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Influence of Line-Tied Boundary Conditions on the Development of Magnetic Reconnection in Force-Free Current Layers CIHAN AKCAY, WILLIAM DAUGHTON, LANL, VYCHESLAV LUKIN, NSF, YI-HSIN LIU, NASA Goddard Space flight center — The evolution of plasmas in magnetically dominated low-β regimes often leads to the formation of nearly force-free current sheets where magnetic reconnection may be triggered by the tearing instability. In three-dimensional systems, the tearing of a current sheet and ensuing magnetic reconnection can result in the formation and interaction of magnetic flux ropes. In addition, many space and laboratory plasmas feature current sheets of finite extent that are embedded in larger systems with line-tied field boundary conditions. Motivated by these properties, we examine the influence of line-tied boundary conditions on the onset and development of three-dimensional magnetic reconnection in kinetic-scale force-free layers. To better understand the physics, we perform cross-comparisons between fully kinetic VPIC simulations and two-fluid HiFi simulations. We focus on a range of guide fields $B_g = (1 - 10)B_0$ relevant to both space and laboratory plasmas, and compare the evolution between systems with line-tied and periodic boundary conditions.

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