



NOAA *Backgrounder*

SPACE WEATHER—WHAT IS IT AND WHY DO WE WANT TO KNOW ABOUT IT?

When you look outside each morning, ever wonder what the weather's like in outer space? Maybe you'd rather know if it's going to rain, snow, or storm right here on Earth. But as our world becomes increasingly complex and computerized, with new technologies and high-tech businesses, more and more people and industries are interested in space weather and find that it is of vital importance to their activities.

Understanding the space environment and being able to accurately predict turbulent space weather is critical to the nation as we face a changing world that includes more and more orbiting satellites, satellite-based communication networks, and global positioning systems for ship and airline navigation.

A WORD ABOUT NOAA. . .

The National Oceanic and Atmospheric Administration (NOAA) conducts research and gathers data about the global oceans, atmosphere, space, and sun, and applies this knowledge to science and service that touch the lives of all Americans.

NOAA warns of dangerous weather, charts our seas and skies, guides our use and protection of ocean and coastal resources, and conducts research to improve our understanding and stewardship of the environment which sustains us all.

A Commerce Department agency, NOAA provides these services through five major organizations: the National Weather Service, the National Ocean Service, the National Marine Fisheries Service, the National Environmental Satellite, Data and Information Service, and Office of Oceanic and Atmospheric Research; and numerous special program units. In addition, NOAA research and operational activities are supported by the Nation's seventh uniformed service, the NOAA Corps, a commissioned officer corps of men and women who operate NOAA ships and aircraft, and serve in scientific and administrative posts.

For further information: NOAA Office of Public Affairs, 14th Street and Constitution Avenue NW, Room 6013, Washington, D.C. 20230. Phone: (202) 482-6090.

NOAA's **Space Environment Center (SEC)**, located in Boulder, Colo., is the national and world warning center for disturbances that can affect people and equipment working in the space environment. Its Space Weather Operations branch is jointly operated by NOAA and the U.S. Air Force, providing forecasts and warnings of solar and geomagnetic activity to users in government, industry, and the private sector. The SEC observes, assesses and predicts activity in the space environment to promote public safety and to mitigate economic loss that could result from disruption of satellite operations, communication and navigation systems, and electric power distribution grids.

Space weather occurs in the area between the Earth and the Sun and refers to the disturbances and storms that swirl through space, which could have adverse effects on human activities. These disturbances are caused by solar activity that cause variations of electromagnetic fields and energetic particle fluxes.

Many activities on the ground, including communication and power generation, are affected by changing conditions in space. For instance, in 1989 the entire province of Quebec was thrown into darkness when a geomagnetic storm caused an overload on power lines. In space, astronauts face unique hazards when venturing outside the safety of the space shuttle and need to be alerted to the dangers of energetic particle emissions from the Sun. This need will increase as

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teams of astronauts construct the International Space Station. As our use of space increases, so must the ability to predict conditions in space, to safeguard human lives, and to protect the nation's investment in these new technologies.

Much of what happens concerning space weather is dictated by the Sun. Solar flares, Coronal Mass Ejections and other solar activities cause the stormy weather of space. Unlike the weather situation on Earth, where observations at thousands of locations around the world are recorded, weather conditions in space are monitored by only a handful of space-based and ground-based facilities. Space weather forecasters are required to predict conditions in space using a minimum of guidance from actual measurements. The launch of NASA's ACE satellite has improved this situation, making it possible for forecasters to get an advance warning (about one hour) of geomagnetic storms heading towards Earth. This will enable SEC to issue alerts to users of space weather information with almost one hundred percent accuracy.

The Center will soon be issuing space weather products similar to those used by the NWS, including:

- ☉ Space Weather Outlooks
- ☉ Space Weather Watches and Warnings
- ☉ Space Weather Advisories and Bulletins

At any time, the Space Environment Center can issue one of 18 categories of alerts and warnings to let us know of a geomagnetic storm approaching, an x-ray or particle event, or other solar activity that would impact Earth's activities. Just like the National Weather Service (NWS), the SEC provides real-time monitoring and forecasting of space weather.

Most forecasts are for expected daily conditions or the probability of a significant event one to three days in advance. Guidance and forecasts are issued by a trained forecasting staff, a supporting research staff and a growing suite of space environment forecasting models. ☉

**For information on the Space Environment Center check its Web site at:
www.sec.noaa.gov**

**For additional information on the SEC contact Barbara McGehan, NOAA Public Affairs,
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