

Abstract Submitted
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A symbiotic approach to fluid equations and non-linear flux-driven simulations of plasma dynamics¹ FEDERICO HALPERN, General Atomics — The fluid framework is ubiquitous in studies of plasma transport and stability. Typical forms of the fluid equations are motivated by analytical work dating several decades ago, before computer simulations were indispensable, and can be, therefore, not optimal for numerical computation. We demonstrate a new first-principles approach to obtaining manifestly consistent, skew-symmetric fluid models, ensuring internal consistency and conservation properties even in discrete form. Mass, kinetic, and internal energy become quadratic (and always positive) invariants of the system. The model lends itself to a robust, straightforward discretization scheme with inherent non-linear stability. A simpler, drift-ordered form of the equations is obtained, and first results of their numerical implementation as a binary framework for bulk-fluid global plasma simulations are demonstrated.

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