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OpenFOAM Implementation of Electromagnetic Field Solver for Fluid Model Applications BENJAMIN MARSHALL, VENKATTRAMAN AYYASWAMY , University of California, Merced — Electromagnetic effects in plasmas are relevant to various applications from plasma-based propulsion to nanomaterial synthesis. These systems require the Maxwell's equations for wave propagation be combined with fluid model equations that describe the plasma itself. The work presented here is intended to improve our in-house finite volume (FVM) plasma code by implementing an FVM-based electromagnetic field solver. Traditionally, the preferred method for solving the Maxwell's equations has been based on the finite difference or finite element method. The current work utilizes a finite volume time domain method approach to determine the electromagnetic fields (in contrast to a potential form). Explicit discretization of the Maxwell's equations was done using various schemes derived from fluid dynamics and are compared with each other. The importance of constructing the fluxes based on the propagation of both left and right characteristics is emphasized. Results are shown for 1-D electromagnetic wave propagation as well as scattering of an incident wave by a dielectric. Results are compared to current literature. The finite volume time domain approach to solving the Maxwell's equations will greatly extend the capabilities of the solver to deal with wave-plasma interactions.

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