Solar Stereo Mission to Improve Space Weather Forecasts

by Pamela Houghtaling

Predicting weather on Earth has never been easy, but trying to gauge the impact of the sun’s magnetic disturbances on the Earth’s atmosphere involves even more ambiguity. These highly charged solar eruptions can affect satellite operations, communications and power systems, and even the global climate over the long term.

To gain a better understanding of the sun’s dynamics, NASA has selected APL to design and build the Solar-Terrestrial Relations Observatory (STEREO). David Rust of the Space Department is serving as the APL project scientist for the mission and Tom Coughlin is the program manager. The Goddard Space Flight Center will oversee the program for NASA.

The second in a series of solar probes planned for NASA’s Sun-Earth Connection program, STEREO will consist of two spacecraft, each carrying four telescopes and selected instruments. STEREO, as its name implies, will be sending back the first three-dimensional (3-D) images of solar coronal mass ejections and their accompanying space disturbances.

As Rust explains, 3-D pictures will provide definitive answers as to the nature of specific structures in the sun’s atmosphere. “Scientists can’t resolve arguments with two-dimensional pictures,” says Rust. “With 3-D, we can figure out what the physical nature of the eruptions is and make predictions with certainty.”

Coughlin and his team recently began the engineering study for the mission. As part of this initial work, Rust is looking into techniques for displaying 3-D data that will provide more insight than the conventional two-dimensional picture format.

In order to provide data from two vantage points instead of a singular view, one spacecraft will travel ahead of the Earth in its orbit around the sun, while the other will be trailing behind. This way, solar eruptions can be tracked from their beginnings through interplanetary space, providing a warning to forecasters that’s earlier and more precise than what’s possible today.

For two years, the STEREO spacecraft will be taking pictures and sending back data that will be received by medium-sized antennas at APL, Air Force, NOAA, and commercial tracking stations. APL will handle mission operations, and the science center will be located at the Goddard Space Flight Center. 

For the latest information about launch of the twin STEREO observatories, click here.