Comparisons of the Two-Fluid, Ten Moment and the Two-Fluid, Five Moment Plasma Models ROBERT LILLY, URI SHUMLAK, Aerospace Energetics Research Program at the University of Washington — The two-fluid ten-moment, and the two-fluid five-moment plasma models are compared. Using linear analysis (dispersion diagrams) it is shown how the ten moment model asymptotically approaches the five moment model as the mean free path shrinks compared to the scale length of interest. Separately, the unmagnetized MHD limit can be recovered by varying the collision frequency. These two equation systems, previously numerically implemented in WARPX, now incorporate interspecies collisional effects as per Braginskii. The Weibel and LHDI instabilities are numerically examined during the transition from the collisional to collisionless regimes. Further, comparisons are made between the algorithms employed: the finite volume (wave propagation) method and a finite element (discontinuous Galerkin) method.

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