2023 Workshop on Explicit Birational Geometry
2023 精细双有理几何会议

会议手册

2023 年 **4** 月 **21** 日– **23** 日
复旦大学，上海

2023 Workshop on Explicit Birational Geometry
2023 精细双有理几何会议

2023 年 4 月 21 日- 23 日
复旦大学，上海

院士论坛报告人 Distinguished Lecture Speakers
Caucher Birkar（清华大学）
周向宇（中国科学院数学与系统科学研究院）

邀请报告人 Speakers
陈亦飞（中国科学院数学与系统科学研究院）
杜荣（华东师范大学）
韩京俊（复旦大学）
胡勇（上海交通大学）
江智（复旦大学）
刘文飞（厦门大学）
刘海东（中山大学）
刘杰（中国科学院数学与系统科学研究院）
余讯（天津大学）

组织委员会 Organizing Committee
陈猛（复旦大学）
江辰（复旦大学）

主办单位 Sponsors
复旦大学数学科学学院
上海数学中心

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日程安排 Schedule

院士论坛地点：复旦大学光华楼东辅楼 202
Distinguished Lecture: Fudan University, Guanghua East Sub Tower 202

会议地点：复旦大学光华楼东主楼 2201
Venue: Fudan University, Guanghua East Main Tower 2201

4/21	
14:00 - 15:00	**院士论坛 Distinguished Lecture** **周向宇 Xiangyu Zhou**
	茶歇 Tea Break
15:30 - 16:30	**陈亦飞 Yifei Chen**
16:40 - 17:40	**刘文飞 Wenfei Liu**
	晚餐 Dinner
4/22	
10:00 - 11:00	**院士论坛 Distinguished Lecture** **Caucher Birkar**
	午餐 Lunch
14:00 - 15:00	**胡勇 Yong Hu**
	合影&茶歇 Group Photo &Tea Break
15:30 - 16:30	**刘杰 Jie Liu**
16:40 - 17:40	**江智 Zhi Jiang**
	晚宴 Banquet
4/23	
9:00 - 10:00	**余讯 Xun Yu**
	茶歇 Tea Break
10:30 - 11:30	**韩京俊 Jingjun Han**
	午餐 Lunch
14:00 - 15:00	**刘海东 Haidong Liu**
	茶歇 Tea Break
15:30 - 16:30	**杜荣 Rong Du**

报告题目摘要 Titles & Abstracts

院士论坛 Distinguished Lectures

报告人：周向宇 Xiangyu Zhou

题目: 从商高的勾股定理证明谈起

摘要: 本演讲从商高证明勾股定理谈起，介绍商高-赵爽“形体不变量”思想，事实上这种思想贯穿于几何、拓扑乃至多复变等的研究发展中；继而简要介绍多复变基本内容与近期进展。

报告人：Caucher Birkar

题目: Explicit birational geometry

摘要: In this talk I will outline the general framework of the classification theory of algebraic varieties. I will then mention various problems about the explicit version of this classification theory.

会议报告 Conference Talks

报告人：陈亦飞 Yifei Chen

题目: Sarkisov program and its application

摘要: Minimal model program has two outputs：one is a minimal model and the other is a Mori fiber space. In other works, over the field of complex numbers, it is conjectured that any variety is birational either to a minimal model or a Mori fiber space. Sarkisov program asserts that any birational map of Mori fiber spaces can be decomposed into 4 types of links. It has many applications in birational geometry. We will introduce the Sarkisov program and latest progress. It is a joint work with Yanze Wang.

报告人：刘文飞 Wenfei Liu

题目: On numerically trivial automorphisms of surfaces of log general type

摘要: In the study of the automorphism group $\mathrm{Aut}(X)$ of a projective variety X, it is natural to consider the cohomological representation $\varphi: \mathrm{Aut}(X) \to \mathrm{Aut}(H^*(X, \mathbb{Q}))$. We denote the kernel of φ by $Aut_{\mathbb{Q}}(X)$, and call it the group of numerically trivial automorphisms. By now, the group $Aut_{\mathbb{Q}}(X)$ has been extensively investigated by several authors for smooth projective surfaces. In this talk, I will report on some recent work on $Aut_{\mathbb{Q}}(X)$ for surfaces of log general type with klt

singularities. One conclusion is that the order $|Aut_{\mathbb{Q}}(X)|$ is uniformly bounded by a constant, if either $q(X) > 0$ or $p_g(X) > 1$. This is a joint work in progress with Zhi Jiang (江智).

报告人：胡勇 Yong Hu

题目: Algebraic threefolds of general type with small volume

摘要：It is known that the optimal Noether inequality $\vol(X) \ge \frac{4}{3}p_g(X) - \frac{10}{3}$ holds for every 3-fold X of general type with $p_g(X) \ge 11$. In this talk, I will introduce the second and the third optimal Noether inequality for minimal threefolds of general type with $p_g(X) \ge 11$. The new phenomenon in dimension three shows that there is a one-to-one correspondence between the three Noether inequalities and three possible residues of $p_g(X)$ modulo 3. If time permits, I will give a complete classification of 3-folds X of general type with $p_g(X) \ge 11$ satisfying the first Noether equality. This is a joint work with Tong Zhang.

报告人：刘杰 Jie Liu

题目: Cotangent bundles of smooth complete intersections of two quadrics

摘要：The cotangent bundle of a complex projective manifold carries a natural holomorphic symplectic form, rendering it a (non-compact holomorphic) symplectic manifold. Though the symplectic geometry of these non-compact complex manifold has only been studied in a very few special classes of projective manifolds, e.g. moduli space of (parabolic) stable vector bundles over curves and rational homogeneous spaces, it exhibits already remarkably rich geometry in these limited samples. In this talk, I will report on a work aimed to show that the symplectic geometry of the cotangent bundles of smooth complete intersections of two quadrics shares many common features with that of moduli spaces of stable vector bundles. This is a joint work in progress with Arnaud Beauville, Antoine Etesse, Andreas Höring and Claire Voisin.

报告人：江智 Zhi Jiang

题目: On varieties of general type with many global forms

摘要: By the work of Jungkai Chen and Meng Chen on geography of 3-folds of general type, we know that it is important to understand the geometry of 3-folds with a non-zero 2-form. We propose here a method to study explicit birational geometry of varieties of general type with many global k-forms.

报告人：余讯 Xun Yu

题目: Smooth complex projective varieties with infinitely many real forms

摘要: The real form problem asks how many different ways one can describe a given complex variety by polynomial equations with real coefficients, up to isomorphisms over the real number field. In this talk, I will discuss some recent results about smooth complex projective varieties with infinitely many

real forms. This talk is based on joint works with T.-C. Dinh, C. Gachet, H.-Y. Lin, K. Oguiso, and L. Wang.

报告人：韩京俊 Jingjun Han

题目: On uniform boundedness conjecture for minimal log discrepancies

摘要: Uniform boundedness conjecture for minimal log discrepancies (mld) predicts that there always exists a prime divisor E over X\ni x, such that a(E,X,B) computing the mld of (X\ni x,B), and a(E,X,0) is uniformly bounded from above provided that the coeffienets of B belongs to a fixed DCC set. This conjecture is closely related to the ACC conjecture for mlds. In this talk, I will report recent progress towards this conjecture. The talk is based on joint works with Jihao Liu, Yujie Luo, and V.V. Shokurov.

报告人：刘海东 Haidong Liu

题目: On a type of Miyaoka type inequality for terminal threefolds with nef anti-canonical divisors

摘要: In 90s, Koll\'{a}r expected to give a structure theory for minimal 3-folds with $c_1\cdot c_2=0$, and find a universal lower bound $-c_1\cdot c_2\geq \epsilon >0$ for the rest case. This expectation can be naturally generalized to any dimensions and terminal varieties with nef anti-canonical divisors. In this talk, I will show a rough classficiation for terminal 3-folds with nef anti-canonical divisors and $c_1\cdot c_2=0$, and give a lower bound $c_1\cdot c_2\geq 1/252$ for the rest case. This is a joint work with Chen Jiang.

报告人：杜荣 Rong Du

题目: An identity on Chern numbers and its applications

摘要: For compact Kähler-Einstein manifolds such as projective manifolds with ample canonical bundle, we find an expression of Chern numbers in the form of the holomorphic sectional curvatures at a fixed point by algebraic invariant theory. As applications, we get a reverse Miyaoka-Yau inequality, improve the classical 1/4-pinched theorem and negative 1/4-pinched theorem to smaller pinching constant, confirm Yau's conjecture for positive holomorphic sectional curvature and confirm Siu-Yang's conjecture for negative holomorphic sectional curvature even for higher dimensions. Moreover, using the new reverse Miyaoka-Yau inequality, we can easily construct smooth projective manifolds with ample canonical bundles but not with negative holomorphic sectional curvatures for any dimension.

参会人员名单

姓名	学校
Caucher BIRKAR	清华大学
Ioannis TSOUKNIDAS	北京雁栖湖应用数学中心
昌文涛	复旦大学
陈炳仪	清华大学
陈国度	西湖大学
陈敬珊	中国科学技术大学
陈猛	复旦大学
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江辰	复旦大学
江孝炜	清华大学
江智	复旦大学
李骏	复旦大学
李濛初	复旦大学
李思辰	华东理工大学
李泽宇	HSE
李志远	复旦大学
刘海东	中山大学
刘核旭	复旦大学
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