Abstract Submitted
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Evaluating the accuracy of recent electron transport models at predicting Hall thruster plasma dynamics MARK CAPPELLI, CHRISTOPHER YOUNG, Stanford University — We present continued efforts towards introducing physical models for cross-magnetic field electron transport into Hall thruster discharge simulations. In particular, we seek to evaluate whether such models accurately capture ion dynamics, both averaged and resolved in time, through comparisons with measured ion velocity distributions which are now becoming available for several devices. Here, we describe a turbulent electron transport model [1] that is integrated into 2-D hybrid fluid/PIC simulations of a 72 mm diameter laboratory thruster operating at 400 W. We also compare this model's predictions with one recently proposed by Lafluer et al [2]. Introducing these models into 2-D hybrid simulations is relatively straightforward and leverages the existing framework for solving the electron fluid equations. The models are tested for their ability to capture the time-averaged experimental discharge current and its fluctuations due to ionization instabilities. Model predictions are also more rigorously evaluated against recent laser-induced fluorescence measurements of time-resolved ion velocity distributions [3]. [1] M.A. Cappelli, C.V. Young, E. Cha, and, E. Fernandez, Physics of Plasmas 22, 114505 (2015). [2] T. Lafleur, S. D. Baalrud, and P. Chabert, Phys. Plasmas 23, 053503 (2016). [3] C.V. Young, A. Lucca Fabris, and M.A. Cappelli, IEPC 2015-437p, 34th International Electric Propulsion Conference Hyogo-Kobe, Japan, July 4–10, 2015.

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