27th Pauli Colloquium, jointly with

Colloquium of the research platform MMM

The Wolfgang Pauli Institute (WPI) Vienna and the Inst. CNRS Pauli (ICP), IRL2842, jointly with the research platform MMM „Mathematics-Magnetism-Materials" of Univ. Wien,

kindly invite you to the talk of **François GOLSE** (Ecole Polytechnique, Centre de Mathématiques Laurent Schwartz)

Time: Thursday, 27. Feb. 2025, 11h00 – 12h00
Place: MMM-WPI SeminarRoom 8.135, 8th floor Fak.Math Univ. Wien
Oskar Morgensternplatz 1, 1090 Wien

Online via zoom-link:
https://us06web.zoom.us/j/81595699552?pwd=MW51SkM4S0JsNUVtRmhzKzc3QXpNUT09

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0) 10h30: ***CoffeeTea & CakeFruit***

1) 11h00: ***Welcome*****:** Norbert J **Mauser** (WPI c/o MMM & Fak. Math. U.Wien)

Introduction**:** Jakob **Möller** (WPI c/o Ecole Polytechnique)

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2) 11h10 – 12h00 : **François GOLSE** (X, CMLS) :

«Velocity Averaging for (Quantum) Kinetic Equations »

Norbert J Mauser
(director WPI & ICP,
head research platform MMM)

Abstract: Velocity averaging in classical kinetic models [1,2,3] like Vlasov or Boltzmann equation is a smoothing mechanism for „macroscopic“ observables (in position space) as averages in the velocity variable of the phase space distribution function.
The Wignertransform [4,5,6,7] converts the Schrödinger (or von Neumann) equation into sort of Vlasov equation for the Wignerfunction, with the standard transport term and a nonlocal (i.e. pseudodifferential) force term.
It is a long standing question if one can apply velocity averaging to quantum kinetic Wigner equations, in order to obtain a gain of regularity on quantities such as the density function.
In this talk we introduce kinetic equations and the classical averaging lemma and then show that this indeed works also in the quantum physics case, for special mixed states, but typically fails for pure states (similar to the situation for the global in time semiclassical limit of nonlinear Schrödinger equations [5,6]).
We use a new (?) derivation of Madelung's fluid dynamic formulation of Schrödinger equations [8].
Joint work with Jakob Möller.

References
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[2] F. Golse, B. Perthame, R. Sentis: C. R. Acad. Sci. Paris Serie I 301 (1985), 341-344
[3] F. Golse, P.-L. Lions, B. Perthame, R. Sentis: J. Funct. Anal. 76 (1988), 110-125
[4] E. Wigner, Phys. Rev. 40 (1932), 749-759
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[6] P.A. Markowich, N.J. Mauser; Math. Mod. Meth. in the Appl. Sci. 3(01) (1993) 109-124
[7] P. Gérard, P.A. Markowich, N.J. Mauser, F. Poupaud; Comm. Pure Appl. Math. 50 (1997), 323-379
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Short Biography:

Francois Golse (born 10. Sep. 1962 in Talence/Bordeaux) studied mathematics at ENS rue d'Ulm and obtained his PhD directed by Claude Bardos in 1986. He has been a member of the Math Dept at ENS Ulm in 1986-1989 and 1994-2004, and since 2006 he is a Professor of Mathematics at Ecole Polytechnique, where he has chaired the Math Dept for about 10 years.
His research interests are in (asymptotic) analysis of partial differential equations and mathematical physics, especially kinetic models and their connection with fluid dynamics, like the transition from Boltzmann to Navier Stokes equations. More recently, he also works on the quantum dynamics of large particle systems in the semiclassical and mean-field regimes.
Together with his former PhD student Laure Saint-Raymond, he has been awarded the first PDE prize of the Society for Industrial and Applied Mathematics (SIAM) in 2006. He has given the 1993 Peccot Lectures at Collège de France, and the 2010 Harold Grad Lecture in the 27th Intl. Symposium on Rarefied GasDynamics (Pacific Grove, USA). He has been a plenary speaker at the 2004 European Congress of Mathematics (Stockholm), and an invited speaker at the 2006 International Congress of Mathematicians (Madrid).