

# SANSA

## SPACE WEATHER CENTRE

### What is Space Weather?

Space weather refers to conditions on the Sun, in the solar wind, magnetosphere, ionosphere, and thermosphere that influence the performance and reliability of space-borne and ground-based technological systems.

### Solar Flare

A sudden eruption of electromagnetic energy on the surface of the Sun. Electromagnetic energy reaches Earth in 8 minutes and may cause effects that last for a few hours.

### Sunspots

Sunspots are dark, cooler areas on the solar surface that contain strong, constantly shifting magnetic fields. CMEs emerge from sunspots.

### Coronal Holes

These are large holes in the Sun's corona that are less dense and cooler than surrounding areas. High-speed solar wind streams flow from coronal holes into space at speeds of up to 900 km per second.

### Coronal Mass Ejection

A CME is a large cloud of charged particles that is ejected from the surface of the Sun when stored energy is suddenly released. CMEs reach Earth in 1-4 days and may cause effects that last for a few days.

### Satellite Operations

Solar energetic particles emitted by the Sun may damage electronic systems on satellites causing them to fail or record incorrect data.

### Human Space Exploration

Solar energetic particles present a health hazard to astronauts on space missions.

### Navigation

GPS radio signals travel from satellites through the Earth's ionosphere to ground-based receivers. When the ionosphere is disturbed by space weather, the accuracy of position estimates by GPS and navigation systems may significantly decrease.

### Impact of Space Weather

Space weather may impact systems such as power grids, high frequency radio communication, GPS, mobile telephones, satellites, avionics, aircraft navigation and communication systems.

### Aviation

Space weather may impact in-flight communication and damage avionics. Crew and passengers risk radiation exposure when flying over polar regions during solar storms.

### Communication

Space weather events may disturb the ionosphere which leads to the disruption of radio wave signals. During extreme solar storms high frequency communication may be affected for days.

### Power Grids

During space weather events, electric currents in the magnetosphere and ionosphere show large variations. These variations induce currents in power lines which may result in power transformer damage and network collapse.