Discovering The Unexpected: Researchers Surprised By First Results From NASA's Interstellar Boundary Explorer Mission

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Nearly a year ago - on October 19, 2008 - the Interstellar Boundary Explorer (IBEX) - a NASA Small Explorer Mission - was launched into Earth orbit to discover the global interaction between the solar wind and the interstellar medium - the gas, dust and radiation environment between the stars - by measuring the neutral atoms created by that interaction. As our Sun travels through the galaxy it is encompassed in a giant bubble inflated by a continuous wind from the Sun - the solar wind - and the edges of our solar system are defined by the interaction between this wind and the surrounding interstellar medium.

Today, IBEX investigators unveiled a surprising set of all-sky map of neutral atoms that define that boundary, and is causing scientists to rethink previous concepts. Five papers by the IBEX team, and a related paper by NASA Cassini scientists will be published in a special edition of Science magazine.

The major question at center stage is: How important are the conditions in the interstellar medium that produce the neutral atoms that we see?

"Apparently the sky map of neutral atoms is organized by the interstellar magnetic field, rather than, as previously theorized, by the outflow of the solar wind. The data we gathered was certainly not anticipated, but we don't set out on these missions to validate our own hypotheses, but rather to gather facts and test our theories against them," said Dr. Stephen A. Fuselier of the Lockheed Martin Space Systems Company Advanced Technology Center (ATC) in Palo Alto, and lead investigator for the IBEX-Lo sensor.

"We designed the mission to have two independent but complementary measurements of the neutral atom flux from the heliosphere," Fuselier continues. "This type of mission design is critical when we discover something not predicted. Without independent measure of the same phenomena, critics could conclude that the problem is not in the theory, but in the measurement. And when we throw in the fortuitous data taken by the Cassini spacecraft at Saturn, we have three independent observations."

It is at the interstellar boundaries that roughly 90% of cosmic radiation is deflected away from the inner solar system, so by understanding their properties scientists will be better able to model some of the processes that may have provided an environment favorable for life on this planet.

The IBEX-Lo sensor was built by a team of scientists and engineers at the ATC in Palo Alto, Calif., the University of New Hampshire in Durham, N.H., SwRI, GSFC, Applied Physics Laboratory, and the University of Bern in Switzerland. After integration at the ATC, IBEX-Lo was calibrated at the University of Bern. The other sensor, IBEX-Hi, was built by a team at Los Alamos National Laboratory and SwRI.

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

The Lockheed Martin Advanced Technology Center is the research and development organization of Lockheed Martin Space Systems Company (LMSSC). LMSSC is a major operating unit of Lockheed Martin Corporation that designs, develops, tests, manufactures and operates a full spectrum of advanced-technology systems for national security and military, civil government and commercial customers. Chief products include human space flight systems; a full range of remote sensing, navigation, meteorological and communications satellites and instruments; space observatories and interplanetary spacecraft; laser radar; ballistic missiles; missile defense systems; and nanotechnology research and development.

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