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Numerical simulations using a physics-based domain-decomposed plasma model[1] A. HO, U. SHUMLAK, I. A. M. DATTA, S. T. MILLER, Univ of Washington — Plasma models have regimes of validity that depend on local parameters. The various models have different levels of physical fidelity and corresponding computational costs. For example, magnetohydrodynamic (MHD) plasma models assume a quasi-neutral fluid, but two-fluid plasma models do not. While two-fluid models are a superset of MHD models, they have to resolve electron dynamics and solve Maxwells equations. In many problems reduced models can adequately describe the plasma behavior in portions of the domain. Partitioning the domain to use a combination of MHD and two-fluid models in different parts of the domain can maintain the required physical fidelity while improving computational efficiency. Coupling between the models is handled using boundary conditions to convert the variable set of one constituent model to the variable set of another constituent model. This research investigates the coupling between multiple plasma models using a physics-based domain-decomposition. Comparisons are made on the accuracy and performance of a physics-based domain-decomposed plasma model with a single conventional plasma model of a plasma opening switch.

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