Workshop on Geometric analysis and Geometric PDE

6-9 September, 2016 Toulouse France

Schedule

	Tuesday, Sept 6	Wednesday, Sept 7	Thursday, Sept 8	Friday, Sept 9
9:30-10:30		RIVIERE	ZHU	GURSKY
10:30-11:00		Coffee Break	Coffee Break	Coffee Break
11:00-12:00	Welcome and registration	TOPPING	SONG	CHANG
12:00-14:30	Lunch Break	Lunch Break	Lunch Break	Lunch
14:30-15:30	HAN	Free discussion	ZHENG	
15:30-16:00	Coffee Break	Free discussion	Coffee Break	
16:00-17:00	MA	Free discussion	GICQUAUD	
20:00		Conference dinner		

Workshop on Geometric analysis and Geometric PDE

6-9 September, 2016 Toulouse France

Titles and Abstracts

10 lectures.

Speakers: A. CHANG, R. GICQUAUD, M. GURSKY, Q. HAN, X. MA, T. RIVIERE, J. SONG, P. TOPPING, K. ZHENG, X. ZHU.

ALICE CHANG (Princeton University, chang@math.princeton.edu)

Title. Comments on Moser-Onofri inequality and the σ_2 functional.

Abstract. T. Branson has a famous remark viewing the Moser-Onofri inequality on 2-sphere as the limiting case of the Sobolov embedding inequality on d dimensional sphere when d tends to 2. In this talk I will make this remark rigorous. I will then discuss the analogue of the σ_2 on 4-manifolds, following the recent work of Gursky-Streets, I will also discuss a scheme to achieve the minimal for the functional on a class of metrics.

ROMAIN GICQUAUD (University of Tours, Romain.Gicquaud@lmpt.univ-tours.fr)

Title. Mass-like invariants for asymptotically hyperbolic manifold

Abstract. The (usual) mass is an invariant at infinity for asymptotically Euclidean manifolds. The celebrated positive mass theorem states that, assuming that the metric has positive scalar curvature, the mass is non-negative unless the manifold is isometric to the Euclidean space. A similar object can be defined for asymptotically hyperbolic manifolds. However, the mass is not a scalar quantity but a vector in Minkowski space-time that transforms covariantly under a change of chart at infinity. In this talk we classify all asymptotic invariants that have similar covariant transformation law.

MATTHEW GURSKY (University of Notre Dame, Matthew.J.Gursky.1@nd.edu)

Title. A formal Riemannian structure on the space of conformal metrics and some applications.

Abstract. In this talk I will present some results from project with J. Streets (UC-Irvine), in which we define a formal Riemannian metric on the set of metrics in a conformal class with positive (or negative) curvature. In the case of surfaces, this metric corresponds to the metric defined in the Kahler cone. I will then talk about extensions to higher dimensions, especially 4-d, in which this construction has some interesting applications to the fully nonlinear Yamabe problem and other geometric variational problems.

QING HAN (University of Notre Dame, Qing.Han.7@nd.edu)

Title. Singular solutions of the Yamabe equation

Abstract. In a classical paper, Cafferelli, Gidas and Spruck discussed positive solutions of the Yamabe equation, corresponding to the positive scalar curvature of the conformal

metrics, with a nonremovable isolated singularity. They proved that solutions are asymptotic to radial singular solutions. Korevaar, Mazzeo, Pacard, and Schoen expanded solutions to the next order. In this talk, we discuss how to expand solutions up to arbitrary order. We also discuss positive solutions of the Yamabe equation, corresponding to the negative scalar curvature of the conformal metrics, that become singular in an $(n-1)$-dimensional set.

XINAN MA (University of Science and Technology of China, xinan@ustc.edu.cn)

Title. Neumann Boundary Value Problem for Hessian Equations on Convex Domain in R^n.

Abstract. For the Dirichlet problem on the k-Hessian equation, Caffarelli-Nirenberg-Spruck (1986) obtained the existence of the admissible classical solution when the smooth domain is strictly $k-1$ convex in R^n. In this talk, we prove the existence of a classical admissible solution to a class of Neumann boundary value problems for k Hessian equations in strictly convex domain in R^n this was asked by Prof. N. Trudinger in 1987, the methods depends upon the establishment of a priori derivative estimates up to second order (joint with Qiu Guohuan). At last we shall mention some recent progress on the other Neumann boundary value problems.

TRISTAN RIVIERE (ETH Zürich, tristan.riviere@fim.math.ethz.ch)

Title. Harmonicity into pseudo-riemannian Geometry

JIAN SONG (Rutgers University, jsong22@gmail.com)

Title. The Ricci flow on the sphere with marked points

Abstract. We study the limiting behavior of the Ricci flow on the 2-sphere with marked points. We show that the normalized Ricci flow will always converge to a unique constant curvature metric or a shrinking gradient soliton metric. In the semi-stable and unstable cases of the 2-sphere with more than two marked points, the limiting metric space carries a different conical and the complex structure from the initial structure. We also study the blow-up behavior of the flow in the semi-stable and unstable cases. This is a joint work with Phong, Sturm and Wang.

PETER TOPPING (University of Warwick, P.M.Topping@warwick.ac.uk)

Title. Global solutions of the Teichmueller harmonic map flow

Abstract. The Teichmueller harmonic map flow is a gradient flow of the classical harmonic map energy, in which both a map from a surface and the metric on that surface are allowed to evolve. In principle, the flow wants to find minimal immersions. However, in general, the domain metric might degenerate in finite time. In this talk we show how to flow beyond finite time singularities, and this allows us to decompose a general map into a collection of minimal immersions. This is forthcoming work joint with Melanie Rupflin.

KAI ZHENG (University of Warwick, K.Zheng@warwick.ac.uk)

Title. Convergence of the Calabi flow.

Abstract. We will present convergence theorems of the global solution to the Calabi flow on extremal Kähler surfaces, which are based on new estimates of regularity scales. We introduce the regularity scales as alternative quantities of $(\max_M |Rm|)^{-1}$ to study the long time behaviour of the Calabi flow. Our results partially confirm Donaldson's conjectural picture for the Calabi flow on Káhler surfaces. Similar results could be extended to high dimension under uniform scalar curvature bound.

XIAOHUA ZHU (Peking University, xhzhu@math.pku.edu.cn)

Title. Rigidity of steady Ricci solitons with positively curved curvature.

Abstract. In this talk, I will discuss the rigidity problem of κ-noncollapsing steady solitons. First , we show that any κ-noncollapsing steady Kähler-Ricci soliton with nonnegative bisectional curvature must be falt. Secondly, we prove that any κ-noncollapsing steady Ricci soliton with nonnegative curvature operator and horizontally ϵ-pinched Ricci curvature should be rotationally symmetric.