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A fluid theory of fast low-beta magnetic reconnection ADAM STANIER, ANDREI SIMAKOV, LUIS CHACON, WILLIAM DAUGHTON, Los Alamos Natl Lab — Low-beta reconnection, where the magnetic field is dominated by a strong out-of-plane component, is important in laboratory magnetic confinement devices, the solar corona, and other magnetically dominated astrophysical environments. Despite the importance of these applications, reconnection in this regime remains poorly understood. It has been suggested that fast dispersive waves are responsible for the fast timescales of reconnection in both the high-beta and low-beta regimes. However, recent kinetic simulations have demonstrated that reconnection rates remain fast, even without such waves. Here we show from fluid simulations that rates are fast in cases with and without fast dispersive waves. We present a fluid theory of the dissipation region, which predicts the functional form of the dissipation region thickness, length, upstream magnetic field, and reconnection rate in both cases. These results are benchmarked against fluid simulations with strict control of dissipation, and comparisons are made with kinetic simulations.

Adam Stanier
Los Alamos Natl Lab

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