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Hybrid reconstruction of field-reversed configurations LOREN STEINHAUER, Tri Alpha Energy, TAE TEAM — Field-reversed configurations (FRC) are poorly represented by fluid-based models and require instead an ion-distribution function. Two such populations are needed since "core" ions are roughly restricted to the region inside the separatrix, whereas "periphery" ions can escape along open field lines. The Vlasov equation governs the distribution, the general solution to which is an arbitrary function of the constants of motion (Hamiltonian, canonical angular momentum). Only a small subset of such distributions are realistic in view of collisions, which smooth the distribution, and instabilities, which reorganize the field structure. Collisions and end loss are included if the distribution is a solution to the Fokker-Planck (FP) equation. Vlasov and FP solutions are nearly identical in weakly-collisional plasmas. Numerical construction of such equilibria requires solving both Ampere's law for the magnetic flux variable and the ponderous task of a full velocity-space integration at each point. The latter can be done analytically by expressing the distribution as the superposition of simple basis elements. This procedure allows rapid reconstruction of evolving equilibria based on limited diagnostic observables in FRC experiments.

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