Media Relations

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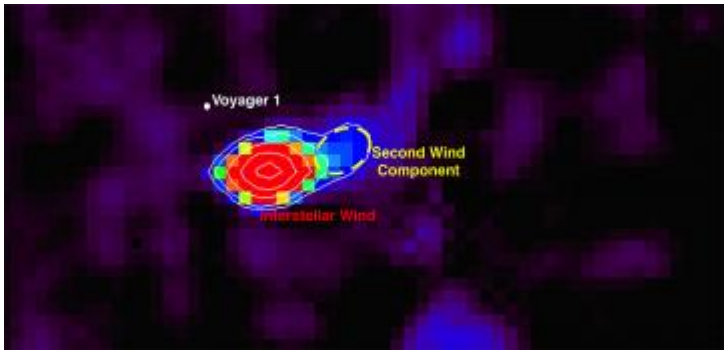
Satellite with UNH Components Sheds New Light on Solar System Boundary



This image shows a sky map of neutral oxygen atomsï¿½represented by the variously colored pixelsï¿½coming towards (foreground) the IBEX spacecraft from the boundary of our solar system. The most intense feature, like a spotlight in the sky, is in red and shows interstellar oxygen wind coming towards IBEX, with the second wind component highlighted by the dashed yellow ellipse. The white dot indicates the direction in which Voyager 1 is heading away from the foreground. Voyager 1 currently traverses the layer of the heliosphere from which the second wind component originates. Image adapted from a figure in the ApJS paper authored by UNH graduate student Jeewoo Park.

DURHAM, N.H. – A team of scientists, including seven from the University of New Hampshire, present findings from six years of direct observations made by NASA's Interstellar Boundary Explorer (IBEX) mission of the interstellar wind that blows through our solar system in 14 papers published today in an Astrophysical Journal Supplement (ApJS) Special Issue.

Launched Oct. 19, 2008, IBEX has now consolidated and refined the physical conditions of the material that surrounds our solar system—the interstellar medium—and has opened a new and unique view into the interface just outside our solar system's boundary.

Among other things, this is important because this is the region where the giant bubble emanating from the sun—the heliosphere—begins to protect our solar system from the hazards of interstellar space, particularly high-energy cosmic radiation.

"We need to understand our heliosphere because it is our first shield against high-energy galactic cosmic rays and thus plays a big role in making our solar system habitable," says Eberhard Möbius, lead author on one of the ApJS papers and professor of physics at the UNH Institute for the Study of Earth, Oceans, and Space (EOS) and department of physics.

Using energetic neutral atoms (instead of photons of light) to create maps of the boundary between our solar system and the rest of our galaxy, the yard-wide, half-a-yard-tall octagonal IBEX satellite is able to make high-fidelity measurements that determine the direction, speed and temperature of the interstellar wind and probe the pristine environment around our solar system as never before.

IBEX discovered that the interstellar wind has a higher temperature than reported previously from observations with the Ulysses spacecraft. Together with the wind speed and density and the interstellar magnetic field, the temperature determines the pressure that the interstellar material

exerts on the heliosphere. The size of the heliosphere, which is controlled by that pressure, and the interaction with the solar wind determine the effectiveness of this shield.

IBEX has also detected for the first time a second wind component from the outer boundary region where the Voyager 1 spacecraft currently traverses. This component is an important telltale sign for the heliosphere's deformation by the surrounding magnetic field, which also influences how the heliosphere serves as a protective bubble. IBEX is uniquely equipped to sample this region just outside the heliospheric boundary because it can distinguish individual species of the interstellar wind. It has detected the second wind component for helium and oxygen.

The ApJS papers represent a broad collaboration between UNH, the Polish Academy of Sciences, Southwest Research Institute, the University of Bern, and other institutions. They compare the results from two major analysis approaches led by IBEX groups in New Hampshire and Warsaw.

Scientists and engineers at the UNH Space Science Center designed and built major portions of the two ultra-high sensitivity cameras on board IBEX, including the "time-of-flight" mass spectrometer that can identify specific species of energetic neutral atoms, the iris or "collimator" of the specialized cameras, and the star sensor that allows very high precision direction finding of the interstellar wind.

Additional UNH authors of the 14 ApJS papers include professors Harald Kucharek, Martin Lee, Nathan Schwadron, graduate students Trevor Leonard and Jeewoo Park, and research engineer David Heirtzler. Five of the 14 papers are led by UNH scientists: Kucharek, Lee, Möbius, Park, and Schwadron.

All 14 ApJS papers can be viewed at http://iopscience.iop.org/0067-0049/page/Special%20Issue%20on%20IBEX

IBEX is one in NASA's series of low-cost, rapidly developed Small Explorers space missions. Southwest Research Institute (SwRI) in San Antonio, Texas leads and developed the mission with a team of national and international partners. NASA's Goddard Space Flight Center in Greenbelt, Md., manages the Explorers Program for NASA's Science Mission Directorate in Washington.

-30-

Image to download: http://www.eos.unh.edu/newsimage/O-Map-Illustration_lg.jpg

Caption: This image shows a sky map of neutral oxygen atoms;represented by the variously colored pixels;coming towards (foreground) the IBEX spacecraft from the boundary of our solar system. The most intense feature, like a spotlight in the sky, is in red and shows interstellar oxygen wind coming towards IBEX, with the second wind component highlighted by the dashed yellow ellipse. The white dot indicates the direction in which Voyager 1 is heading away from the foreground. Voyager 1 currently traverses the layer of the heliosphere from which the second wind component originates. Image adapted from a figure in the ApJS paper authored by UNH graduate student Jeewoo Park.

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