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José Ortuño Macías - Relativistic Radiative Magnetic Reconnection

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We will present the results of kinetic simulations of relativistic magnetic reconnection including synchrotron radiation reaction in a domain with open boundaries. In such configuration, reconnection produces steady relativistic outflows that involve chains of plasmoids with well-defined statistical characteristics (Sironi et al. 2016). Due to the stochasticity of plasmoids chains, the plasmoid reconnection offers an attractive scenario for the multi-timescale and multi-wavelength variability of high-energy non-thermal sources, in particular those associated with relativistic magnetized jets, e.g., blazars (Christie et al. 2019). However, the effects of radiative cooling on the evolution of plasmoid properties have not been investigated yet. By means of particle-in-cell (PIC) simulations using the Zeltron code that includes synchrotron radiation reaction, a strong cooling efficiency regime is achieved, with typical synchrotron cooling length scales of the order of the physical size of our computational domain. As has been noted before, the evolution of individual plasmoids depends fundamentally on their size, e.g. the bulk acceleration length scale is shorter for small plasmoids, and small plasmoids are responsible for the most rapid variability of the emitted radiation. We find that small plasmoids are able to radiate away a large fraction of their thermal energy within the domain boundaries, and hence their contribution to the observed light curves can be accurately described by the results of our simulations.

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