Dynamical Geometric Analysis in Orsay

(June 27th to June 30th, 2017)

Titles and Abstracts

- ***Steady Kaehler-Ricci solitons with nonnegatively holomorphic bisectional curvature*, by Xiaohua Zhu**, SMS and BICMR-Peking University.

Abstract: In this talk, we discuss a rigidity problem of steady Kaehler-Ricci solitons with nonnegatively bisectional curvature. By using the Ricci flow method, we show that any n-dimensional κ-noncollapsed steady Kaehler-Ricci soliton with nonnegatively holomorphic bisectional curvature must be flat.

- ***Generalized Kahler Ricci flow and a generalized Calabi conjecture*, by Jeffrey D. Streets**, University of California.

Abstract: Generalized Kahler geometry is a natural extension of Kahler geometry with roots in mathematical physics, and is a particularly rich instance of Hitchin's program of 'generalized geometries.' In this talk I will discuss an extension of Kahler-Ricci flow to this setting. After introducing the equation, I will formulate a natural Calabi-Yau type conjecture based on Hitchin/Gualtieri's definition of generalized Calabi-Yau equations. The main result is a global existence and convergence result for the flow which yields a partial resolution of this conjecture, and which classifies generalized Kahler structures on hyperKahler backgrounds.

- ***Quasi-local mass and isoperimetric inequality in General relativity*, by Yuguang Shi**, BICMR-Pekin University.

Abstract: Quasi-local mass is very important notion in General Relativity. Geometrically, it can be regarded as a geometric quantity of a boundary of a 3-dimensional compact Riemannian manifold. Usually, it is in terms of area and mean curvature of the boundary. It is interesting to see that some of quasi-local masses, like Brown-York mass, Hawking mass and isoperimetric mass have deep relation with classical isoperimetric inequality in Riemannian manifolds. I will discuss these problems in this talk which is based on some of my recent joint works in this direction.

- ***Sasaki-Einstein metrics and normalized volumes*, by Chi Li**, Purdue University.

Abstract: I will show that the real valuation associated to the Reeb vector field of a Sasaki-Einstein metric minimizes the normalized volume among

all centered valuations. This is a generalization of a result of Martelli-Sparks-Yau. If time permits I will also discuss the application of normalized volumes to the study of metric tangent cones on singular Kähler-Einstein metrics.

- ***Fully Nonlinear flows on complete graphs*, by Panagiota Daskalopoulos**, Colombia University.

Abstract: We will discuss the evolution of complete non-compact graphs by full-nonlinear geometric flows. Special emphasis will be given to the Gauss curvature flow, an example of degenerate diffusion and the Inverse Mean curvature flow, an example of ultra-fast diffusion.

- ***L^2 curvature estimates on manifolds with bounded Ricci curvature*, by Wenshuai Jiang**, Warwick University.

Abstract: In this talk, we will discuss the L^2 curvature estimates on noncollapsing Einstein manifolds. We also discuss some applications of the L^2 estimates. In order to show the L^2 estimates, we first introduce δ-neck region on the manifold, which is roughly the regular region of codimension four cone. Basing on several estimates on the neck region, we can decompose our manifolds into neck regions and regular balls. Moreover, the number of the neck regions and regular balls are well controlled. Combining the estimates on decomposition numbers with the curvature estimates on neck regions and regular balls, we finally prove the L^2 curvature estimates on noncollapsing Einstein manifolds. In this talk, we will discuss some details of the proof. This is a joint work with Professor Aaron Naber of Northwestern University.

- ***Asymptotic structure of self-shrinkers of mean curvature flow*, by Lu Wang**, University of Wisconsin Madison.

Abstract: Self-shrinkers are a special class of solutions to mean curvature flow and they are singularity models of the flow. In this talk, I will show that each end of a noncompact self-shrinker in three-dimensional Euclidean space of finite topology must be smoothly asymptotic at infinity to a regular cone or a round cylinder.

- ***Expanders of the harmonic map flow*, by Alix Deruelle**, Université Pierre et Marie Curie.

Abstract: Joint work with Tobias Lamm. Expanding self-similarities of a given evolution equation create an ambiguity in the continuation of the flow after it reached a first singularity. In this talk, we investigate the possibility of smoothing out any map from the n-sphere, n¿1, to another sphere, that is homotopic to a constant by a self-similarity of the harmonic map flow. To do so, in the spirit of Chen-Struwe, we introduce a one-parameter family of Ginzburg-Landau equations that exhibit the same

homogeneity and once the existence of expanders for this family is granted, we pass to the limit. We also study the singular set of such solutions as well as the uniqueness issue when the initial map is already harmonic.

- ***Asymptotic expansions of holonomy*, by Erlend Grong**, University of Luxembourg.

Abstract: Given a principal bundle with a connection over a base manifold, we want to give asymptotic expansions for the holonomy of a loop given in terms of its length. The length of the loop is here determined by either a Riemannian or a sub-Riemannian metric on the base manifold. We give an explicit formula for how curvature and its covariant derivatives can be used to approximate the holonomy up to a certain order. Surprisingly, this order is larger in some sub-Riemannian manifolds compared to the Riemannian case. These results have been obtained in collaboration with professor Pierre Pansu.

- ***Optimal regularity of plurisubharmonic envelopes on Hermitian manifolds*, by Bin Zhou**, Pekin University.

Abstract: In this talk, we discuss the regularity of plurisubharmonic envelopes on compact Hermitian manifolds. We confirm a conjecture of Berman on the optimal $C^{1,1}$-regularity. The main ingredients are a priori estimates for a family of complex Monge-Ampere equations. We also present examples to show this regularity is sharp. It is a joint work with Jianchun Chu.

- ***Degeneration of Kahler-Einstein manifolds of negative scalar curvature*, by Jian Song**, Rutgers University.

Abstract: We consider any algebraic family of Kahler-Einstein manifolds of negative scalar curvature over a punctured disc $B \setminus \{0\}$. We show that the Kahler-Einstein manifolds converge, as the parameter of the punctured disc tends to 0, in pointed Gromov-Hausdorff topology to a unique finite disjoint union of complete metric length spaces homeomorphic to an algebraic semi-log canonical model with its locus of non log-terminal singularities removed. In particular, the limiting metric is a smooth Kahler-Einstein metric on the nonsingular part of the semi-log canonical model and the Hausdorff measure of the limit metric space is equal to the volume of Kahler-Einstein manifolds. This is the first step of our approach toward compactification of the analytic geometric moduli space of Kahler-Einstein manifolds of negative scalar curvature.

- ***Geometry and analysis of waves on domains with boundary*, by Oana Ivanovici**, Université Nice Sophia Antipolis.

Abstract : We are concerned with localization properties of solutions to hyperbolic PDEs, especially problems with a geometric component: how do

boundaries and heterogeneous media influence spreading and concentration of solutions. While our first focus is on wave and Schrdinger equations on manifolds with boundary, strong connections exist with phase space localization for (clusters of) eigenfunctions, which are of independent interest. Motivations come from nonlinear dispersive models (in physically relevant settings), properties of eigenfunctions in quantum chaos (related to both physics of optic fiber design as well as number theoretic questions), or harmonic analysis on manifolds.

- ***TBA*, by Philippe EYSSIDIEUX**, Université Grenoble Alpes.

- ***TBA*, by Gang Tian**, Princeton University and BICMR-Peking University.

- ***TBA*, by Claudio Arezzo**, ICTP, Italy.