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Implications of electron beam propagation and its associated return current on energy deposition in solar flares

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During solar flares, a large flux of energetic electrons propagate from the tops of reconnecting magnetic flux tubes toward the lower atmosphere. Over the course of the electrons' transport, a co-spatial counter-streaming return current is induced, thereby balancing the current density. In response to the return current electric field, a fraction of the ambient electrons will be accelerated into the runaway regime. In a recent paper, we developed a model describing the accelerated electron beam/return-current system which self-consistently accounts for these suprathermal runaway electrons. I will show a systematic study of the effect of the return current on the energy deposition by the electron beam in the corona versus the chromosphere by varying the beam parameters (total electron flux density, spectral index, and low-energy cutoff) and the initial atmosphere in which the beam is injected.