



UNIVERSITY OF CENTRAL FLORIDA

COLLOQUIUM

The Primitive Equations in Atmospheric Dynamics and Related Nonlocal Fluid Models

Speaker: Dr. Changhui Tan

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Abstract

The primitive equations—also known as the hydrostatic Navier-Stokes equations—serve as a foundational mathematical model for large-scale atmospheric and oceanic dynamics. Strikingly, their analytical behavior sits between two extreme regimes: while the inviscid equations are notoriously ill-posed (exhibiting instabilities worse than the 3D Euler equations), full horizontal viscosity renders them globally well-posed, displaying regularizing properties even stronger than the standard Navier-Stokes system.

In this talk, we explore the transition between these regimes by considering primitive equations with fractional horizontal dissipation. We will discuss how varying the strength of fractional operators dictates sharp boundary lines between ill-posedness, local well-posedness, and global well-posedness. To provide a broader perspective, we will also survey other related nonlocal fluid models, highlighting common analytical frameworks and mechanisms where fractional and nonlocal operators govern fluid motion.

Speaker Bio



Changhui Tan is an Associate Professor in the Department of Mathematics at the University of South Carolina. He studied applied mathematics at Peking University earning his Bachelor of Science in 2008 and received his Ph.D. in Applied Mathematics from the University of Maryland College Park in 2014. His research areas include the analysis of nonlinear partial differential equations fluid dynamics kinetic theory hyperbolic conservation laws and mathematical models arising from physics and biology. His research has been supported by multiple grants from the National Science Foundation (NSF) including the NSF CAREER Award.

Event Details

- **Date:** Friday, November 6, 2026
- **Time:** 1:30 PM – 2:30 PM
- **Location:** MSB 318

Refreshments will be served from 2:30pm–3:30pm in MSB 201

School of Data, Mathematical, and Statistical Sciences