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Large moment simulations of plasma dynamics with exact conservation[1] FEDERICO HALPERN, RONALD WALTZ, MARK KOSTUK, RYAN STEFAN, General Atomics — Understanding edge turbulent phenomena in tokamaks requires global, transport-timescale simulations with sub-millimeter resolution, which must handle large amplitude fluctuations, large gradients, and strong non-linearity. ALMA (Accelerated, Large-Moment, Anti-symmetric) is being developed to address such scenarios using high-order fluid hierarchies based on Gaussian Radial Basis Functions. We employ the anti-symmetry formalism, which results in exact conservation of mass, momentum, and energy independently of the chosen numerical scheme, preserving the Hamiltonian structure of fluid models. First simulations of drift-ordered high-order fluid hierarchies will be demonstrated. Benchmark simulations are also presented, including flow instabilities in neutral fluids, the Tang-Orszag vortex problem in MHD, and plasma filament motion in two fluid plasma models.

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