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Pronounced energy-dependent anisotropy of particle acceleration and associated radiation in relativistic pair reconnection[1] GREGORY WERNER, BENOIT CERUTTI, DMITRI UZDENSKY, MITCHELL BEGELMAN, University of Colorado — Magnetic reconnection is one of a few astrophysical mechanisms that can accelerate particles to energies sufficient to emit observable high-energy radiation. This work reports on 2D simulations of reconnection in relativistic electron-positron pair plasmas, which may power gamma-ray emission from pulsar wind nebulae (PWNe), Gamma-Ray Bursts (GRBs), and blazar jets. The most important new discovery is the strong, energy-dependent angular anisotropy and spatial inhomogeneity of accelerated particles: high-energy particles are bunched in space and focused into beams mostly confined to the reconnection layer midplane. Another important advance is the calculation of the associated radiative signatures (spectra and light curves) seen by a distant observer. The synchrotron and inverse Compton radiation from the high-energy particles is likewise focused in narrow beams. The beams sweep back and forth within the midplane, so that an observer sees intense bursts (only) when a beam crosses the line of sight. The resulting rapid variability, on timescales much shorter than the light-crossing time of the reconnection region, could explain the short, intense gamma-ray flares observed in blazar jets and PWNe, including the GeV flares recently discovered in the Crab nebula.

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Gregory Werner
University of Colorado

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