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Energetic Neutral Atom (ENA) imaging of the heliosphere: Is the heliospheric cavity comet-like?

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The Ion and Neutral Camera (INCA), part of the Magnetospheric Imaging Instrument (MIMI) sensor suite on the Cassini orbiter at Saturn, is an energetic neutral atom imager designed to obtain measurements of magnetospheric phenomena, and has done so for more than five years. When not pointing at the planet, INCA can sense ENA from other sources, notably those traversing the interplanetary medium from the direction of the heliosheath. Maps of such emissions (Krimigis et al, 2009) have now been constructed spanning the energy range $\sim 5 \leq E \leq 55$ keV. Similarly, maps < 6 keV have been obtained by the IBEX mission (McComas et al, 2009). These maps, on the main, do not conform to the standard models of the shape of the heliosphere. The distributions of the emissions are clearly influenced by factors over and above those estimated from the flow of interstellar plasma. Assuming that measurements of energetic ions by Voyagers 1, 2 in the heliosheath (Decker et al, 2009) represent the average intensity along the line of sight through the heliosheath, Cassini ENA intensities may be converted to ion fluxes, thus providing a continuous heliosheath ion spectrum $5 \leq E \leq 4000$ keV. This conversion yields an estimate of the thickness of the heliosheath ($\sim$ 50 AU) and the local pressure ($\sim$ 0.13 pPa). Based on the ordering of ENA intensities in galactic coordinates, it is hypothesized that the local interstellar magnetic field plays an important role in determining the shape of the heliospheric cavity. The results will be discussed in the context of previous and evolving models.

References

Krimigis et al, *Science, 326*, 971, 2009

McComas et al, *Science, 326*, 959, 2009

Decker et al, *Solar Wind 12*, 25 June, 2009