

# Winter Workshop on Geometric Analysis

Department of Mathematics & IMS, Nanjing University

2019 年 11 月 29 日 - 12 月 2 日

## 一、会议时间与地点:

- 2019 年 11 月 29 日, 参会人员直接去酒店办理入住。
- 2019 年 11 月 30 日-12 月 1 日, 会议学术报告。
- 2019 年 12 月 2 日, 离会。

会议地点: 南京大学鼓楼校区 (汉口路 22 号) 现代数学研究所蒙民伟楼 11 楼 1105 室。

## 二、住宿与交通:

住宿: 南京市中山路 251 号, 新纪元大酒店 A 座

交通方式:

- 飞机抵达。南京禄口机场离新纪元大酒店约 43 公里, 1 小时车程, 打车约 200 元。也可以地铁前往酒店: 禄口机场站乘坐地铁 S1 号线至南京南站, 换乘地铁 1 号线至珠江路站 (1 号口或 3 号口出站), 步行 350 米抵达新纪元酒店, 全程约 1.5 小时。
- 高铁抵达。绝大多数高铁会抵达南京南站, 建议地铁前往酒店: 南京南站乘坐地铁 1 号线至珠江路站 (1 号口或 3 号口出站), 步行 350 米抵达酒店, 全程约半小时, 若坐出租车前往也需要半小时, 堵车风险较高。
- 火车抵达。少数高铁、动车会抵达南京站, 建议地铁前往酒店: 南京站乘坐地铁 1 号线至珠江路站 (1 号口或 3 号口出站), 步行 350 米抵达酒店, 全程约 25 分钟, 若坐出租车前往需要 20 分钟左右, 遇高峰期有堵车风险。

## 三、报告日程安排:

	11 月 30 日	12 月 1 日
9:00-9:50	马世光	赵纯奕
10:00-10:50	张莹莹	王博
10:50-11:10	茶歇	茶歇
11:10-12:00	张科伟	冯可
12:00-14:00	午餐	午餐
14:00-14:50	胥世成	自由讨论
15:00-15:50	朱萌	
15:50-16:10	茶歇	
16:10-17:00	贺飞	
17:10-18:00	王越	
18:30-	晚餐	晚餐

四、报告题目与摘要：(按姓氏拼音排序)

- (1) 冯可 (北京大学)

**Title:** The Dirichlet problem of fully nonlinear equation on Hermitian manifold

**Abstract:** We study the Dirichlet problem of a class of fully nonlinear equations on Hermitian manifold and derive a priori  $C^2$  estimates. And we also obtain the gradient estimates in some special case; hence we can solve the Dirichlet problem of the Gauduchon metrics on Hermitian manifolds with admissible subsolutions. This is a joint work with Huabin Ge and Tao Zheng.

- (2) 贺飞 (厦门大学)

**Title:** Uniqueness for the heat equation on complete Riemannian manifolds

**Abstract:** In this talk we will revisit the uniqueness problem for the heat equation on Riemannian manifolds. After reviewing some classic uniqueness theorems, I would like to report on some new progress based on recent joint work with Man-Chun Lee.

- (3) 马世光 (南开大学)

**Title:** On high dimensional generalization of Huber's theorem

**Abstract:** This is a joint work with Professor Jie Qing. We generalize Huber's theorem to high dimensions for locally conformal flat manifolds. We only put restrictions on the norm of the negative part of the Ricci curvature. Our method is to use the  $n$ -Laplacian equation.

- (4) 王博 (北京理工大学)

**Title:** On the  $\sigma_k$ -Nirenberg problem

**Abstract:** In this talk, I will present some recent results concerning the  $\sigma_k$ -Nirenberg problem in the study of conformal geometry, including existence and compactness. This is a joint work with Professor YanYan Li and Professor Luc Nguyen.

- (5) 王越 (首都师范大学)

**Title:** The minimal graph equation in the hyperbolic space over singular domains

**Abstract:** In this talk, I will introduce our series of work studying the boundary behavior of solutions to the Dirichlet problem for minimal graphs in the hyperbolic space, especially with singular asymptotic boundaries. These are joint works with Qing Han and Weiming Shen.

- (6) 胥世成 (首都师范大学)

**Title:** Recognizing the shape of a domain via geometric information from boundary

**Abstract:** Let  $M^n$  be a closed immersed hypersurface lying in a contractible ball  $B(p, R)$  of the ambient  $(n + 1)$ -manifold  $N^{n+1}$ . We prove that, by pinching Heintze-Reilly's inequality which consists of upper curvature bound of  $B(p, R)$ , mean curvature of  $M$ , 1st eigenvalue of Laplacian of  $M$ , not only  $M$  is Hausdorff close to a geodesic sphere  $S(p_0, R_0)$  in  $N$ , but also the "enclosed" ball  $B(p_0, R_0)$  is close to be of constant curvature, provided with a uniform control on the volume and mean curvature of  $M$ .

- (7) 张科伟 (北京大学, BICMR)

**Title:** Some remarks on Tian's partial  $C^0$  estimate

**Abstract:** Partial  $C^0$  estimate plays crucial roles in the proof of Yau-Tian-Donaldson conjecture, which measures the very ampleness of a line bundle in a quantitative way. I will report some recent progress on the partial  $C^0$  estimate. I will show that, along the normalized Kähler-Ricci flow on a Fano manifold, the partial  $C^0$  estimate holds uniformly. I will also show that for polarized Kähler manifolds with Ricci lower bound and diameter upper bound, the Bergman kernel has a uniform polynomial growth.

- (8) 张莹莹 (清华大学)

**Title:** Obstructions to the existence of coupled Kahler-Einstein metrics

**Abstract:** Coupled Kähler-Einstein metric was introduced by Hultgren and Witt-Nystrom. It is a new type canonical metric generalizing Kähler-Einstein metrics or Kähler Ricci solitons on a compact Kahler manifolds. In this talk, we will discuss two obstructions to the existence of the coupled Kähler-Einstein metrics. One is the Matsushima type obstruction, which is about the reductivity of the Lie algebra of automorphism. Another is an extension of original Futaki invariant. We will also discuss the localization formula of this generalized Futaki invariant and use it to verify the existence of coupled Kähler-Einstein metric on an example. (This is the joint work with Professor Akito Futaki.)

- (9) 赵纯奕 (华东师范大学)

**Title:** Concentration on curves for a nonlinear Schrodinger problem with electromagnetic potential

**Abstract:** We prove the existence of solutions to the nonlinear Schrödinger equation  $\varepsilon^2(i\nabla + \mathbf{A})^2u + V(y)u - |u|^{p-1}u = 0$  in  $\mathbb{R}^2$  with a magnetic potential  $\mathbf{A} = (A_1, A_2)$ . Here  $V$  represents the electric potential, the index  $p$  is greater than 1. Along some sequence  $\{\varepsilon_n\}$  tending to zero we exhibit complex-value solutions that concentrate along some closed curves.

- (10) 朱萌 (华东师范大学)

**Title:** Li-Yau gradient estimates without Ricci curvature lower bound

**Abstract:** Li-Yau type gradient bounds have been widely used in geometric analysis, and become a powerful tool in exploring geometric and topological properties of differential manifolds. Since the celebrated work of P. Li and S.-T. Yau, numerous efforts have been made to improve the Li-Yau estimates on manifolds with Ricci curvature bounded from below. In this talk, we will present our works on Li-Yau type gradient bounds for positive solutions of the heat equation on complete manifolds with certain integral curvature bounds, namely,  $|Ric|$  in  $L^p$  for  $p > n/2$  or Kato type norm of  $|Ric|$  being bounded together with a Gaussian upper bound of the heat kernel. These assumptions allow the lower bound of the Ricci curvature to tend to negative infinity, which is weaker than the assumptions in the known results. We will also introduce a Li-Yau type bound for the heat equation under the compact Ricci flow with uniformly bounded scalar curvature. These are joint works with Qi S. Zhang.