The Technology
Monitoring Space
Weather
Information is gathered from many sources to predict the current and future condition of the sun/earth environment.

Conditions on the sun, within the solar wind, and within the earth's ionosphere have an impact on many of today's technologies.
How Do We Study the Sun?

- Satellites, such as SOHO, ACE, and STEREO, monitor the sun and the properties of the solar wind.

Image courtesy of National Oceanic and Atmospheric Administration (NOAA)
SOHO Satellite

- Maintains a position in the earth-sun line at the LaGrange Point (L1 point)
- At this location the satellite maintains a period of revolution equal to the earth

Image courtesy of The Worlds of David Darling
SOHO

- Provides various images of the sun helping scientists
  - Predict space weather
  - Study the sun’s atmosphere
  - Study sun spots
  - Study the interior of the sun

Images courtesy of National Aeronautics and Space Administration (NASA)
SOHO Coronagraphs

- A coronagraph produces an artificial solar eclipse
- Allows scientists to block the light of the sun and view the corona

Courtesy of SOHO/LASCO consortium. SOHO is a project of international cooperation between ESA and NASA.
ACE Satellite

- ACE is also positioned at the L1 point.
- Provides data on the velocity and composition of the solar wind.
STEREO Satellites

- Two satellites orbiting the sun at 1 AU, ahead and behind the earth
- Provide 3-D images of the sun
- Data will greatly enhance understanding of CME’s and solar wind

Image courtesy of National Aeronautics and Space Administration (NASA)
STEREO

- STEREO can see the sun in several different wavelengths and temperatures
- Each wavelength allows scientists to see different features on the sun

171 Angstrom wavelength of extreme ultraviolet light

Put on your 3D glasses!!

Image courtesy of National Aeronautics and Space Administration (NASA)
Studying the Ionosphere

- Conditions within the earth’s ionosphere have a direct impact on technologies such as:
  - cell phones
  - radio transmission
  - satellite communication
  - GPS

Image courtesy of Sergei Maurits, Arctic Region Supercomputing Center, University of Alaska Fairbanks
How Do We Monitor Earth Conditions?

- GPS satellites provide data to evaluate the condition of the ionosphere
- Incoherent Scatter Radar takes ground based measurements of the ionosphere
GPS (Global Positioning System) Satellites

- Orbit the earth every 12 hours
- Emit continuous navigation signals
- At any given time there are at least 4 satellites overhead

Image courtesy of National Oceanic and Atmospheric Administration (NOAA)
By using GPS data, a map of the variations in the makeup of the ionosphere can be constructed.

Changes in the ionosphere affect technologies such as satellite communications.
Incoherent Scatter Radar (ISR)

- Targets the electrons in the ionosphere
- Provides data on electron density, temperature, and movement