

## SPACE WEATHER SERVICES IN AUSTRALIA

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### ABSTRACT

The Australian national space weather services are provided by IPS Radio and Space Services, an Australian Government agency and part of the Department of Industry, Science and Resources. IPS operates the Australian Space Forecast Centre through which a wide range of services are provided for the many and diverse people affected by space weather. To produce these services, IPS has a network of stations in the Australian region to monitor solar, geomagnetic and ionospheric conditions. These include solar observatories at Culgoora in the east of Australia, and at Learmonth (jointly managed with the US Air Force) in Western Australia. IPS also has access to a wide range of international data which are essential to maintain a continuous watch on space weather conditions. Most of IPS space weather services are provided by facsimile and electronic mail. However, the most dramatic growth area has been products on the World Wide Web. This medium has allowed IPS to produce a host of innovative products.

### 1. WHAT IPS DOES

IPS Radio and Space Service has as its objective to provide timely and reliable radio propagation and space weather advice to the Australasian community. To achieve its objective, IPS has a comprehensive range of services for public and private sector customers in defence, communications, aviation, geophysical exploration, space activities, and national and international science.

When formed in 1949, IPS was mostly concerned with supporting High Frequency (HF) radio communications. Today, HF users remain important to IPS, especially those in the defence forces and emergency services but other groups have become significant users of IPS services. Many companies do aeromagnetic surveys for minerals and depend on warnings of disturbances and indications of magnetic pulsations. Other users include radio amateurs, powerline and pipeline authorities, satellite operators, and scientific researchers. Growing numbers of communication and navigation satellites place more emphasis on the effects of space weather on spacecraft. Customers with space operations are an expanding client group.

IPS has a wide range of customers with a diverse set of interests. These include:

- Department of Defence
- Airservices Australia
- Australian Communications Authority
- Australian Customs Service
- Australian Maritime Safety Authority
- Radio Australia
- State Police and Emergency Services
- Qantas, Ansett and other Airlines
- New Zealand and PNG Defence Forces
- Optus Communications
- Telstra
- Geophysical Exploration Companies

## 2. IPS DATA SOURCES

To provide space weather services, a wide range of data, often in near real-time, is required to assess conditions. These data include information about the sun, the geomagnetic field, the ionosphere, and about the near-earth and interplanetary environment. Some of this information must be obtained from space, but some comes from ground-based observations. In the later case, it is often necessary to have a global network of observatories.

IPS has a network of ground-based ionosondes in the Australasian and Antarctic region to monitor the ionosphere, which is important for HF communications. IPS also has a number of magnetometers of its own and access to those operated by the Australian Geological Survey Organisation and others. To monitor the sun, IPS operates the Learmonth Solar Observatory in West Australia (jointly with the US Air Force) and the Culgoora Solar Observatory in eastern Australia.

International data play a very important role for IPS services. IPS is a member of the International Space Environment Service (ISES) and has close links with many overseas agencies who are interested in space weather.

## 3. IPS SERVICES AND PRODUCTS

Table 1 lists the major areas in which IPS provides services and some of the specific products.

Table 1. A list of IPS Services and Products

### Consultancy Services

- HF Network Design and Evaluation
- Customised Software
- Specialised HF Predictions
- LF, MF, HF, VHF antenna radiation patterns

### Event-Driven Reports

- Geomagnetic Warnings
- HF Propagation Warnings
- Solar Terrestrial Activity Alerts

### Geophysical Reports

- Weekly Geophysical Report

### HF Radio Frequency Predictions

- Air Route Charts
- Hourly Area Predictions
- Local Area Mobile Predictions
- Field Strength Predictions
- GRAFEX Predictions

### HF Radio Propagation Reports

- Daily HF Propagation Report
- Weekly HF Propagation Report

### Internet Services

- Internet List Server for most of the standard IPS reports
- IPS Web site containing a large amount of solar,

geomagnetic, ionospheric, and space weather information, including near real-time maps of the ionosphere for Australia, New Zealand, North America, and Europe

#### Solar, Geophysical and Space Weather Reports

- Daily Solar and Geophysical Report
- Weekly Solar and Geophysical Report
- Monthly Solar and Geophysical Report
- Recorded Telephone Message

#### Computer Software

- Advanced Stand Alone Prediction System (ASAPS)
- Ground Wave Prediction System (GWPS)
- Autoscale (for computer scaling of ionograms)

#### Courses and Publications

- HF Radio Propagation Course
- ASAPS Tutorial
- HF Radio Propagation Manual
- Technical Reports

## 4. IPS WEB SERVICES

The type of services provided by IPS, and the method of delivery has changed significantly. Whereas telex and telephone were once the basis of fairly simple warning services, now email, the World Wide Web and facsimile provide customers with access to a host of sophisticated products. Increasingly, these data will be available in an interactive manner in which customers can select what they require and the rate at which it is provided.

The IPS Web system as a means of product delivery has grown greatly in the last few years. A key element of the IPS Web system is the provision of near real-time maps of the ionosphere where suitable ionospheric observations are available. It is then possible to establish charts which identify suitable communication frequencies for HF circuits in the region. IPS has established real-time ionospheric maps using data from its own network in the Australasian region including New Zealand; a map of the North American region using US Air Force observations obtained via Space Environment Center in the USA; and a European map using data from the Rutherford Appleton Laboratory in the UK, the Swedish Institute of Space Physics, and the Istituto Nazionale di Geofisica in Italy.

Once a real-time map of the ionosphere is available, it is then possible to establish charts which give the maximum frequencies supported by the ionosphere for HF communications from particular locations. IPS has a wide range of such predictions for locations within the Australian and New Zealand region, North America, and Europe. These charts are available on the Web and are updated each hour.

To make access to this information easier for users, IPS has several customer support pages for users of HF communications. There are presently support pages for Australia, New Zealand, North America, and Europe. The addresses of these pages are listed in Table 2 along with other IPS Web addresses.

## Table 2. The Major IPS Web Pages

### IPS HOME PAGE

<http://www.ips.gov.au/>

### CURRENT HF RADIO PROPAGATION AND SPACE WEATHER REPORT

<http://www.ips.gov.au/asfc/current/>

### SPACE WEATHER STATUS PANEL

[http://www.ips.gov.au/asfc/current/status\\_panel/](http://www.ips.gov.au/asfc/current/status_panel/)

### REPORTS FROM THE AUSTRALIAN SPACE FORECAST CENTRE

<http://www.ips.gov.au/asfc/>

### IPS SUPPORT FOR HF RADIO IN AUSTRALIA

[http://www.ips.gov.au/asfc/aus\\_hf/](http://www.ips.gov.au/asfc/aus_hf/)

### IPS SUPPORT FOR HF RADIO IN NEW ZEALAND

[http://www.ips.gov.au/asfc/nz\\_hf/](http://www.ips.gov.au/asfc/nz_hf/)

### IPS SUPPORT FOR HF RADIO IN NORTH AMERICA

[http://www.ips.gov.au/asfc/usa\\_hf/](http://www.ips.gov.au/asfc/usa_hf/)

### IPS SUPPORT FOR HF RADIO IN EUROPE

[http://www.ips.gov.au/asfc/euro\\_hf/](http://www.ips.gov.au/asfc/euro_hf/)

### INTERESTING FACTS AND EDUCATIONAL MATERIAL

<http://www.ips.gov.au/papers/>

### LEARMONTH SOLAR OBSERVATORY

<http://www.ips.gov.au/learmonth/>

### CULGOORA SOLAR OBSERVATORY

<http://www.ips.gov.au/culgoora/>

### INFORMATION ABOUT IPS HF PREDICTIONS

<http://www.ips.gov.au/prediction/>

### ASAPS HF PREDICTION SOFTWARE

<http://www.ips.gov.au/asaps/>

## 5. HOW TO CONTACT IPS

IPS welcomes enquiries about space weather and any of its services. Contact details for IPS are given in Table 3.

### Table 3. IPS Contact Details

Postal Address:  
IPS Radio and Space Services  
PO Box 1386  
Haymarket NSW 1240  
Australia

Telephone:

+61-2-9213 8000 (General Enquiries)  
+61-2-9213 8012 (Recorded Message)  
+61-2-9213 8010 (Forecast Centre)

Facsimile:

+61-2-9213 8061 (Services)  
+61-2-9213 8060 (Administration)

Electronic Mail:

[asfc@ips.gov.au](mailto:asfc@ips.gov.au)

World Wide Web:

<http://www.ips.gov.au>