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NIMROD Simulations of Reconnection in MRX and SSX
NICHOLAS MURPHY, CARL SOVINEC, University of Wisconsin — Two-fluid effects are known to influence magnetic reconnection rates through non-MHD communication between the reconnection layer and surrounding magnetic field topology [1]. To examine the interrelationship between the local reconnection physics and the global magnetic field arrangement, we perform simulations of the Magnetic Reconnection Experiment (MRX) and the Swarthmore Spheromak Experiment (SSX) using the NIMROD extended MHD code. The presence of dual flux cores makes the grid of MRX nontrivial, and the steps to account for a logically non-rectangular grid in NIMROD are outlined. For MRX, we show simulations of co- and counter-helicity push and pull reconnection and discuss the characteristics of the reconnection sheet. For SSX, we show simulations of reconnection during counter-helicity spheromak merging. We compare single-fluid and two-fluid simulations to gauge the importance of two-fluid effects. These results are compared to the recent detection of the quadrupole field resulting from two-fluid collisionless reconnection in both SSX [2] and MRX [3].

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2. Matthaeus, Cothran, Landreman, and Brown, Geophys. Rev. Lett., 32 (2005).
3. Ren, Yamada, Gerhardt, Ji, Kulsrud, and Kuritsyn, Phys. Rev. Lett. 95 (2005).

Nicholas Murphy
University of Wisconsin

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