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Modeling the Interaction between Fluid and Kinetic Scales[1] JEREMIAH BRACKBILL, unaffiliated, GIOVANNI LAPENTA, Los Alamos National Laboratory — An understanding of magnetic reconnection often requires the self-consistent description of the interaction between internal layers and plasma flows in open domains. For example, changes in the global topology of a magnetic field and collision-less reconnection in a thin current sheet may be strongly coupled. The challenges in modeling such problems are the incommensurable time and space scales involved, and the differences in basic assumptions and dependent variables between the kinetic description of the thin current sheet and the magnetohydrodynamic (MHD) model for the surrounding flow. These make imposing flux balance or Marshak conditions across an interface between fluid and kinetic regions much more difficult. To meet these challenges, we explore the special properties of implicit simulations, which allows us not only to extend kinetic simulations to much longer time and space scales, but also to formulate the MHD equations in a form that shares field equations and dependent variables with the kinetic simulations. The cost, of course, is increased computational complexity of the MHD equations, but the gain in range of applicability is significant.

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