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

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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 assimilations. 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 hold also to other dissipative evolution PDEs.