Multiscale numerical schemes for the collisional Vlasov equation in the finite Larmor radius approximation regime

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In this talk, I present a work devoted to the construction of multiscale numerical schemes efficient in the finite Larmor radius approximation of the collisional Vlasov equation. Following [1], the system involves two different regimes, a highly oscillatory and a dissipative regimes, whose asymptotic limits do not commute. 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.

References

[1] M. Bostan and A. Finot. Finite Larmor radius regime: Collisional setting and fluid models. *Communications in Contemporary Mathematics*, 22(6):1950047, 2020.