New space map reveals “mystery ribbon”

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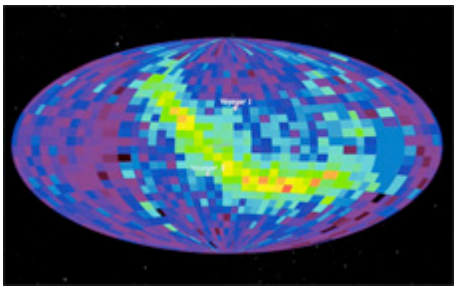
Courtesy NASA
and World Science staff

A NASA spacecraft has helped scientists build the first full map of our solar system showing its position with respect to the galaxy—and has also turned up a mystery, astronomers say.

What researchers describe as a “ribbon” of highly energetic particles at the boundary of our solar system is causing the puzzlement.



An animation (click to play) showing the strip of energetic particles. It portrays how the sky is "flattened" to create the IBEX maps. (Credit: NASA/Goddard SFC)

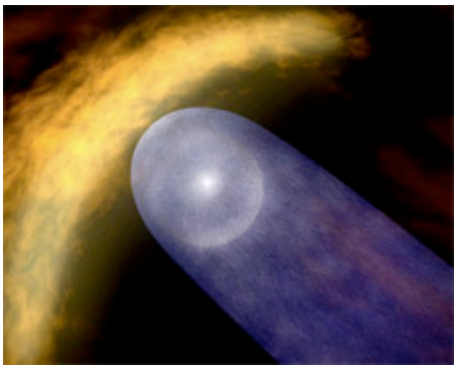
The map was produced with data from two detectors on NASA’s Interstellar Boundary Explorer, or IBEX, spacecraft, launched a year ago.

The instruments measure and count particles known as energetic neutral atoms. These arise from an area called the interstellar boundary. This zone, undetectable by normal telescopes, is where electrically charged particles flowing from the sun, called the solar wind, pass far beyond the planets and plow into the gas and dust of the larger galaxy.

After being formed, the energetic neutral atoms travel toward the sun at speeds up to 2.4 million miles (3.9 million km) per hour or more.

The new map reveals the region that separates the nearest reaches of our galaxy, called the local interstellar medium, from our heliosphere—a protective bubble that shields and protects our solar system from most of the dangerous cosmic radiation traveling through space.

“We’re sticking our heads out of the sun’s atmosphere and beginning to really understand our place in the galaxy,” said David J. McComas, IBEX principal investigator and assistant vice president of the Space Science and Engineering Division at Southwest Research Institute in San Antonio, Texas.



This animation (click to play) zooms in from a view of the Milky Way Galaxy to our heliosphere. It sets the scale for our home in the galaxy. (Credit: NASA/ Goddard SFC)

One result in particular was "truly remarkable," he added: "a narrow ribbon of bright details or emissions not resembling any of the current theoretical models of this region."

"We expected to see small, gradual spatial variations at the interstellar boundary," McComas told physicsworld.com, a website of the London-based Institute of Physics. Scientists think the finding doesn't fit with the accepted model of the heliosphere, thought to be shaped like a comet by the collision of the outgoing solar wind and a greater "galactic wind."

NASA released the sky map image Oct. 15 in conjunction with publication of the findings in the research journal *Science*. The IBEX data were complemented and extended by information collected using an imaging instrument sensor on NASA's Cassini spacecraft.

The sky maps are also meant to put observations from NASA's Voyager spacecraft into context.

The twin Voyager crafts, launched in 1977, traveled to the outer solar system to explore Jupiter, Saturn, Uranus and Neptune. In 2007, Voyager 2 followed Voyager 1 into the interstellar boundary. Both are now in this region where the energetic neutral atoms originate. But the Voyagers didn't detect the ribbon of bright emissions. "It's like having two weather stations that miss the big storm that runs between them," said Eric Christian, IBEX deputy mission scientist at NASA's Goddard Space Flight Center in Greenbelt, Md., which manages the craft.