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Electron transport in a two-dimensional, hybrid-direct kinetic Hall thruster simulation[1] ASTRID RAISANEN, IAIN BOYD, Univ of Michigan - Ann Arbor — A two-dimensional, axisymmetric, hybrid-direct kinetic (DK) simulation of a Hall effect thruster channel and its near-field plume is capable of producing both steady and oscillating discharge current profiles, depending on the frequency of electron collisions with the channel walls and energy loss due to those collisions. This study attempts to improve the existing simulation and evaluate the effectiveness of different methods that have been proposed to model anomalous electron transport in Hall thrusters. The hybrid-DK algorithm uses an Eulerian approach to model the evolution of ions and neutral particles in discretized phase space, and due to its deterministic approach, it does not contain the statistical noise that is associated with Particle-in-Cell (PIC) methods. The two-dimensional simulation was recently benchmarked with a hybrid-PIC simulation, and there was good agreement overall. This work applies the DK simulation to an experimentally well-characterized thruster, improves simulation submodels including a more accurate implementation of an anode sheath, and applies different methods to model electron transport to ascertain their overall levels of utility.

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