Abstract Submitted
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Second-order ion drift-kinetic equation[1] J.J. RAMOS, M.I.T. Plasma Science and Fusion Center — A novel form of ion drift-kinetic equation is presented, well suited to close the fluid description of slow macroscopic dynamics in low-collisionality, magnetically confined plasmas. It features second-order accuracy in the gyroradius expansion, with diamagnetic-scale ordering of frequencies and flow velocities. This second-order drift-kinetic equation is derived in the moving reference frame of the ion macroscopic flow, which facilitates the precise consistency with the complementary fluid system, as well as the rigorous treatment of the electric field. Examples of intended applications are the precursor of the "sawtooth" internal disruption and the "neoclassical tearing mode" in fusion-relevant tokamak temperature regimes. With these applications to slow excursions from well confined equilibria in mind, the distribution function is assumed to be close to a Maxwellian. The Maxwellian part carries the density, mean flow and temperature in Chapman-Enskog-like fashion. The resulting drift-kinetic equation for the non-Maxwellian perturbation is shown to be automatically consistent with the required condition that the density, random parallel velocity and random kinetic energy moments of such non-Maxwellian part be equal to zero.

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