



广西师范大学  
GUANGXI NORMAL UNIVERSITY

# The 8th China-Japan Geometry Conference

## Conference Guide

中国·桂林

Guilin, China

September 8-14, 2023



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## **Introduction**

The 8th China-Japan geometry conference is going to be held in Guilin, China (Guangxi Normal University) from September 8th to 14th, 2023. The China-Japan or Japan-China Geometry Conference was established in 2015, which is a communication platform between Chinese and Japanese academic researchers in differential geometry. There are Scientific and Organizing Committees both in China and Japan for the conference. The 1st Japan-China geometry conference was held in Kyoto and Nara, Japan from September 6th to 12th, 2015 (Kyoto University and Nara Women's University). The 2nd China-Japan geometry conference was held in Fuzhou, China from September 6th to 12th, 2016 (Fujian Normal University). The 3rd Japan-China geometry conference was held in Sendai, Japan from September 1th to 7th, 2017 (Tohoku University). The 4th China-Japan geometry conference was held in Hefei, China from September 6th to 12th, 2018 (University of Science and Technology of China). The 5th Japan-China geometry conference was held in Kusatsu, Japan from September 1th to 7th, 2019 (Ritsumeikan University). The 6th China-Japan geometry conference was held in Chongqing, China (Chongqing University of Technology) online from December 23th to 29th, 2021, which was delayed by Covid-19. The 7th Japan-China geometry conference was held in Hiroshima, Japan (Hiroshima University) online from December 23th to 29th, 2022.

**Sponsors:**

Guangxi Normal University

**Conference Time:** September 8-14, 2023

**Conference Venue:** Jin-Gui hall on the 2th floor, Guilin Bravo Hotel, Guilin

**Scientific Committee:**

Akito Futaki (Tsinghua University)

Ryoichi Kobayashi (Nagoya University)

Anmin Li (Sichuan University)

Toshiki Mabuchi (Osaka University)

Reiko Miyaoka (Tohoku University)

Yoshihiro Ohnita (Osaka City University)

Gang Tian (Peking University)

Weiping Zhang (Nankai University)

**Organizing Committee:**

Qing-Ming Cheng (Fukuoka University)

Qing Ding (Wenzhou/Fudan University)

Ryushi Goto (Osaka University)

Shouhei Honda (Tohoku University)

Haizhong Li (Tsinghua University)

Jiayu Li (University of Science and Technology of China)

Ayato Mitsuishi (Fukuoka University)

Hitoshi Moriyoshi (Nagoya University)

Takashi Shioya (Tohoku University)

Hiroshi Tamaru (Osaka Metropolitan University)

Zizhou Tang (Nankai University)

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Supported by NSFC Grants (No. 11771103 and No.12101145), Talent special-Research start-up funds (DC2200005033) .

# Schedule

**September 8, Friday**

Arrival day

**September 9, Saturday**

Zoom : 924 157 10371

Password: 23909

Chair	Time	Speaker	Title
Vice President Wentao Huang	Beijing time: 8:30-9:00 Tokyo time: 9:30-10:00	Opening speeches by President Jieyuan Sun, Prof. Gang Tian and Prof. Hiroshi Tamaru	Opening ceremony
	Beijing time: 9:00-9:50 Tokyo time: 10:00-10:50	Photo time and tea break	
	Beijing time: 9:50-10:40 Tokyo time: 10:50-11:40	Akito Futaki (Tsinghua University)	Deformations of Fano manifolds with weighted solitons
	Beijing time: 10:45-11:35 Tokyo time: 11:45-12:35	Kefeng Liu (Chongqing University of Technology and UCLA)	Spectral rigidity of complex projective space
	Beijing time: 11:50-14:00 Tokyo time: 12:50-15:00	Lunch time	
	Beijing time: 14:00-14:50 Tokyo time: 15:00-15:50	Tadashi Fujioka (Osaka University)	Upper curvature bound and the curvature integral

	Beijing time: 14:50-15:10 Tokyo time: 15:50-16:10	Tea break	
	Beijing time: 15:10-16:00 Tokyo time: 16:10-17:00	Changwei Xiong (Sichuan University)	On an exterior Steklov eigenvalue problem and the capacity
	Beijing time: 16:05-16:55 Tokyo time: 17:05-17:55	Naoto Yotsutani (Kagawa University)	Semistable pairs of projective toric varieties
	Beijing time: 17:30-19:30 Tokyo time: 18:30-20:30	Dinner time	

**September 10, Sunday**

Zoom: 982 808 84429

Password: 230910

<b>Chair</b>	<b>Time</b>	<b>Speaker</b>	<b>Title</b>
	Beijing time: 8:30-9:20 Tokyo time: 9:30-10:20	Guofang Wang (Albert-Ludwigs- Universität Freiburg)	Capillary hypersurfaces
	Beijing time: 9:25-10:15 Tokyo time: 10:25-11:15	Shin Nayatani (Nagoya University)	First eigenvalue maximization and isometric immersion
	Beijing time: 10:15-10:50 Tokyo time: 11:15-11:50	Tea break	

	Beijing time: 10:50-11:40 Tokyo time: 11:50-12:40	Yoshinori Hashimoto (Osaka Metropolitan University)	Recent developments on constant scalar curvature Kähler metrics with cone singularities along a divisor
	Beijing time: 11:40-14:00 Tokyo time: 12:40-15:00	Lunch time	
	Beijing time: 14:00-14:50 Tokyo time: 15:00-15:50	Zhichao Wang (Fudan University)	Existence of four minimal spheres in $S^3$ with a bumpy metric
	Beijing time: 14:50-15:20 Tokyo time: 15:50-16:20	Tea break	
	Beijing time: 15:20-16:10 Tokyo time: 16:20-17:10	Atsufumi Honda (Yokohama National University)	Intrinsic invariants of wave fronts
	Beijing time: 16:15-17:05 Tokyo time: 17:15-18:05	Kotaro Kawai (BIMSA)	Deformed Donaldson-Thomas connections
	Beijing time: 17:30-19:30 Tokyo time: 18:30-20:30	Reception	



**September 11, Monday**

Zoom: 926 014 58506

Password: 230911

Chair	Time	Speaker	Title
	Beijing time: 08:30-09:20 Tokyo time: 09:30-10:20	Hitoshi Moriyoshi (Nagoya University)	Geometry on the circle diffeomorphism group and the space of equicentroaffine curves
	Beijing time: 9:25-10:15 Tokyo time: 10:25-11:15	Yuguang Shi (Peking University)	Rigidity and non-rigidity of $H^n/Z^{n-2}$ with scalar curvature bounded from below
	Beijing time: 10:15-10:50 Tokyo time: 11:15-11:50	Tea break	
	Beijing time: 10:50-11:40 Tokyo time: 11:50-12:40	Jiawei Liu (Nanjing University of Science and Technology)	Conical Kähler-Ricci flow and its related topics
	Beijing time: 11:40-14:00 Tokyo time: 12:40-15:00	Lunch time	
	Beijing time: 14:00-14:50 Tokyo time: 15:00-15:50	Keita Kunikawa (Tokushima University)	Morse index estimate via first Betti number for self-shrinkers in higher codimension
	Beijing time: 14:50-15:20 Tokyo time: 15:50-16:20	Tea break	

	Beijing time: 15:20-16:10 Tokyo time: 16:20-17:10	Hongxin Guo (Wenzhou University)	On some entropy formulas and Harnack inequalities in the curvature flows
	Beijing time: 16:15-17:05 Tokyo time: 17:15-18:05	Yuya Kodama (Tokyo Metropolitan University)	Alexander's theorem for subgroups of Thompson's group
	Beijing time: 17:30-19:30 Tokyo time: 18:30-20:30	Dinner time	
<b>September 12, Tuesday</b>			
Free discussion			
<b>September 13, Wednesday</b> Zoom: 986 043 72812 Password: 230913			
<b>Chair</b>	<b>Time</b>	<b>Speaker</b>	<b>Title</b>
	Beijing time: 8:30-9:20 Tokyo time: 9:30-10:20	Takashi Shioya (Tohoku University)	Principal bundle structure of the space of metric measure spaces
	Beijing time: 9:25-10:15 Tokyo time: 10:25-11:15	Tomohiro Fukaya (Tokyo Metropolitan University)	Coarse geometry of groups and spaces of nonpositive curvature
	Beijing time: 10:15-10:50 Tokyo time: 11:15-11:50	Tea break	

	Beijing time: 10:50-11:40 Tokyo time: 11:50-12:40	Takayuki Okuda (Hiroshima University)	Coarse geometry and Kobayashi's properness criterion
	Beijing time: 11:40-14:00 Tokyo time: 12:40-15:00	Lunch time	
	Beijing time: 14:00-14:50 Tokyo time: 15:00-15:50	Koichi Nagano (University of Tsukuba)	Wall singularity of spaces with an upper curvature bound
	Beijing time: 14:50-15:20 Tokyo time: 15:50-16:20	Tea break	
	Beijing time: 15:20-16:10 Tokyo time: 16:20-17:10	Linlin Sun (Guangxi Normal University)	Rigidity results of CSL submanifolds in the unit sphere
	Beijing time: 16:15-16:30 Tokyo time: 17:15-17:30	1. Announcement for the next conference by Prof. Ryushi Goto 2. Closing speech by Prof. Weiping Zhang	Closing ceremony
	Beijing time: 17:30-19:30 Tokyo time: 18:30-20:30	Dinner time	
<b>September 14, Thursday</b>			
Leaving day			

# Summary

## 1. Akito Futaki (Tsinghua University)

**Title:** Deformations of Fano manifolds with weighted solitons

**Abstract:** We consider weighted solitons on Fano manifolds which include Kähler-Ricci solitons, Mabuchi solitons and base metrics which induce Sasaki-Einstein metrics on the  $U(1)$ -bundles of the canonical line bundles. We show that all the members  $M_t$  of the Kuranishi family of a Fano manifold  $M_0$  with a weighted soliton have weighted solitons if and only if the dimensions of the  $T$ -equivariant automorphism groups of  $M_t$  are equal to that of  $M_0$ , and also if and only if the  $T$ -equivariant automorphism groups of  $M_t$  are all isomorphic to that of  $M_0$ , where the weight functions are defined on the moment polytope of the Hamiltonian  $T$ -action.

## 2. Kefeng Liu (Chongqing University of Technology and UCLA)

**Title:** Spectral rigidity of complex projective space

**Abstract:** I will discuss recent joint work with X. Huang, H. Xu and Y. Zhi on certain new geometric characterizations of complex projective space using  $p$ -form spectra and Bergman kernel.

## 3. Tadashi Fujioka (Osaka University)

**Title:** Upper curvature bound and the curvature integral

**Abstract:** We prove that the integral of scalar curvature over a Riemannian manifold is uniformly bounded below in terms of its dimension, upper bounds on sectional curvature and volume, and a lower bound on injectivity radius. This is an analogue of an earlier result of Petrunin for Riemannian manifolds with sectional curvature bounded below. Both proofs rely on the convergence theory of Riemannian manifolds with one-sided curvature bounds. The parallel structure comes from that of the limit spaces, i.e., Alexandrov spaces and GCBA spaces.

## 4. Changwei Xiong (Sichuan University)

**Title:** On an exterior Steklov eigenvalue problem and the capacity

**Abstract:** In the talk first we will present estimates on the first two eigenvalues of an exterior Steklov eigenvalue problem. Some estimates are derived via the capacity of Euclidean compact sets. Then we shall discuss several estimates on the capacity of

compact sets in the Euclidean and hyperbolic spaces. These results are partially joint with Prof. Haizhong Li and Ruixuan Li.

5. Naoto Yotsutani (Kagawa University)

**Title:** Semistable pairs of projective toric varieties

**Abstract:** Let  $X \rightarrow \mathbb{P}^n$  be a smooth linearly normal projective variety, and  $(R_x, \Delta_x)$  the pair of Chow/hyperdiscriminant forms. It was proved by S. Paul that the K-energy of  $X$  restricted to the Bergman metrics is bounded from below if and only if the pair  $(R_x, \Delta_x)$  is semistable. In this talk, for a smooth projective toric variety  $X$ , we give a necessary and sufficient condition for the pair  $(R_x, \Delta_x)$  to be semistable with respect to the standard maximal torus action, using the theory of Gelfand-Kapranov-Zelevinsky (A-Resultants/A-Discriminants).

6. Guofang Wang (Albert-Ludwigs-Universität Freiburg)

**Title:** Capillary hypersurfaces

**Abstract:** I will report recent work on capillary hypersurfaces joint with my collaborators, especially with Chao Xia.

7. Shin Nayatani (Nagoya University)

**Title:** First eigenvalue maximization and isometric immersion

**Abstract:** I will discuss first eigenvalue maximization, isometric immersion and their relation on manifolds and graphs.

8. Yoshinori Hashimoto (Osaka Metropolitan University)

**Title:** Recent developments on constant scalar curvature Kähler metrics with cone singularities along a divisor

**Abstract:** We present some recent results concerning constant scalar curvature Kähler (cscK) metrics with cone singularities along a divisor. One of the main results is that the existence of cscK cone metrics implies various stability conditions of the underlying pair of the manifold and the divisor, including G-uniform K-stability and K-polystability. We also prove that any Kähler manifold admits a cscK cone metric if the divisor is a generic member of the linear system defined by a sufficiently large multiple of the polarisation. This talk is based on a joint work with Takahiro Aoi and

Kai Zheng.

9. Zhichao Wang (Fudan University)

**Title:** Existence of four minimal spheres in  $S^3$  with a bumpy metric

**Abstract:** In this joint work with X. Zhou, we prove that in the three dimensional sphere with a bumpy metric or a metric with positive Ricci curvature, there exist at least four distinct embedded minimal two-spheres. This confirms a conjecture of S. T. Yau in 1982 for bumpy metrics and metrics with positive Ricci curvature. The proof relies on a multiplicity one theorem for the Simon-Smith min-max theory.

10. Atsufumi Honda (Yokohama National University)

**Title:** Intrinsic invariants of wave fronts

**Abstract:** In this talk, we investigate the behavior of geometric quantities (such as Gaussian curvature) at singular points of wave fronts. To characterize their boundedness at singular points, we introduce several intrinsic invariants along singular points.

11. Kotaro Kawai (BIMSA)

**Title:** Deformed Donaldson-Thomas connections

**Abstract:** The deformed Donaldson-Thomas (dDT) connection is a Hermitian connection of a Hermitian line bundle over a G2-manifold satisfying certain nonlinear PDEs. This is considered to be the mirror of a calibrated (associative) submanifold via mirror symmetry. As the name indicates, the dDT connection can also be considered as an analogue of the Donaldson-Thomas connection (G2-instanton). In this talk, after reviewing these backgrounds, I will show that dDT connections indeed have properties similar to associative submanifolds and G2-instantons. I would also like to present some related problems. A part of this talk is based on the joint work with Hikaru Yamamoto.

12. Hitoshi Moriyoshi (Nagoya University)

**Title:** Geometry on the circle diffeomorphism group and the space of equicentroaffine curves

**Abstract:** A plane curve  $\gamma: S^1 \rightarrow R^2$  is called equi-centro-affine. If the position vector  $\gamma$  and the velocity vector  $\gamma'$  makes a triangle of constant area with respect to the

origin. In other words, the determinant of 2 by 2 matrix  $(\mathcal{V}\mathcal{V}')$  is constant. Even though the space  $M$  of all equicentroaffine curves is infinite dimensional,  $M$  admits a transitive action by the circle diffeomorphism group due to Pinkall. It is also known that there exists an invariant pre-symplectic form on  $M$ , called the Fujioka-Kurose 2-form. In this talk we shall manifest an intriguing interaction between Geometry and Analysis, namely a beautiful relationship among curvature of equicentroaffine curves, moment map, the Bott-Virasoro group and the KdV equation. This is a joint work with A. Fujioka and T. Kurose.

13. Yuguang Shi (Peking University)

**Title:** Rigidity and non-rigidity of  $H^n/Z^{n-2}$  with scalar curvature bounded from below

**Abstract:** We present a counterexample to a generalization of Min-OO's hyperbolic rigidity theorem proposed by M. Gromov, and also prove a rigidity result of ALH manifolds with scalar curvature bounded from below. This talk is based on my recent joint work with my postdoc Y.H. Hu and my Ph.d. students P. Liu and T. Z. Hao.

14. Jiawei Liu (Nanjing University of Science and Technology)

**Title:** Conical Kähler-Ricci flow and its related topics

**Abstract:** In this talk, I will talk about the existence, regularity and uniqueness of conical Kähler-Ricci flow on compact Kähler manifold, and then the stability of this flow on Fano manifold and its applications. At last, I will talk about some related topics. These are joint work with Professor Xi Zhang.

15. Keita Kunikawa (Tokushima University)

**Title:** Morse index estimate via first Betti number for self-shrinkers in higher codimension

**Abstract:** Mean curvature flow self-shrinkers are critical points of the Gaussian weighted volume functional. In this talk, I will show that the Morse index of shrinkers can be estimated from below by the first Betti number if they satisfy some restrictive Ricci curvature condition. For hypersurface case, a much better index estimate was already known without such a restriction. In this sense, our index estimate is still under consideration. I will share the difficulties and explain why our method does not work well in higher codimension. This talk is based on a joint work

with Yohei Sakurai (Saitama University).

16. Hongxin Guo (Wenzhou University)

**Title:** On some entropy formulas and Harnack inequalities in the curvature flows

**Abstract:** In the studies of geometric flows, entropy formulas play important roles. For a wide class of entropy formulas, there is a strategy to define them as follows. Calculate the first two derivatives of the Boltzmann entropy of positive solutions to the heat type equations associated to the flow, and then modify the quantities to fit shrinking or expanding self-similar solutions. Calculate pointwisely one gets the corresponding Harnack inequalities. In this talk, we apply this method to get some entropy formulas and the corresponding Harnack inequalities in the Ricci flow, the Gaussian curvature flow and the curve shortening flow. This talk is based on joint works with Masashi Ishida, Robert Philipowski and Anton Thalmaier.

17. Yuya Kodama (Tokyo Metropolitan University)

**Title:** Alexander's theorem for subgroups of Thompson's group

**Abstract:** Thompson's group  $F$  is a subgroup of  $Homeo([0,1])$ . In 2017, Jones found a way to construct knots and links from elements in  $F$ . Moreover, any knot (or link) can be obtained in this way. In this talk, I would like to report some recent results on the relation of  $F$  and knot theory. This talk is based on a joint work with Akihiro Takano.

18. Takashi Shioya (Tohoku University)

**Title:** Principal bundle structure of the space of metric measure spaces

**Abstract:** We study the topological structure of the space  $\mathcal{X}$  of isomorphism classes of metric measure spaces equipped with the box or concentration topologies. We consider the scale-change action of the multiplicative group  $\mathbb{R}_+$  of positive real numbers on  $\mathcal{X}$ , which has a one-point metric measure space, say  $*$ , as only one fixed point. We prove that the  $\mathbb{R}_+$ -action on  $\mathcal{X}_* := \mathcal{X} \setminus \{*\}$  admits the structure of nontrivial and locally trivial principal  $\mathbb{R}_+$ -bundle over the quotient space. Our bundle  $\mathbb{R}_+ \rightarrow \mathcal{X}_* \rightarrow \mathcal{X}_*/\mathbb{R}_+$  is a curious example of a nontrivial principal fiber bundle with contractible fiber. A similar statement is obtained for the pyramidal compactification of  $\mathcal{X}$ , where we completely determine the structure of the fixed-point set of the  $\mathbb{R}_+$ -action on the compactification.



19. Tomohiro Fukaya (Tokyo Metropolitan University)

**Title:** Coarse geometry of groups and spaces of nonpositive curvature

**Abstract:** The theory of hyperbolic groups is one of the most successful studies in the geometric group theory. Nowadays, there are many intensive works to explore the world of groups and spaces beyond hyperbolicity. Examples are CAT(0) spaces, Busemann spaces, systolic complexes and Helly graphs. The coarsely convex spaces, introduced by S. Oguni and myself, includes all of the above examples. We proved that proper coarsely convex spaces satisfy the coarse Baum-Connes conjecture, which arises from the noncommutative geometry. In this talk, I will present an overview of the recent studies of the coarse geometry of nonpositively curved groups and spaces. This talk is based on the joint works with S. Oguni and with T. Matsuka.

20. Takayuki Okuda (Hiroshima University)

**Title:** Coarse geometry and Kobayashi's properness criterion

**Abstract:** Let  $G$  be a locally compact group and  $H$  be a closed subgroup of  $G$ . The homogeneous space of  $(G,H)$  is denoted by  $X = G/H$ . Note that we mainly consider the case where  $H$  is non-compact and  $X = G/H$  has no  $G$ -invariant metrics. A discrete subgroup  $\Gamma$  of  $G$  is called a discontinuous group for  $X = G/H$  if the  $\Gamma$ -action on  $X$  is fixed-point free and properly-discontinuous. In the case where  $G$  is a Lie group, study of discontinuous groups for  $X = G/H$  is one of important researching areas in differential geometry because it can be understood as a study of  $(G,H)$ -manifolds. In general, if we have a closed subgroup  $L$  of  $G$  (which might not be discrete) such that the  $L$ -action on  $X = G/H$  is proper, then any torsion-free discrete subgroup  $\Gamma$  of  $L$  becomes a discontinuous group for  $X = G/H$ . Therefore, the study of closed subgroups of  $G$  acting on  $X$  properly is also important. It should be noted that one of the difficulty of such the study is that the following problem is not easy in general: For a given closed subgroup  $L$ , check whether or not the  $L$ -action on  $X = G/H$  is proper. For the problem above, in the case where  $G$  is a reductive Lie group, Toshiyuki Kobayashi ([Math. Ann. '89, J. Lie Theory '96]) gave a criterion of the properness of the  $L$ -action on  $X = G/H$  in terms of Cartan's KAK decomposition of  $G$ . Nowadays, Kobayashi's properness criterion is one of the most important tools to study discontinuous groups and proper actions on  $X = G/H$  and has many applications. In this talk, we give a generalization of Kobayashi's properness criterion from the

view point of Coarse geometry. This talk is based on the joint work with Kento Ogawa (Hiroshima University) and Hiroki Nagaya (Hiroshima University).

21. Koichi Nagano (University of Tsukuba)

**Title:** Wall singularity of spaces with an upper curvature bound

**Abstract:** In this talk, I would like to focus on typical wall singularity of metric spaces with an upper curvature bound. Lytchak and I have studied basic geometric structure of GCBA spaces. A GCBA space means a locally compact, separable, locally geodesically complete metric space with an upper curvature bound in the sense of Alexandrov. I will report on a wall singularity theorem of codimension one, and a regularity theorem of codimension two for GCBA spaces. These theorems give necessary and sufficient conditions for singular sets to be of codimension at least two.

22. Linlin Sun (Guangxi Normal University)

**Title:** Rigidity results of CSL submanifolds in the unit sphere

**Abstract:** I will talk about the rigidity of contact stationary Legendrian (CSL) submanifolds in the unit sphere based on the joint works with Prof. Luo Yong and Dr. Yin Jiabin. We prove some optimal rigidity results of closed CSL submanifolds and obtain a new characterization of the minimal Calabi torus in the unit sphere.

## The list of participants

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# Transportation

All the participants are arranged to accommodate in Guilin Bravo Hotel. Guilin Bravo Hotel is located near the Rong-Lake, which is a part of the famous two-rivers - four-lakes scenic area in Guilin.

**Hotel address:** No.14 Rong-lake South Road, Xiangshan District, Guilin, China  
(Guilin Bravo Hotel)

1. The hotel is 28 km away from Guilin International Airport and 50 minutes away by taxi.
2. It's 2 km away from Guilin South Railway Station.
3. It's 8 km away from Guilin North Railway Station and 20 minutes away by taxi.
4. It's 12 km away from Guilin West Railway Station and 23 minutes away by taxi.





