



## Vlasov equations : geometrical, kinetic and semi-classical aspects.

Thursday 17 november

**13h50-14h50** (room 16 - IRMAR). Nicolas Besse (Observatoire de la Côte d'Azur). *Around the quasilinear approximation of the Vlasov equation.*

In this talk we study the Hamiltonian dynamics of charged particles subject to a non self-consistent stochastic electric field, when the plasma is in the so-called weak turbulent regime. We show that the asymptotic limit of the Vlasov equation is a diffusion equation in the velocity space, but homogeneous in the physical space. We obtain a diffusion matrix, quadratic with respect to the electric field, which can be related to the diffusion matrix of the resonance broadening theory and of the quasilinear theory, depending on whether the typical autocorrelation time of particles is finite or not. In the self-consistent deterministic case, using a convenient scaling, we show that the asymptotic distribution function is homogenized in the space variables, while the electric field converges weakly to zero. We also show that the lack of compactness in time for the electric field is necessary to obtain a genuine diffusion limit. By contrast, time compactness property leads to a "cheap" version of the Landau damping : the electric field converges strongly to zero, implying the vanishing of the diffusion matrix, while the distribution function relaxes, in a weak topology, towards a spatially homogeneous stationary solution of the Vlasov-Poisson system. Finally, in the self-consistent case, without scaling, we prove the validity of the standard quasilinear approximation of the Vlasov-Poisson by a diffusion equation.

**15h-16h** (room 16 - IRMAR). Serena Cennatiempo (Gran Sasso Science Institute). *Trial states for the zero temperature dilute Bose gas.*

Interacting bosons are unique quantum systems, whose low temperature phases exhibit fascinating quantum mechanics effects at a macroscopic scale. In the past two decades, the mathematical understanding of these systems improved tremendously. In this talk we review part of these advances, by describing trial states for the dilute three dimensional Bose gas, capturing the celebrated Lee-Huang-Yang sub-leading correction to the ground state energy expansion. We conclude with some open questions and perspectives. Based on joint works with G. Basti, C. Boccato, C. Brennecke, A. Olgiatei, G. Pasqualetti and B. Schlein.

⇒ T.S.V.P.

Friday 18 november

**10h30-11h30** (room 16 - IRMAR). Velozo Ruiz Renato (University of Cambridge). *Stability of Schwarzschild spacetime for the spherically symmetric Einstein–massless Vlasov system.*

The Einstein-massless Vlasov system is a relevant model in the study of collisionless many particle systems in general relativity. In this talk, I will present an upcoming asymptotic stability result for the exterior of Schwarzschild spacetime as a solution of this system assuming spherical symmetry. We exploit the hyperbolicity of the radial dynamics of massless particles around the black hole, to obtain decay estimates for the energy momentum tensor, despite the presence of trapped orbits. I will explain the use of hyperbolic dynamics to obtain decay estimates of momentum averages, by considering a linear Vlasov equation with an unstable trapping potential.