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Reduced energy principle for ideal/tearing modes in separatrix limited plasmas[1] JOSHUA KALLMAN, Princeton University, LEONID ZAKHAROV, PPPL — Ideal and tearing MHD modes near the edge of a plasma represent a significant threat to plasma stability, confinement, and plasma facing material surfaces. Theoretical and numerical studies of these modes are extremely difficult due to the presence of a magnetic separatrix and the multiple resonance surfaces inside it. In this presentation, we examine an exceptional case in which the MHD energy principle can be reduced to the minimization of a line integral functional instead of a complicated 2-D expression, thereby avoiding numerical convergence problems. In addition, a numerical implementation of Bishop-Taylor equilibria, a special class of toroidal equilibria in which a unique set of magnetic flux surfaces can be determined by infinitely many pressure and current profiles, is discussed. Due to this indeterminacy, such equilibria are of great use in calibrating equilibrium codes, and can additionally contain a separatrix region, which makes them especially relevant for the stability analysis outlined above.

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