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Flux tube formation by oblique tearing instabilities across a current sheet S.D. BAALRUD, A. BHATTACHARJEE, Y.-M. HUANG, University of New Hampshire, W. DAUGHTON, Los Alamos National Laboratory — Tearing modes arise at resonant surfaces where a wavevector is perpendicular to the magnetic field. In 2D this is the single reversal surface of the polodial field, but in 3D guide field geometries, resonant surfaces span the current layer. Flux tubes at each surface can interact, leading to field line stochasticity, which may limit the efficacy of particle acceleration by trapping in flux tubes. Knowing the volume of the plasma that is tearing unstable is important for understanding these effects. Using analytic and numerical approaches, we find that the most unstable modes in an MHD current sheet have a similar growth rate across the current layer. In contrast, collisionless kinetic theory for a Harris current sheet predicts that flow stabilizes modes far from the reversal surface. Since flux tubes are aligned along the total field, these modes have an oblique angle with respect to the conventional 2D geometry. The eigenfunction of oblique modes is found to have an odd parity component, in addition to the usual even parity of parallel modes. Ion-electron mass ratio is also found to have a profound effect, with the trend of a broader mode spectrum at lower mass ratios. Comparison of analytic and linear numerical theories with full-orbit Vlasov computation will also be given.

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