New Phenomena on the Sun

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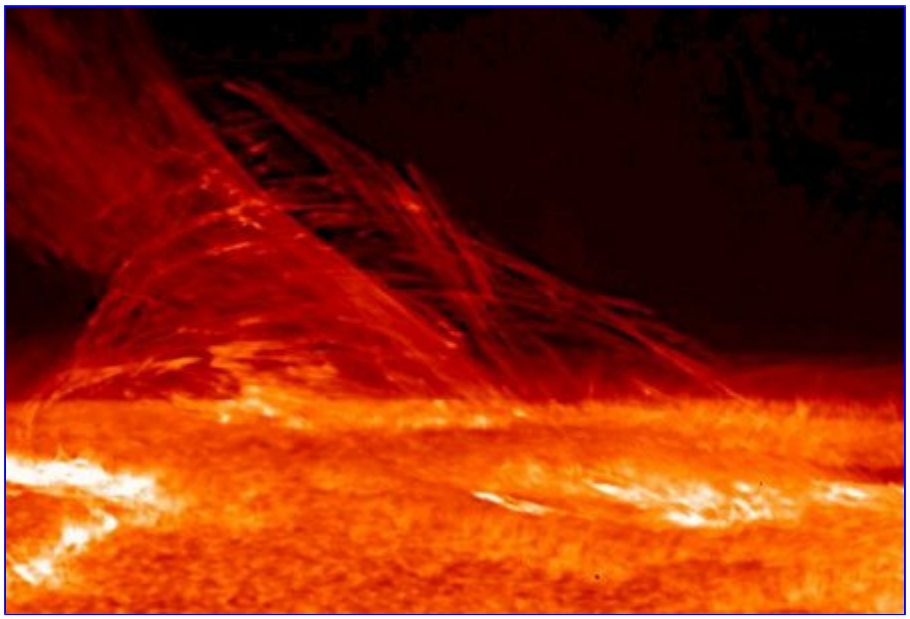
March 21, 2007: It's enough to make you leap out of your seat: A magnetic vortex almost as big as Earth races across your computer screen, twisting, turning, finally erupting in a powerful solar flare. Japan's Hinode spacecraft recorded just such a blast on Jan. 12, 2007.

Click on the image to see the movie:



Above: A solar flare in the chromosphere, recorded by JAXA's Hinode spacecraft on Jan. 12, 2007. Movies: #1, #2.

"I managed to stay in my seat," says solar physicist John Davis of the Marshall Space Flight Center, "but just barely."

Davis is NASA's project scientist for Hinode, Japanese for *Sunrise*. The spacecraft was launched in Sept. 2006 from the Uchinoura Space Center in Japan on a mission to study sunspots and solar flares. Hinode's Solar Optical Telescope, which some astronomers liken to "a Hubble for the Sun," produces crystal-clear images with 0.2 arc-second resolution. (Comparison: 0.2 arc-second is a tiny angle approximately equal to the width of a human hair held about 100 meters away.) "We're getting movies like these all the time now," he says.

This particular movie is visually stunning, but the most amazing thing about it, notes Davis, is where the scene unfolded--in the sun's chromosphere. "We used to think the chromosphere was a fairly uneventful place, but Hinode is shattering those misconceptions."

Chromosphere means "sphere of color." It's the name astronomers of the 19th century gave to a narrow and very red layer of the sun's atmosphere they saw peeking over the edge of the Moon during solar eclipses. The color comes from the chromosphere's abundant hydrogen which emits light at a wavelength of 6563 Angstroms, also known as "hydrogen alpha" light. Hinode's telescope is equipped with filters tuned to this specific color.

Right: The chromosphere, viewed the old-fashioned way

during a solar eclipse. Photo credit: Vic and Jen Winter. [More]

The view from space is impressive. Visually, the chromosphere resembles a shag carpet with threads of magnetism jutting up from the floor below. Hinode's movies show the threads swaying back and forth as if blown by a gentle breeze. There is nothing gentle, however, about "spicules" shooting into the chromosphere from the underlying photosphere. "These are jets of gas as big as Texas," says Davis. "They rise and fall on time scales of 10 minutes."

And then there are the explosions. "The fact that Hinode is able to observe solar flares taking place in the chromosphere is very important," he says.

The origin of solar flares is a mystery. Researchers have long known that flares develop from magnetic instabilities near sunspots, but even after centuries of studying sunspots, no one can predict exactly when a flare is about to happen. This is a problem for NASA because astronauts in space are vulnerable to intense radiation and high-energy particles produced by the explosions. An accurate system of forecasting would help explorers stay out of harm's way.

Hinode may be looking right into the genesis zone of flares. If so, "it could teach us how flares work and improve our ability to predict them."

Meanwhile, hang on and enjoy the show.

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Author: Dr. Tony Phillips | Production Editor: Dr. Tony Phillips | Credit: Science@NASA

More Information

Hinode home page at nasa.gov

National Astronomical Observatory of Japan -- Hinode Project page

Hinode credits: Led by the Japan Aerospace Exploration Agency (JAXA), Hinode is a collaborative mission that also includes the space agencies of the United States, Great Britain and Europe. Its three primary instruments – the Solar Optical Telescope, the X-ray Telescope and the Extreme Ultraviolet Imaging Spectrometer – are observing the different layers of the solar atmosphere ranging from the sun's visible surface to the corona, the outer atmosphere that extends outward into the solar system. The movies highlighted in this story come from the Solar Optical Telescope developed by the National Astronomical Observatory of Japan in Tokyo with focal plane instruments provided by the Lockheed Martin Advanced Technology Center of Palo Alto, Calif.

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