

RECOMMENDATION ITU-R P.313-9

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

(Question ITU-R 213/3)

(1951-1959-1966-1974-1978-1982-1986-1990-1992-1995-1999)

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 h should be disseminated in accordance with the International Space Environment Service (ISES) 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 ISES 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 ISES, 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. Recommendation ITU-R P.533 provides an HF propagation prediction method.

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; 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. 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.

2.3 Working documents for long-term predictions

Recommendation ITU-R P.1240 is the source of basic MUF and optimum working frequency (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 (<http://www.sec.noaa.gov/ises>). Since 1962, through ISES (a permanent service of the International Union of Radio Science (URSI) in association with the International Astronomical Union (IAU) and the International Union of Geodesy and Geophysics (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 h, 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, Canada, the People's Republic of China, France, India, Japan, the Republic of Poland, the Czech Republic and the Russian

Federation collect data in their regions and forward them by the most suitable means of telecommunication to the ISES World Warning Agency (at Boulder, Colorado, United States of America), which has also collected data from its region. The ISES 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.

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. K. Marubashi, Chairman, Communications Research Laboratory, Ministry of Posts and Telecommunications, 2-1, Nukui-Litamachi 4-chome, Koganei-shi, Tokyo 184, Japan, or Mr. G. Heckman, Secretary, ISES Steering Committee, NOAA, Boulder, Colorado 80303, United States of America.
