Abstract Submitted
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Toroidal effects on gyrokinetic and fluid models[1] LINDA SUGIYAMA, M.I.T. — Fluid and gyrokinetic models of high temperature, magnetically confined plasmas both rely on expansion in a gyroradius parameter small compared to a reference size ($\rho_i/L < 1$), but emphasize different aspects of physics. Fluid models retain the effects of toroidal geometry at lowest order but relegate important kinetic effects to ever higher velocity moments, by implicitly taking the gyroradius smaller than a fluid element. Gyro-orbit expansions drop inverse aspect ratio terms in zeroth order (drift kinetic equation), but retain kinetic effects, assuming that the gyro-radius is the most important small parameter. Both kinds of physics are needed to describe high temperature toroidal plasmas. Coupling through the fluid moments requires first or second order. Gyrokinetic models are rigorously derived to all orders for 2D straight field line systems. 3D configurations and toroidal effects greatly complicate the equations, particularly at higher order. Existing models are not completely consistent and these effects are discussed for toroidal plasmas.

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