

TWINS Skymap ENA Images

The ENA images are shown on a skymap projection with dipole field lines plotted at McIlwain L-shells, $L = 4$ and $8 R_E$. The red and purple L-shells point in the sun and dusk directions, respectively. The TWINS instruments normally acquire full images every 78 s with an integration time of 60 s. The ENA images shown here are integrated over 15-16 sweeps corresponding to ~ 15 m of observation time during an ~ 20 m time period. The energy band of ENAs is centered at 40 keV, extending from 20.0 to 60.0 keV. The flux is in units of $[\text{eV cm}^2 \text{sr s}]^{-1}$.

A full description of the NASA TWINS (Two Wide-angle Imaging Neutral-atom Spectrometers) mission of opportunity is given in *McComas et al.* [2009a] and *Goldstein and McComas* [2013]. The two spacecraft are in Molniya orbits with inclinations of 63.4° , perigee altitudes of ~ 1000 km, and apogees in the northern hemisphere at ~ 7.2 RE. The spacecraft are 3 axis stabilized and provide approximately nadir pointing of the TWINS instruments. Because the orbital planes of the two spacecraft are significantly offset, the pair provides a combination of continuous magnetospheric observations from at least one TWINS satellite with several hours of simultaneous, dual platform viewing each orbit.

A full description of the instruments is given by *McComas et al.* [1998]. The TWINS imagers are based upon the “slit camera” concept [*McComas et al.*, 1998] originally flown on the IMAGE satellite in the MENA instrument. This design provides the very large aperture, and hence geometric factor, required to properly image ENAs across the critical energy range from ~ 1 keV to 100 keV. For TWINS, a full image is acquired using two sensor heads that are mounted together on a rotating actuator, which sweeps back and forth over an approximately Earth centered viewing cone.

The TWINS images are processed using a statistical smoothing technique along with a background suppression technique described in detail in Appendix A of *McComas et al.* [2012]. This approach has also been applied successfully to ENA measurements on IBEX [*McComas et al.*, 2009b].

References:

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