Mini-workshop on Geometric Analysis and Partial Differential Equations

2018 年 6 月 22-24 日

南京大学

NANJING UNIVERSITY

南京大学数学系

现代数学研究所

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地点：南京大学现代数学研究所蒙民伟楼 **1105** 室

会议日程：

时间	报告人	题目
6 月 23 日		
9:00-9:50	王作勤	**Semiclassical wave functions associated to isotropic submanifolds**
9:50-10:20	茶歇	
10:20-11:10	阮立志	**Some results on radiative Euler equations and related models**
11:10-12:00	费明稳	**On the isotropic-nematic phase transition for the liquid crystal**
12:00-14:00	午餐（南苑餐厅）	
14:30-15:20	许孝精	**Global well-posedness of the 2D Boussinesq equations with partial dissipation**
15:20-15:50	茶歇	
15:50-16:40	来米加	**On the topology of positively curved 4-manifolds with symmetry**
16:40-17:40	王芳	**Comparison theorem for eigenvalues of fractional GJMS operators**
18:00	晚餐（南苑餐厅）	

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(1) 费明稳 (安徽师范大学)

Title: On the isotropic-nematic phase transition for the liquid crystal

Abstract: In this talk, we study the isotropic-nematic phase transition for the nematic liquid crystal based on the Landau-de Gennes $\mathbf{Q}$-tensor theory. We justify the limit from the Landau-de Gennes flow to a sharp interface model: in the isotropic region, $\mathbf{Q} \equiv 0$; in the nematic region, the $\mathbf{Q}$-tensor is constrained on the manifolds $\mathcal{N} = \{s_+(\mathbf{n} \otimes \mathbf{n} - \frac{1}{3}\mathbf{I}), \mathbf{n} \in \mathbb{S}^2\}$ with s_+ a positive constant, and the evolution of alignment vector field $\mathbf{n}$ obeys the harmonic map heat flow; while the interface separating the isotropic and nematic regions evolves by the mean curvature flow. This problem can be viewed as a concrete but representative case of the Rubinstein-Sternberg-Keller problem. This is a joint work with Professor Wei Wang in ZJU, Professor Pingwen Zhang and Professor Zhifei Zhang in PKU.

(2) 来米加 (上海交通大学)

Title: On the topology of positively curved 4-manifolds with symmetry

Abstract: In this talk, I will explain in detail the paper as in the title by Hsiang and Kleiner. The main result asserts a 4-dimensional compact positively curved manifold with a nontrivial Killing vector field is homeomorphic to either S^4 or $\mathbb{CP}^2$.

(3) 阮立志 (华中师范大学)

Title: Some results on radiative Euler equations and related models

Abstract: In this talk, we will consider radiative Euler equations and related models. In particular, some results on the global well-posedness and the optimal decay rates will be discussed.

(4) 王芳 (上海交通大学)

Title: Comparison theorem for eigenvalues of fractional GJMS operators

Abstract: In this talk, I will introduce the fractional GJMS operators on the conformal infinity of Poincare-Einstein manifold and give some comparison theorem for the first eigenvalues of them.

(5) 王作勤 (中国科技大学)

Title: Semiclassical wave functions associated to isotropic submanifolds

Abstract: In this talk I will describe a semiclassical analog of the classical theory of Hermite distributions developed by Boutet de Monvel and Guillemin more than 30 years. More precisely, to each isotropic submanifold of the phase space, we define a space of semi-classical states and develop the symbol theory. I will also discuss a couple applications of the theory. This is a joint work with Alejandro Uribe and Victor Guillemin.

(6) 许孝精 (北京师范大学)

Title: Global well-posedness of the 2D Boussinesq equations with partial dissipation

Abstract: In this talk, I shall first introduce some recent well-posedness of the 2D Boussinesq equations with anomalous dissipation terms. I shall also examine the global regularity problem on the two-dimensional (2D) incompressible Boussinesq equations with fractional partial dissipation. The goal is to establish the global existence and regularity for the Boussinesq equations with minimal dissipation and thermal diffusion. By working with this general 1D fractional Laplacian dissipation,

we are no longer constrained to the standard partial dissipation and this study will help understand the issue on how much dissipation is necessary for the global regularity. Due to the non-locality of these 1D fractional operators, some of the standard energy estimate techniques such as integration by parts no longer apply and new tools including several anisotropic embedding and interpolation inequalities involving fractional derivatives are derived. These tools allow us to obtain very sharp upper bounds for the nonlinearities. This is a joint work with Prof. J. Wu, L. Xue and Z. Ye.