

examines issues such as transnational comanagement regimes/wildlife management and land claims, and the control of resources.

Given the rapidly changing face of the Arctic, the gaps in global change education highlighted here are important, and they likely are the key results on which UArctic and the circumpolar authorities need to work.

The full survey results may be found on the University of the Arctic Web site at <http://www.uarctic.org>.

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References

Arctic Climate Impact Assessment (2004), *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*, 140 pp., Cambridge Univ. Press, New York.

Arctic Human Development Report (2004), Stefansson Arct. Inst., Akureyri, Iceland.
U.S. General Accounting Office (2003), *Alaska native villages: Most are affected by flooding and erosion, but few qualify for federal assistance*, Rep. GAO-04-142, 91 pp., Washington, D.C., 12 Dec.

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NEWS

New Detailed Images of the Sun

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Newly released images of small-scale solar structures indicate that the Sun is much more turbulent than previously known. The images, produced by the satellite Hinode (formerly known as Solar-B), were released by NASA and the Japan Aerospace Exploration Agency (JAXA) on 21 March.

Many of the recently released images focused on a large sunspot identified by scientists in December 2006. The sunspot, which was anomalous because it occurred in the declining phase of the 11-year sunspot cycle, ejected a flare of white light and protons.

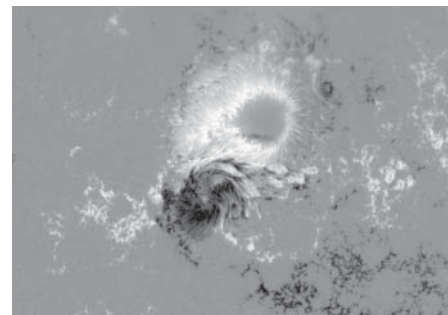
With Hinode instrumentation, scientists viewed the detailed evolution of the sunspot area without interruption for more than four days and witnessed the emergence of a rotating smaller sunspot described as "a kind of magnetic hurricane," according to Alan Title, a senior fellow at Lockheed Martin's Advanced Technology Center, the agency that built Hinode's Solar Optical Telescope (SOT). At a diameter of 50 centimeters, the SOT is the largest telescope ever to be in

orbit, allowing for the recovery of images at resolutions that have never been viewed before.

A quick comparison between SOT images and pictures of the same area from the Solar and Heliospheric Observatory (SOHO) satellite revealed that Hinode has about 15 times better resolution. "We can see all of the [Sun's] fine-structure," said Title. "With Hinode, we have new eyes."

The improvement in image quality is "equivalent to going from ground-based astronomy at night with Earth telescopes to [looking through] the Hubble space telescope," said Richard Fisher, the director of NASA's Heliophysics Division.

In addition to the SOT, new data was also released from the X-ray Telescope (XRT), and the Extreme Ultraviolet Imaging Spectrometer. Comparisons of SOT and XRT data show "complicated intermingling of hot and cold material" in the Sun's turbulent structures, explained Leon Golub, a senior astrophysicist at the Harvard-Smithsonian Center for Astrophysics. Further, images reveal magnetic loops collapsing during flares, phenomena not predicted by theory.



An image from Hinode's Solar Optical Telescope shows two sunspots colliding, revealing their hurricane-like structure. Courtesy of JAXA/NASA.

"There are many things in the data... that are going to change our views once we figure out what's going on," Golub said.

Hinode, an international collaboration between JAXA, the European Space Agency, NASA, and other partners, was launched on 23 September 2006 from Japan's Uchinoura Space Station to study the Sun's magnetic field and how its explosive energy propagates from the Sun's surface through the solar atmosphere. The satellite circles the Earth at a polar orbit along the dawn/dusk line, allowing it to continuously view the Sun for nine months of the year.

—MOHI KUMAR, Staff Writer