International spacecraft reveals detailed processes on the sun

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NASA released on Wednesday never-before-seen images that show the sun's magnetic field is much more turbulent and dynamic than previously known. The international spacecraft Hinode, formerly known as Solar B, took the images.Hinode, Japanese for "sunrise," was launched Sept. 23, 2006, to study the sun's magnetic field and how its explosive energy propagates through the different layers of the solar atmosphere. The spacecraft's uninterrupted high-resolution observations of the sun will have an impact on solar physics comparable to the Hubble Space Telescope's impact on astronomy. "For the first time, we are now able to make out tiny granules of hot gas that rise and fall in the sun's magnetized atmosphere," said Dick Fisher, director of NASA's Heliophyics Division, Science Mission Directorate, Washington. "These images will open a new era of study on some of the sun's processes that effect Earth, astronauts, orbiting satellites and the solar system."Hinode's three primary instruments, the Solar Optical Telescope, the X-ray Telescope and the Extreme Ultraviolet Imaging Spectrometer, are observing the different layers of the sun. Studies focus on the solar atmosphere from the visible surface of the sun, known as the photosphere, to the corona, the outer atmosphere of the sun that extends outward into the solar system. "By coordinating the measurements of all three instruments, Hinode is showing how changes in the structure of the magnetic field and the release of magnetic energy in the low atmosphere spread outward through the corona and into interplanetary space to create space weather," said John Davis, project scientist from NASA's Marshall Space Flight Center, Huntsville, Ala. Space weather involves the production of energetic particles and emissions of electromagnetic radiation. These bursts of energy can black out long-distance communications over entire continents and disrupt the global navigational system."Hinode images are revealing irrefutable evidence for the presence of turbulence-driven processes that are bringing magnetic fields, on all scales, to the sun's surface, resulting in an extremely dynamic chromosphere or gaseous envelope around the sun," said Alan Title, a corporate senior fellow at Lockheed Martin, Palo Alto, Calif., and consulting professor of physics at Stanford University, Stanford, Calif. Hinode is a collaborative mission led by the Japan Aerospace Exploration Agency and includes the European Space Agency and Britain's Particle Physics Astronomy Research Council. The National Astronomical Observatory of Japan, Tokyo, developed the Solar Optical Telescope, which provided the fine-scale structure views of the sun's lower atmosphere, and developed the X-ray Telescope in collaboration with the Smithsonian Astrophysical Observatory of Cambridge, Mass. The X-ray Telescope captured the rapid, time-sequenced images of explosive events in the sun's outer atmosphere."By following the evolution of the solar structures that outline the magnetic field before, during and after these explosive events, we hope to find clear evidence to establish that magnetic reconnection is the underlying cause for this explosive activity," said Leon Golub of the Smithsonian Astrophysical Observatory. The Marshall Space Flight Center manages the development of the scientific instrumentation provided for the mission by NASA, industry and other federal agencies.