*Kinetic equations and turbulence*

# Solutions for weak turbulence models in electrostatic plasmas

Irene Gamba

The weak turbulence model for electrostatic system, also known as the quasilinear theory in plasma physics, has been a cornerstone in modeling resonant particle-wave interactions in plasmas. This reduced model stems from the Vlasov-Poisson/Maxwell system under the weak turbulence assumption, incorporating the random phase approximation and ergodicity, as justified in the work of Besse and Bardos (2021). The interaction between particles and waves (plasmons) can be treated as a stochastic process, whose transition probability bridges the momentum space and the spectral space. We establish the existence of global weak and bounded solutions for the system modeling electrostatic plasmas. Our key contribution consists of associating the original integral-differential system to a degenerate inhomogeneous porous medium equation(PME) with nonlinear source terms, and leveraging advanced techniques from the PME literature. This approach opens a novel pathway for analyzing weak turbulence models in plasma physics and may bring new tools for tackling related problems in the broader context of nonlinear nonlocal PDE systems.

*In honor of Claude Bardos's 85th birthday*