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Parallel closures for plasma fluid equations E.D. HELD, M.K. ADDAE-KAGYAH, J.J. JAMES, M. SHARMA, D.R. HATCH, J.-Y. JI, Dept. of Physics, Utah State University, SCIDAC CEMM COLLABORATION, PSI-CENTER COLLABORATION — Accurately incorporating the effects of rapid electron and ion motion along magnetic field lines in plasma fluid models requires a kinetic treatment that admits arbitrary collision and transit frequencies. Coupled solutions to the electron and ion drift kinetic equations (DKE's) are presented which permit the construction of accurate closure relations for plasma fluid equations. The linearized collision operator employed in this work includes both particle/field and field/particle terms which guarantee accurate transport coefficients in the collisional limit. A gyroaveraged moment expansion for the kinetic distortions is used to approximately treat speed diffusion and drag terms as well as the field/particle elements of the collision operator. In addition, flow conservation is provided for by nonlocal momentum restoring terms which couple to the closure moments. It is shown that the parallel heat flow and stress closures map continuously from the collisional to the nearly collisionless limits. It is emphasized that in the present closure scheme, thermodynamic drives are considered simultaneously thus generalizing previous work that considered the heat flow and stress drives separately. The extension of this work to include time-dependent effects as well as the generalization to toroidal geometry is discussed.
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