VINCENT MARTINEZ, Tulane University

Applications of asymptotic coupling in hydrodynamic and related equations

In their 1967 seminal paper, Foias and Prodi captured precisely a notion of finitely many degrees of freedom in the context of the two-dimensional (2D) incompressible Navier-Stokes equations (NSE). In particular, they proved that if a sufficiently large low-pass filter of the difference of two solutions converge to 0 asymptotically in time, then the corresponding high-pass filter of their difference must also converge to 0 in the infinite-time limit. In other words, small scales are "eventually enslaved" by the large scales. One could thus define the number of degrees of freedom to be the smallest number of modes needed to guarantee this convergence for a given flow, insofar as it is represented as a solution to the NSE. This property has since led to several developments in the long-time behavior of solutions to the NSE, in addition to finding applications in data assimilation. In this talk, we will discuss various applications of this phenomenon of "asymptotic coupling" in the context of other hydrodynamic and related equations.