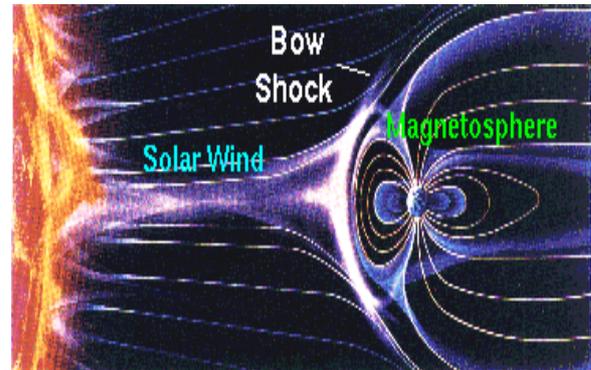


Space Weather and its effects

Ghulam Murtaza

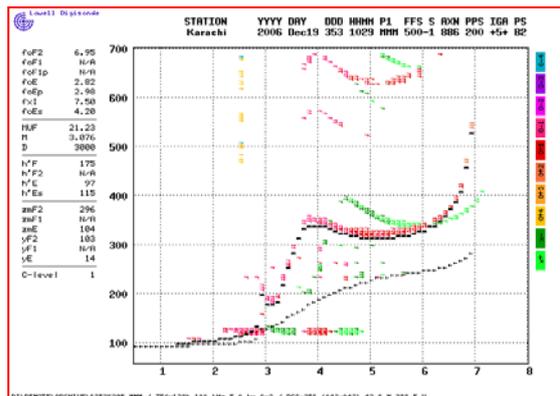
Space weather refers to conditions on the sun and in the solar atmosphere that influences the performance and reliability of space-borne and ground-based technological systems on earth. It links the sun, the earth, the solar wind and the space in contiguous chain of universe components. Weather systems on the sun can spawn interplanetary storms of colossal size and energy that envelop our earth in electromagnetic hurricanes. At least four solar phenomena (coronal mass ejections, solar flares, coronal holes and solar prominences), not one of which is well understood, release matter from the sun into the solar system. Solar flares can last from minutes to hours. In view of the importance of space weather, SUPARCO is actively engaged in its monitoring and provides advisory services to national agencies for taking steps to minimize the effects of high energy solar radiation.



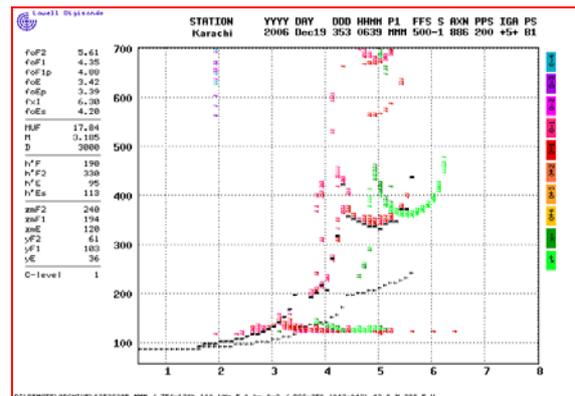
The sun along with five major planets (smallest- earth) and the solar atmosphere affecting the earth

Source: <http://Chandra.harvard.edu>

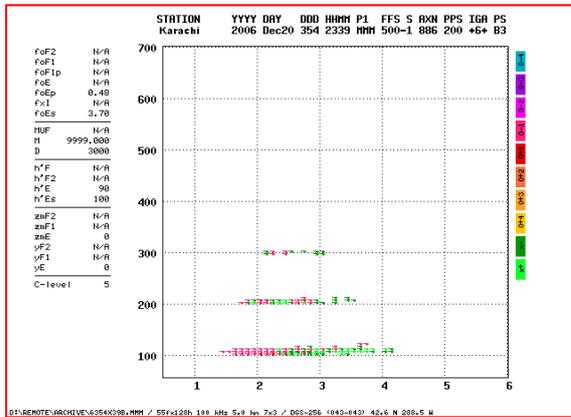
It operates a network of ionospheric and geomagnetic observatories to monitor and analyze the behavior of upper atmospheric and geomagnetic variations for ensuring continuous operation of satellites and other communication systems on ground. Solar data from sun monitoring satellites (at 1.5 million Km away from earth) such as Solar Dynamics Observatory (SDO), Solar and Heliospheric Observatory (SOHO) etc is also utilized for this purpose.



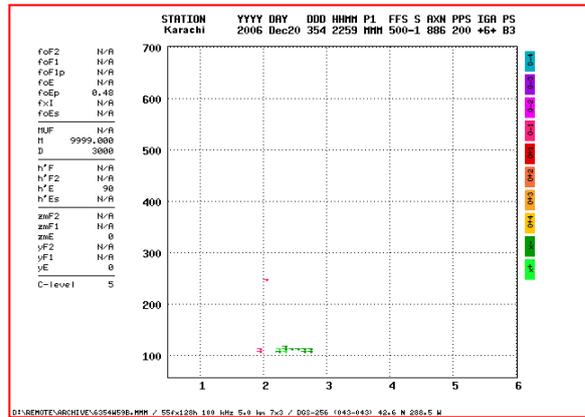
Normal ionospheric conditions



Ionosphere during magnetic storm



Ionosphere during moderate solar activity



Ionosphere during high solar activity

SUPARCO shares its ionospheric and geomagnetic data with the World Data Center for Solar-Terrestrial Physics, NOAA, Boulder, Colorado, USA for cooperative scientific research projects such as upper atmosphere climate studies and improvement in global / regional assimilative ionospheric models etc. It also participated in the Constellation Observing Systems for Meteorology, Ionosphere and Climate (COSMIC) campaign.

As part of Pakistan's space vision, SUPARCO is in the process of establishment of Space Weather Monitoring and Prediction Centre. This facility would be used for impact assessment of solar radiation on spacecraft as well as ground based facilities, probing and monitoring of high energy particles, hot plasma and their charging effect, upper atmosphere density and composition, and earthquakes studies.

Conclusion

Better understanding of space weather phenomena and their consequences would assist in reducing the effects of solar radiation on the satellites and communication systems on the earth. This would ultimately help in the development of high quality space components and availability of reliable communication.