AOGS 2005

The ENA Signal coming from the Heliospheric Boundary

K. C. HSIEH
Physics Department, University of Arizona, Tucson AZ 85721, USA

By "heliospheric boundary", we mean "the regions of space surrounding the Sun that is bounded *inside* by the termination shock, which separates the supersonic solar wind from the subsonic flow of solar plasma in the heliosheath, and *outside* by the heliopause, which separates the heliosheath from the interstellar plasma that flows around it". Sun's motion relative to the interstellar medium compresses the head, the portion of this region in the apex direction, to a thickness ~60 AU, and stretches the tail, the portion in the anti-apex direction, to the order of at least several 10^2 AU. Energetic neutral atoms (ENA) coming from these regions should be a direct sample, in species and energy, of the energetic ion populations therein. Current understanding of the structure of and dynamics at the heliospheric boundary suggests that these ions include all the charged particles swept out by the solar wind and then accelerated by and convected away from the termination shock. The energy dependence of the charge-exchange cross sections and of the ion spectra limits the ENA signals to an energy window between ~1 and ~100 keV/amu. Since the lunch of ENA-capable instrument HSTOF/CELIAS on SoHO in 1995, ENA imagers INCA/MIMI on Cassini, LENA, MENA and HENA on IMAGE, and NPD & NPI/ASPERA-3 on Mar Express were lunched in 1997, 2000, and 2003, respectively. All these ENA instruments are confined to the inner heliosphere – SoHO and IMAGE at 1 AU, Mar Express at 1.5 AU and Cassini at 10 AU. In the meantime, modeling of the production of ENA in the heliospheric boundary made advances. We shall review what ENA signals have been received that could be coming from the heliospheric boundary and what have we learned from these signals in light of the models. In light of the lessons learned, the development of new instruments and mission studies, we shall also discuss what can be done in the near future to greatly improve our ability in receiving and understanding the ENA signals from the heliospheric boundary.