Cassini Data Help Redraw Shape of Solar System (w/ Video)

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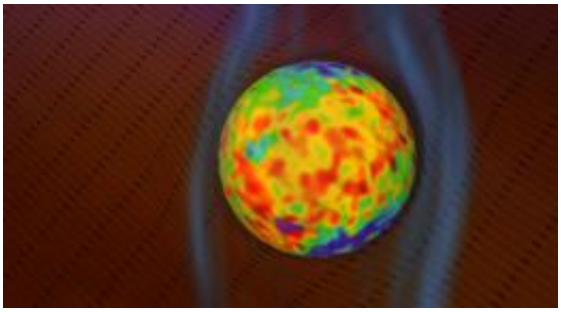


This image shows an artist's conception of the bubble around our solar system moving through the interstellar medium, the matter that fills the local region of our galaxy. New observations from the Cassini spacecraft orbiting Saturn suggest the shape resembles something like a slippery ball moving through smoke. Image credit: NASA/JPL-Caltech/JHUAPL

(PhysOrg.com) -- Images from the Ion and Neutral Camera on NASA's Cassini spacecraft suggest that the heliosphere, the region of the sun's influence, may not have the comet-like shape predicted by existing models. In a paper published Oct. 15 in *Science Express*, researchers from the Johns Hopkins Applied Physics Laboratory present a new view of the heliosphere, and the forces that shape it.

"These images have revolutionized what we thought we knew for the past 50 years; the sun travels through the galaxy not like a comet but more like a big, round bubble," said Stamatios Krimigis of the Applied

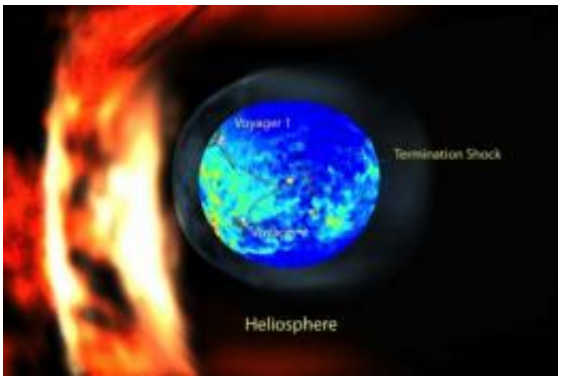
Physics Lab, in Laurel, Md., principal investigator for Cassini's Magnetospheric Imaging Instrument which carries the Ion and Neutral Camera. "It's amazing how a single new observation can change an entire concept that most scientists had taken as true for nearly fifty years."

As the solar wind flows from the sun, it carves out a bubble in the interstellar medium. Models of the boundary region between the heliosphere and interstellar medium have been based on the assumption that the relative flow of the interstellar medium and its collision with the solar wind dominate the interaction. This would create a foreshortened "nose" in the direction of the solar system's motion, and an elongated "tail" in the opposite direction.

The Ion and Neutral Camera images suggest that the solar wind's interaction with the interstellar medium is instead more significantly controlled by particle pressure and magnetic field energy density.

"The map we've created from the images suggests that pressure from a hot population of charged particles and interaction with the interstellar medium's magnetic field strongly influence the shape of the heliosphere," says Don Mitchell, Magnetospheric Imaging Instrument/Ion and Neutral Camera co-investigator at the Applied Physics Lab.

Since entering into orbit around Saturn in July of 2004, the Ion and Neutral Camera has been mapping energetic neutral atoms near the planet, as well as their dispersal across the entire sky. The energetic neutral atoms are produced by energetic protons, which are responsible for the outward pressure of the heliosphere beyond the interface where the solar wind collides with the interstellar medium, and which interact with the magnetic field of the interstellar medium.



Images from NASA's Cassini spacecraft suggest that the heliosphere may not have the comet-like shape predicted by existing models. The instrument imaged a population of hot particles that resides just beyond the boundary of where the solar wind collides with the interstellar medium, forming a termination shock. Credit: Johns Hopkins University Applied Physics Laboratory

"Energetic neutral atom imaging has demonstrated its power to reveal the distribution of energetic ions, first in Earth's own magnetosphere, next in the giant magnetosphere of Saturn and now throughout vast structures in space-out to the very edge of our sun's interaction with the interstellar medium," says Edmond C. Roelof, Magnetospheric Imaging Instrument co-investigator at the Applied Physics Lab.

The results from Cassini complement and extend findings from NASA's Interstellar Boundary Explorer, or IBEX, spacecraft. Data from IBEX and Cassini have made it possible for scientists to construct the first comprehensive sky map of our solar system and its location in the Milky Way galaxy.

More information:

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