SEARCH FOR ENA FROM THE HELIOSPHERIC BOUNDARY USING IMAGE/HENA

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The HENA instrument on the IMAGE spacecraft measures energetic neutral atoms (ENAs) using time-of-flight over the energy range 10-200 keV/nuc. Whenever there are neither magnetospheric ENAs nor energetic ions in sufficient numbers to penetrate the electrostatic deflection system, HENA will respond to ENAs from the heliosphere. These may either be ENAs produced within the solar wind by shock-accelerated ions that charge exchange with interstellar H-atoms [Roelof, 1992], or ENA H-atoms produced by protons accelerated in the vicinity of the heliospheric termination shock and transported beyond it into the sub-sonic heliosheath [Gruntman *et al.*, 2001]. During $\sim$2 hr of every appropriate apogee pass of IMAGE, we select a region of the anti-Earthward sky approximately $60\,\mathrm{deg}$x$60\,\mathrm{deg}$ and accumulate counts in $6\,\mathrm{deg}$x$6\,\mathrm{deg}$ instrument pixels and in $\sim$5 energy channels. The energy spectrum and angular distribution accumulated during each apogee pass (usually containing $>$30 counts) are both examined for possible contamination. Acceptable counts are mapped into absolute intensities (cm^2 sr s keV)$^{-1}$ over the celestial sphere using the calibrated response function of the instrument. This allows counts from separate apogee passes to be properly concatenated. Any resulting intensity then gives an upper bound on ENAs from either within the heliosphere or from the termination shock. The portion of the celestial sphere covered so far is predominantly in the northern hemisphere. Preliminary results give an upper bound on the spectrum in the range 16-60 keV that is below the ENA intensity recently predicted for pickup protons accelerated at a strong heliospheric termination shock [Fahr and Lay, 2000]. However, this upper bound is well above the intensity we calculate for ENAs that would be produced by the recently reported ubiquitous high energy tails on long-term-averaged energetic ion spectra measured on the ACE spacecraft [Mewaldt *et al.*, 2001].