Flare particle acceleration resulting from the interaction of twisted coronal flux ropes

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Solar flares are highly explosive events which release significant quantities of energy (upto 10^32 ergs) from specific magnetic configurations in the solar atmosphere. As part of this process, flares produce unique signatures across the entire electromagnetic spectrum, from radio to ultra-violet (UV) and X-ray wavelengths, over extremely short length and timescales. Many of the observed signals are indicative of strong particle acceleration, where highly energised electron and proton populations rapidly achieve MeV/GeV energies and therefore form a significant fraction of the energy budget of each event. It is almost universally accepted that magnetic reconnection plays a fundamental role (on some level) in the acceleration of particles to such incredible energies.

I will briefly summarise a recent investigation of non-thermal particle behaviour in a three-dimensional (3D) magnetohydrodynamical (MHD) model of unstable multi-threaded flaring coronal loops. Using the test-particle approach, I will describe how particle orbits respond to the reconnection and fragmentation in MHD simulations wherein the onset of the kink instability in a single loop thread can lead to the destabilisation and fragmentation of other loop threads. I will also compare the test particle energy distributions and final positions with other theoretical particle acceleration models in the context of observed energetic particle populations during solar flares.