

Calderón–Zygmund Analysis Seminar

Monday, April 26, 3:45 pm (cdt)

Hypoellipticity and Enhanced Dissipation

Dallas Albritton

Courant Institute of Mathematical Sciences, NYU

Abstract. We consider the evolution of a passive scalar (for example, a temperature distribution) which is transported by a fluid flow and diffuses:

$$\partial_t f + \mathbf{u} \cdot \nabla f = \kappa \Delta f.$$

It is well known that shear in the background flow \mathbf{u} may interact with the diffusion to cause the solution to decay faster than it would by diffusion alone. This so-called *enhanced dissipation* has been widely studied in the PDE community over the past two decades. We revisit this phenomenon from the new but old perspective of Hormander’s classical work on hypoellipticity. This allows us to give short and, in our opinion, transparent proofs of enhanced dissipation in shear flows $\mathbf{u} = (b(y), 0)$, originally due to Bedrossian and Coti-Zelati. Time permitting, we will also discuss applications to kinetic theory. This is joint work with Rajendra Beekie and Matthew Novack.