ZHUHAI INTERNATIONAL WORKSHOP ON COMPLEX GEOMETRY

School of Mathematics (Zhuhai)
Sun Yat-sen University

Co-organizer:
Institute of Mathematics,
Henan Academy of Sciences

[中国·珠海]

13-16 March 2026

Zhuhai International Workshop on Complex Geometry

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Overview

1. **Workshop Venue：** B101 Haiqin No.2 Building, Zhuhai Campus, Sun Yat-sen University, Zhuhai, Guangdong, China
2. **Hotel：** Qingzhu Hotel（Tel：+867563662088 / +8613326666227）
3. **Organizer:**

   Xiaonan Ma (Nankai University)

   George Marinescu (Universität zu Köln)

   Guokuan Shao (Sun Yat-sen University)

   Local Organizer:

Guokuan Shao	shaogk@mail.sysu.edu.cn	+8613726243760
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4. **Support**： Start-up Fundings of Sun Yat-sen University

   Start-up Project Funding of Henan Academy of Sciences

   National Natural Science Foundation of China

Remind

(1) Transportation: We offer free Pickup Service from/to Airports, Railway Stations and shuttle bus between hotel and lecture hall.

• Zhuhai Jinwan Airport (59km)
• Shenzhen Bao'an International Airport (72km)
• Hong Kong International Airport (72km via Hong Kong-Zhuhai-Macao Bridge)
• Macao International Airport (27km via Gongbei Port)
• Zhuhai Railway Station (21km)
• Zhuhaibei Railway Station (9km)
• Tangjiawan Railway Station (5km)
Shuttle bus from the hotel: 8:35am, 2:10pm

(2) Accommodation: The address of the hotel (青竹书院酒店) is No. 1858 Qinglv North Road, Tangjiawan Town, Zhuhai, which is 600m away from the workshop venue.

(3) Catering: The restaurant for the Banquet is Tangyan Seafood Restaurant (唐宴海鲜酒家). Besides the Banquet, the dining room is Kingsoft Restaurant (1988 金山私膳), located at the second floor of the Qingzhu Hotel.

Speakers

Name	Affiliation
Fusheng Deng	University of Chinese Academy of Sciences
Hendrik Herrmann	University of Vienna
Chin-Yu Hsiao	National Taiwan University
Xiaoshan Li	Wuhan University
Bingxiao Liu	Great Bay University
Bo Liu	East China Normal University
Ngaiming Mok	The University of Hong Kong
Ngoc Cuong Nguyên	Korea Advanced Institute of Science & Technology
Viêt-Anh Nguyên	Université de Lille
Nikhil Savale	Trinity College Dublin
Huan Wang	Henan Academy of Sciences
Zhiwei Wang	Beijing Normal University
Songyan Xie	Chinese Academy of Sciences
Wanke Yin	Wuhan University

Conference Schedule

Time	Item	Location
Fri, 13 Mar	Arrival&Registration 09:00-22:00	Qingzhu Hotel
	Buffet Dinner 18:30-21:00	Kingsoft Restaurant 2F, Qingzhu Hotel
Sat, 14 Mar	Registration 08:15-08:55	B101, Haiqin No.2 Zhuhai Campus
	Opening Remarks 08:55-09:00	
	Talks; Group Photo	
Sun, 15 Mar	Talks	B101, Haiqin No.2 Zhuhai Campus
Mon, 16 Mar	Departure	

Workshop Program（14 Mar）

Venue：B101 Haiqin No.2 Building

Time	Speaker	Title	Chair
09:00-09:40	Ngaiming Mok	A rigidity phenomenon on higher-rank irreducible lattices of the Hermitian type with respect to bounded holomorphic functions and an application to Kähler geometry	George Marinescu
09:45-10:25	Viêt-Anh Nguyên	Siu's analyticity theorem for positive pluriharmonic currents	
10:25-11:00	Group Photo & Coffee Break		
11:00-11:40	Fusheng Deng	Rigidity and multiplicity of singularities assocaited to ample vector bundles	Guangxiang Su
12:00-13:30	Buffet Lunch: Kingsoft Restaurant, 2F, Qingzhu Hotel		
14:30-15:10	Wanke Yin	Bounding smooth Levi-flat hypersurfaces in a Stein manifold	Quanting Zhao
15:15-15:55	Ngoc Cuong Nguyên	Polar sets for quasi-plurisubharmonic functions on compact Hermitian manifolds	
15:55-16:15	Coffee Break		
16:15-16:55	Xiaoshan Li	On the Bergman metric of a pseudoconvex domain with a strongly pseudoconvex polyhedral boundary point	Wen Lu
17:00-17:40	Hendrik Herrmann	Bergman kernel asymptotics in complex and CR geometry	
18:00-20:30	Banquet: Wuhan Private Room, Tangyan Seafood Restaurant		

Workshop Program（15 Mar）

Venue：B101 Haiqin No.2 Building

Time	Speaker	Title	Chair
09:00-09:40	Chin-Yu Hsiao	Bergman kernel asymptotics on weakly pseudoconvex domains	Xiaonan Ma
09:45-10:25	Bo Liu	Real analogue of arithmetic K-theory	
10:25-10:50	Coffee Break		
10:50-11:30	Zhiwei Wang	Recent progress on complex Hessian equations	Rung-Tzung Huang
12:00-13:30	Buffet Lunch: Kingsoft Restaurant, 2F, Qingzhu Hotel		
14:30-15:10	Songyan Xie	A universal central limit theorem for intersection currents of random holomorphic sections	Weixia Zhu
15:15-15:55	Nikhil Savale	Quantitative Weyl's law for Toeplitz operators	
15:55-16:15	Coffee Break		
16:15-16:55	Huan Wang	Nakano-Griffiths inequality, holomorphic Morse inequalities, and extension theorems for q-concave domains	Hanlong Fang
17:00-17:40	Bingxiao Liu	Tian's theorem for Grassmannian embeddings and degeneracy sets of random sections	
18:00-20:00	Buffet Dinner: Kingsoft Restaurant, 2F, Qingzhu Hotel		

Abstract

Title: Rigidity and multiplicity of singularities assocaited to ample vector bundles

Speaker: Fusheng Deng (University of Chinese Academy of Sciences)

Abstract: We show that the irreducible desingularization of an isolated singularity given by the Grauert blow down of a negative vector bundle is unique up to isomorphism, and give a formula for the multiplicty of an isolated singularity given by the Grauert blow down of an exceptional divisor in a complex manifold. The second result can be applied to give exact formula or estimate for the multiplicity of an isolated singularity given by the Grauert blow down of a negative vector bundle. In the special case that the base is a compact Riemann surface and the line bundle is given by the divisor of a single point, this is closely related to the classical results about Weierstrass points of compact Riemann surfaces. This lecture is based on joint work with Yinji Li, Qunhuan Liu, and Xiangyu Zhou.

Title: Bergman kernel asymptotics in complex and CR geometry

Speaker: Hendrik Herrmann (University of Vienna)

Abstract: The asymptotic expansion of Bergman kernels for high tensor powers of positive holomorphic line bundles encodes geometric information of the underlying complex manifold. In this talk, we revisit this expansion and describe its geometric consequences, in particular for the approximation of Kähler metrics. We then turn to the CR setting, where the absence of ellipticity introduces new analytic features, and discuss how analogous asymptotic phenomena emerge despite these structural differences.

Title: Bergman kernel asymptotics on weakly pseudoconvex domains

Speaker: Chin-Yu Hsiao (National Taiwan University)

Abstract: In this talk, I will report my recent works about Bergman kernel asymptotics on weakly pseudoconvex domains. This talk is based on joint work with George Marinescu, Xiaoshan Li and Guokuan Shao.

Title: On the Bergman metric of a pseudoconvex domain with a strongly pseudoconvex polyhedral boundary point

Speaker: Xiaoshan Li (Wuhan University)

Abstract: Let D be a pseudoconvex domain, possibly unbounded, that contains a non-smooth strongly pseudoconvex polyhedral boundary point. We show that the Bergman metric of D is not Einstein. This talk is based on a joint work with Xiaojun Huang and Scott James.

Title: Tian's theorem for Grassmannian embeddings and degeneracy sets of random sections

Speaker: Bingxiao Liu (Great Bay University)

Abstract: In this talk, I will present an extension of Tian's approximation theorem to the setting of Grassmannian embeddings and discuss applications to the equidistribution of degeneracy sets of random holomorphic sections. Let (X, ω) be a compact Kähler manifold, (L, h^L) a positive line bundle, and (E, h^E) a Hermitian holomorphic vector bundle of rank $r \geq 1$ on X. We prove that the pullback by the Kodaira embedding associated to $L^p \otimes E$ of the k-th Chern class of the dual of the universal bundle over the Grassmannian converges as $p \to \infty$ to the k-th power of the Chern form $c_1(L, h^L)$ for $0 \leq k \leq r$. If $c_1(L, h^L) = \omega$, we also determine the second term in the semiclassical expansion, which involves $c_1(E, h^E)$. As a consequence, we show that the limit distribution of zeros of random sequences of holomorphic sections of $L^p \otimes E$ is equidistributed on X with respect to

$c_1(L, h^L)^r$. Furthermore, we compute the expectation of the currents of integration along degeneracy sets of random holomorphic sections. This is a joint work with Turgay Bayraktar, Dan Coman, and George Marinescu.

Title: Real analogue of arithmetic K-theory

Speaker: Liu Bo (East China Normal University)

Abstract: In 1957, in order to formalize his work on Riemann-Roch theorem, Grothendieck introduced the K-theory in algebraic geometry. In 1959, Atiyah and Hirzebruch constructed the topological K-theory as the real counterpart. Later, using the topological K-theory, Atiyah and Singer gave a new proof of the famous index theorem as a part of the topological version of the Riemann-Roch theorem. In 1990, in order to extend the Arakelov theory to the higher dimension, Gillet and Soule extended the K-theory to the arithmetic K-theory in arithmetic algebraic geometry. In 2008, Gillet, Roessler and Soule proved the famous arithmetic Riemann-Roch theorem in Arakelov geometry. In this talk, we will discuss the real analogue of the arithmetic K-theory, called the differential K-theory. It is a new research field in 21 century which is motivated by the study of theoretical physics. We will mainly focus on the comparison of these K-theories. In particular, we will explain a localization formula in differential K-theory, which is a joint work with Xiaonan Ma.

Title: A rigidity phenomenon on higher-rank irreducible lattices of the Hermitian type with respect to bounded holomorphic functions and an application to Kähler geometry

Speaker: Ngaiming Mok (The University of Hong Kong)

Abstract: Let $\Omega \Subset \mathbb{C}^n$ be a bounded symmetric domain and $\Gamma \subset \mathrm{Aut}(\Omega)$ be a torsion-free irreducible lattice, and we write $X_\Gamma := \Omega/\Gamma$. Let $\mathbf{V}$ be a complex vector space of *bounded holomorphic function* on Ω such

that $\mathbb{C} \subsetneq \mathbf{V} \subset H^\infty(\Omega)$. Suppose $\mathbf{V}$ is Γ-invariant and it is closed under taking limits within the Banach unit ball $\mathbf{B} \subset H^\infty(\Omega)$ with respect to uniform convergence on compact subsets. When Ω is of rank ≥ 2 we prove that $\mathbf{V}$ must necessarily be $H^\infty(\Omega)$. The same fails in general for Ω of rank 1.

The aforementioned rigidity property of irreducible lattices $\Gamma \subset \mathrm{Aut}(\Omega)$ was implicitly established in a joint work of the author with Kwok-Kin Wong (2025). The proof makes use of the boundary behaviour of bounded holomorphic functions on the complex unit ball $\mathbb{B}^m$ and Moore's ergodicity theorem on semisimple Lie groups. Let $\left(Y, ds_Y^2\right)$ be a complete Kähler-Einstein manifold of finite volume and $f: X_\Gamma \to Y$ be a holomorphic functions which induces an isomorphism $f_*: \Gamma \xrightarrow{\cong} \pi_1(Y)$ on fundamental groups. We proved that $f: X_\Gamma \xrightarrow{\cong} Y$ under the assumption that the universal covering space $\widetilde{Y}$ is Carathédory hyperbolic, i.e, that the Carathédory pseudo-metric is a (complex Finsler) metric. This applies in particular to the case of $Y = D/\Gamma'$ where D is a bounded domain of holomorphy, in which case the existence of a canonical $\mathrm{Aut}(D)$-invariant Kähler-Einstein metric was proven by Cheng-Yau (1980) and its completeness was established by Mok-Yau (1982). When we consider $Y = D/\Gamma'$ where D is any bounded domain, the same was proven by Mok-Wong under the assumption Volume $(Y, \mu_Y) < \infty$ with respect to the Kobayashi-Eisenmann measure μ_Y on Y by working with the hull of holomorphy $D \supset D$ and proving that $\widehat{D} - D$ is of zero Lebesgue measure.

Title: Polar sets for quasi-plurisubharmonic functions on compact Hermitian manifolds

Speaker: Ngoc Cuong Nguyen (Korea Advanced Institute of Science & Technology)

Abstract: This is joint work with S. Kolodziej. We prove a sharp decay of capacity of sublevel sets of a ω-plurisubharmonic functions on a

n-dimensional compact Hermitian manifold (X, ω) by a global argument. This result also holds for a general class of (ω, m)-subharmonic functions $1 \leq m \leq n$ on such a manifold. We also obtain the full characterizations of polar sets of such functions in terms of the corresponding local and global capacities, and of the extremal functions in Hermitian setting.

Title: Siu's analyticity theorem for positive pluriharmonic currents

Speaker: Viêt-Anh Nguyên (Université de Lille)

Abstract: Let T be a positive dd^c-closed current of bidimension $(1, 1)$ on a projective manifold X. We show that for every $c > 0$ the set of points of X where the Lelong number of T is larger or equal to c is an analytic subset of dimension at most 1 of X. Moreover, the following Siu decomposition holds

$$T = \sum_{i \in I} \lambda_i [V_i] + T_0,$$

where $\{V_i\}_{i \in I}$ is a (possibly empty) finite or countable family of compact analytic curves in X, $\lambda_i \in \mathbb{R}^+$, and T_0 is a positive dd^c-closed current of bidimension $(1, 1)$ on X whose Lelong number vanishes outside a finite or countable set. As a consequence, the cohomology class of every positive dd^c-closed current of bidimension $(1, 1)$ on X, which does not give mass to any proper analytic set, belongs to the movable cone $\mathcal{M}$. This is a joint-work with Tien-Cuong Dinh (National University of Singapore).

Title: Quantitative Weyl's law for Toeplitz operators

Speaker: Nikhil Savale (Trinity College Dublin)

Abstract: We prove a general estimate for the Weyl remainder of a Toeplitz operator in terms of volumes of recurrence sets for the Hamilton flow of its principal symbol. This extends classical results by Boutet de Monvel - Guillemin and semiclassical ones by Borthwick - Paul - Uribe on Toeplitz operators. And generalizes recent work of the author from the

pseudodifferential case. Time permitting, some examples will be given.

Title: Nakano-Griffiths inequality, holomorphic Morse inequalities, and extension theorems for q-concave domains

Speaker: Huan Wang (Henan Academy of Sciences)

Abstract: The history of holomorphic Morse inequalities was initiated from the seminal work of J.-P. Demailly, which was influenced by the Witten's analytic proof of classical Morse inequalities and Siu's solution of Grauert - Riemenschneider conjecture on Moishezon manifolds . These inequalities provide a flexible way to produce holomorphic sections of high tensor powers of line bundle under mild positivity assumption and have various generalizations in complex geometry. We will recall this subject and introduce our results jointly with Bingxiao Liu and George Marinescu in arXiv:2506.00879. We establish a general Nakano–Griffiths inequality with boundary conditions and apply it to derive holomorphic Morse inequalities for domains satisfying analytic convexity assumptions. As applications, we obtain extension theorems for q-concave domains.

Title: Recent progress on complex Hessian equations

Speaker: Zhiwei Wang (Beijing Normal University)

Abstract: The complex Hessian equation is a very important class of equations in complex geometry. In this talk, we will introduce recent advances in the study of complex Hessian equations, as well as some of our recent work. The content of the talk is based on collaborations with Kai Pang, Haoyuan Sun, and Professor Xiangyu Zhou.

Title: A universal central limit theorem for intersection currents of random holomorphic sections

Speaker: Xie Songyan (Chinese Academy of Sciences)

Abstract: In 2010, Shiffman and Zelditch established a fundamental central

limit theorem for the smooth statistics of zero sets of Gaussian random holomorphic sections. They further suggested a natural twofold generalization: extending from zeros in codimension one to common zeros of several sections-i.e., to intersection currents in higher codimension-and passing from smooth statistics to numerical ones, such as intersection numbers.

For more than a decade, this generalization remained an open problem. In this talk, I will present a complete solution, obtained by my Ph.D. student Bin Guo. He has proved a universal central limit theorem that applies to both smooth and numerical statistics arising from several independent Gaussian holomorphic sections. This result fully extends the theorem of Shiffman and Zelditch.

Title: Bounding smooth Levi-flat hypersurfaces in a Stein manifold

Speaker: Wanke Yin (Wuhan University)

Abstract: In this talk, we will focus on the problem of constructing a smooth Levi-flat hypersurface locally or globally attached to a real codimension two submanifold in $\mathbb{C}^{n+1}$, or more generally in a Stein manifold, with elliptic CR singularities. This is a question left open from the work of Dolbeault-Tomassini-Zaitsev, or a generalized version of a problem already asked by Bishop in 1965. Our study reveals an intricate interaction of Several Complex Variables with Symplectic Geometry and Foliation Theory. This is based on a recent joint work with H. Fang, X. Huang and Z. Zhou.

Participants

Name	Affiliation
Anjali Bhatnagar	Wuhan University
Zhangchi Chen	East China Normal University
Fusheng Deng	University of Chinese Academy of Sciences
Hanlong Fang	Peking University
Hendrik Herrmann	University of Vienna
Chin-Yu Hsiao	National Taiwan University
Rung-Tzung Huang	National Central University
Xiaoshan Li	Wuhan University
Zhenghao Li	Institute for Basic Science
Bingxiao Liu	Great Bay University
Bo Liu	East China Normal University
Zhuo Liu	Chongqing University of Technology
Zihao Liu	East China Normal University
Wen Lu	Huazhong University of Science and Technology
Xiaonan Ma	Nankai University
George Marinescu	Universität zu Köln
Ngaiming Mok	The University of Hong Kong
Duc Bao Nguyên	National University of Singapore
Ngoc Cuong Nguyên	Korea Advanced Institute of Science & Technology

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Weixia Zhu	Xiamen University
Hongrong Chen	Sun Yat-sen University
Guokuan Shao	Sun Yat-sen University
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Wei Xia	Sun Yat-sen University
Hang Xu	Sun Yat-sen University
Wang Xu	Sun Yat-sen University