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Fluid Closure Model for Anomalous Electron Transport in a Low Temperature Crossed Field Device BENJAMIN JORNS, Univ of Michigan - Ann Arbor — The existence of anomalous, or non-classical, electron transport in Hall effect thrusters poses a major challenge for the modeling of these devices. While most engineering simulations for these thrusters are fluid-based, the anomalous electron transport is believed to be related to the kinetically-driven onset of drift-driven turbulence. This presents a problem for how to self-consistently and predictively model the anomalous transport in a fluid framework. The approach presented here is to leverage a two-equation model, analogous to the k-e closures from classical fluid modeling. The evolution of the average energy of the turbulence and the rate of dissipation in the thruster are both modeled with one dimensional PDEs. These models are then calibrated against experimental measurements from a 9-kW class Hall thruster. The calibrated model is inserted into a 2D fluid model to yield predictions for thruster plasma properties and performance. These results are discussed in the context of extensibility of the closure model to other thruster operating conditions and geometries.

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