OBSERVATION OF INTERSTELLAR FLOW THROUGH THE HE FOCUSING CONE WITH THE INTERSTELLAR BOUNDARY EXPLORER (IBEX): EVIDENCE FOR A SECONDARY NEUTRAL COMPONENT?

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Due to the motion of the Sun relative to its neighborhood, the neutral gas of the local interstellar medium (LISM) flows through the inner heliosphere where it is subject to ionization, the Sun’s gravity, and radiation pressure. Observing the resulting spatial distribution and flow pattern of several interstellar gas species with UV backscatter, pickup ion, and neutral atom imaging techniques allows us to unravel the physical conditions of the LISM and its interaction with the outer heliosheath. A secondary component of the interstellar neutral gas flow in the inner heliosphere stems from charge exchange with outer heliosheath ions, which are diverted around the heliosphere. Therefore, this component contains information of the deceleration, deflection, and heating of the interstellar plasma in the boundary layer. IBEX was launched in October 2008 and has now scanned the interstellar gas flow at 1 AU twice from mid December 2008 through March 2009, and from late November 2009 through March 2010, taking advantage of simultaneous observations of several interstellar species with its triple-coincidence time-of-flight IBEX-Lo sensor. First data demonstrated that IBEX-Lo is observing interstellar O, He, along with secondary O. During the second year, a substantial flux of interstellar He was observed extending even before the passage of the gravitational focusing cone in early December. The modeled He distribution, which was shown to agree with the ISM flow peak observed by IBEX-Lo in February 2009 within 10%, is exceeded by this flux by more than two orders of magnitude. The most likely explanation for this new observation is a small, but significant, secondary He component, consistent with the simultaneous observation of a secondary O component.