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Forced Magnetic Reconnection at an X-point: Particle-In-Cell and Ten-Moment Extended MHD Simulations LIANG WANG, NAOKI BESSHO, Space Science Center, University of New Hampshire, Durham, NH, AMITAVA BHATTACHARJEE, Princeton Plasma Physics Laboratory, Princeton University, Princeton, NJ, KAI GERMASCHEWSKI, Space Science Center, University of New Hampshire, Durham, NH, AMMAR HAKIM, Princeton Plasma Physics Laboratory, Princeton University, Princeton, NJ — We will present comparative numerical studies of current sheet formation and forced magnetic reconnection at an X-point, beginning from a potential field. The problem will be simulated by the fully kinetic Particle Simulation Code (PSC) [1] and an extended ten-moment MHD code Gkeyll [2] that retains important kinetic physics, particularly, electron inertia and full electron/ion pressure tensors. Our goals are to investigate the similarities and differences between the two models, and to seek suitable parameterization of kinetic effects in the fluid models. The simulation domain is restrained in 2-D and is closed by conducting wall boundaries. The reconnection is forced by in-plane flows imposed on two opposite boundaries, where the forcing flows converge at the two boundary centers, and are slow compared to the characteristic Alfvén speed. We will compare results on the time-dependence of the reconnecting electric field (suitably normalized), as well as the structure of current sheets from PSC, Gkeyll, and an MHD code, varying ion-to-electron mass ratio and domain size. This study is carried out under the auspices of a Focus Topic in the NASA Living With a Star Targeted Research and Technology Program.

[1] Fox, eta, Phys Plasmas, 2012
[2] Hakim, J Fusion Energy, 2008

Liang Wang
University of New Hampshire

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