

Energetic Neutral Atoms from the Heliosphere

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Energetic neutral atoms (ENAs) provide an important and delicate tool to the remote probe the energetic charged particle population in far regions of the heliosphere which are inaccessible for in-situ measurement. ENAs are produced by charge exchange between energetic ions and slow neutral atoms. Momentum transfer is negligible, so the energetic ion picking up an electron continues to move as a fast neutral, free of electromagnetic forces, with its momentary speed. This ENA radiation of the plasma can be detected at Earth. Because of the low flux and high background, the detection of ENAs is challenging and their identification requires great care.

In the talk, I shall overview past and current ENA measurements and discuss their implications. In particular, I shall discuss the recent controversial measurement from STEREO. The suprathermal electron (STE)

instrument on STEREO was not designed to identify ENAs but, as a byproduct, STE obtained a steady signal that could be interpreted as ENAs from the direction not far from the nose of the heliosphere. This ENA source, if correct, would have far reaching implications for the structure of the heliosphere. We, in collaboration with other researches, re-interpreted the STE measurement, and found that the signal was produced by X-rays from SCO-X1, and was mistakenly ascribed to ENAs.

I shall also briefly discuss expectations from the IBEX mission. The Interstellar Boundary Explorer (IBEX), launched in 2008, is a dedicated ENA mission with a single goal to obtain a full-sky ENA survey. These ENAs can map the outer boundary region of the heliosphere, which formed by the interaction between solar and interstellar material.