



The Hong Kong University of Science and Technology

Department of Mathematics

Seminar on PDE

2D Boussinesq System with Partial Dissipation

By

Prof. Kun Zhao

Department of Mathematics

Tulane University

Abstract

The two-dimensional incompressible Boussinesq equations have been routinely used to model systems across a tremendous range of length and time scales from microfluidics and biophysics to geodynamics and astrophysics. It plays an important role in the study of atmospheric and oceanographic turbulence as well as other situations where rotation and stratification play a dominant role. In addition to its own physical background, the model is also known for its close connection with fundamental models in mathematical fluid mechanics, such as the incompressible Euler and Navier-Stokes equations. In a special situation, the vortex formulation of this two-dimensional model in Eulerian coordinates is formally identical to the vortex formulation of the three-dimensional Euler equations in cylindrical coordinates for axisymmetric swirling fluid flows, which makes it a tremendously rich area for mathematical investigations. This talk focuses on the rigorous mathematical demonstration of one of the common phenomena in geophysical fluid flows: thermal (vertical) stratification. After introducing the background, the proof will be fully explained, which only requires knowledge of calculus and real analysis. Some open problem and numerical experiments will be exposed towards the end of the talk.

Date : : Friday, 1 June 2018

Time: : 1:30 p.m. – 2:30 p.m.

**Venue: : Room 3464, Academic Building,
HKUST (near Lifts 25&26)**

All are welcome!