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非线性偏微分方程新进展

会议联系人：郭林敏，guolinmin@ustc.edu.cn

会议信息

组委会成员

陈世炳，中国科学技术大学
刘 勇，北京工商大学
麻希南，中国科学技术大学

会议时间及地点

会议时间：5月8日-5月9日
会议地点：中科大东区第五教学楼

报告人（按姓氏拼音排序）

黄耿耿，复旦大学
孙玉华，南开大学
王克磊，武汉大学
王征平，武汉理工大学
朱熹平，中山大学



5月8日，5507教室

时间	报告人	报告题目	主持人
14:30-15:15	朱熹平	Lipschitz regularity of harmonic map heat flows into $CAT(0)$ spaces	麻希南
15:30-16:15	孙玉华	Mixed-norm parabolicity and Liouville properties for products of Riemannian manifolds	李俊钢
16:30-17:15	王克磊	Classification for entire solutions to the parabolic Allen-Cahn equation	陈世炳
17:30-19:30	晚餐：教工餐厅		

5月9日5506教室

08:20-09:05	黄耿耿	Monge-Ampere equation with Guillemin boundary condition	刘勇
09:15-10:00	王征平	Ground state for a logarithmic Schrodinger-Poisson system	沈舜麟

Lipschitz regularity of harmonic map heat flows into CAT(0) spaces



朱熹平，中山大学

In 1992, Gromov and Schoen initiated the study of harmonic maps into CAT(0) metric spaces. In 1998, Mayer and Jost independently studied the harmonic map heat flow into CAT(0) spaces. They obtained the long-time existence of weak solutions, uniqueness and well-established long-time behaviors. It remained an open question to ask if the weak solutions possess the Lipschitz regularity.

Recently, Lin, Segatti, Sire, and Wang obtained a partial answer. They used elliptic approximation method to prove that the weak solutions are Lipschitz in space and $1/2$ -Hölder continuous in time, for a wide class of CAT(0) spaces.

In this talk I report my joint work with Hui-Chun Zhang to give a complete answer to the question. We show that every weak solution of the harmonic map heat flow into CAT(0) spaces is Lipschitz continuous in both space and time. Very recently, Lin and Wang gave an alternative proof.

Mixed-norm parabolicity and Liouville properties for products of Riemannian manifolds

Let $M = M_1 \times M_2$ be a product of geodesically complete Riemannian manifolds, and let $p_1, p_2 \in (1, \infty)$. We introduce a mixed-norm capacity associated with the Green operator on M and the mixed Lebesgue space $L^{p_2}(L^{p_1})(M)$. This capacity leads to notions of $L^{p_2}(L^{p_1})$ -parabolicity and the $L^{p_2'}(L^{p_1'})$ -Liouville property for product manifolds, where $1/p_i + 1/p_i' = 1$ for $i=1,2$. We establish equivalent characterizations of this mixed capacity and prove the existence of capacitary measures represented by a nonlinear mixed potential.

Our main result is a mixed-norm analogue of the equivalence between parabolicity, Green-kernel integrability, and the Liouville property: M is $L^{p_2}(L^{p_1})$ -parabolic if and only if, for some, equivalently for every, $x \in M$ and $r > 0$, the restriction $G^M(x; \cdot) \mathbf{1}_{M \setminus B(x,r)}$ does not belong to $L^{p_2'}(L^{p_1'})(M)$; this is further equivalent to the $L^{p_2'}(L^{p_1'})$ -Liouville property. Under a radial Harnack-type inequality--for example, under Li-Yau heat kernel estimates, and hence for products with nonnegative Ricci curvature-- these conditions are also equivalent to the divergence of the nonlinear mixed potential $\mathcal{G}_{p_1, p_2}(f)$ for every nonzero, nonnegative $f \in C_c^\infty(M)$. Finally, we derive explicit volume-growth criteria and apply them to Euclidean products, obtaining a sharp mixed-norm Liouville criterion for $\mathbb{R}^n \times \mathbb{R}^m$.



孙玉华，南开大学

Classification for entire solutions to the parabolic Allen-Cahn equation



王克磊，武汉大学

The classification of entire solutions to the Allen-Cahn equation has long been a prominent topic of research, with potential implications for numerous related problems concerning the Allen-Cahn equation itself, as well as for minimal surfaces. A typical example in this realm is the renowned De Giorgi conjecture, which addresses the one-dimensional symmetry of entire solutions to the elliptic Allen-Cahn equation..

In this talk, I will discuss classification problems inspired by this line of inquiry, but extended to entire solutions of the parabolic Allen-Cahn equation. Specifically, I will present a recent joint work with my current PhD student, Lubo Wang, demonstrating that if the blow-down limit of an entire solution is a shrinking sphere, then the solution is radially symmetric in the spatial directions.

Monge-Ampere equation with Guillemin boundary condition

We will talk about the following boundary value problem of Monge-Ampere equation

$$\det D^2 u = \frac{h(x)}{\prod_{i=1}^N l_i(x)}, \quad \text{in } P \subset \mathbb{R}^n, \quad (1)$$

$$u(x) - \sum_{i=1}^N l_i(x) \log l_i(x) \in C^\infty(\bar{P}) \quad (2)$$

Here

$$0 < h(x) \in C^\infty(\bar{P}), \quad P = \cap_{i=1}^N \{l_i(x) > 0\}$$

is a simple convex polytope in $\mathbb{R}^n$. $l_i(x)$ are affine functions $i = 1, \dots, N$. Under suitable conditions, we will show (1) and (2) are solvable. This is a joint work with Weiming Shen.



黄耿耿，复旦大学

Ground state for a logarithmic Schrodinger-Poisson system

王征平，武汉理工大学



In this talk, we give some recent results on the three dimensional logarithmic Schrodinger-Poisson system with coercive potential. Under some technical conditions on the potential, by using variational methods we investigate the existence, asymptotic behavior and radial symmetry of ground state.



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+86-551-63600206 cims@ustc.edu.cn
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Communications in Mathematics and Statistics

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Communications in Mathematics and Statistics 《数学与统计通讯(英文)》是由中国科学技术大学主办，中科大学数学科学学院承办，由德国施普林格出版社负责出版和全球发行的综合性数学与统计方向的英文SCI国际期刊。主要发表基础数学、应用数学、计算数学、概率与统计等领域的高水平原创性研究论文(包括高水平的综述文章)。期刊致力于为中国数学研究各领域的工作者构建交流和共享的平台，帮助相关领域学者在世界范围内发出自己的声音并获取前沿信息，其宗旨是反映全球研究所、高等院校等机构在数学与统计学科各研究领域的最新研究成果和动态。期刊于2013年3月正式出版发行。

2019年8月, Communications in Mathematics and Statistics 《数学与统计通讯(英文)》被SCI正式收录, 在国内外同行中已有一定的知名度和影响力。通过借助施普林格强大的网络出版平台和先进的服务, 本刊目前有非常好的国内外发行推广渠道。《Communications in Mathematics and Statistics》(中国数学会T1期刊), 2019年获中国科技期刊卓越行动计划高起点新刊项目资助, 2024年获中国科技期刊卓越行动计划二期英文梯队项目资助。

期刊主编马志明, 为中国科学院院士, 第三世界科学院院士, 中国科学院数学与系统科学研究院学术委员会主任。

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编辑部地址: 安徽省合肥市金寨路96号管理科研楼1514
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