

GEOX: TITLE AND ABSTRACTS

- **Monday 11th September:**

- **Speaker:** Jason Lotay.

Title: Joyce conjectures for Lagrangian mean curvature flow with circle symmetry

Abstract: Since special Lagrangians are volume minimizing in their homology class, it is natural to expect that one might be able to decompose a Lagrangian in a Calabi-Yau manifold into special Lagrangians. Joyce made a series of conjectures for how to produce such a decomposition via Lagrangian mean curvature flow. I will report on recent progress with G. Oliveira which verifies aspects of Joyce's conjectures in the setting of Lagrangian surfaces in gravitational instantons with circle symmetry.

- **Speaker:** Quang-Tuan Dang

Title: Singularities of the Chern-Ricci flow

Abstract: We study the nature of finite-time singularities for the Chern-Ricci flow, partially answering a question of Tosatti-Weinkove. In connection with the "analytic analog" of the Minimal Model Program, proposed by Song-Tian, it motivated attempts to run the flow on a compact complex manifold X from degenerate initial data. We show that the Chern-Ricci flow can be run from any arbitrary positive current, and that it is immediately smooth in a Zariski open subset of X , extending works by DiNezza-Lu.

- **Speaker:** Julieth Saavedra

Title: Laplacian cflow of G2-structures on 7-manifolds

Abstract: Flows of G2-structures have been used as tools in the study of G2-geometry. The goal of this talk is to introduce important concepts of contact Calabi-Yau manifolds and the Almost abelian Lie group which will be used in the Laplacian cflow. Therefore, on contact Calabi-Yau manifolds were shown that it admits a singularity; the metric and volume collapse at this singularity. On the other hand, in the case of Almost abelian Lie groups it was found that the solution converges to G2-structure torsion free.

- **Speaker:** Giuseppe Gentili

Title: Hypercomplex geometric flows

Abstract: One of the main research interests in modern geometry focuses on the search of special metrics. Parabolic flows have long been one of the most powerful and useful tools to use on this quest. We will outline the role of geometric flows in hypercomplex geometry, highlighting difficulties and differences from the complex setting. Most notably, we will present recent progress towards the solution of the quaternionic Calabi-Yau conjecture posed by Alesker and Verbitsky in 2010. With the same spirit we will also introduce an analogue of the Chern-Ricci flow on hypercomplex manifolds. The talk is based on joint works with L. Bedulli, L. Vezzoni and J. Zhang.

- **Tuesday 12th September**

- **Speaker:** Anna-Maria Fino

Title: Balanced Hermitian metrics

Abstract: A Hermitian metric on a complex manifold is called balanced if its fundamental form is co-closed. In the talk I will give a general overview about balanced metrics and I will present some results in relation to geometric flows and the Hull-Strominger system.

- **Speaker:** Giuseppe Barbaro

Title: Global stability of the pluriclosed flow

Abstract: We compute the $(1, 1)$ -Aeppli cohomology of compact simply-connected Lie groups. From this, we deduce that the Bismut flat metrics on the compact Bismut flat manifolds with finite fundamental group are globally stable for the pluriclosed flow. As an implication, this prevents the existence of non-flat homogeneous Bismut Hermitian Einstein (hence also pluriclosed Calabi-Yau with torsion) metrics on C-spaces.

- **Speaker:** Ronan Conlon

Title: Two-dimensional shrinking Kahler-Ricci solitons

Abstract: Shrinking Kahler-Ricci solitons model finite-time singularities of the Kahler-Ricci flow, hence the need for their classification. I will talk about the classification of such solitons in 4 real dimensions. This is joint work with Deruelle-Sun, Cifarelli-Deruelle, and Bamler-Cifarelli-Deruelle.

- **Speaker:** Francesco Pediconi

Title: Torus symmetry of collapsed ancient solutions to the homogeneous Ricci flow

Abstract: An ancient solution to the Ricci flow on a compact homogeneous space G/H is said to be collapsed if the injectivity radius of the corresponding curvature-normalized metrics is not uniformly bounded away from zero as we move backward in time. In this talk, we describe the general structure of these solutions and we show that, under some algebraic assumptions, they are invariant under the right action of a torus T that centralizes the isotropy group H . This is joint work with S. Sbiti and A. M. Krishnan.

- **Wednesday 13th September**

- **Speaker:** Ovidiu Munteanu

Title: 4D shrinking Ricci solitons

Abstract: This talk will survey several results regarding four-dimensional complete non-compact Ricci solitons, including their asymptotic structure at infinity, curvature estimates, and volume growth estimates. Several open problems will be presented.

- **Speaker:** Manchun Lee

Title: Gap Theorem in Kahler and Riemannian geometry

Abstract: For complete non-compact non-negatively curved manifold, we are interested to know how much curvature can a non-flat manifold have at infinity. In this talk, we will discuss some earlier works in Kahler geometry and their partial extension to the Riemannian case. This is based on joint work with P.-Y. Chan.

- **Speaker:** Xi-Sisi Chen

Title: A Chern-Calabi flow on Hermitian Manifolds

Abstract: We discuss the existence problem of constant Chern scalar curvature metrics on a compact complex manifold and introduce a Hermitian analogue of the Calabi flow on compact complex manifolds with vanishing first Bott-Chern class. We outline a proof of the estimates we need, which is a generalization of Chen-Cheng's estimates for cscK metrics, to obtain convergence results along the flow.

- **Thursday 14th September**

- **Speaker:** Vincent Guedj

Title: Positivity of Kähler-Einstein currents

Abstract: Kähler-Einstein currents have been constructed on mildly singular projective varieties in the last decades. These are canonical Kähler forms at regular points which admit local bounded potentials near the singularities. In this lecture we study whether these currents are positive (i.e. they are Kähler current) near the singular locus. This is joint work with H.Guenancia and A.Zeriahi.

- **Speaker:** Nicolina Istrati

Title: Vaisman manifolds with vanishing first Chern class

Abstract: Vaisman manifolds are non-Kähler manifolds closely related to projective geometry. When their first Chern class vanishes, they exhibit different behaviors, depending on the sign of a refined characteristic class. I will describe this behavior in comparison to the Kähler context. In particular, I will discuss the existence of canonical Vaisman metrics, their automorphism group and their small deformations.

- **Speaker:** Elia Fusi

Title: Homogeneous Generalized Ricci flow

Abstract: The Generalized Ricci flow is the natural analogous of the Ricci flow in the setting of Generalized Geometry. In this talk, after a brief introduction on the main objects in Generalized Geometry, I will propose a new definition of solitons for the Generalized Ricci flow which allows for the existence of non-steady solitons with non-zero torsion. Afterwards, I will discuss the homogeneous case, focusing on the moving Dorfman brackets framework and the moment map formulation of the Generalized Ricci curvature. Motivated by these, I will introduce the Dorfman bracket flow and discuss its long-time behaviour on solvable Lie groups and asymptotics in the nilpotent case, with a special focus on the consequences for the pluriclosed flow. This is a joint work with Ramiro Lafuente and James Stanfield.

- **Speaker:** Nicoletta Tardini

Title: SKT and Kähler-like metrics on complex manifolds

Abstract: Several special non-Kähler Hermitian metrics can be introduced on complex manifolds. Among them, SKT metrics deserve particular attention. They can be defined on a complex manifold by saying that the torsion of the Bismut connection associated to the metric is closed. These metrics always exist on compact complex surfaces but the situation in higher dimension is very different. We will discuss several properties concerning these metrics also in relation with the Bismut connection having Kähler-like curvature. Since this last property on nilmanifolds will force the complex structure to be abelian, we will also discuss the relation between SKT metrics and abelian complex structures on unimodular Lie algebras. These are joint works with Anna Fino and Luigi Vezzoni.

- **Friday 15th September**

- **Speaker:** Louis Ioos

- Title :** Canonical Kähler metrics and quantization

- Abstract :** The search for canonical Kähler metrics on projective manifolds can be considered as an attempt to extend the uniformization theorem of Riemann surfaces to general dimensions. This research has made significant progresses in the last decades, culminating in what is now called the Yau-Tian-Donaldson program. In this talk, I will explain the role played by quantization methods in this program, and how they can be improved by a semi-classical study of the quantum noise of Berezin-Toeplitz quantization.

- **Speaker:** Bing Wang

- Title:** Rigidity theorems related to the Ricci flow

- Abstract:** We shall survey some recent topological and geometric rigidity theorems related to the Ricci flow. By topological rigidity, we use the Ricci flow to construct canonical diffeomorphisms near spheres, canonical bi-holomorphic maps near projective spaces, and canonical collapsing fibrations. For geometric rigidity, we shall discuss some particular cases where the moduli space of Ricci shrinkers can be understood. Part of this work is joint with Yu Li and Shaosai Huang.