Workshop on some evolution PDEs

January 27, 2023

This event is a 1-day workshop in PDE will be held at **10th, Feb, 2023**. Speaker will present some new ideas/insights in the following directions:

- *non-local transport type equations,*

- *kinetic equations,*

- *stochastic shallow water wave equations,*

- *free boundary problems in compressible fluid motions.*

We hope that this workshop will give an opportunity for different communities working in PDEs to come together, share ideas and establish new collaborations.

Zoom link: https://uio.zoom.us/j/68857984708?pwd=LzRiUWlybmdOV1FNTGplOXZObC9hdz09
Conference No.: 688 5798 4708
Password: 417249

The following is the schedule at **10th, Feb, 2023** (all the times refer to the *local Oslo time* in zone **GMT +1**)[1]:

09:20-09:30 **Opening**.

09:30-10:40 **Speaker**: Diego Alonso-Orán (*Universidad de La Laguna - IMAULL*).
Title: Active scalar equations with non-local drift : old and new results.
Abstract: Active scalar equations arise in the study of several fluid dynamic problems. Roughly speaking, they can be understood as a transported quantity advected by a drift. The relation between the drift and transported quantity is typically describe by a non-local operator. In this talk, we will first review some old results regarding the well-posedness of different active scalar equations and conclude with a recent result which shows finite time blow-up for a class of active scalar equations on compact Riemannian manifolds.

10:40-10:50 **Q & A**.

10:50-12:00 **Speaker**: Dingqun Deng (*Tsinghua University*).
Title: Spectral Gap to Kinetic Equations with Soft Potentials in Bounded Domain
Abstract: It has been unknown in kinetic theory whether the linearized Boltzmann or Landau equation with soft potentials admits a spectral gap in the spatially inhomogeneous setting. Most existing works indicate a negative answer because the spectrum of two linearized self-adjoint collision operators is accumulated to the origin in case of soft interactions. In this talk, we will prove it in an affirmative way when the space domain is bounded with an inflow boundary condition. The key strategy is to introduce a new Hilbert space with

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[1]Please notice that the time differences in **Spain** (0 to 1 hour slower) and **China** (7 hours faster).

an exponential weight function that involves the inner product of space and velocity variables and also has the strictly positive upper and lower bounds. The action of the transport operator on such space-velocity dependent weight function induces an extra non-degenerate relaxation dissipation in large velocity that can be employed to compensate the degenerate spectral gap and hence give the exponential decay for solutions in contrast with the sub-exponential decay in either the spatially homogeneous case or the case of torus domain. The result reveals a new insight of hypocoercivity for kinetic equations with soft potentials in the specified situation.

12:00-12:10 **Q & A**.

12:10-13:30 **Break**.

13:30-14:40 **Speaker**: Peter H.C. Pang (*University of Oslo*).
Title: The inviscid limit of the stochastic Camassa–Holm equation with gradient noise.
Abstract: The Camassa–Holm (CH) equation is a nonlocal equation that manifests super-critical behaviour in "wave-breaking" and non-uniqueness. In this talk, I will discuss the existence of global (dissipative weak martingale) solutions to the CH equation with multiplicative, gradient type noise, derived as an inviscid limit. The goal of the talk is twofold. The stochastic CH equation will be used to illustrate aspects of a stochastic compactness and renormalisation method which is popularly used to derive well-posedness and continuous dependence results in SPDEs. I shall also discuss how a lack of temporal compactness introduces fundamental difficulties in the case of the stochastic CH equation.

This talk is based on joint works with L. Galimbert and H. Holden, both at NTNU, and with K.H. Karlsen at the University of Oslo.

14:40-14:50 **Q & A**.

14:50-16:00 **Speaker**: Wenbin Zhao (*Peking University*).
Title: Well-posedness of some free boundary problems in compressible fluids.
Abstract: In this talk, we will discuss some free boundary problems in compressible fluids. We derive the evolution equation of the free surface and identify the stability condition of the problem. This method gives a unified approach to treat both incompressible and compressible fluids.

16:00-16:10 **Q & A**.

If you have any questions, please kindly contact:

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