4-8-2009

Unmanned Antarctic Observatories Gather Space Weather Data

David Sims
UNH Institute for the Study of Earth, Oceans and Space

Peter West
National Science Foundation

UNH Media Relations

Unmanned Antarctic Observatories Gather Space Weather Data

Media Contact: David Sims
603-862-5369
Science Writer
Institute for the Study of Earth, Oceans, and Space

Peter West
703) 292-7761
National Science Foundation

April 8, 2009

DURHAM, N.H. -- With funding from the National Science Foundation, an international consortium of scientists, including a team from the University of New Hampshire, has successfully developed a series of autonomous observatories in Antarctica that provide critical year-round "space weather" data from the Earth's harshest environment for the first time.

Recently, data from these observatories were used in conjunction with the National Aeronautics and Space Administration's array of THEMIS satellites to reveal new information about magnetospheric substorms - the sudden release of energy that causes auroral displays.

The observatories gather data on the interaction of solar-wind energy with Earth's magnetic field lines, which arc high above our atmosphere and connect at both the North and South poles. Gathering such information in Antarctica is significantly more challenging in comparison to the more populous and relatively milder Arctic.

"In order to fully understand the phenomena we're studying, you have to know what happens with the field lines at both the poles," notes UNH space scientist Marc Lessard of the Institute for the Study of Earth, Oceans, and Space.

Lessard and Allan Weatherwax of Siena College are co-principal investigators for the multi-institutional project known the Polar Experiment Network for Geospace Upper-atmosphere Investigations or PENGUIn.

"The Antarctic is magnetically connected to vast regions of space and the solar wind, and provides a unique window to observe dynamic processes in Earth's upper atmosphere and beyond," says Weatherwax.

Earth's magnetic field extends far into space, where energy from the solar wind can be readily transferred to our "magnetosphere." A vast amount of energy follows magnetic field lines to the vicinity of the poles, driving aurora and other phenomena at high latitudes. By measuring such things as magnetic field variations, auroral emissions, and other phenomena, scientists are learning more about space weather.

The term "space weather" generally refers to conditions on the Sun, in the solar wind, and within Earth's magnetosphere and upper atmosphere that can influence the performance and reliability of space-borne and ground-based technological systems and can pose risks to astronauts and people onboard aircraft in polar regions.

Besides emitting a continuous stream of plasma (solar wind), the Sun periodically releases billions of tons of matter via coronal mass ejections. These immense clouds of material, when directed towards Earth, can cause large magnetic storms in the space environment around Earth or "geospace" - the magnetosphere and the upper atmosphere.

The automated observatories have been developed over a period of years, evolving from platforms that run on fossil fuels and require frequent maintenance to the more efficient, modular observatories that can be easily transported and installed at remote locations with extreme climates. In addition, the new-generation observatories operate by solar and wind energy alone and transfer data via satellite uplinks year-round.

As energy from the solar wind is transferred to Earth's magnetic field it is sometimes stored for a period of time and then released to deliver large fluxes of energetic particles. The combined satellite and observatory data showed for the first time that some of these energetic particles reach very high latitudes as they collide with Earth's upper atmosphere.

In addition to UNH and Siena College, the PENGUIn science and engineering team includes investigators from Augsburg College, the University of California-Berkeley, Dartmouth College, the University of Maryland, the New Jersey Institute of Technology, Stanford, Virginia Tech., the University of Michigan, and Tohoku University in Japan.

The U.S. investigators were supported by the National Science Foundation, which manages the U.S. Antarctic Program (http://www.usap.gov).

More information on the PENGUIn project can be found at http://www.mirl.sr.unh.edu.

The University of New Hampshire, founded in 1866, is a world-class public research university with the feel of a New England liberal arts college. A land, sea and space-grant university, UNH is the state's flagship public institution, enrolling 11,800 undergraduate and 2,400 graduate students.

-30-

Photograph available to download: http://www.eos.unh.edu/newsimage/sundog_lg.jpg

Caption: An Automated Geophysical Observatory (AGO) is highlighted by sundogs on the Antarctic polar plateau. Located approximately 880 miles from the South Pole, it is powered with solar panels in the austral summer and small wind generators in the winter.

Credit: August Allen, Raytheon Polar Services Company.