Department of Mathematics
University of Notre Dame

Sam Stechmann - University of Wisconsin-Madison

PDE, COMPLEX ANALYSIS AND DIFFERENTIAL GEOMETRY SEMINAR

Guest Speaker: Sam Stechmann
University of Wisconsin-Madison

Date: Tuesday, April 2, 2024
Time: 11:00 AM
Location: 258 Hurley Bldg
Zoom URL: https://notredame.zoom.us/j/98530943143

Lecture Title:
Singular Limits of Atmospheric Dynamics with Clouds and Phase Changes

Abstract

Many interesting PDEs arise as a singular limit of fast wave oscillations, such as the compressible-to-incompressible limit of fluid dynamics with fast acoustic (sound) waves, and the quasi-geostrophic limit of geophysical fluid dynamics with fast inertia-gravity waves. Here, we derive the quasi-geostrophic limit for an atmosphere with additional realism and complexity, now including clouds, i.e., phase changes between water vapor and liquid water. A new PDE system arises, called the moist or precipitating quasi-geostrophic (PQG) equations, and a new feature of the PDEs is a non-smooth nonlinearity at cloud edge. In this talk, I will describe formal asymptotics, numerical simulations, rigorous analysis for the elliptic component of the PDEs, and open questions. Joint work with Antoine Remond-Tiedrez, Leslie Smith, and Yeyu Zhang.