Finite Number of Determining Parameters for the Navier-Stokes Equations with
Applications into Feedback Control and Data Assimilation

Abstract:

In this talk we will implement the notion of finite number of determining parameters for the long-time
dynamics of the Navier-Stokes equations (NSE), such as determining modes, nodes, volume elements,
and other determining interpolants, to design finite-dimensional feedback control for stabilizing their
solutions. The same approach is found to be applicable for data assimilation of weather prediction. In
addition, we will show that the long-time dynamics of the NSE can be imbedded in an infinite-
dimensional dynamical system that is induced by an ordinary differential equations, named
determining form, which is governed by a globally Lipschitz vector field. The NSE are used as an
illustrative example, and all the above mentioned results equally hold to other dissipative evolution
PDEs.

This is a joint work with A. Azouani, H. Bessaih, A. Farhat, C. Foias, M. Jolly, R. Kravchenko, E. Lunasin
and E. Olson.