾	
	NOAA Environmental Data and Information Services	World Data Center A for Solar-Terrestrial Physics NOAA E/GC2 325 Broadway Boulder, Colorado 80303			6 (see Note 1)		
	National Telecommunications and Information Administration	Institute for Telecommunication Sciences 325 Broadway Boulder, Colorado 80303	x				
France	CNET	Service des Ursigrammes Observatoire de Paris F-92190 Meudon Telefax: +33 1 45077959	x	x		x	
		Service des Prévisions Ionosphériques CNET 2, avenue Pierre Marzin F-22307 Lannion Cedex Telefax: +33 96053256	x		3	x	
India	Council of Scientific and Industrial Research	The Secretary Radio Research Committee National Physical Laboratories Hillside Road, New Delhi, 12 Telefax: +91 11 575 2678	x	x	6		
	India Meteorological Department	Kodaikanal Observatory				x	
	All India Radio	Research Department, All India Radio Indraprastha Estate, New Delhi-1	x				
Israel	Radio Observatory	P.O. Box 911 Haifa 31008	x		1		
Italy		Istituto Nazionale di Geofisica Via di Vigna Murata, 605 00143 Roma Telefax: +39 6504 1181	x		3		

TABLE 1 (continued)

Country	Organization	Address	A	RC	L	S	I
Japan	CRL	Hiraiso Solar Terrestrial Research Centre Communications Research Laboratory Ministry of Posts and Telecommunications 3601, Isozaki Hitachinaka-shi 311-12 Telefax: +81 292 659 720	x	x		x ⁽²⁾	
Mexico	SCT	Dirección General de Telecomunicaciones Estación de sondeo ionosférico Xola y Universidad, Mexico, (12) DF	x				
Poland (Republic of)	Polish Academy of Sciences Space Research Centre	Helio-Geophysical Prediction Service Polish Academy of Sciences Space Research Centre Bartycka 18a 00-716 Warsaw Telefax: +48 39 121273		x		x	
United Kingdom	Rutherford Appleton Laboratory	World Data Centre C1/STP Rutherford Appleton Laboratory Chilton, Didcot Oxfordshire, OX11 0QX Telefax: +44 1235 44 5753	x				12
	GEC-Marconi Research Centre	GEC-Marconi Research Centre West Hanningfield Road Great Baddow Chelmsford Essex CM2 8HN Telefax: +44 1245 475244			6	x	
Republic of South Africa	CSIR	National Institute for Telecommunications Research 18a Gill Street P.O. Box 3718 Observatory Johannesburg, 2000	x		1		
Sweden		Institute of Space Physics Uppsala Division S-75591 Uppsala Telefax: +46 18 403100	x				
		National Defense Research Establishment Division of Communications Box 1165 S-58111 Linköping Telefax: +46 13 318049			3	x	
Czech Republic		Geophysical Institute Academy of Sciences Boční 2 cp 1401 14131 Praha 4 Telefax: +42 2 762528		x			
Russian Federation	Hydrometeorological Service	Hydrometeorological Service Institute of Applied Geophysics 9, Rostokinskaya Street Moscow 128226	x	x	6	x ⁽³⁾	

(1) Solar and geophysical information radiated from WWV.

(2) Warnings radiated from JJY.

(3) Warnings radiated from RDZ and RND.

NOTE 1 – World Data Center A for Solar-Terrestrial Physics receives and distributes ionospheric data from a few geographical areas not directly represented through membership in the ITU.