UtahStateUniversity
MATHEMATICS & STATISTICS

Applied Math Seminar

Thursday, January 25th, 2017 @ 2:00 P.M. in ANSC 112

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A Moment Approach to Plasma Fluid/Kinetic Theory and Closures

A system of exact fluid equations always involves more unknowns than equations. This is called the closure problem. An important aspect of obtaining quantitative closures is an accurate account of collisional effects. Recently, analytical calculations of the Landau (Fokker-Planck) collision operator as well the derivation of an infinite hierarchy of moment equations have been carried out using expansions for the distribution function in terms of irreducible Hermite polynomials. In this talk, I will present solutions to the moment hierarchy that provide closure for the set of five-moment fluid equations. In the collisional limit, improved Braginskii closures are obtained by increasing the number of moments and considering the ion-electron collision effects. For magnetized plasmas, I highlight the effect of long mean free path and derive parallel integral closures for arbitrary collisionality. Finally, I will show how the integral closures can be used to study radial transport due to magnetic field fluctuations and electron parallel transport for arbitrary collisionality.