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Lacuna-based Artificial Boundary Condition And Uncertainty Quantification of the Two-Fluid Plasma Model EDER SOUSA, URI SHUMLAK, University of Washington, GUANG LIN, Pacific Northwest National Laboratory — Modeling open boundaries is useful for truncating extended or infinite simulation domains to regions of greatest interest. However, artificial wave reflections at the boundaries can result for oblique wave intersections. The lacuna-based artificial boundary condition (ABC) method is applied to numerical simulations of the two-fluid plasma model on unbounded domains to avoid unphysical reflections. The method is temporally nonlocal and can handle arbitrary boundary shapes with no fitting needed nor accuracy loss. The algorithm is based on the presence of lacunae (aft fronts of the waves) in wave-type solutions in odd- dimensional space. The method is applied to Maxwell's equations of the two-fluid model. Placing error bounds on numerical simulations results is important for accurate comparisons, therefore, the multi-level Monte Carlo method is used to quantify the uncertainty of the two-fluid plasma model as applied to the GEM magnetic reconnection problem to study the sensitivity of the problem to uncertainty on the mass ratio, speed of light to Alfven speed ratio and the magnitude of the magnetic field initial perturbation.

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