


复旦大学数学科学学院
数学综合报告会

报告题目：Stable and unstable manifolds for capillary gravity water waves and a class of nonlinear PDEs

报告人：曾崇纯 教授 (美国佐治亚理工学院)

时间：2025-06-24 星期二 10:00-11:00

地点：光华东主楼2001

报告摘要：

Invariant manifold theory is a fundamental tool in the study of local dynamics near invariant structures in smooth evolution systems. It ensures the existence of nonlinearly invariant structures from linear ones. The theory has been well developed for diffeomorphisms, ODEs, semilinear PDEs, and some quasilinear parabolic PDEs. However, it becomes subtle for quasilinear or more nonlinear PDEs due to regularity issues when there is no smoothing effect. In this talk, we consider a class of nonlinear PDEs whose linearizations satisfy certain energy estimates. We prove that the linear exponential dichotomy implies the existence of local stable/unstable manifolds of the equilibria. In particular the result applies to a class of nonlinear Hamiltonian PDEs including the capillary gravity water waves of one or two fluids, quasilinear wave and Schr \"odinger equations, KdV type equations, etc., for which the linear analysis is also discussed. Basically, for such systems under certain conditions, spectral instability implies the existence of stable and unstable manifolds, which in particular yields the nonlinear instability in rough Sobolev norms and/or the existence of solutions decaying in high Sobolev norms. This is a joint work with Jalal Shatah.

简历：

美国佐治亚理工学院教授，美国数学会会士。主要从事微分方程与动力系统研究，在Invent. Math., Comm. Pure. Appl. Math.等顶级学术刊物发表论文多篇，曾获得美国Career奖和Sloan基金，并多次主持美国国家自然科学基金，现任J. Differential Equation和Discrete Contin. Dyn. Syst.等杂志编委。

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