Abstract Submitted
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Plasma interfacial mixing layers: Comparisons of fluid and kinetic models[1] ERIK VOLD, LIN YIN, WILLIAM TAITANO, B. J. ALBRIGHT, LUIS CHACON, ANDREI SIMAKOV, KIM MOLVIG, Los Alamos Natl Lab — We examine plasma transport across an initial discontinuity between two species by comparing fluid and kinetic models. The fluid model employs a kinetic theory approximation for plasma transport in the limit of small Knudsen number. The kinetic simulations include explicit particle-in-cell simulations (VPIC) and a new implicit Vlasov-Fokker-Planck code, iFP. The two kinetic methods are shown to be in close agreement for many aspects of the mixing dynamics at early times (to several hundred collision times). The fluid model captures some of the earliest time dynamic behavior seen in the kinetic results, and also generally agrees with iFP at late times when the total pressure gradient relaxes and the species transport is dominated by slow diffusive processes. The results show three distinct phases of the mixing: a pressure discontinuity forms across the initial interface (on times of a few collisions), the pressure perturbations propagate away from the interfacial mixing region (on time scales of an acoustic transit) and at late times the pressure relaxes in the mix region leaving a non-zero center of mass flow velocity. The center of mass velocity associated with the outward propagating pressure waves is required to conserve momentum in the rest frame.

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