Department of Mathematics
University of Notre Dame

PDE, COMPLEX ANALYSIS AND DIFFERENTIAL GEOMETRY SEMINAR

Guest Speaker: Alexey Cheskidov

Institute for Theoretical Sciences, Westlake University

Date: Tuesday, November 21, 2023

Time: 2:00 PM

Location: 258 Hurley Bldg

Zoom URL: https://notredame.zoom.us/j/98530943143

Lecture Title:

Dissipation anomaly for long time averages

Abstract

In turbulent flows, the energy injected at forced low modes (large scales) cascades to small scales through the inertial range where viscous effects are negligible, and only dissipates above Kolmogorov's dissipation wavenumber. The persistence of the energy flux through the inertial range is what constitutes dissipation anomaly for viscous fluid flows as well as anomalous dissipation for the limiting inviscid flows. We first analyze these intrinsically linked phenomena on a finite time interval and prove the existence of various scenarios in the limit of vanishing viscosity, ranging from the total dissipation anomaly to a pathological one where anomalous dissipation occurs without dissipation anomaly, as well as the existence of infinitely many limiting solutions of the Euler equations in the limit of vanishing viscosity. Finally, expanding on the obtained total dissipation anomaly construction, we show the existence of dissipation anomaly for long time averages, relevant for turbulent flows, proving that the Doering-Foias upper bound is sharp.

Alexey Cheskidov - Institute for Theoretical Sciences, Westlake University