

A splitting method for semi-Lagrangian Vlasov-Poisson solvers with a strong external uniform magnetic field

Michel MEHRENBARGER , Anh-Tuan VU

I2M-Institut de Mathématique de Marseille Aix-Marseille Université
CHATEAU GOMBERT - 39 Rue F. Joliot Curie - 13453 Marseille
anh-tuan.VU@univ-amu.fr

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Abstract

We solve numerically of the Vlasov-Poisson system with splitting method suited for strong external magnetic field. Our splitting scheme is inspired by J. Ameres [1] but uses the semi-Lagrangian solver instead of a Fourier spectral discretization solver. We show that when the magnitude of the external magnetic field becomes large while the time step is independent of the fast oscillation in time, this scheme is able to provide a consistent semi-Lagrangian discretization of the guiding-center model. In addition, we propose some numerical simulations to validate the method under the Kelvin-Helmholtz instability test case.

Keywords: Vlasov-Poisson system, Guiding-centre model, Asymptotic analysis, Splitting schemes.

References

- [1] Jakob Ameres, Splitting methods for Fourier spectral discretizations of the strongly magnetized Vlasov-Poisson and the Vlasov-Maxwell system, arXiv:1907.05319.