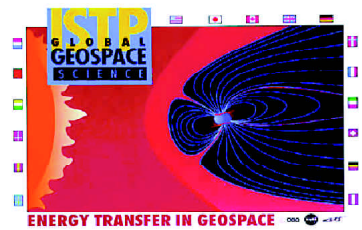
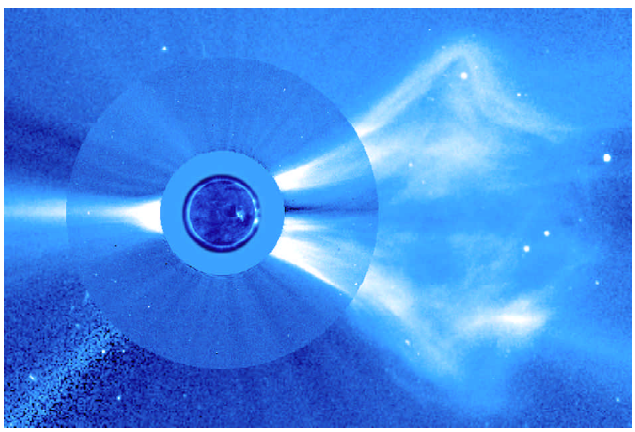
Profile of a Sun-Earth Observatory:
International Solar-Terrestrial Physics Program (ISTP)

What? The ISTP program is a comprehensive effort to observe and understand our star and its effects on our environment. An armada of space- and ground-based observatories probe the Sun, the Earth, and the space between them from many angles and in many different ways...most of them invisible to the human eye.

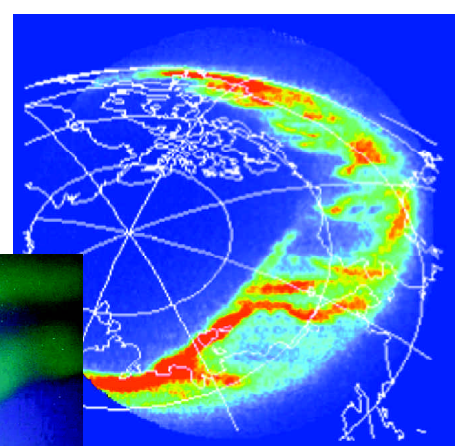




SOHO image of a coronal mass ejection

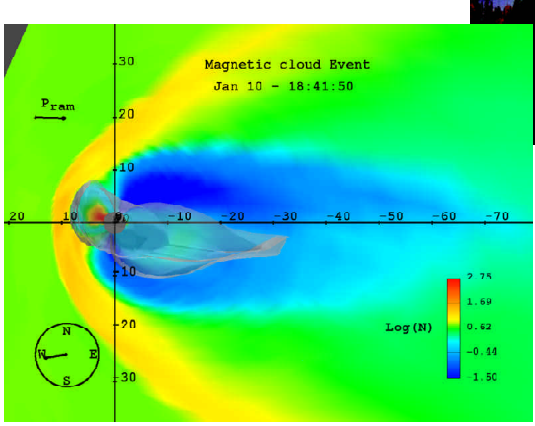
Who? ISTP includes spacecraft launched by NASA and the European Space Agency, Russia's Space Research Institute, and Japan's Institute for Space &Astronautical Science. Other spacecraft and significant computer and radar facilities are also provided by: Max Planck Institute, National Oceanic & Atmospheric Administration, Los Alamos National Laboratory, the U.S.Air Force, Canadian Space Agency, British Antarctic Survey, U.S. National Science Foundation, and Johns Hopkins Applied Physics Laboratory. The four principal spacecraft are Polar, Geotail, Wind, and the Solar and Heliospheric Observatory (SOHO).

Why? Events on the Sun can trigger changes in Earth's environment, particularly in the regions of the atmosphere known as the ionosphere and the magnetosphere. Like the wind here on Earth, the solar wind blows soft and hard, sometimes leading to magnetic storms in the atmosphere. Such storms can interfere with radio, television, and telephone signals, upset the navigation systems of ships and airplanes, and cause blackouts. Also, sun-induced storms can damage satellites and spacecraft or force them to re-enter the atmosphere prematurely. By closely observing the Sun and the energy and material it blows at Earth, scientists may someday be able to anticipate changes in Earth's environment. Aside from disturbing our electronic tools and toys, the Sun and its wind—the solar wind—seem to play a role in long-term climate changes on Earth. And finally, since our solar system is probably typical of other single-star systems in the universe, what scientists learn about the Sun-Earth connection could lead to a better understanding of other solar systems.

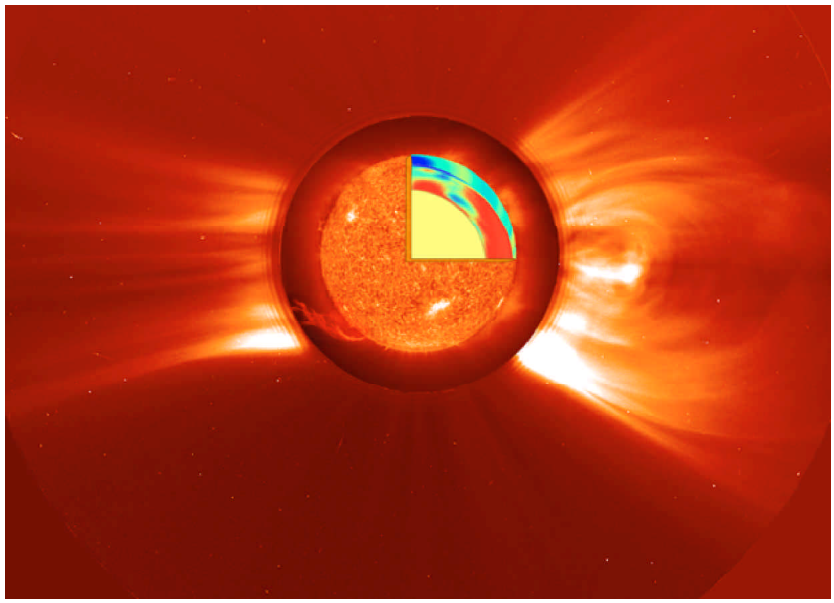


Polar spacecraft image of aurora in ultraviolet light

Photo of aurora in Alaska (Credit: Jan Curtis)



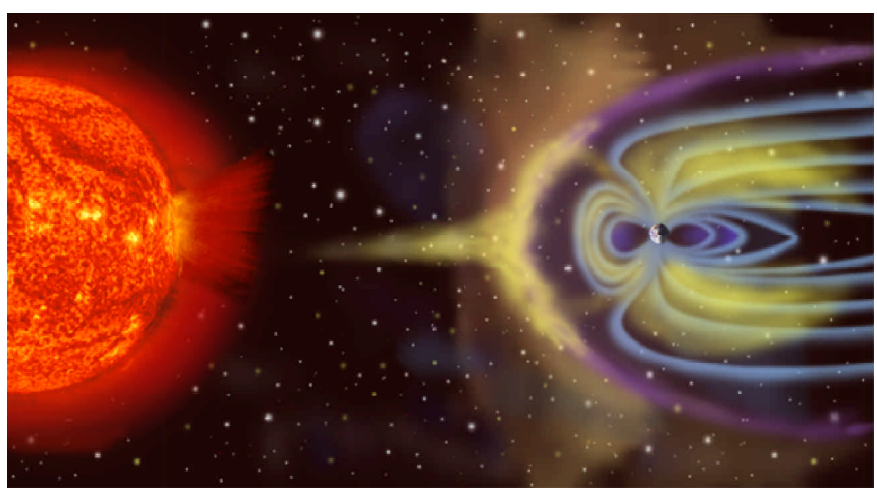
Model of magnetic cloud event impacting Earth's magnetosphere



Composite image from SOHO instruments of the Sun's surface, a coronal mass ejection exploding to the right, and (inset) a cutaway illustration of the Sun's interior, suggesting the breadth of its scientific explorations of the Sun

When? ISTP was conceived in the 1970s, planned in the 1980s, and launched in the 1990s. The first spacecraft, Geotail, was launched in 1992, and the most recent, Polar, went up in 1996. Each of the missions of ISTP is scheduled to continue through 2001.

Artist's illustration showing the Sun (actual image) and its powerful influence on the Earth and its magnetosphere from the constant solar wind and frequent geomagnetic storms



Credit: Steele Hill, NASA

How? The spacecraft of ISTP are placed in orbits that allow physicists to observe the key regions of Earth's space, or "geospace." Those regions include the Sun's surface and atmosphere, the solar wind, and Earth's magnetosphere, from the bow shock to the auroral regions to the magnetic tail. Orbiting as far as one million miles from Earth and as close as a few hundred, the spacecraft of ISTP make coordinated, simultaneous observations of the Sun and geospace over extended periods of time. With such observations, scientists are increasing our knowledge of: the structure and dynamics of the Sun; the origin of the solar wind; the composition and character of the solar wind; the flow of energy between Sun and Earth, and the cause-effect relationship between events on the Sun and their impact on Earth.

Brought to you by the International Solar-Terrestrial Physics Program and NASA.
http://www-istp.gsfc.nasa.gov/istp/