

# 2022 Chongqing Geometric Analysis Workshop

**Beijing Time: October 22-23, 8:00am-12:00noon.**

**Organizers: Xinyue Cheng, Fei He, Lei Ni, Bo Yang, Xiaokui Yang, Chunna Zeng, Yingying Zhang, Fangyang Zheng**

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**Zoom Meeting ID: 928 5627 6102**

**link: <https://ucsd.zoom.us/j/92856276102>**

## Program schedule:

### Oct 22 (Sat) 8:am-12noon Beijing time:

8:00am-8:50am, V. Tosatti (NYU), (local time Friday 8:00pm), host: X. Yang

9:00am-9:50am, J. Wang (U Minn), (local time Friday 8:00pm), host: G. Liu

10:00am-10:50am, X. Li (Wichita State U), (local time Friday 8:00pm), host: C. Zeng

11:00am-11:50am, G. Liu (East China Normal U), host: X. Cheng

### Oct 23 (Sun) 8:am-12noon Beijing time:

8:00am-8:50am, J. Streets (UC Irvine), (local time Sat 5:00pm), host: F. Zheng

9:00am-9:50am, Y. Ustinovskiy (Lehigh U), (local time Sat 9:00pm), host: Y. Zhang

10:00am-10:50am, X. Zhang (UC Irvine), (local time Sat 7:00pm), host: B. Yang

11:00am-11:50am, L. Ni (UC San Diego), (local time Sat 8:00pm), host: F. He

## Title and Abstract:

### **Xiaolong Li (Wichita State University)**

Title: The Curvature Operator of the Second Kind

Abstract: In the first part of this talk, I will give an introduction to the notion of the curvature operator of the second kind. In the second part, I will present the proof of Nishikawa's conjecture, which states that a closed Riemannian manifold with positive (resp. nonnegative) curvature operator of the second is diffeomorphic to a spherical space form (resp. a Riemannian locally symmetric space). In the third part, I will talk about my recent works on the curvature operator of the second kind on Kahler manifolds and product manifolds. At last, I will mention some interesting questions and conjectures.

### **Gang Liu (East China Normal University)**

Title: quantitative analysis on noncompact Kahler manifolds with nonnegative bisectional curvature

Abstract: We study quantitative analysis on noncompact Kahler manifolds with nonnegative bisectional curvature. As a result, we answer a question of Ni on uniqueness of average of scalar curvature on such manifolds.

**Lei Ni (UC San Diego)**

Title: When Chern meets Ambrose and Singer

Abstract: Kahler manifolds can be characterized by the fact that the Riemannian structure/connection of a Hermitian complex manifold coincides with its holomorphic structure/Chern connection. In this talk I shall explain some progresses made with Fangyang Zheng on the classification of Hermitian complex manifolds whose Chern connection coincides with the Ambrose-Singer connection.

**Jeffrey Streets (UC Irvine)**

TBA

**Valentino Tosatti (NYU)**

Title: Estimates for collapsing Calabi-Yau manifolds

Abstract: The problem of studying the collapsing behavior of Ricci-flat Kahler metric on fibered Calabi-Yau manifolds as the fiber size shrinks translates into obtaining uniform estimates for a family of degenerating complex Monge-Ampere equations. I will describe joint work with H.J. Hein where we prove a priori  $C^k$  estimates for all  $k$  for the solution (away from the singular fibers), as a consequence of an asymptotic expansion in the fiber size, where each additional term of the expansion arises as the obstruction to proving a uniform bound on one additional derivative of the remainder.

**Yury Ustinovskiy (Lehigh University)**

Title: Scalar Curvature in Generalized Kahler Geometry

Abstract: Construction and classification of the constant scalar curvature metrics in Kahler geometry has been a central problem in complex geometry. It is related to deep notions of stability in algebraic geometry and represents a challenging analytic problem. In this talk we turn our attention to the generalized geometry introduced by Hitchin and its Kahler counterpart formulated by Gualtieri. Recently, several notions of scalar curvature in this context have emerged, mirroring the fundamental results in the classical Kahler geometry. We will review various approaches to the definition of generalized scalar curvature, prove their equivalence, and set up a formal GIT picture for the search of the constant generalized scalar curvature metrics. This talk is based on a joint work with Vestislav Apostolov and Jeffrey Streets.

**Jiaping Wang (University of Minnesota)**

Title: Geometry of three-manifolds with scalar curvature lower bound.

Abstract: In this talk, we plan to discuss our recent joint work with Ovidiu Munteanu concerning the geometry of three dimensional complete manifolds with scalar curvature bounded from below. Our focus will be on monotonicity formulas and their applications.

**Xiangwen Zhang (UC Irvine)**

Title: Geometric flows in symplectic geometry

Abstract: Geometric flows have been proven to be powerful tools in the study of many important problems arising from both geometry and theoretical physics. Aiming to study the equations from the flux compactifications of Type IIA superstrings, we introduce the

so-called Type IIA flow, which is a flow of closed and primitive 3-forms on a symplectic Calabi-Yau 6-manifold. Remarkably, the Type IIA flow can also be viewed as a flow as a coupling of the Ricci flow with a scalar field. In this talk, we will discuss the recent progress on this flow. This is based on a joint project with Fei, Phong and Picard.