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An Unstructured-Mesh Code for Iteratively Computing the Ion and Electron Distribution Functions Near a Collecting Object in a Non-Uniform Quasineutral Plasma[1] CHRISTIAN BERNT HAAKONSEN, IAN H. HUTCHINSON, MIT PSFC — Probes and other collecting objects perturb the surrounding plasma, deforming and introducing voids in the ion and electron distribution functions. This perturbation complicates the inference of plasma parameters from probe measurements, and many settings remain without a satisfactory model or understanding. For example, previous work using a fluid approximation has suggested that diamagnetic drifts due to background density and temperature gradients may affect magnetized Mach probe measurements, but detailed computational study is required to validate and elaborate on those results. To that end, a new code has been developed for self-consistently computing the steady-state six-dimensional ion and electron distribution functions in the perturbed region of a quasineutral plasma. The code computes the ion and electron density at each node of an unstructured mesh by integrating particle orbits backwards in time to the domain boundary, where arbitrary background distribution functions can be specified. The potential is then updated based on the computed densities, and the process is iterated until convergence. An overview of the code and its capabilities is presented, along with preliminary results on the impact of a background density gradient on magnetized Mach probe measurements.

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