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Global Modeling Overview: From Volume-Averaged Global Models to PARNMA[1] THOMAS JENKINS, SERGEY AVERKIN, Tech-X Corporation — Global modeling can often provide initial insight into the physics of complex chemically reacting plasmas (e.g. gas discharges, ion sources). From global species continuity and electron energy equations, global models provide quick estimates of volume-averaged plasma properties such as species number densities and temperatures. However, such models cannot provide spatial profiles of these properties. Interpretation of global modeling results can thus be difficult; simulations may differ from experimental measurements due to limitations of the global model assumptions, uncertainties in chemical reaction data, etc. In this talk, we present an overview of conventional global models and their limitations. We also present a more general new framework, Pade Approximation Residuals Norm Minimization Algorithm (PARNMA), for solving 1D steady-state plasma fluid equations. The model uses a rational function representation of various plasma properties. These profiles are substituted into the fluid equations. We then solve a multi-objective minimization problem to find optimal coefficients for the rational function representation. The framework allows sheaths to be resolved without imposing any artificial boundary conditions. We demonstrate its use in simulations of various gas discharges.

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