GEC18-2018-000433

Abstract for an Invited Paper
for the GEC18 Meeting of
the American Physical Society

Fluid modeling of transport and instabilities in magnetized plasma sources

GERJAN HAGELAAR, LAPLACE, CNRS and University of Toulouse

Magnetized low-temperature plasma sources such as Hall thrusters or magnetrons involve complex transport phenomena which play a key role in their operation but are still not well understood, posing great challenges to both the development and the modeling of these sources. One of the main problems is the presence of various types of plasma instabilities, causing "anomalous" electron transport across the magnetic field lines. In this presentation, we discuss the capabilities and limitations of fluid models to describe transport in these magnetized plasma sources. We demonstrate that even very standard fluid models, when solved properly in the 2D plane perpendicular to the magnetic field lines, intrinsically produce certain plasma instabilities and anomalous transport. The behavior of these fluid instabilities may be more or less realistic in some cases but unphysical in others, depending on the plasma conditions and magnetic field configuration. Results are shown from a quasineutral fluid code based on standard equations for continuity, momentum and energy of (partially) magnetized electrons and ions, for different basic magnetized plasma source configurations. These results are compared with PIC simulations and linear stability analysis.