School of Physics and Astronomy

COLLOQUIUM

Evolution of large-scale flow from turbulence in a two-dimensional superfluid

Professor Kris Helmerson
Monash University

In two-dimensional turbulent flow the seemingly random swirling motion of a fluid can evolve towards persistent large-scale vortices. To explain such behavior, Lars Onsager proposed a statistical hydrodynamic model based on quantized vortices, in which the persistent large-scale vortices correspond to negative temperature states. I will describe the experimental confirmation of Onsager's model in a superfluid gas of atoms. By dragging grid barriers through an oblate atomic gas Bose-Einstein condensate, we generate non-equilibrium distributions of vortices. We observe, in the subsequent evolution of the superfluid, signatures of an inverse energy cascade driven by the evaporative heating of vortices, leading to steady-state configurations of clustered vortices characterized by negative absolute temperatures. Our results open a pathway for quantitative studies of emergent structures in interacting quantum systems driven out of equilibrium.

Date:	Wednesday 15 May
Time:	2pm
Venue:	L1, Large Seminar Room, 10 College Walk, Clayton

Info: meera.parish@monash.edu