

“Advances in Partial Differential Equations”

交流会

程序册



上海交通大学数学科学学院

2021. 11. 14

2021 年上海交通大学 “Advances in Partial Differential Equations” 交流会

为了加强偏微分方程理论及应用领域的学术交流，由上海交通大学主办的“Advances in Partial Differential Equations”交流会将于 2021 年 11 月 14 日在线上线下召开，有关领域的专家将赴会报告最新研究成果。

一、会议主办单位：上海交通大学（数学科学学院）

二、会议主席：王维克教授（上海交通大学）

三、组织委员会：邓师瑾，谢峰，杨雄锋

四、上午线上会议腾讯会议号：742 916 297

下午线下会议地址：曼哈顿酒店（闵行区鹤庆路 900 号碧江广场）

会议日程

2021年11月14日（星期日）	
8:20-8:30 开幕式	主持人：王维克
报告	主持人：杨雄锋
8:30-9:05	报告人：何凌冰 报告题目：Solutions to the non-cutoff Boltzmann equation in the grazing limit
9:10-9:45	报告人：张挺 报告题目：三维不可压缩黏弹性流体系统解的逐点估计
9:45-9:55	茶歇
报告	主持人：谢春景
9:55-10:30	报告人：王金环 报告题目：The optimal criterion for existence and blow-up to some PDEs vs the best constant of functional inequalities
10:35-11:10	报告人：徐霄乾 报告题目：Suppression of explosion by mixing
11:15-11:50	报告人：徐鑫 报告题目：New development on fast singular limits of hyperbolic PDEs
12:00-15:00	午餐及午休
报告	主持人：谢峰
15:00-15:35	报告人：黎野平 报告题目：Asymptotic Behavior of Solutions to the IBVP of the Compressible Navier-Stokes-Korteweg Equations
15:40-16:15	报告人：廖杰 报告题目：Some recent studies on nonlinear Fokker-Planck type equations
16:20-16:55	报告人：吴志刚 报告题目：Generalized Huygens' principle for some non-conservative fluid models
17:00	会议结束

报告题目与摘要

Solutions to the non-cutoff Boltzmann equation in the grazing limit

何凌冰（清华大学）

摘要：It is known that in the parameter range $-2 \leq \gamma < -2s$ spectral gap does not exist for the linearized Boltzmann operator without cutoff but it does for the linearized Landau operator. This talk is devoted to the understanding of the formation of spectral gap in this range through the grazing limit. Precisely, we study the Cauchy problems of these two classical collisional kinetic equations around global Maxwellians in torus and establish the following results that are uniform in the vanishing grazing parameter ϵ : (i) spectral gap type estimates for the collision operators; (ii) global existence of small-amplitude solutions for initial data with low regularity; (iii) propagation of regularity in both space and velocity variables as well as velocity moments without smallness; (iv) global-in-time asymptotics of the Boltzmann solution toward the Landau solution at the rate $O(\epsilon)$; (v) continuous transition of decay structure of the Boltzmann operator to the Landau operator.

In particular, the result in part (v) captures the uniform-in- ϵ transition of intrinsic optimal time decay structures of solutions and reveals how the spectrum of the linearized non-cutoff Boltzmann equation in the mentioned parameter range changes continuously under the grazing limit.

三维不可压缩黏弹性流体系统解的逐点估计

张挺（浙江大学）

摘要：考虑三维不可压缩黏弹性流体力学模型的Cauchy问题。首先引入适当的变量变换，对变换后的方程组，研究其线性化系统的Green 函数。接着，根据Green 函数逐点估计方法，结合方程组解的表达式，分析Riesz 算子的影响，得到解关于时空的逐点估计。

The optimal criterion for existence and blow-up to some PDEs vs the
best constant of functional inequalities

王金环（辽宁大学）

摘要： In many physical and biological systems, there are some competing effects such as focus and defocus, attraction and repulsion, spread and concentration. These competing effects usually are represented by terms with different signs in a free energy. The dynamics of the physical system sometimes can be described by a gradient flow driven by the free energy. Some functional inequalities can be used to determine the domination among these competing effects in the free energy, and provided sharp conditions on initial data or coefficients in the system for the global existence. In this talk, we will show some important relations between functional inequalities and sharp conditions distinguishing global existence and blow-up to some PDEs. For example, the Hardy-Littlewood-Sobolev inequality vs parabolic-elliptic Keller-Segel (K-S) model, the Onofri inequality vs linear parabolic-parabolic K-S model, the Sobolev inequality vs degenerate parabolic-parabolic K-S model, and the Sz. Nagy inequality vs 1-D thin film equation. And we will give results on global existence and blow-up of solutions for above models under sharp conditions.

Suppression of explosion by mixing

徐霄乾（昆山杜克大学）

摘要： In the study of incompressible fluid, one fundamental phenomenon that arises in a wide variety of application is dissipation enhancement by so-called mixing flow. In this talk, I will give a brief introduction to the idea of mixing flow and the role it plays in the field of advection-diffusion-reaction equation. More specifically, I will explain why the presence of fluid can enhance the dissipation and prevent the singularity formation for some types of evolution equations, even with degeneracy.

New development on fast singular limits of hyperbolic PDEs

徐鑫（中国海洋大学）

摘要： In this talk, we will introduce some recent results about the fast singular limits of PDEs. First, we will show the moderately fast three-scale singular limit for PDEs. Second, we prove the uniform existence for a class of PDEs that violates the Klainerman-Majda balance.

Asymptotic Behavior of Solutions to the IBVP of the Compressible Navier-Stokes-Korteweg Equations

黎野平（南通大学）

摘要： In this talk, I am going to present the time-asymptotic behavior of strong solutions to the initial-boundary value problem of the isothermal compressible fluid models of Korteweg type with density-dependent viscosity and capillarity on the half-line \mathbb{R}^+ . The case when the pressure $p(v)=v^{-\gamma}$, the viscosity $\mu(v)=\tilde{\mu} v^{-\alpha}$ and the capillarity $\kappa(v)=\tilde{\kappa} v^{-\beta}$ for the specific volume $v(t,x)>0$ is considered, where $\alpha, \beta, \gamma \in \mathbb{R}$ are parameters, and $\tilde{\mu}, \tilde{\kappa}$ are given positive constants. I focus on the impermeable wall problem where the velocity $u(t,x)$ on the boundary $x=0$ is zero. If α, β and γ satisfy some conditions and the initial data have the constant states (v_+, u_+) at infinity with $v_+, u_+>0$, and have no vacuum and mass concentrations, we prove that the one-dimensional compressible Navier-Stokes-Korteweg system admits a unique global strong solution without vacuum, which tends to the 2-rarefaction wave as time goes to infinity. Here both the initial perturbation and the strength of the rarefaction wave can be arbitrarily large. As a special case of the parameters α, β and the constants $\tilde{\mu}, \tilde{\kappa}$, the large-time behavior of large solutions to the compressible quantum Navier-Stokes system is also obtained for the first time. Our analysis is based on a new approach to deduce the uniform-in-time positive lower and upper bounds on the specific volume and a subtle large-time stability analysis. This is a joint work with Prof. Chen Zhengzheng.

Some recent studies on nonlinear Fokker-Planck type equations

廖杰（华东理工大学）

摘要： In this talk, I will introduce some recent studies on nonlinear Fokker-Planck type equations, including

1. A simplified nonlinear Fokker–Planck model conserves only mass;
2. The fully nonlinear Fokker–Planck model;
3. Vlasov-Poisson-Fokker-Planck equations;
4. Sensitivity analysis of the nonlinear Fokker–Planck equations with uncertainty.

Generalized Huygens' principle for some non-conservative fluid models

吴志刚（东华大学）

摘要： In this talk, we present some results on the pointwise space-time description of the classical solution of the Cauchy problem for some non-conservative fluid models, where they exhibit the generalized Huygens' principle named by Liu-Wang (1998CMP) for the compressible Navier-Stokes equations. The topic mainly concerns the compressible micro-polar model, and the compressible two-phase fluid model. Some new observations and nonlinear estimates will be introduced. These works are joint with Professor Weike Wang, and Wenyue Zhou.
