偏微分方程前沿学术研讨会

本次在线研讨会将汇聚国内外偏微分方程领域的知名学者，共同探讨非线性分析、双曲方程、流体动力学方程等前沿方向。会议聚焦解的正则性、稳定性及长时间行为等核心问题，集中展示最新研究成果与方法创新。

会议特邀报告人：

黄飞敏（中科院数学与系统科学研究院）　江　宁（武汉大学）

李　栋（香港大学）　苗长兴（北京应用物理与计算数学研究所）

吴家宏（美国圣母大学）　尹会成（南京师范大学）

周　忆（复旦大学）

会议日程安排（2026 年 5 月 31 日）：

9:00-9:45　苗长兴

10:00-10:45　尹会成

11:00-11:45　周　忆

14:00-14:45　吴家宏

15:00-15:45　黄飞敏

16:00-16:45　江　宁

17:00-17:45　李　栋

会议组织者：章志飞（北京大学）、王盛（北京大学）

腾讯会议链接：https://meeting.tencent.com/dm/SOnCSNNeWcYJ

腾讯会议：735-324-644

报告题目和摘要

函数谱几何及其在 PDEs 中应用

苗长兴（北京应用物理与计算数学研究所）

摘要：总所周知,自由色散方程解的 Fourier 变换支撑在 Gauss 曲率非零的光滑超曲面上,超曲面的几何曲率如何影响解在物理空间所发生的结构性干涉？这就导致了研究非线性色散方程、非线性波动方程的 Fourier 限制模方法。限制性定理的对偶形式-Strichartz 估计、解的频率支撑光滑超曲面上所导致了波包分解及相应的平方函数估计、decoupling 估计等为研究非线性色散方程提供了研究框架与方法. 而对椭圆方程、抛物方程而言,解的 Fourier 变换谱不再落在几何曲率非平凡的超曲面上，转而视为属于超平面上具有谱几乎紧化的特征，此时解在物理空间具有平均特征且满足 Harnack 不等式(实质上提供了局部反向 Sobolev 不等式)。 这为研究椭圆、抛物、具耗散效应的流体方程提供研究框架-变分原理或正则逼近研究弱解的存在性，通过 De Giorgi 迭代、Nash-Moser 迭代等经典数学方法研究弱解正则性。本次报告拟从函数论观点出发，不同类型的 PDE 决定了函数 Fourier 谱集演化对应的不同规律与作用,从而获得 PDE 解的动力学行为与奇性传播规律。 另一方面，从 PDEs 领域的公开问题出发，探索这些问题核心困难之症结，为年轻数学工作者提供一些可能研究启示与思考.

On the long time existence of small data smooth solutions to 2-D quadratic quasilinear wave equations in exterior domains

尹会成（南京师范大学）

Abstract : For the 3-D quadratic quasilinear wave equations in exterior domains, the long time existence of small data smooth solutions have been established. However, for the 2-D quadratic quasilinear wave equation in exterior domains with homogenous Dirichlet or Neumann boundary value, so far it is still open whether the global solution exists or not. In this talk, we will investigate this open question systematically. These works are joint with Prof. Ding Bingbing, Dr. Hou Fei and Dr. Yuan Meng.

Physical space approach to bilinear estimates and applications to wave and dispersive equations

周忆（复旦大学）

Abstract : We develop a new bilinear estimate method based on a new div curl lemma. We can use our mathod to give alternative proof of low regularity local well posedness for dispersive equations, which previously relay on Bourgain space. We can also use our method to give new proof of global existence of classical solutions for nonlinear wave equations with small initial data. Moreover, we establish new results including the proof of Weiyue Ding's conjecture for periodic Schrodinger flow and the global well posedness in the critical Besov space of the skew mean curvature flow.

Stability of Compressible MHD Flows Near Background Magnetic Fields

吴家宏（美国圣母大学）

Abstract: This talk presents recent results on the stability of compressible magnetohydrodynamic (MHD) flows near nontrivial background magnetic fields. We first review the global stability theory for 2D compressible MHD systems without magnetic diffusion in both the whole space and the periodic domain. We then discuss recent progress on 3D compressible MHD flows near a background magnetic field in the periodic domain. Several settings will be considered, including both isentropic and non-isentropic systems, with or without thermal diffusion, and with or without Diophantine restriction on the background magnetic field.

音速-亚音速极限

黄飞敏

摘要：本报告首先简要回顾高维欧拉方程音速-亚音速流的研究历史，接着介绍这方面近来的主要研究进展。

On self-organization models: kinetic and hydrodynamics

江宁（武汉大学）

Abstract: In this talk, we review some self-organization models arising in biology and physics, in particular, Vicsek model 1999 and its mathematical re-visit by Degond and Motsch in 2007. Starting from particle system, it

can be derived the kinetic models (SOK) and more macroscopic hydrodynamic models (SOH). Together and Tengfei Zhang, Yi-long Luo and Zixuan Cheng, we prove the rigorous justifications from SOK to SOH, using a Generalized Collision Invariants (GCI)-based Hilbert expansion, and a dynamical “2+3”moment closure method. This method can be also applicable to several other non-selfadjoint operator based relaxation limits.

Refined analyticity radius for Navier-Stokes and related issues

李栋（香港大学）

Abstract: We will discuss a number of recent results characterizing the analyticity radius of solutions to NS and related models.