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Magnetic reconnection with asymmetry in the outflow direction[1]
NICHOLAS MURPHY, CARL SOVINEC, University of Wisconsin-Madison, PAUL CASSAK, West Virginia University — Magnetic reconnection with asymmetry in the outflow direction occurs in the Earth's magnetotail, spheromak merging experiments, coronal mass ejections, and astrophysical disks. We analyze the case of steady reconnection with asymmetric downstream pressure, using conservation of mass, momentum, and energy to derive the outflow velocities for both sides of the reconnection layer. As in reconnection with asymmetric inflow [1], the flow stagnation point and magnetic field null will not coincide, unless the pressure gradient is negligible at the flow stagnation point. When the two points are separated, there will be a Poynting flux across the flow stagnation point. We compare the derived properties of this model with resistive MHD simulations of driven reconnection. We perform a similar analysis for reconnection in toroidal geometry when the outflow is aligned with the radial direction. The toroidal geometry model is compared against simulations of push reconnection (similar to spheromak merging) using the geometry of the MRX device [2].
[1] P. A. Cassak & M. A. Shay, Phys. Plasmas 14, 102114 (2007)
[2] N. A. Murphy & C. R. Sovinec, Phys. Plasmas 15, 042313 (2008)

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