# Joint Applied Math Colloquium

# Study of 3D Euler Singularity via Computer-Assisted Analysis

## Professor Thomas Hou
## California Institute of Technology

Abstract: Whether the 3D incompressible Euler equation can develop a singularity in finite time from smooth initial data is one of the most challenging problems in mathematical fluid dynamics. This question is closely related to the Clay Millennium Problem on 3D Navier-Stokes Equations. In a recent joint work with Dr. Guo Luo, we provided convincing numerical evidence that the 3D Euler equation develops finite time singularities. Inspired by this finding, we have recently developed an integrated analysis and computation strategy to analyze the finite time singularity of a regularized 3D Euler equation. We first transform the regularized 3D Euler equation into an equivalent dynamic rescaling formulation. We then study the stability of an approximate self-similar solution. By designing an appropriate functional space and decomposing the solution into a low frequency part and a high frequency part, we prove nonlinear stability of the dynamic rescaling equation around the approximate self-similar solution, which implies the existence of the finite time blow-up of the regularized 3D Euler equation. This is a joint work with Jiajie Chen, De Huang, and Dr. Pengfei Liu.

Date:     28 March 2018 (Wednesday)
Time:     11:00am – 12:00noon
Venue:   Room 222, Lady Shaw Building,
              The Chinese University of Hong Kong, Shatin

*All are Welcome!*