变分方法与非线性椭圆方程会议

Workshop on Variational Methods and Nonlinear Elliptic Equations

# 程 序 册

## Conference Program

中国科学院数学与系统科学研究院

Academy of Mathematics and Systems Science,

Chinese Academy of Sciences

华中师范大学数学与统计学学院

School of Mathematics and Statistics,

Central China Normal University

2025 年 9 月 21 日 - 9 月 26 日

September 21 - September 26, 2025

# 变分方法与非线性椭圆方程研讨会

为促进"变分方法与非线性椭圆方程"领域最新研究进展和成果的交流，"变分方法与非线性椭圆方程研讨会"将于2025年9月21日至9月26日在昆明天元数学国际交流中心举办。本次研讨会旨在邀请变分法及非线性椭圆方程领域的专家学者汇聚一堂，通过主题报告和集中研讨的形式，共同探讨变分方法与非线性椭圆方程研究领域的前沿理论及最新进展。

研讨会有关事项如下：

一、会议时间：2025年9月21日至9月26日，9月21日(周日)报到，9月22日至9月25日学术报告，9月26日学术交流并离会。

二、会议地点：天元数学国际交流中心(云南省昆明市宜良县)。

三、相关说明：本次会议不收取注册费，天元数学国际交流中心将提供免费餐饮和住宿，参会者交通费用自理。

四、会议召集人：曹道民(中国科学院数学与系统科学研究院)、
彭双阶(华中师范大学)、严树森(华中师范大学)

五、会议联系人：罗 鹏(华中师范大学)，

Email：pluo@ccnu.edu.cn 电话：+86-15172342578

中国科学院　　　　　　　　　　　　　华中师范大学
数学与系统科学研究院　　　　　　　　数学与统计学学院

# Workshop on Variational Methods and Nonlinear Elliptic Equations

In order to promote the exchange of the latest research progress and achievements in the field of variational methods and nonlinear elliptic equations, "Seminar on Variational Methods and Nonlinear Elliptic Equations" will be held from September 21 to September 26, 2025 at Kunming Tianyuan Mathematics International Exchange Center in China. The purpose of this symposium is to invite scholars at home and abroad who are interested in variational methods and nonlinear elliptic equations to gather together, and to conduct extensive and in-depth exchanges on the cutting-edge methods and theories, latest developments and future trends of variational methods and nonlinear elliptic equations and related fields through keynote reports and intensive discussions, so as to jointly discuss and promote the further development of variational methods and nonlinear elliptic equations.

The relevant matters of the seminar are as follows:

1. **Conference time:** September 21 to September 26, 2025, registration on September 21 (Sunday), academic reports from September 22 to September 25, in addition academic exchange and departure on September 26.

2. **Venue:** Tianyuan Mathematics International Exchange Center (Yiliang County, Kunming City, Yunnan Province).

3. **Note:** There is no registration fee for this conference, and Tian Yuan Mathematics International Exchange Center will provide free catering and accommodation, and participants will pay for their own transportation expenses.

4. **Convener:** Cao Daomin (Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China), Peng Shuangjie (Central China Normal University, China), Yan Shusen (Central China Normal University, China)

5. **Contact:** Luo Peng (Central China Normal University, China),

Email：pluo@ccnu.edu.cn

Phone: 86-15172342578

# 会议日程安排简表

**Brief Conference Schedule**

| 日 期<br>Date | 9 月 22 日（周一）<br>September 22 (Monday) | |
|---|---|---|
| 9:00 - 9:20 | 会议开幕式与合影<br>Opening ceremony of the conference & Group photo session | |
| 报告安排<br>Report schedule | | |
| 时 间<br>Time | 报告人<br>Speaker | 主持人<br>Chairman |
| 9:20 - 10:05 | 魏军城<br>Juncheng Wei | 曹道民<br>Daomin Cao |
| 10:10 - 10:55 | Bernhard Ruf | |
| 11:00 - 11:45 | 麻希南<br>Xinan Ma | 彭双阶<br>Shuangjie Peng |
| 12:00 - 14:00 | 午 餐<br>Lunch | |
| 14:30 - 15:15 | 戴蔚<br>Wei Dai | 王春花<br>Chunhua Wang |
| 15:20 - 16:05 | 敖薇薇<br>Weiwei Ao | |
| 16:10 - 16:30 | 茶 歇<br>Coffee break | |
| 16:30 - 17:15 | 李本鸟<br>Benniao Li | 王春花<br>Chunhua Wang |
| 18:00 - 20:00 | 晚 餐<br>Dinner | |

| 日　期<br>Date | 9 月 23 日（周二）<br>September 23 (Tuesday) | |
|---|---|---|
| 时　间<br>Time | 报告人<br>Speaker | 主持人<br>Chairman |
| 9:00 - 9:45 | 钟晓<br>Xiao Zhong | 严树森<br>Shusen Yan |
| 9:50 - 10:35 | Angela Pistoia | |
| 10:40 - 11:00 | 茶　歇<br>Coffee break | |
| 11:00 - 11:45 | Massimo Grossi | 杨健夫<br>Jianfu Yang |
| 12:00 - 14:00 | 午　餐<br>Lunch | |
| 14:30 - 15:15 | 胡烨耀<br>Yeyao Hu | 龙薇<br>Wei Long |
| 15:20 - 16:05 | 苏一鸣<br>Yiming Su | |
| 16:10 - 16:30 | 茶　歇<br>Coffee break | |
| 16:30 - 17:15 | 吴元泽<br>Yuanze Wu | 刘忠原<br>Zhongyuan Liu |
| 18:00 - 20:00 | 晚　餐<br>Dinner | |

| 日　期<br>Date | 9 月 24 日（周三）<br>September 24 (Wednesday) | |
|---|---|---|
| 时　间<br>Time | 报告人<br>Speaker | 主持人<br>Chairman |
| 9:00 - 9:45 | 王克磊<br>Kelei Wang | 周焕松<br>Huansong Zhou |
| 9:50 - 10:35 | Seunghyeok Kim | |
| 10:40 - 11:00 | 茶　歇<br>Coffee break | |
| 11:00 - 11:45 | 陈志杰<br>Zhijie Chen | 周风<br>Feng Zhou |
| 12:00 - 14:00 | 午　餐<br>Lunch | |
| 14:30 - 17:30 | 自由活动<br>Free activity | |
| 18:00 - 20:00 | 晚　餐<br>Dinner | |

| 日　期<br>Date | 9 月 25 日（周四）<br>September 25 (Thursday) | |
|---|---|---|
| 时　间<br>Time | 报告人<br>Speaker | 主持人<br>Chairman |
| 9:00 - 9:45 | 李嘉禹<br>Jiayu Li | 郭宗明<br>Zongming Guo |
| 9:50 - 10:35 | Francesca Gladiali | |

| | | |
|---|---|---|
| 10:40 - 11:00 | 茶 歇<br>Coffee break | |
| 11:00 - 11:45 | Isabella Ianni | 郭玉霞<br>Yuxia Guo |
| 12:00 - 14:00 | 午 餐<br>Lunch | |
| 14:30 - 15:15 | 郭青<br>Qing Guo | 秦国林<br>Guolin Qin |
| 15:20 - 16:05 | 陈海霞<br>Haixia Chen | |
| 16:10 - 16:30 | 茶 歇<br>Coffee break | |
| 16:30 - 17:15 | 王国栋<br>Guodong Wang | 罗鹏<br>Peng Luo |
| 17:20 - 17:35 | 闭幕致辞<br>Closing ceremony address | |
| 18:00 - 20:00 | 晚 餐<br>Dinner | |

| |
|---|
| 9 月 26 日(周五)上午<br>September 26 (Friday) AM |
| 9:00 - 12:00      自由讨论并离会<br>Free discussion and leaving the meeting |

# 报告日程

## Report Schedule

<table>
<tr><td colspan="4">9 月 22 日 上午<br>September 22 AM</td></tr>
<tr><td>9:00 - 9:20</td><td colspan="3">会议开幕式与合影<br>Opening ceremony of the conference & Group photo session</td></tr>
<tr><td>时 间<br>Time</td><td colspan="2">报告内容<br>Report content</td><td>主持人<br>Chairman</td></tr>
<tr><td rowspan="2">9:20 - 10:05</td><td>报告人<br>Speaker</td><td>魏军城<br>Juncheng Wei</td><td rowspan="4">曹道民<br>Daomin Cao</td></tr>
<tr><td>题目<br>Title</td><td>On Brezis' two open problems</td></tr>
<tr><td rowspan="2">10:10 - 10:55</td><td>报告人<br>Speaker</td><td>Bernhard Ruf</td></tr>
<tr><td>题目<br>Title</td><td>Singular solutions of elliptic equations with exponential nonlinearities in R^2: existence and relevance for related</td></tr>
<tr><td rowspan="2">11:00 - 11:45</td><td>报告人<br>Speaker</td><td>麻希南<br>Xinan Ma</td><td rowspan="2">彭双阶<br>Shuangjie Peng</td></tr>
<tr><td>题目<br>Title</td><td>Vector field method for fourth-order elliptical partial differential equations</td></tr>
<tr><td>12:00 - 14:00</td><td colspan="3">午 餐<br>Lunch</td></tr>
<tr><td colspan="4">9 月 22 日 下午　　September 22 PM</td></tr>
<tr><td>时 间<br>Time</td><td colspan="2">报告内容<br>Report content</td><td>主持人<br>Chairman</td></tr>
<tr><td rowspan="2">14:30 - 15:15</td><td>报告人<br>Speaker</td><td>戴蔚<br>Wei Dai</td><td rowspan="2">王春花<br>Chunhua Wang</td></tr>
<tr><td>题目<br>Title</td><td>Classification of solutions to critical quasilinear elliptic equations</td></tr>
</table>

| 时间<br>Time | 报告人<br>Speaker | | 敖薇薇<br>Weiwei Ao | 主持人<br>Chairman |
|---|---|---|---|---|
| 15:20 - 16:05 | 报告人<br>Speaker | | 敖薇薇<br>Weiwei Ao | |
| | 题目<br>Title | | On bubbling solutions of the Maxwell-Chern-Simons system | |
| 16:10 - 16:30 | 茶 歇<br>Coffee break | | | |
| 16:30 - 17:15 | 报告人<br>Speaker | | 李本鸟<br>Benniao Li | 王春花<br>Chunhua Wang |
| | 题目<br>Title | | Clustering peak solutions for Schrodinger systems with saddle-point potentials | |
| 18:00 - 20:00 | 晚餐<br>Dinner | | | |

| 9 月 23 日上午<br>September 23 AM | | | | |
|---|---|---|---|---|
| 时 间<br>Time | 报告内容<br>Report content | | | 主持人<br>Chairman |
| 9:00 - 9:45 | 报告人<br>Speaker | | 钟晓<br>Xiao Zhong | 严树森<br>Shusen Yan |
| | 题目<br>Title | | Variational problems with gradient constraints | |
| 9:50 - 10:35 | 报告人<br>Speaker | | Angela Pistoia | |
| | 题目<br>Title | | Sign-changing solutions for critical Hamiltonian systems | |
| 10:40 - 11:00 | 茶 歇<br>Coffee break | | | |
| 11:00 - 11:45 | 报告人<br>Speaker | | Massimo Grossi | 杨健夫<br>Jianfu Yang |
| | 题目<br>Title | | Critical points of the Kirchhoff-Routh function in domains with small holes | |
| 12:00 - 14:00 | 午 餐<br>Lunch | | | |

| 9 月 23 日下午<br>September 23 PM | | | |
|---|---|---|---|
| 时 间<br>Time | 报告内容<br>Report content | | 主持人<br>Chairman |
| 14:30 - 15:15 | 报告人<br>Speaker | 胡烨耀<br>Yeyao Hu | 龙薇<br>Wei Long |
| | 题目<br>Title | Blow-up configurations and self-organized patterns in Elliptic PDEs | |
| 15:20 - 16:05 | 报告人<br>Speaker | 苏一鸣<br>Yiming Su | |
| | 题目<br>Title | On multi solitary waves to nonlinear Schrödinger equations | |
| 16:10 - 16:30 | 茶 歇<br>Coffee break | | |
| 16:30 - 17:15 | 报告人<br>Speaker | 吴元泽<br>Yuanze Wu | 刘忠原<br>Zhongyuan Liu |
| | 题目<br>Title | On Brezis-Nirenberg problems：open questions and new results in low dimensions | |
| 18:00 - 20:00 | 晚 餐<br>Dinner | | |

| 9 月 24 日上午<br>September 24 AM | | | |
|---|---|---|---|
| 时 间<br>Time | 报告内容<br>Report content | | 主持人<br>Chairman |
| 9:00 - 9:45 | 报告人<br>Speaker | 王克磊<br>Kelei Wang | 周焕松<br>Huansong Zhou |
| | 题目<br>Title | A reduction approach to bubbling analysis for Yamabe type equations | |
| 9:50 - 10:35 | 报告人<br>Speaker | Seunghyeok Kim | |
| | 题目<br>Title | Compactness and non-compactness theorems of the fourth-order and sixth-order constant Q-curvature problems | |
| 10:40 - 11:00 | 茶 歇<br>Coffee break | | |

| 11:00 - 11:45 | 报告人<br>Speaker | 陈志杰<br>Zhijie Chen | 周风<br>Feng Zhou |
| --- | --- | --- | --- |
| | 题目<br>Title | Mean field equations and Green functions on torus, and Lame equations | |
| 12:00 - 14:00 | 午 餐<br>Lunch | | |
| 14:30 - 17:30 | 自由活动<br>Free activity | | |
| 18:00 - 20:00 | 晚 餐<br>Dinner | | |

### 9 月 25 日上午
### September 25 AM

| 时 间<br>Time | 报告内容<br>Report content | | 主持人<br>Chairman |
| --- | --- | --- | --- |
| 9:00 - 9:45 | 报告人<br>Speaker | 李嘉禹<br>Jiayu Li | 郭宗明<br>Zongming Guo |
| | 题目<br>Title | The non-existence of solitary solutions for the mean curvature flow | |
| 9:50 - 10:35 | 报告人<br>Speaker | Francesca Gladiali | |
| | 题目<br>Title | Solutions with many critical points on nearly geodesically convex domains | |
| 10:40 - 11:00 | 茶 歇<br>Coffee break | | |
| 11:00 - 11:45 | 报告人<br>Speaker | Isabella Ianni | 郭玉霞<br>Yuxia Guo |
| | 题目<br>Title | New solutions for the planar Lane-Emden problem | |
| 12:00 - 14:00 | 午 餐<br>Lunch | | |

| 时 间<br>Time | 9 月 25 日下午<br>September 25 PM | | 主持人<br>Chairman |
|---|---|---|---|
| | 报告内容<br>Report content | | |
| 14:30 - 15:15 | 报告人<br>Speaker | 郭青<br>Qing Guo | 秦国林<br>Guolin Qin |
| | 题目<br>Title | Segregated solutions for sublinearly coupled NLS | |
| 15:20 - 16:05 | 报告人<br>Speaker | 陈海霞<br>Haixia Chen | |
| | 题目<br>Title | Quantitative stability estimates for the Yamabe Problem and the Brezis-Nirenberg problem | |
| 16:10 - 16:30 | 茶 歇<br>Coffee break | | |
| 16:30 - 17:15 | 报告人<br>Speaker | 王国栋<br>Guodong Wang | 罗鹏<br>Peng Luo |
| | 题目<br>Title | Orbital stability of first Laplacian eigenstates for the Euler equation on flat 2-tori | |
| 17:20 - 17:35 | 闭幕致辞<br>Closing ceremony address | | |
| 18:00 - 20:00 | 晚 餐<br>Dinner | | |

| | 9 月 26 日上午<br>September 26 AM |
|---|---|
| 9:00 - 12:00 | 自由讨论并离会<br>Free discussion and leaving the meeting |

# On bubbling solutions of the Maxwell-Chern-Simons system

敖薇薇 (武汉大学)

Weiwei Ao (Wuhan University)

**Abstract:** We will talk about the Maxwell-Chern-Simons model on flat torus. We consider the Chern-Simons limit case and derive a Brezis-Merle type alternative results. For the bubbling solutions, we derive the non co-existence of different blow up profile, and also construct bubbling solutions. This is joint work with Youngae Lee, Xiaoyan Lin and Ohsang Kwon.

# Quantitative stability estimates for the Yamabe problem and the Brezis-Nirenberg problem

陈海霞 (汉阳大学)

Haixia Chen (Hanyang University)

**Abstract:** In this talk, we present our recent progress on quantitative stability estimates for two classical problems: the Yamabe problem and the Brezis–Nirenberg problem. Motivated by earlier works of Ciraolo-Figalli-Maggi (IMRN 2018), Figalli-Glaudo (ARMA 2020), and Deng-Sun-Wei (DUKE 2025), we establish quantitative stability estimates for the Sobolev inequality on smooth closed manifolds $(M, g)$ and bounded domains $\Omega$. Compared with the Euclidean case, our results reveal new and unexpected stability exponents. The stability function depends delicately on the solution $u_0$, the interaction of multiple bubbles, and the metric g for the Yamabe problem(boundary effects of $\Omega$, and the linear term $\lambda u$ in the Brezis-Nirenberg problem). We will outline the backgrounds, state the main theorems, highlight the novel aspects of our proofs.

# Mean field equations and Green functions on torus, and Lame equations

陈志杰 (清华大学)

Zhijie Chen (Tsinghua University)

**Abstract:** I will talk about mean field equations on torus, introduce its deep connections with the Green function on torus and the Lame equation from integrable systems.

# Classification of solutions to critical quasilinear elliptic equations

戴蔚 (北京航空航天大学)

Wei Dai (Beihang University)

**Abstract:** In this report, we aim to talk about some recent results on the classification of solutions to critical quasilinear elliptic equations. These classification results are usually related to sharp geometric inequalities and their best constants.

# Solutions with many critical points on nearly geodesically convex domains

Francesca Gladiali (University of Sassari)

**Abstract:** Given a complete d-dimensional Riemannian manifold $(M, g)$ I will prove that, for any $p \in M$, any nonlinearity $f(q, u)$ with $f(p, 0) > 0$ and for any integer $n \geq 2$, there exists a sequence of smooth bounded domains $\Omega_k \subset M$ containing $p$ and corresponding positive solutions $u_k : \Omega_k \to R^+$ to the Dirichlet boundary problem

$-\Delta_g u_k = f(\cdot, u_k)$ in $\Omega_k$, $u_k = 0$ on $\partial \Omega_k$. such that the solution $u_k$ have exactly $2n-1$ nondegenerate critical points in $\Omega_k$ (specifically, n nondegenerate maxima and n−1

nondegenerate saddles). Moreover the domains $\Omega\_k$ are star-shaped with respect to p and become "nearly geodesically convex", in a precise sense, as $k \to +\infty$. The proof relies on similar results in R^d, d $\geq$2, for the torsion problem.

The talk is based on past and ongoing results involving A. Enciso, M. Grossi and L. Provenzano.

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# Critical points of the Kirchhoff-Routh function in domains with small holes

Massimo Grossi (Sspienza University of Rome)

**Abstract:** In this talk we will study the number of critical points (as well as their stability) of the Robin and Kirchhoff–Routh functions. As is well known, this study is related to the concentration properties of semilinear elliptic problems.

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# Segregated solutions for sublinearly coupled NLS

郭青 (中央民族大学)

Qing Guo (Minzu University of China)

**Abstract:**In this talk, we apply an enhanced Lyapunov–Schmidt reduction to a class of nonlinear Schrödinger systems with sublinear coupling. The nonsmooth structure makes classical reductions ineffective for establishing segregated solutions. To overcome this, we reformulate the procedure as a fixed-point problem on a suitably constructed metric space based on a tail minimization procedure. Inspired by variational gluing techniques, we reduce the analysis to a finite-dimensional setting by use of sharp a priori estimates. In the sublinear regime, we also reveal a new phenomenon: the solutions develop a distinct "dead core" behavior, marked by non-strict positivity. The work presented here is joint with Chengxiang Zhang.

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# Blow-up configurations and self-organized patterns in Elliptic PDEs

胡烨耀 (中南大学)

Yeyao Hu (Central South University)

**Abstract:** Self-organized vortex-type patterns are well documented in a wide range of PDE models, such as diblock copolymer theory, reaction–diffusion systems, and, more recently, mean field equations. A unifying framework for these problems is provided by Kirchhoff–Routh type interaction energies. In this talk, we study a prototypical two-dimensional energy functional defined on the unit disk, involving both boundary vortices and interior vortices. We establish the existence and qualitative properties of minimizing configurations in the case of a single interior vortex coupled with a small number of boundary vortices. In addition, we investigate the limiting variational problem as the number of vortices on the boundary tends to infinity, and describe the corresponding asymptotic distribution.

# New solutions for the planar Lane-Emden problem

Isabella Ianni (Sapienza University of Rome)

**Abstract**: We consider a Lane-Emden problem in a smooth bounded domain. When the exponent p of the nonlinearity is large, the existence and multiplicity of solutions strongly depend on the geometric properties of the domain, which also deeply affect their qualitative behaviour. Remarkably, a wide variety of solutions, both positive and sign-changing, have been found when p is sufficiently large. In this talk, we focus on this topic and find new sign-changing solutions that exhibit an unexpected concentration phenomenon as p approaches infinity.

# Compactness and non-compactness theorems of the fourth-order and sixth-order constant Q-curvature problems

Seunghyeok Kim (Hanyang University)

**Abstract:** We provide a complete resolution to the question of compactness for the full solution sets of the fourth-order and sixth-order constant Q-curvature problems on smooth closed Riemannian manifolds, provided the associated conformally covariant differential operator has a positive Green's function. Firstly, we prove that the solution set of the fourth-order constant Q-curvature problem is $C^4$-compact in dimensions $5 \leq n \leq 24$. For $n \geq 25$, an example of an $L^\infty$-unbounded sequence of solutions has been known for over a decade. Secondly, we demonstrate that the solution set of the sixth-order constant Q-curvature problem is $C^6$-compact

in dimensions $7 \leq n \leq 26$, whereas a blow-up example exists for $n \geq 27$. Our principal observation is that the linearized equations associated with the Q-curvature problems can be transformed into overdetermined linear systems, which admit nontrivial solutions due to unexpected algebraic structures of the Paneitz operator and the sixth-order GJMS operator. This key insight not only plays a crucial role in deducing the compactness result for high-dimensional manifolds, but also reveals an elegant hierarchical pattern with respect to the order of the conformally covariant operators, suggesting the possibility of a unified theory of the compactness of the constant Q-curvature problems of all even integer orders.

This is a joint work with Liuwei Gong and Juncheng Wei (The Chinese University of Hong Kong).

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# Clustering peak solutions for Schrodinger systems with saddle-point potentials

李本鸟 (江西师范大学)

Benniao Li (Jiangxi Normal University)

**Abstract:** In this talk, I will introduce the following nonlinear Schrodinger system

$$\begin{cases} -\varepsilon^2 \Delta u + V_1(x)u = \mu_1 u^3 + \beta u v^2 & \text{in } \mathbb{R}^3, \\ -\varepsilon^2 \Delta v + V_2(x)v = \mu_2 v^3 + \beta u^2 v & \text{in } \mathbb{R}^3, \end{cases}$$ where $\varepsilon > 0$ is a small parameter, $\mu_1, \mu_2$ are two

positive constants, $\beta \neq 0$ is a coupling constant, and $V_1(x), V_2(x)$ are positive potentials. Applying Lyapunov-Schmidt reduction method and topological degree theory, we show the existence of clustering peak solutions concentrating at saddle points of $V_1 + \dfrac{\mu_1 - \beta}{\mu_2 - \beta} V_2$.

Notably, the characteristics of energy functionals exhibit significant differences between the saddle point case and the local maximum case, and thus a series of subtle difficulties arise. Moreover, we also prove the non-existence of clustering peak solutions with all peaks concentrating at local minimum points of $V_1 + \dfrac{\mu_1 - \beta}{\mu_2 - \beta} V_2$. This talk is based on the joint work with Yuke He, Wei Long and Weilin Yu.

# The non-existence of solitary solutions for the mean curvature flow

李嘉禹 (中国科学技术大学)

Jiayu Li (University of Science and Technology of China)

**Abstract:** We will introduce the basic properties of the symplectic mean curvature flow. Then we will prove the Bernstein-type theorem for the translation of solitons under the symplectic mean curvature flow, which is recent work in collaboration with Han Xiaoli and Sun Jun.

# Vector field method for fourth-order elliptical partial differential equations

麻希南 (中国科学技术大学)

Xinan Ma (University of Science and Technology of China)

**Abstract:** A powerful tool for the a priori estimates of elliptic partial differential equations is the energy method, which is the vector field method. Inspired by geometric problem studies such as Bochner techniques and Obata methods, the vector field method for elliptic partial differential equations has been applied since the 1970s to various equations, such as Gidas-Spruck's work in the 1980s using it to study second-order semilinear elliptic equations. For subelliptic semilinear equations on the Heisenberg group, Jerison-Lee proposed a method in 1988 using a computer program to find vector fields, and recently (2023, Ma-Ou-Wu), there has been work on finding vector fields on general Cauchy-Riemann manifolds for subelliptic semilinear equations without the aid of computer programs and their applications in related Sobolev inequalities. In this report, I will introduce the method of finding vector fields for fourth-order elliptic equations and the uniqueness of solutions and related inequalities applied to fourth-order elliptic equations on manifolds. In particular, one of its corollaries provides a new proof of the Liouville theorem regarding bi-harmonic semilinear elliptic equations obtained by Lin Changshou in 1998 (CMH) using the moving plane method. This is a collaborative work with Wu Tian, Wu Wangzhe, Zhou Xiao, and others.

# Sign-changing solutions for critical Hamiltonian systems

Angela Pistoia (Sapienza University of Rome)

**Abstract:** We build infinitely many geometrically distinct non-radial sign-changing solutions for the Hamiltonian-type elliptic systems

$$\begin{cases} -\Delta u = \mid v \mid^{p-1} v \text{ in } \mathbb{R}^n, \\ -\Delta v = \mid u \mid^{q-1} u \text{ in } \mathbb{R}^n, \end{cases}$$

where the exponents (p,q) satisfy p,q>1 and belong to the critical hyperbola $\frac{1}{p+1} + \frac{1}{q+1} = \frac{n-2}{n}$. The result is obtained in collaboration with Yuxia Guo (Tsinghua University), Seunghyeok Kim (Hanyang University) and Shusen Yan (Central China Normal University).

# Singular solutions of elliptic equations with exponential nonlinearities in R^2 : existence and relevance for related parabolic equations

Bernhard Ruf (Lombard Institute, Academy of Sciences and Letters)

**Abstract**: We consider singular solutions for elliptic equations with exponential nonlinearities in two dimensions. Beside weak H1 -solutions (which can be found variationally and are in fact regular), elliptic equations with exponential nonlinearities admit also singular solutions. They are distributional solutions which lie just barely outside of the space H1 (and hence are not weak solutions). We discuss the construction of such solutions, and then show that they give rise to non-uniqueness for the associated heat equation.

# On multi solitary waves to nonlinear Schrödinger equations

苏一鸣 (杭州师范大学)

Yiming Su (Hangzhou Normal University)

**Abstract:** In this talk, we will discuss the construction and classification of multi solitary wave solutions to nonlinear Schrodinger equations. First we provide a short survey on this subject.

Then we also introduce some of our recent process on the study of the deterministic and stochastic nonlinear Schrodinger equations.

# Orbital stability of first Laplacian eigenstates for the Euler equation on flat 2-tori

王国栋 (大连理工大学)

Guodong Wang (Dalian University of Technology)

**Abstract:** On a flat 2-torus, the Laplacian eigenfunctions can be expressed in terms of sinusoidal functions. For a rectangular or square torus, it is known that every first eigenstate is orbitally stable up to translation under the Euler dynamics. In this talk, we show that this is also true for flat tori of arbitrary shape. As a corollary, we obtain for the first time a family of orbitally stable sinusoidal Euler flows on a hexagonal torus. The proof is carried out within the framework of Burton's stability criterion and consists of two key ingredients: (i) establishing a suitable variational characterization for each equimeasurable class in the first eigenspace, and (ii) analyzing the number of translational orbits within each equimeasurable class.

# A reduction approach to bubbling analysis for Yamabe type equations

王克磊 (武汉大学)

Kelei Wang (Wuhan University)

**Abstract:** For Yamabe type equations with critical Sobolev exponent, Struwe's global compactness theorem gives a decomposition of solutions into bubbles in the H^1 space. There are many subsequent works (especially those related to the study of Schoen's compactness conjecture) improving this decomposition to higher order levels, e.g. in C^0 spaces. In this talk I will discuss an approach to this problem via the reverse Lyapunov-Schmidt reduction method. This is based on a joint work with Linlin Dou and Bin Deng.

# On Brezis' two open problems

魏军城 (香港中文大学)

Juncheng Wei (The Chinese University of Hong Kong)

**Abstract:** In this talk, we gave a complete answer to Brezis' first open problem (Problem 1.1) on Brezis-Nirenberg problem in a three-dimensional ball, and a partial answer to the fifth open problem (Problem 3.1) on harmonic maps.

# On Brezis-Nirenberg problems: open questions and new results in low dimensions

吴元泽 (云南师范大学)

Yuanze Wu (Yunnan Normal University)

**Abstract:** In this talk, we shall discuss the Brezis-Nirenberg problem in general bounded domains. We first recall the history of the Brezis-Nirenberg problem and then provide new results of it in low dimensions. Finally, we also list some open questions on the Brezis-Nirenberg problem. This talk is based on the recent works joint with Fengliu Li, Giusi Vaira and Juncheng Wei.

# Variational problems with gradient constraints

钟晓 (中山大学)

Xiao Zhong (Sun Yat-sen University)

**Abstract:** I will talk about three different types of variational problems with gradient constraints. They arise from elastic-plastic tortion, hypersurfaces in the Lorentz-Minkowski spaces with given mean curvature and dimer models.

# 变分方法与非线性椭圆方程会议

# Workshop on Variational Methods and Nonlinear Elliptic Equations

## 参会名单

### Attendee List

（按姓氏拼音字母排序）

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