

Numerical schemes for the collisional Vlasov equation in the finite Larmor radius regime

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This work is devoted to the construction of multiscale numerical schemes efficient in the finite Larmor radius approximation of the collisional Vlasov equation. Following the paper of Bostan and Finot (2019), the system involves two different regimes, a highly oscillatory and a dissipative regimes, whose asymptotic limits do not commute. In this work, we consider a Particle-In-Cell discretization of the collisional Vlasov system which enables to deal with the multiscale characteristics equations. Different multiscale time integrators are then constructed and analysed. We prove asymptotic properties of these schemes in the highly oscillatory regime and in the collisional regime. In particular, the asymptotic preserving property towards the modified equilibrium of the averaged collision operator is recovered. Numerical experiments are then shown to illustrate the properties of the numerical schemes.

This work has been performed in collaboration with Nicolas Crouseilles and Damien Prel.

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