



# IPS RADIO AND SPACE SERVICES

## FACTS ON SPACE WEATHER EFFECTS



Australian Government  
Department of Industry  
Tourism and Resources

We are all familiar with the effects of terrestrial weather on our society. Perhaps less well known are the effects of space weather. Energetic events on the sun, the flow of solar wind material, and subsequent effects on the earth's geomagnetic field and upper atmosphere (ionosphere) comprise space weather. A variety of technologies can be affected by space weather, as discussed below:

### **High Frequency (HF) Radio Systems:**

Despite the development of competing technologies, HF radio remains an important tool for long distance communications and surveillance. HF radio signals propagate over long distances via the ionosphere. As such, changes to the ionosphere due to space weather may adversely affect HF radio systems. The main effects of space weather on HF radio systems include:

- Short-wave fadeouts - blackouts of HF signals caused by large solar flares
- Polar Cap absorption events - blackouts of HF signals propagating through the earth's polar regions, resulting from protons emitted from the sun, and
- Changes to the usable range of HF frequencies due to geomagnetic and ionospheric storms (large scale disruptions to the geomagnetic field and ionosphere that usually last between one and three days).

### **Satellites**

Space weather effects on satellites depend on their orbits. Geosynchronous satellites in the highest orbits are susceptible to infrequent bursts of high energy particles from the sun. These particles may cause memory upsets, dielectric charging and radiation damage to components. This can result in operational glitches, degradation of service or in extreme cases, loss of the satellite.

Satellites in low Earth orbits are less susceptible to particle damage, except over the polar regions, but may suffer increased orbital decay (and consequent reduced lifetime) when significant space weather occurs.

### **Geophysical Exploration - Aeromagnetic Surveys**

Aeromagnetic surveys are flown to help locate various mineral resources. The quality of data obtained from these surveys can be degraded by space weather such as geomagnetic storms. Where possible, aeromagnetic surveyors seek to conduct their work under quiet geomagnetic conditions.

### **Long-distance pipelines and power lines**

Intense geomagnetic storms can cause surges in long-distance power lines located at high latitudes. The cathodic protection of long distance pipe-lines may also be adversely affected under such circumstances.

### **IPS SERVICES AND SPACE WEATHER EFFECTS**

One of the key roles of IPS is to monitor and forecast space weather, so that customers can minimise any adverse affects on their operations. A wide range of IPS space weather services are available via e-mail or SMS subscriptions, as well as through the IPS web site. For further details, please contact IPS.

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