Singularity and mixing in incompressible fluid equations

Abstract:
The question of global regularity vs. finite time blow-up remains open for many fluid equations. Even in the cases where global regularity is known, solutions may develop small scales as time progresses. In this talk, I will first discuss an active scalar equation which is an interpolation between the 2D Euler equation and the surface quasi-geostrophic equation. We study the patch dynamics for this equation in the half-plane, and prove that the solutions can develop a finite-time singularity. I will also discuss a passive transport equation whose solutions are known to have global regularity, and our goal is to study how well a given initial density can be mixed if the incompressible flow satisfies some physically relevant quantitative constraints. This talk is based on joint works with A. Kiselev, L. Ryzhik and A. Zlatos.

Host: Ioan Bejenaru

Tuesday, January 6, 2015
4:00 PM
AP&M 6402