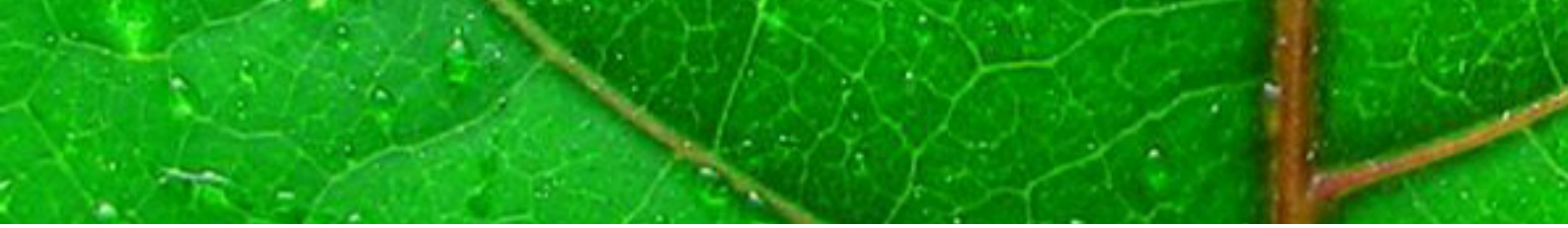

Godard-Cadillac Ludovic

Le 30 novembre 2022

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Title : A bi-species kinetic model for cylindrical Langmuir probe : existence result and numerical analysis (joint works with Mehdi Badsi and Anaïs Crestetto)

Abstract : We study a collisionless kinetic model for plasmas in the neighborhood of a cylindrical metallic Langmuir probe. This model consists in a bi-species stationnary Vlasov-Poisson equation in a domain contained between two cylinders with prescribed boundary conditions. The interior cylinder models the probe while the exterior cylinder models the interaction with the plasma core. We prove the existence of a weak-strong solution for this model in the sense that we get a weak solution for the 2 Vlasov equations and a strong solution for the Poisson equation. The first parts of this work are devoted to explain the model and proceed to a detailed study of the Vlasov equations. This study then leads to a reformulation of the Poisson equation as a 1D non-linear and non-local elliptic equation and we prove it admits a strong solution using an iterative fixed-point procedure. Eventually we proceed to a qualitative description of the solution under the so-called "generalized Bohm condition" on the incomming fluxes and a numerical investigation of the obtained equation. Due to technical obstacles, we mainly focussed on the "quasi-radial" fluxes for the numerical analysis, which turns out to be enough to validate the model. Generalization of our method is questionned. Curves of the obtained trajectories of particles and curves of the collected current versus the applied voltage are presented.