

Abstract Submitted
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Verification strategies for fluid-based plasma simulation models

SHANKAR MAHADEVAN, Esgee Technologies Inc. — Verification is an essential aspect of computational code development for models based on partial differential equations. However, verification of plasma models is often conducted internally by authors of these programs and not openly discussed. Several professional research bodies including the IEEE, AIAA, ASME and others have formulated standards for verification and validation (V&V) of computational software. This work focuses on verification, defined succinctly as *determining whether the mathematical model is solved correctly*. As plasma fluid models share several aspects with the Navier-Stokes equations used in Computational Fluid Dynamics (CFD), the CFD verification process is used as a guide. Steps in the verification process: consistency checks, examination of iterative, spatial and temporal convergence, and comparison with exact solutions, are described with examples from plasma modeling. The Method of Manufactured Solutions (MMS), which has been used to verify complex systems of PDEs in solid and fluid mechanics, is introduced. An example of the application of MMS to a self-consistent plasma fluid model using the local mean energy approximation is presented. The strengths and weaknesses of the techniques presented in this work are discussed.

Shankar Mahadevan
Esgee Technologies Inc.

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