Electron energizations and distributions associated with magnetic flux ropes in Earth's magnetotail

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Abstract

Magnetic flux ropes are significant magnetic structures observed in various eruptive phenomena in space and astrophysical plasma physics, including magnetospheric substorms and solar coronal mass ejections. These structures possess strong core fields with diameters ranging from a few Earth radii to the ion inertial length (di) in Earth's magnetotail plasma sheet. In this study, we investigate the distribution of electrons and potential energizations associated with magnetic flux ropes at ion inertial scales by using the measurements from MMS. We analyze the energetic electron fluxes, electron temperature, spectral index, and energy density (both thermal and supra-thermal electrons). Our findings reveal clear variations in these parameters within magnetic flux ropes, which are closely correlated with the evolution of the flux ropes.

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