Linear Landau Damping in a Vlasov-Euler system for Thick Sprays

Victor FOURNET, Max Planck Institute for Plasma Physics - Garching

We are interested in the suspension of small particles—such as dust specks or liquid droplets—within a gas. A common model for such systems is a Vlasov-Euler type system, where the coupling occurs through a drag force and the volume fraction of the fluid. We study the linearized system around reference states and show that an interaction mechanism emerges between the sound waves in the fluid and the particles. In particular, we prove that when the velocity distribution of the particles is radially decreasing, these sound waves are damped through a mechanism which is very similar to the classical Landau damping in the Vlasov-Poisson system. We also present particle distributions—which are classical in plasma physics : two-bump profiles—that instead lead to an amplification of the sound waves, resulting in instabilities.

Références

[1] C. Buet, D. Després, V. Fournet : Analog of linear Landau damping in a coupled Vlasov-Euler system for thick sprays, *Communications in Mathematical Sciences*, 2024.

[2] V. Fournet : Investigation on the stability in a thick spray model, *ESAIM : Proceedings and Surveys*, 2024, to appear.

Contact : victor.fournet@ipp.mpg.de