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Implementing a reacting plasma-neutral model in the NIMROD finite element code PETER NORGAARD, URI SHUMLAK, Plasma Science and Innovation Center, University of Washington — In previous work by E.T. Meier and U. Shumlak, a generalized fluid model was derived from the Boltzmann equation that captures the effects of plasma interacting with a gasdynamic neutral fluid. Our present effort extends this work by beginning implementation in the NIMROD pseudospectral / finite element code, which has been used extensively for simulating MHD and multifluid plasma physics. An extension to NIMROD was developed by V.A. Izzo et al. for modeling injection of impurity gas to quench a tokamak, however it was limited to coupling through the continuity equation. The goal of this work is a more complete implementation of the plasma-neutral interaction, which will allow broader application such as the study of tokamak edge plasmas. As a preliminary step, the neutral fluid is treated as static, and interacts with the single-fluid MHD plasma model as a source term in the MHD continuity, momentum, and energy equations. The background neutral density and temperature is held fixed, so the ionization and recombination rates only vary with the plasma properties. In future work we plan to allow variable neutral density and temperature, and then implement the fully dynamic reacting plasma-neutral model.

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