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Energetic Neutral Atom Imaging of the Heliosphere

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Energetic neutral atoms (ENAs) are born in charge exchange of space
plasma ions on neutral interstellar gas atoms. Recording ENA fluxes is

recognized to be a powerful tool to remotely study distant regions in the heliosphere because ENA's, in contrast with charged particles, can travel large distances through space with minimal disturbance. By measuring ENA fluxes as a function of observational direction, one can reconstruct global heliospheric ENA images. ENA imaging is essentially a line-of-sight observations and extensive modelling is required to get insight into the structure of the objects of interest. ENA fluxes are produced by ions of various origin such as the quiescent solar wind, coronal mass ejections (CMEs), thermalized solar wind in the heliospheric interface region, shock accelerated protons (SAPs), and anomalous cosmic rays (ACRs). ENA images carry a wealth of unique information, for example the global images of the heliospheric boundary would provide a basis for remote determination of the size and shape of the heliosphere and substantially improve our understanding of the processes in the region of the heliospheric interface. Depending on particle origin, ENA energies can be in the range from few eV up to > 100 keV and the measurement of exceptionally weak ENA fluxes presents a challenging experimental task. Recent developments in experimental technique suggest that ENA fluxes can be reliably measured and promising experimental techniques, mature as well as fledgling, will be discussed.