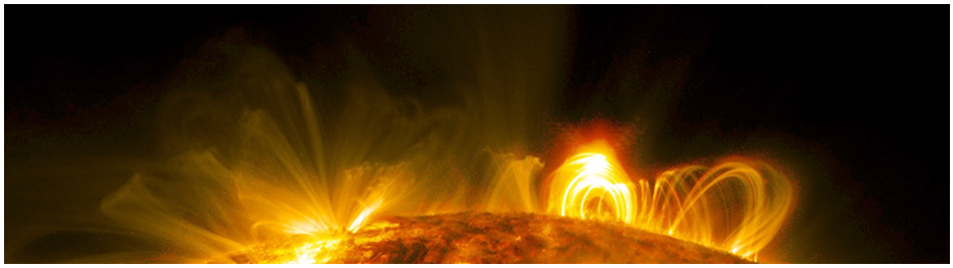

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Electron energy partition in solar flares and Earth's magnetotail

Wednesday, 17 November 2021 09:45 (1 hour)

Electrons are accelerated to non-thermal energies during explosive energy-release in solar flares and Earth's magnetotail. To understand the origin of energetic electrons, magnetic reconnection and associated kinetic structures have been studied extensively. However, it still remains unclear how the electron energy spectrum evolve during magnetotail reconnection and how energies are partitioned between thermal and non-thermal electrons. Here we show, based on in-situ observations by NASA's Magnetospheric Multiscale (MMS) mission, that electron energy spectra during reconnection are generally represented by the kappa distribution with the typical power-law index δ of 3-4, regardless of preconditioning (or activity level) of the magnetotail. However, an additional Maxwellian distribution is often necessary to better fit the data, indicating there might be an additional plasma population in the plasma sheet. The resultant non-thermal fraction of electron energy ranges from ~20% to ~60%. These values are consistent with those obtained in solar flares or, more specifically, the above-the-looptop hard X-ray coronal source. We envision that the observed properties facilitate comparative studies of particle acceleration during explosive energy-release in solar and terrestrial plasma environment.

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