JOHNS HOPKINS
Center for Environmental & Applied Fluid Mechanics

Weekly CEAFM Seminar: Fall 2012

Date: **Friday, September 28, 2012**

Time: 11:00 AM

Location: Gilman 50 (Marjorie M. Fisher Hall)

Speaker: **Dr. Cristian Constantin Lalescu** (AMS | Johns Hopkins University)

Title: *"Synchronization of Chaos and the Smallest Turbulent Eddy"*

Abstract

Although chaotic dynamics are famously unpredictable, their evolution can --- somewhat surprisingly --- be recovered in all detail from only partial observations. This is possible due to the phenomenon of Chaos Synchronization (CS), a process wherein two or more chaotic systems adjust a given property of their motion to a common behavior, due to a coupling or to a forcing.

Turbulence is a specific type of chaotic motion of a fluid, and it is not yet fully understood; a defining characteristic is that it involves fluctuations on a wide range of scales. Presently, one of the outstanding problems in the field is determining what is the length-scale of the smallest turbulent eddies. The Kolmogorov 1941 theory makes a specific prediction, but accumulated experimental and numerical evidence suggests that fluid turbulence develops scales considerably smaller than the Kolmogorov length.

We present our observation of CS in numerical simulations of fluid turbulence, and we discuss how this phenomenon can be exploited in a spacetime database of hydrodynamic turbulence to study the problem of the smallest turbulent eddy. This has some relevance to the Clay Millenium Prize Problem about the regularity of solutions of the incompressible Navier-Stokes equation.