Partial Differential Equations Seminar

Title On vorticity supported on logarithmic spirals

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Location 과학과 225

Abstract

We study logarithmic spiraling solutions to the 2d incompressible Euler equations which solve a nonlinear transport system on the unit circle. We show that this system is locally well-posed for L^p data as well as for atomic measures, that is logarithmic spiral vortex sheets. We prove global well-posedness for almost bounded logarithmic spirals and give a complete characterization of the long time behavior of logarithmic spirals. This is due to the observation that the local circulation of the vorticity around the origin is a strictly monotone quantity of time. We are then able to show a dichotomy in the long-time behavior, solutions either blow up (in finite or infinite time) or completely homogenize.
In particular, bounded logarithmic spirals converge to constant steady states. For vortex logarithmic spiral sheets the dichotomy is shown to be even more drastic where only finite time blow-up or complete homogenization of the fluid can and does occur. Joint work with A. Said.

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