非线性偏微分方程及其应用

学术会议

南开大学数学科学学院

西北工业大学数学与统计学院

2022 年 10 月 21 日-23 日

天津-西安

非线性偏微分方程及其应用学术会议

本次学术会议旨在邀请偏微分方程及其相关领域专家学者分享最新研究成果，进一步探讨偏微分方程中的前沿问题，促进彼此间的学术交流与合作。学术会议的主题涉及椭圆和抛物方程，非线性分析等相关领域。

本次学术会议由南开大学数学科学学院和西北工业大学数学与统计学院联合举办，受南开大学数学交叉中心专项经费、国家自然科学基金以及陕西省杰出青年科学基金等项目支持。此次会议共邀请领域内 50 位专家学者进行学术交流研讨。

受疫情影响，本次会议以线上方式进行。欢迎大家参加！

主办单位：　南开大学数学科学学院

　　西北工业大学数学与统计学院

组委会：　孙文昌、孙玉华　（南开大学）

　　郭千桥、夏健康　（西北工业大学）

会议时间：　2022 年 10 月 21-23 日

腾讯会议 ID：　**739-6260-2528**

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邀请专家名单（按姓氏排序）

姓名	工作单位	姓名	工作单位
保继光	北京师范大学	屈长征	宁波大学
曹道民	中国科学院数学与系统科学研究院	苏加宝	首都师范大学
陈传强	宁波大学	孙永忠	南京大学
陈化	武汉大学	唐春雷	西南大学
邓引斌	华中师范大学	唐先华	中南大学
丁彦恒	中国科学院数学与系统科学研究院	陶有山	上海交通大学
窦井波	陕西师范大学	王明新	河南理工大学
耿俊	兰州大学	王学锋	香港中文大学（深圳）
郭上江	中国地质大学（武汉）	王智诚	兰州大学
郭玉劲	华中师范大学	吴建华	陕西师范大学
郭玉霞	清华大学	吴雅萍	首都师范大学
郭宗明	河南师范大学	严树森	华中师范大学
黄勇	湖南大学	杨健夫	江西师范大学
蒋美跃	北京大学	杨孝平	南京大学
李从明	上海交通大学	叶东	华东师范大学
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李福义	山西大学	张超	哈尔滨工业大学
李工宝	华中师范大学	张健	电子科技大学
李嘉禹	中国科学技术大学	张立群	中国科学院数学与系统科学研究院
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刘兆理	首都师范大学	张志涛	中国科学院数学与系统科学研究院 & 江苏大学
楼元	上海交通大学	周风	华东师范大学
麻希南	中国科学技术大学	周焕松	武汉理工大学
穆春来	重庆大学	周蜀林	北京大学
彭双阶	华中师范大学	邹文明	清华大学

会议日程安排（腾讯会议：739-6260-2528）						
10 月 21 日 08:10-08:25			开幕式、在线合影			
	10 月 21 日		10 月 22 日		10 月 23 日	
时间	报告人	主持人	报告人	主持人	报告人	主持人
08:30-09:15	曹道民	陈化	李嘉禹	李工宝	邹文明	杨健夫
09:15-10:00	刘兆理	丁彦恒	周风	邓引斌	麻希南	唐春雷
茶歇						
10:15-11:00	张健	李从明	保继光	郭宗明	张志涛	屈长征
11:00-11:45	李万同	张立群	苏加宝	周焕松	郭玉霞	吴雅萍
午餐						
时间	报告人	主持人	报告人	主持人	报告人	主持人
14:00-14:45	杨孝平	王学锋	彭双阶	叶东	蒋美跃	尹景学
14:45-15:30	严树森	楼元	陶有山	唐先华	黄勇	周蜀林
茶歇						
15:45-16:30	孙永忠	王明新	张正策	穆春来	郭玉劲	李东升
16:30-17:15	耿俊	郭上江	张超	吴建华	窦井波	李福义
17:15-18:00	陈传强	王智诚				
10 月 23 日 17:15-17:30			会议闭幕式			

每节时长共 45 分钟，其中含提问交流环节约 5 分钟。

会议信息

10 月 21 日 08:10-08:25			**开幕式、在线合影**
10 月 21 日	**报告人**	**主持人**	**报告题目**
08:30-09:15	曹道民	陈化	Helical symmetry solutions for 3D incompressible Euler equations in an infinite cylinder
09:15-10:00	刘兆理	丁彦恒	Quasilinear Schrödinger equations involving singular potentials
10:15-11:00	张健	李从明	Big Solitons and Multi-Solitons in Nonlinear Schrödinger Equations
11:00-11:45	李万同	张立群	Results on Nonlocal Dispersal SIS Models in Heterogeneous Environments
14:00-14:45	杨孝平	王学锋	On Critical Points of Solutions to Some Elliptic Equations
14:45-15:30	严树森	楼元	On the non-degenerate Critical Points for the Robin Functions
15:45-16:30	孙永忠	王明新	Singular Limit Problems to Compressible Navier-Stokes Equations
16:30-17:15	耿俊	郭上江	W^{l,p} Solvability for Higher Order Elliptic Equations on Non-smooth Domains
17:15-18:00	陈传强	王智诚	Recent progress of a class of mixed Hessian Geometric PDEs

会议信息

10 月 22 日	**报告人**	**主持人**	**报告题目**
08:30-09:15	李嘉禹	李工宝	Recent progress on the mean field type equations
09:15-10:00	周风	邓引斌	On singular solutions for Choquard equation: Existence and stability
10:15-11:00	保继光	郭宗明	Entire Solutions to Parabolic Monge-Ampere Equations
11:00-11:45	苏加宝	周焕松	The ground state solutions of Henon equation with upper weighted critical exponents
14:00-14:45	彭双阶	叶东	Qualitative analysis for Moser-Trudinger nonlinearities
14:45-15:30	陶有山	唐先华	Taxis-driven formation of hotspots in a cross-diffusion model for virus infection
15:45-16:30	张正策	穆春来	Liouville-type theorems and existence of solutions for quasilinear elliptic equations with
16:30-17:15	张超	吴建华	Some recent results on the double phase problems

会议信息

10 月 23 日	**报告人**	**主持人**	**报告题目**
08:30-09:15	邹文明	杨健夫	TBA
09:15-10:00	麻希南	唐春雷	TBA
10:15-11:00	张志涛	屈长征	完全非线性椭圆方程（组）解的存在唯一性和对称性
11:00-11:45	郭玉霞	吴雅萍	Non-degeneracy of the blowing-up solution for Lane-Embden systems with linear perturbation
14:00-14:45	蒋美跃	尹景学	The Dual L_p-Minkowski Problem in Dimension 2
14:45-15:30	黄勇	周蜀林	Brunn-Minkowski Theory and Minkowski problems
15:45-16:30	郭玉劲	李东升	Refined Expansions of Ground States for Attractive Bose-Einstein Condensates Under
16:30-17:15	窦井波	李福义	Sharp affine weighted L^2 Sobolev inequalities on the upper half space
10 月 23 日 17:15-17:30			**会议闭幕式**

非线性偏微分方程及其应用学术会议
报告题目与摘要

Entire Solutions to Parabolic Monge-Ampère Equations

保继光
北京师范大学

Abstract: In this talk, we focus on the global solutions of parabolic Monge–Ampère type equations. The Liouville theorem is obtained when the derivative of the solution with respect to time is bounded. While in the unbounded case, the global solvability is given.

Helical symmetry solutions for 3D incompressible Euler equations in an infinite cylinder

曹道民
中国科学院数学与系统科学研究院

Abstract: In this talk we are interested in solutions whose vorticities are large and concentrated uniformly near a smooth curve $\Gamma(t)$ embedded in entire $\mathbb{R}^3$.This type of solutions, vortex filaments, are classical objects of fluid dynamics. Under suitable assumptions it is known to some extent that the curve evolves by its binormal flow. Two special kinds of binormal flows are traveling circle and rotating-translating helix. Solutions concentrating near a traveling circle is called vortex ring which have been studied extensively. In this talk, we will present existence of solutions near rotating-translating helix. The general case is called vortex filament conjecture which is still a well-known open problem. This talk is based on a joint paper with Wan Jie at Beijing University of Technology.

Recent progress of a class of mixed Hessian Geometric PDEs

陈传强
宁波大学

Abstract: In this talk, we introduce some mixed Hessian type operators and some works about these geometric PDEs.

Sharp affine weighted L^2 Sobolev inequalities on the upper half space

窦井波

陕西师范大学

Abstract: In this talk, I present some sharp affine weighted L^2 Sobolev inequalities on the upper half space involving a divergent operator with degeneracy on the boundary. Our approach is direct to analyze the L^2 structure of gradient norm, which does not depend on the geometric structure of Euclidean space such as L_p Busemann Petty centroid inequality and solution of even L_p Minkowski problem. The extremal functions and best constants are showed by the results of sharp weighted L^2 Sobolev inequities on the upper half space involving a divergent operator. This is a joint work with Yunyun Hu and Caihui Yue.

$W^{\ell,p}$ Solvability for Higher Order Elliptic Equations on Non-smooth Domains

耿俊

兰州大学

Abstract: In this paper, we establish the $W^{\ell,p}$ estimates for biharmonic and polyharmonic equations in Lipschitz and convex domains.

Refined Expansions of Ground States for Attractive Bose-Einstein Condensates Under Rotation

郭玉劲

华中师范大学

Abstract： This talk is concerned with ground states of two-dimensional attractive Bose-Einstein condensates (BECs) confined in a rotational trap. We discuss mainly the refined expansions of ground states for attractive BECs and illustrate how the trapping Potential $V(x)$ affects ground states.

Non-degeneracy of the blowing-up solution for Lane-Embden systems with linear perturbation

郭玉霞

清华大学

Abstract:In this talk, we consider the following elliptic system

$$\begin{cases} -\Delta u = |v|^{p-1}v + \varepsilon(\alpha u + \beta_1 v), & \text{in } \Omega, \\ -\Delta v = |u|^{q-1}u + \varepsilon(\beta_2 u + \alpha v), & \text{in } \Omega, \\ u = v = 0, & \text{on } \partial\Omega, \end{cases} \tag{1}$$

where Ω a smooth bounded domain in $\mathbb{R}^N$, $N \geq 3$, ε is a small parameter, α, β_1 and β_2 are real numbers, (p,q) is a pair of positive numbers lying on the critical hyperbola

$$\frac{1}{p+1} + \frac{1}{q+1} = \frac{N-2}{N}. \tag{2}$$

We first revisited the multiple blowing-up solutions constructed in [Kim-Pis] and then we prove its non-degeneracy.

Brunn-Minkowski Theory and Minkowski problems

黄勇

湖南大学

Abstract:In this talk, we will give a survey about the history of Brunn-Minkowski theory and Minkowski problems. In particular, we introduce some main research topics of convex geometry analysis, and how to solve their problems by using PDE methods, for example, Aleksandrov’s variational method, continuity method, geometric flow and so on.

The Dual L_p-Minkowski Problem in Dimension 2

蒋美跃

北京大学

Abstract: The dual L_p-Minkowski problem proposed by Lutwak-Huang-Yang-Zhang is an important generalization of the classical Minkowski problem and the L_p-Minkowski problem. In dimension 2 case, it is equivalent to the solvability of the following ODE:

$$(u'^2 + u^2)^{\frac{q-2}{2}}(u'' + u) = \frac{a(x)}{u^p}, \quad x \in S^1, \tag{3}$$

where a is a function defined on S^1, p,q are real numbers.

In this talk we will give some detail analysis of solutions of the equation for $a = 1$ and present some existence results for general positive a based on the variational method.

Recent progress on the mean field type equations

李嘉禹

中国科学技术大学

Abstract: We start from Chern-Simon-Higgs model, the Kazdan-Warner equation and the mean field type equation can be seen as its limiting case. Then we will talk about the evolution equation of the mean field type equation in the critical case. At last we talk how to solve the Q-curvature problem for the critical case using the variation method and the geometric flow method.

Some Results on Nonlocal Dispersal SIS Models in Heterogeneous Environments

李万同

兰州大学

Abstract: In this talk we consider a nonlocal dispersal SIS epidemic model, where the spatial movement of individuals is described by a nonlocal diffusion operator, the transmission rate and recovery rate are spatially heterogeneous. We first define the basic reproduction number R_0 and discuss the existence, uniqueness and stability of steady states of the nonlocal dispersal SIS epidemic model in terms of R_0. Then we study the asymptotic profiles of the endemic steady states for large and small diffusion rates to illustrate the persistence or extinction of the infectious disease. We also observe the concentration phenomenon which occurs when the diffusion rate of the infected individuals tends to zero. The obtained results indicate that the nonlocal movement of the susceptible or infectious individuals will enhance the persistence of the infectious disease. In particular, our analytical results suggest that the spatial heterogeneity tends to boost the spread of the infectious disease. This talk is based on joint works with Yan-Xia Feng, Shigui Ruan and Fei-Ying Yang.

Quasilinear Schrödinger equations involving singular potentials

刘兆理

首都师范大学

Abstract: In this talk, I shall talk about existence of multiple solutions of the quasilinear Schrödinger equation

$$-\Delta u + V(x)u + \frac{\kappa}{2}\Delta(u^2)u = h(u), \quad u \in H^1(\mathbb{R}^N),$$

where $N \geq 3$, κ is a real parameter, $V(x) = V(|x|)$ is a potential allowed to be singular at the origin and $h : \mathbb{R} \to \mathbb{R}$ is a nonlinearity satisfying conditions similar to those in the paper [Arch. Rational Mech. Anal., 82 (1983), 347-375] by H. Berestycki and P.-L. Lions. We establish the existence of infinitely many radial solutions for $\kappa < 0$ and the existence of more and more radial solutions as $\kappa \downarrow 0$. This is joint work with Yongtao Jing and Haidong Liu (靖永涛和刘海东).

TBA

麻希南

中国科学技术大学

Abstract:

Qualitative analysis for Moser-Trudinger nonlinearities

彭双阶

华中师范大学

Abstract: In this talk, we are concerned with the Moser-Trudinger problem. By by using a variety of local Pohozaev identities, we qualitatively analyze the positive solutions of Moser-Trudinger problem with a low energy, which contains the Morse index, non-degeneracy, asymptotic behavior, uniqueness and symmetry of solutions. This is a joint with Peng Luo and Kefan Pan.

The ground state solutions of Hénon equation with upper weighted critical exponents

苏加宝

首都师范大学

Abstract: I will talk about the existence of ground state solutions for Hénon equations involving with single or multiple upper weighted critical exponents with general perturbational term, where the upper weighted critical exponents include upper Hardy-Sobolev, Sobolev or Hénon-Sobolev critical exponents for the embedding from $H_r^1(\mathbb{R}^N)$ into $L^q(\mathbb{R}^N;|x|^\alpha)$ with $\alpha > -2$. The Nehari manifold method and the mountain pass theorem are applied to obtain the ground state solutions with different assumptions on general perturbational term. The existence of ground state solutions is closely related to the sign of the parameters in the equations. It is a joint work with Dr. Cong Wang(王聪). JDE，302（2021）444–473

Singular Limit Problems to Compressible Navier-Stokes Equations

孙永忠

南京大学

Abstract: In this talk, I will first introduce several singular limit problems related to compressible/isentropic Navier-Stokes equations such as incompressible, inviscid and/or thin domain limits. Some recent results on these limit problems then will be given and possible extensions will also be discussed.

Taxis-driven formation of hotspots in a cross-diffusion model for virus infection

陶有山

上海交通大学

Abstract: This lecture reports a recent joint work with Michael Winkler (Paderborn), and it addresses a three-component chemotaxis model which accounts for spatially heterogeneous dynamics of viral infection. In contrast to the classical Keller-Segel type systems, the considered attractant is produced in an inherently nonlinear mechanism. We develop an approach capable of detecting taxis-driven blow-up in this complex model, known as virus hotspot formation phenomena observed in biological experiments.

On the non-degenerate Critical Points for the Robin Functions

严树森

华中师范大学

Abstract: In this talk, I will present some results on the number, location and non-degeneracy of critical points of the Robin functions in bounded domains with small holes. Such results play an important role in the study of bubbling/peak solutions for well-studied nonlinear elliptic problems. This is a joint work with Gladiali, Grossi and Peng Luo.

On Critical Points of Solutions to Some Elliptic Equations

杨孝平

南京大学

Abstract: In this talk, we will discuss some properties including distributions, geometrical structures and numbers of critical points of solutions to some elliptic equations.

Some recent results on the double phase problems

张超

哈尔滨工业大学

Abstract: In this talk, we first review some regularity results for the double phase problems. Then we present a result on the equivalence between weak solutions and viscosity solutions for the double phase equations. Moreover, we report a new Campanato type estimate for the weak solutions of multi-phase equations. The result obtained here is different from the BMO type estimates for the usual p-Laplacian equation due to DiBenedetto and Manfredi. The content of this talk is in close relationship with the recent pioneering contributions of Marcellini and Mingione in the qualitative analysis of double phase problems.

Big Solitons and Multi-Solitons in Nonlinear Schrödinger Equations

张健

电子科技大学

Abstract: By introducing and solving two correlative constrained variational problems, a one-to-one correspondence from the prescribed mass to frequency of soliton is established for the double power nonlinear Schrödinger equation. The uniqueness of the normalized ground state is shown. Then orbital stability of big solitons depending on frequencies is proved. Moreover multi-solitons with different speeds are constructed by stable big solitons.

Liouville-type theorems and existence of solutions for quasilinear elliptic equations with nonlinear gradient terms

张正策

西安交通大学

Abstract: In this talk, we consider two properties of positive weak solutions of quasilinear elliptic equations, $-\Delta_m u = u^q|\nabla u|^p$ in $\mathbb{R}^N$, with nonlinear gradient terms. First, we show a Liouville-type theorem for positive weak solutions of the equation involving the m-Laplacian operator. The technique of Bernstein gradient estimates is ultilized to study the case $p < m$. Moreover, a Liouville-type theorem for supersolutions under subcritical range of exponents $q(N-m)+p(N-1) < N(m-1)$ is also established. Then, we use a degree argument to obtain the existence of positive weak solutions for a nonlinear Dirichlet problem of the type $-\Delta_m u = f(x,u,\nabla u)$, with f satisfying certain structure conditions. Our proof is based on a priori estimates, which will be accomplished by using a blow-up argument together with the Liouville-type theorem in the half-space. As another application, some new Harnack inequalities are proved. This is a joint work with Caihong Chang and Bei Hu.

完全非线性椭圆方程（组）解的存在唯一性和对称性

张志涛

中国科学院数学与系统科学研究院&江苏大学

Abstract: 我们利用拓扑方法、分歧理论和移动平面法研究完全非线性椭圆方程（组），特别研究 Monge–Ampère方程和 k-Hessian 方程在不同区域上解的存在唯一性、解的个数估计、解的对称性，给出一些新结果.

On singular solutions for Choquard equation: Existence and stability

周风

华东师范大学

Abstract: In this talk, we discuss some qualitative properties of isolated singular solutions to Choquard equation. In particular, we prove the existence of minimal singular and extremal solutions for $N = 2$. We analyze the stability of minimal singular solutions and the semi-stability of extremal solutions, as well as their radial symmetric properties. The talk is based on joint works with H. Y. Chen.

TBA

邹文明

清华大学

Abstract: