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Non-thermal particle acceleration in 3D magnetic reconnection XIAOCAN LI, FAN GUO, HUI LI, Los Alamos Natl Lab — Non-thermal particle acceleration is one major unresolved problem in space physics and astrophysics. Recent studies have shown that magnetic reconnection is one primary mechanism for particle energization in space and astrophysical plasmas. Using fully kinetic simulations, these studies have shown the formation of power-law particle energy distributions during reconnection. Mostly of those simulations are two-dimensional (2D), causing energetic particles being artificially confined in magnetic islands with closed field lines. By carrying out similar 2D kinetic simulations, we show that the distribution of accelerated particles integrated over the whole simulation box appears highly non-thermal, it is actually the superposition of a series of distributions in different sectors of 2D magnetic islands. To resolve the issue of artificially particle confinement, we carry out 3D kinetic simulations and show that the mixing of particles are enhanced by the development of turbulence and mixing of magnetic field lines. We investigate the local energy distribution as a result of including the 3D physics.

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