Mathematics, Statistics, and Computer Science **@ UIC**

Statistics and Data Science Seminar

From a stochastic vortex dynamic model to Onsager-Joyce-Montgomery theory

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Abstract: The vorticity formulation of 2-D incompressible Navier-Stokes equation can be viewed as mean-field limit of stochastic interacting point vortices. As number of particles goes to infinity and viscosity term goes to zero, we arrive at inviscid limit of 2-D incompressible Euler equation.

We study multi-scale large deviation limits of such model, on the torus, as particle number and time go large but viscosity goes small. The result gives a first principle approach to establish the Onsager-Joyce-Montgomery theory as limit theorem derived from microscopically defined non-equilibrium models. The Onsager-Joyce-Montgomery theory concerns large time coherent structures of vortex dynamics associated with 2-D Euler equation. It was previously informally formulated using equilibrium models only.

The talk is based on joint works (some of which are ongoing) of the speaker with Fasto Gozzi, Tom Kurtz and Andrzej Swiech, a SQuaRE team funded by American Institute of Mathematics.

Wednesday, April 25 at 4:00 PM in SEO 636