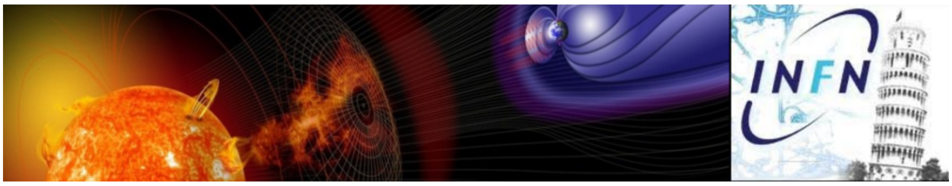

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How do supra-thermal runaway electrons affect the return current/nonthermal beam dynamics in solar flares?

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As energetic electrons propagate from the corona toward the lower atmosphere during a solar flare, a co-spatial counter-streaming return current is induced, thereby balancing the current density of the nonthermal flare-accelerated electron beam. In response to the return current electric field, a fraction of the ambient electrons are accelerated into the runaway regime. The background return current plasma is therefore not simply a drifting Maxwellian but a distribution with a high energy tail of freely accelerated suprathermal electrons. I will show in this talk the results of a model in which an accelerated electron beam drives a steady-state, sub-Dreicer co-spatial return-current electric field, which locally balances the direct beam current and freely accelerates a fraction of background electrons. The model is self-consistent, i.e., the electric field induced by the co-evolution of the direct beam and the runaway current is considered. We find that (1) a significant number of suprathermal electrons can reach the acceleration region in the weak-field sub-Dreicer regime, where they can be further accelerated to higher energies, (2) the energy gain of the suprathermal electrons can be up to 10-35 keV, (3) the heating rate in the corona can be reduced by a factor three for medium range injected fluxes in comparison to models which neglect the runaway component. The results depend on the injected beam flux density, the temperature and density of the background plasma.

Email

Meriem.alaouiabdallaoui@nasa.gov

Primary author: ALAOUI, Meriem (CUA & NASA/GSFC)

Co-authors: HOLMAN, Gordon (NASA/GSFC); ALLRED, Joel (NASA/GSFC); EUFRASIO, Rafael (UARK)

Presenter: ALAOUI, Meriem (CUA & NASA/GSFC)

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