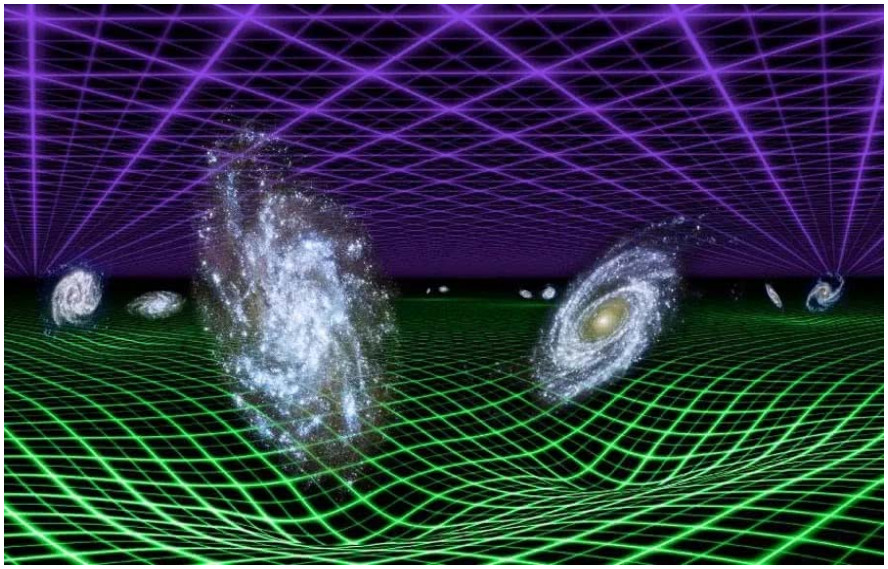

2018 几何分析与双曲方程研讨会

2018 GEOMETRIC ANALYSIS AND HYPERBOLIC EQUATION

2018 年 10 月 18-23 日 北京

主办单位：中国科学院数学与系统科学研究院

资助单位：华罗庚数学科学中心

会议组织者：张晓、吴小宁

会议联系人：王莉 （wangli@math.ac.cn, 010-82541600）

会议安排

10 月 18 日：入住北京物科宾馆（http://www.bjwkbg.com/）

10 月 19 日：会议报到（8：30-9：00，中科院数学院南楼二楼 N204）

10 月 19-20 日：会议（中科院数学院南楼二楼 N204）

10 月 21 日：上午 8：30 在中科院物理所 M 楼南门外乘客车去国科大怀柔校区

中午在国科大国际会议中心就餐并入住（http://icc.ucas.ac.cn/）

10 月 21-22 日：会议（国科大国际会议中心 4 层 12 会议室）

10 月 23 日：自由讨论及离会

附：物科宾馆位置图

会议日程

日　期		报告时间	报告人
10 月 19 日（N204）	主持人：张 晓	09:00-09:50	杨诗武
		10:00-10:50	王 芳
		10:50-11:10	茶 歇
		11:10-12:00	韦东奕
	午　餐（12:00）		
	主持人：安歆亮	14:00-14:50	黎俊彬
		15:00-15:50	王成波
		15:50-16:10	茶 歇
		16:10-17:00	谢纳庆
	晚　餐（18:00）		
10 月 20 日（N204）	主持人：王成波	09:00-09:50	徐兴旺
		10:00-10:50	袁 伟
		10:50-11:10	茶 歇
		11:10-12:00	刘见礼
	午　餐（12:00）		
	主持人：谢纳庆	14:00-14:50	刘 超
		15:00-15:50	魏昌华
		15:50-16:10	茶 歇
		16:10-17:00	冯仁杰
	晚　餐（18:00）		

10 月 21 日 （国科大）	**上午**	从中关村数学院去国科大怀柔校区	
	主持人：吴小宁	14:00-14:50	李国玮
		15:00-15:50	安歆亮
		15:50-16:10	茶 歇
		16:10-17:00	崔茂培
	晚 餐（18:00）		
10 月 22 日 （国科大）	**主持人：沈伟明**	09:00-09:50	马 跃
		10:00-10:50	马思远
		10:50-11:10	茶 歇
		11:10-12:00	查冬兵
	午 餐（12:00）		
	主持人：马 跃	14:00-14:50	沈伟明
		15:00-15:50	张 林
		15:50-16:10	茶 歇
		16:10-17:00	李炯玥
	晚 餐（18:00）		
10 月 23 日 （国科大）	**上 午**	自由讨论	
	下 午	离 会	

题目与摘要

10 月 19 日

上午：主持人 张 晓

报告人：杨诗武（北京大学）

题 目：On the global dynamics of Maxwell-Klein-Gordon equations

摘 要：On the three dimensional Euclidean space, for data with finite energy, it is well-known that the Maxwell-Klein-Gordon equations admit global solutions. However, the asymptotic behaviours of the solutions for the data with non-vanishing charge and arbitrary large size are unknown. It is conjectured that the solutions disperse as linear waves and enjoy the so-called peeling properties for pointwise estimates. We provide a gauge independent proof of the conjecture. This is jointed work with P. Yu

报告人：王 芳（上海交通大学）

题 目：Some comparison theorems for fractional GJMS operators

摘 要：In this talk, I will introduce the fractional GJMS operators defined on the conformal infinity of a Poincare-Einstein manifold, as well as some comparison theorems for the Yamabe constants or eigenvalues associated to theses operators.

报告人：韦东奕（北京大学）

题 目：Type D metric and the construction of metric close to Kerr

摘 要：We consider the local coordinate construction of solutions to 3+1 dimensional Einstein equations. Roughly speaking, assume that g is a local solution to Ric(g)=0 in $M<r<10M$, g is close to a Schwarzschild metric, and the curvature tensor is R close to a Type D tensor R_I, (i.e. only the middle component of R_I not vanishes for some null tetrad) then we can find a Kerr metric g_K satisfying the interior bound $|g-g_K|_{W^{k+2,p}} \leqslant C |R-R_I|_{W^{k,p}}$ (i.e. no derivative lose).

下午：主持人 安歆亮

报告人：黎俊彬（中山大学）

题 目：Construction of a black hole formation spacetime in vacuum

摘 要：In this talk we will show that we can construct a spacetime that starts from a complete regular and dispersive initial data with trivial topology and ends with a black hole (not just a single trapped surface) in vacuum. The spacetime can be constructed in principle to have a complete regular past null infinity without white holes.

报告人：王成波（浙江大学）

题 目：双曲空间中的非线性波动方程初探

摘 要：本报告中，我们将报告我们最近关于双曲空间中的非线性波动方程的一些初步的结果。本报告基于与 Chris Sogge 与 Yannick Sire 的工作。

报告人：谢纳庆（复旦大学）

题 目：On Some Estimates of Hawking Mass and Bartnik mass

摘 要：We discuss some estimates of Hawking mass and Bartnik mass of constant mean curvature surfaces under certain intrinsic conditions. This talk is based on a recent work by Pengzi Miao (University of Miami), Yaohua Wang (Henan University) and the speaker.

10 月 20 日

上午：主持人 王成波

报告人：徐兴旺（南京大学）

题 目：Einstein scalar field Lichnerowicz equations

摘 要：I will discuss the existence and multiplicity results regarding this equation. The talk is based on joint work with Dr. NGO Quoc Anh.

报告人：袁 伟（中山大学）

题 目：Brown-York mass and scalar curvature - Applications and generalization

摘 要：Positive mass theorem is one of the most fundamental results in both physics and mathematics. It has many applications in various fields of geometric analysis. As its compact manifold version, Shi-Tam's positive mass theorem for Brown-York mass has been also proved to be a very powerful tool in the study of geometry. In this talk, we first present some applications of Brown-York mass on problems involving scalar curvature, which includes an eigenvalue estimate for Laplacian on manifolds with boundary, an estimate of the area of horizons of vacuum static spaces with positive cosmological constant and a partial solution to Besse's conjecture. In the end, we will briefly talk about a possible generalization of Brown-York mass for vacuum static spaces. This talk is main based on some joint works with Dr. Fang Yi in Anhui University of Technology and Prof. Qing Jie in UC Santa Cruz.

报告人：刘见礼（上海大学）

题 目：Uniqueness and stability of traveling waves to the time-like extremal surface in Minkowski space

摘 要：In this paper we will concern with the uniqueness and stability of traveling waves to the time-like extremal surface in Minkowski space. For the existence and uniqueness of traveling wave solutions for timelike extremal surface in Minkowski space, it can be considered the generalized Bernstein theorem. Furthermore, we also get the global stability for traveling wave solutions with the speed of light for extremal surface in (1+3) dimensional Minkowski space. This work is collaborated with Prof.Yi Zhou of Fudan university.

下午：主持人 谢纳庆

报告人：刘超（北京大学）

题 目：FLRW-like cosmology can be approximated by Newtonian universe

摘 要：I will give a very brief overview of the rigid mathematical proof of one basic question in cosmological simulation: on what space and time scales Newtonian cosmological simulations can be trusted to approximate relativistic cosmologies?

We resolve this question by investigating Einstein-Euler systems with positive cosmological constant and Poisson-Euler systems under a small initial data condition. Informally, we establish the initial data set in the meaning of cosmological scale which solves constraint equations and construct the existence of 1-parameter families of ϵ-dependent solutions to Einstein-Euler systems with a positive cosmological constant that:

(1) are defined for $\epsilon \in (0,\epsilon_0)$ for some fixed constant $\epsilon_0>0$,

(2) exist globally on $(t,x^i)\in[0,+\infty)\times \mathbb{R}^3$,

(3) converge, in a suitable sense, as $\epsilon \searrow 0$ to solutions of the cosmological Poison-Euler equations of Newtonian gravity, and

(4) are small, non-linear perturbations of the FLRW fluid solutions (via conformal singular formulation of Einstein-Euler system).

This talk originates from a joint work with Todd Oliynyk

报告人：魏昌华 (浙江理工大学)

题 目：Future stability of the FLRW spacetime for a class of perfect fluids

摘 要：In this talk, I will introduce our recent results on the goblal nonlinear stability of a class of perfect fluids evolving in an accelerated expanding universe, which is dominated by the positive cosmological constant. Combining the conformal method and the wave coordinates, we give a criteion on the fluids, under which the Einstein-Euler system admits a unique global solution. As an application, we use this criterion to prove the global stability for Isothermal gases, generalized Chaplygin gases and Polytropic gases. This is a joint work with Chao Liu.

报告人：冯仁杰（北京大学）

题 目：Random matrices: new results and open problems

摘 要：We will first review some classical results on random matrix theory, then we will present two results on the extreme spacing problems we solved recently with Dongyi Wei, we will also talk about some open problems. The talk is very elementary and accessible to all students with basic knowledge on probability.

10 月 21 日

上午：从中关村数学院出发去国科大怀柔校区

下午：主持人 吴小宁

报告人：李国玮（彰化师范大学）

题　目：Constant mean curvature foliations in the Schwarzschild and Reissner-Nordström spacetimes

摘 要：In this talk, we first give an introduction to the constant mean curvature (CMC) foliations and the CMC time function. Then we summarize some CMC foliations results in cosmological spacetimes. For spatially noncompact cases, Schwarzschild spacetime and Reissner-Nordstrom spacetime for example, they both have CMC foliation properties and we will give the ideas of these proofs in this talk.

报告人：安歆亮（新加坡国立大学）

题 目：On Formation of Singularities in General Relativity

摘 要：In this talk, we will present several results related to singularity formation in gravitational collapse. Techniques from both hyperbolic and elliptic PDEs will be used.

报告人：崔茂培（台湾大学）

题 目：Jang's equation and an Inverse mean curvature like flow in asymptotically flat three manifolds

摘 要：Jang's equation plays an important role in Schoen and Yau's proof the of the positive energy theorem. In this talk, we propose an inverse mean curvature like flow on the solution of the Jang's equation. This flow has a Hawking-mass like quantity that is monotone along the flow which maybe related to the general Penrose inequality.

10 月 22 日

上午：主持人 沈伟明

报告人：马 跃（西安交通大学）

题 目：The Euclidean-hyperboloidal foliation construction

摘 要：We introduce a generalization of the hyperboloidal foliation method in order to remove the main restriction on the support of the initial data. The key point is to make a smooth gluing together asymptotically Euclidean hyper-surfaces and asymptotically hyperboloidal hyper-surfaces. Well-chosen frames of vector fields (null-semi-hyperboloidal frame, Euclidean-hyperboloidal frame) allow us to exhibit clearly the structure of the wave-Klein-Gordon system under consideration and then analyze the decay of solutions in time-like and in space-like directions. New Sobolev inequalities valid in positive cones and in each domain of Euclidean-hyperboloidal foliation are established. Based on these constructions, we establish a first set of results including global existence of Einstein-positive scalar field model system and a type of wave-Klein-Gordon system in 1+1 dimension.

报告人：马思远（索邦大学）

题 目：Linear stability of Kerr spacetimes

摘 要：This talk contains two parts. The first part is about the Teukolsky master equation (TME), which governs the dynamics of massless spin-s fields in Kerr spacetime, with $s=0,1,2$ corresponding to scalar field, electromagnetic field and linearized gravity respectively. I will show how to obtain energy, Morawetz and pointwise decay estimates for TME in the cases of both Maxwell field and linearized gravity on Kerr backgrounds. In the second part, I will outline an approach of utilizing these estimates of the Teukolsky variables to achieve linear stability of Kerr spacetimes. Part of the work is joint work with Lars Andersson, Thomas Backdahl and Pieter Blue.

报告人：查冬兵（东华大学）

题 目：Global solutions for systems of quasilinear wave equations with low regularity data and applications to elastic waves

摘 要：We study the Cauchy problem for systems of 3-D quasilinear wave equations satisfying the null condition with low regularity initial data. In the radially symmetric

case, we prove the global existence for every small data in H3xH2 with a low weight and apply the result to 3-D nonlinear elastic waves.

下午：主持人 马 跃

报告人：沈伟明（首都师范大学）

题 目：The Rigidity and Gap Theorem for Liouville's Equation

摘 要：In this talk, I will talk about the properties of the first global term in the polyhomogeneous expansions for Liouville's equation. We obtain rigidity and gap results for the boundary integral of the global coefficient. We prove that such a boundary integral is always nonpositive, and is zero if and only if the underlying domain is a disc. More generally, we prove some gap theorems relating such a boundary integral to the number of components of the boundary. The conformal structure plays an essential role.

报告人：张林（中科院数学所）

题 目：The null-timelike boundary problems of Maxwell equations and spin-2 equations.

摘 要：In this talk, we discuss the mixed boundary/initial problems of Maxwell equations and spin-2 equations, where an initial value is given on the null hypersurface and a boundary value on the timelike hypersurface. We obtain spacetime estimates and derive an asymptotic expansion of Maxwell field and spin-2 field at null infinity.

报告人：李冏玥（清华大学）

题 目：Asymptotic properties of the Dirac equation and the application to nonlinear models.

摘 要：In this talk, we prove peeling properties of the solutions to linear Dirac equation by using a vector field method developed by S. Klainerman and D. Christodoulou. Then combine the peeling property and the null estimate, we study the global existence of the solutions of the Thirring model and Solar model with small initial datas. These two models are well-known nonlinear models of Dirac equation

10 月 23 日

上午：自由讨论

下午：离会

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