Abstract Submitted
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Hybrid equilibria of divertor tori with application to field-reversed configurations[1] LOREN STEINHAUER, University of Washington — High-beta plasmas of interest to fusion energy are poorly captured by fluid or even extended-fluid models. In local regions of low magnetic field (O-point, X-points) as well as regions with steep gradients [separatrix, scrape-off-layer (SOL)] even the gyroviscous model is questionable. An adequate treatment of the ion species calls for a fully kinetic treatment. The electrons can still be treated as a warm massless fluid. The label "hybrid equilibrium" describes this combination of fully-kinetic ions and fluid electrons. A flexible analytic solution to the steady Vlasov equation for the ions is found. Since it allows for loss of unconfined ions, it is called an "end-loss" distribution. Analytic forms of the important moments of the distribution are also found. While the fluid description of the electron fluid is straightforward, the paradigm for the electrostatic potential requires some care, especially to account for electrical shorting. Hybrid equilibria (kinetic ions + electron fluid + potential) require modest computations. Computed equilibria of field-reversed configurations yield insight into the SOL thickness, naturally sheared ion flows, and global confinement properites.

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