

# Kinetic/fluid micro-macro numerical schemes for Vlasov-Poisson-BGK equation using particles

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## Abstract

We are interested in the numerical simulation of the Vlasov equation in the fluid limit using particles. To that purpose, we first perform a micro-macro decomposition and then use a particle approximation for the kinetic (micro) part, the fluid (macro) part being discretized by standard finite volume schemes. There are many advantages in doing so:

- the so-obtained scheme presents a much smaller level of noise compared to the standard particle method;
- the computational cost of the micro-macro model is reduced in the fluid regime since a small number of particles is needed for the micro part;
- the scheme is asymptotic preserving in the sense that it is consistent with the kinetic equation in the rarefied regime and it degenerates into a uniformly (with respect to the Knudsen number) consistent (and deterministic) approximation of the limiting equation in the fluid regime.

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