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The heliosphere's interaction with the interstellar medium: Observations and Models

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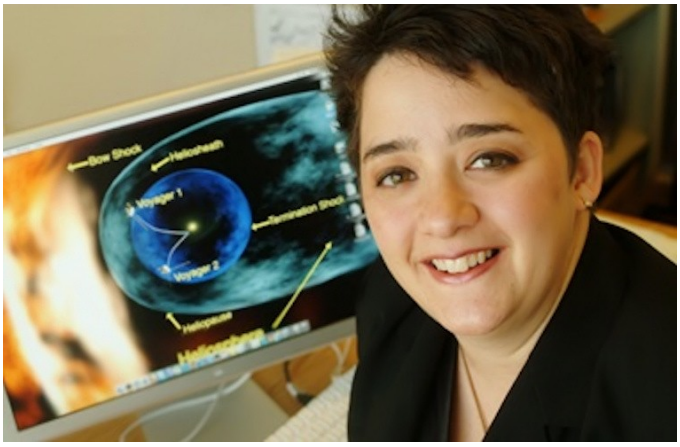
Abstract. The solar wind flowing from the Sun carves out a bubble in the interstellar medium called the heliosphere. The Voyager spacecraft, launched in 1977, are nearing the boundary between these two regions, the heliopause. We present and discuss the data from the new regions of space explored by the Voyagers. In the outer heliosphere, pickup ions formed from interstellar neutrals dominate the pressure and control the energy dissipation at the termination shock, where the solar wind becomes subsonic. In the heliosheath, the region of shocked solar wind, data show the radial speed decreased to near zero in 2010, then in 2012 the energetic particles from inside the heliosphere disappeared and the galactic cosmic rays increased. At the same time, the magnetic field increased but the magnetic field direction did not change. Whether or not this boundary is the heliopause is controversial; we will present the issue under debate.

The Voyager spacecraft measure data at only two widely separated points. Global models are used to round out our knowledge of the heliospheric structure. This problem is complex as important physics occurs on very large through very small scales. We discuss recent model results and the picture they provide of the 3D heliosphere.

John Richarson started his career analyzing data and modeling plasma transport and chemistry in planetary magnetospheres. He is now principal investigator of the Voyager plasma experiment and studies the interaction of the solar wind with the interstellar medium.
His main research interests include the solar wind from the Sun out to the heliopause, its propagation and evolution, and the modelling of planetary magnetopsheres, particularly Saturn.

For representative publications, see http://web.mit.edu/space. For the relationships with the Voyager Interstellar NASA Mission see http://voyager.jpl.nasa.gov/science/principal.html.



Merav Opher's interests are in how plasma and magnetic effects reveal themselves in astrophysical and space physics environments. In particular, in how stars interact with the surrounding media, how the solar system interacts with the local interstellar medium, and the interaction of extra-solar planets with their host stars. Her other interests are in how magnetic disturbances are driven and propagate from the Sun to Earth. She uses state-of the art 3D computational models to investigate these phenomena.

See also http://www.bu.edu/dbin/astronomy/ast_faculty.php?id=681 and http://science1.nasa.gov/science-news/science-at-nasa/2011/09jun_bigsurprise/