Geophysical Research Abstracts
Vol. 14, EGU2012-1919, 2012
EGU General Assembly 2012

The Voyagers in the 3-D Heliosheath: Transition in Intensities, Flows, and Velocities

S. Krimigis (1), R. Decker (1), E. Roelof (1), and M. Hill (1)

(1) Applied Physics Laboratory, Johns Hopkins University, Laurel, MD 20723, United States (tom.krimigis@jhuapl.edu), (2) Office for Space Research and Technology, Academy of Athens, Athens, Greece

The Voyager 1 (V1) and 2 (V2) spacecraft have been traversing the heliosheath since 2004 (V1) and 2007 (V2), after crossing the termination shock (TS) at distances (latitudes) of 94 AU (34°) and 84 AU (- 29°), respectively. They are currently located at 120 AU (34.5°) and 98 AU (29.5°). The Low Energy Charged Particle (LECP) instrument's measurements of the intensity spectra and the angular distribution of energetic ions ($\sim$ 30 keV <E $\leq$ 200 Mev) and electrons ($\sim$ 30 keV <E $\leq$ 1 Mev) allow us to determine the underlying plasma convection velocities in the R, T plane (in RTN coordinates) by using the Compton-Getting effect. At V1 there has been a steady decrease in the radial component VR of plasma flow velocity beginning in 2007.7 from $\sim$ 80 km/s to zero in 2010.4. VR then became negative in early 2011($\sim$ -25 km/s) and has fluctuated about these mainly negative values ever since. This «transition layer» is at least $\sim$6 AU thick and was proposed to be due to the flow being deflected northward, in accordance with standard MHD models. Reorientation of V1 to enable periodic determinations by LECP of the meridional component of velocity VN has shown that there is no persistent flow (|VN| < 20 km/s) so far. The zero and negative VR were measured while the intensity of energetic ions (>40 keV) at V1 decreased by a factor of 2, suggesting that the spacecraft may be approaching the heliopause. Similar decreases in intensity, however, were also seen a month earlier at V2 some $\sim$ 130 AU away, indicating that there may be a global reordering of heliospheric structure connected with the onset of the new solar cycle. V2 intensities recovered after $\sim$6 months, while more recently, intensities at V1 are increasing again. At V2 the intensities of Anomalous Cosmic Rays (ACR) have now increased for the first time to levels even higher than those seen at V1, and substantially higher than they were at the crossing of the TS. Overall, the outer heliosheath appears to be surprisingly diverse and dynamic, and those variations may well reflect a closer connection to the magnetic configuration of the solar corona than thought possible heretofore.