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Benchmarking of the LAPS dust-plasma code MAXIMILIAN FORSTNER, GIAN LUCA DELZANNO, ZEHUA GUO, BHUVANA SRINIVASAN, XIANZHU TANG, LANL — Los Alamos Plasma Simulation (LAPS) is an integrated modeling code based on a common-data framework for multi-physics simulation of both magnetic and inertial confinement fusion plasmas. As part of the larger LAPS framework, we developed a fluid code to simulate the interaction between electron, ions and dust. In the model we solve continuity equations for two of the three species (quasi-neutrality provides the density of the third species), momentum equations for ion and dust velocities, Faraday's and Ampere's laws, an equation for the current density and Ohm's law where we assume massless electrons. To solve the system of equations we use second order accurate finite difference schemes on a structured mesh and second order accurate implicit time stepping. We implemented the code in C++ in parallel by making extensive use of the Portable Extensible Toolkit for Scientific Computing (PETSc) to handle both vectors and non-linear solvers. We will present some benchmark studies of the code against standard waves and instabilities tests. We will also present preliminary studies of the interaction of a dust cloud with a streaming, magnetized plasma under different plasma and magnetic field configurations.

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