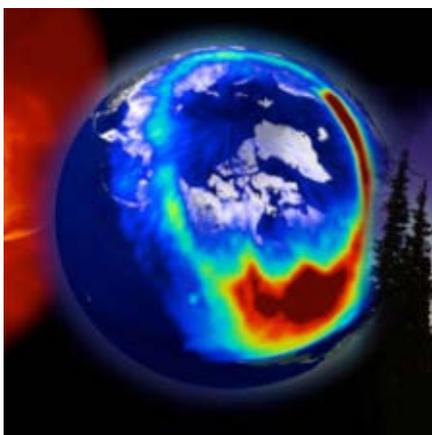


Space weather

Find out more about how we forecast space weather



Space weather describes changing environmental conditions in near-Earth space. Magnetic fields, radiation, particles and matter, which have been ejected from the Sun, can interact with the Earth's upper atmosphere and surrounding magnetic field to produce a variety of effects.

Space weather conditions vary, with streams of particles from the Sun constantly hitting Earth via the solar wind. Earth experiences an increased impact during periods of high solar activity, when a large number (compared to quiet periods) of solar eruptions can occur in the form of flares and coronal mass ejections (CMEs). Extreme events that cause the largest impacts can occur at any time during the 11 year solar cycle.

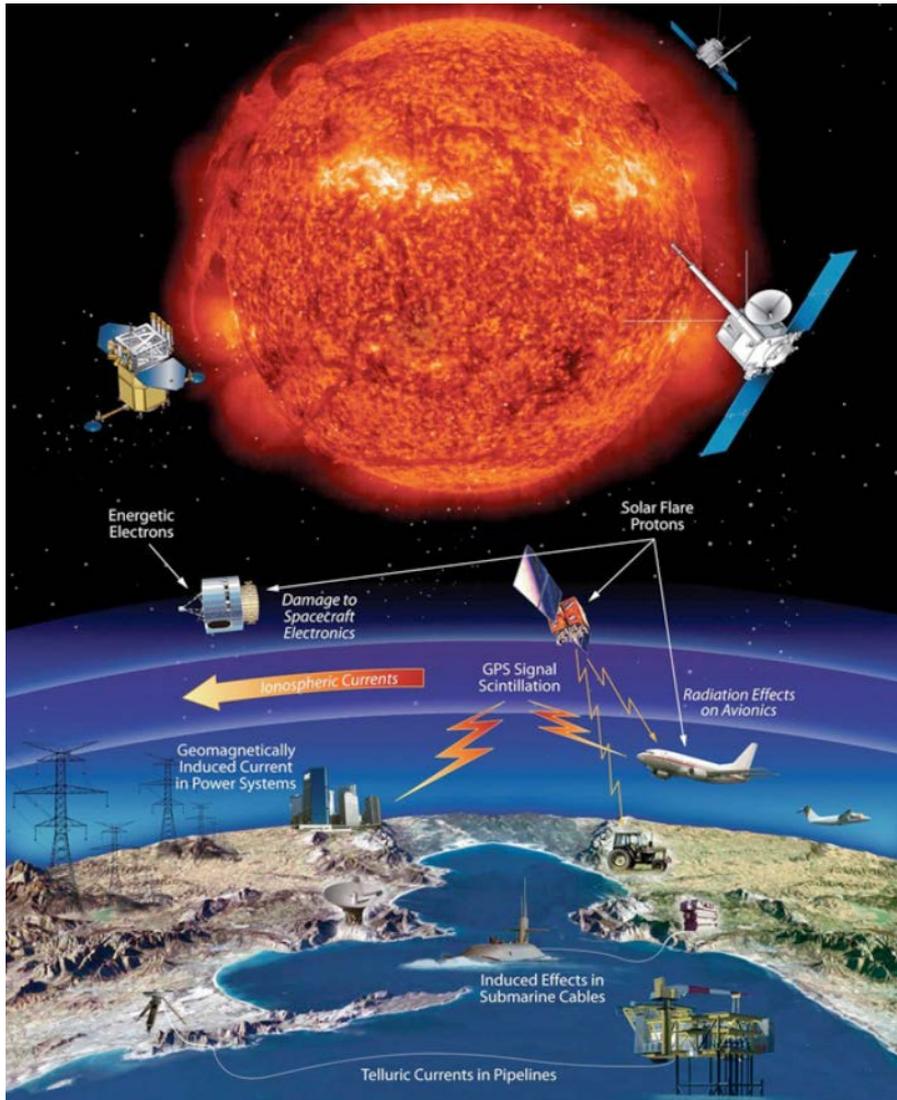
Solar flares are sudden releases of energy across the entire electromagnetic spectrum. They are hard to predict, and the energy can be detected in Earth's atmosphere as soon as 8.5 minutes after a solar flare (travelling at the speed of light). CMEs are often associated with flares, eruptions of large amounts of matter from the solar atmosphere. These can take days to reach Earth, carrying a local magnetic field from the Sun, and their arrival time is the focus of space weather forecasting.

What is the impact of space weather?

Space weather has several effects on near-Earth space; the most recognisable might be the aurorae at high latitudes, also known as the Northern Lights. Large solar eruptions can cause aurorae to form in even lower latitudes, as far south as the equator in very strong events.

In our increasingly technologically-dependent society, the impact of solar eruptive events can be severe. Interruptions to radio communications and GPS can occur, and power grids can also be disrupted.

Particles accelerated during eruptions can damage spacecraft and degrade electronics, and instruments often have to be switched-off or reset. In the aviation industry, flight crews, passengers, and onboard electronics are all under direct exposure to higher levels of radiation on transpolar flights. Even astronauts cannot take space walks during these events. Solar activity monitoring systems are imperative to keep astronauts safe.



How do we monitor and forecast space weather?

Ground-based and satellite instrumentation is used to monitor space weather events. The solar surface and atmosphere is observed in near-real time to detect any new active regions that may become the source of large events. These observations can help determine whether an eruption may be a threat if it is Earth-directed. The Earth's atmosphere is also monitored to detect changes related to solar wind variations, as well as short-term impacts of solar eruptions.

To minimise the impact of space weather, we are developing forecasting infrastructure. Ongoing scientific research is imperative to understand fundamental physical processes involved in driving space weather, such as solar magnetic fields. The more that is known about these processes, the more models can be improved to accurately predict when a flare or eruption will occur. Current forecasting enables prediction of CMEs impacting Earth within plus or minus six hours (at best). Improving the accuracy of this window will offer additional protection to our technology-based society.

For more information please call our 24 hour Customer Centre
on **0870 900 0100**