

第二届南开大学-南方科技大学数学联合会

The 2nd NKU-SUSTech Joint Conference on Mathematics

Schedule of Lectures

October 15th (Thursday)

Time	Speaker	Title	Host
8:40-9:00	开幕式及合影 Opening Ceremony, then Group Photo		
9:00-9:50	尤建功 Jiangong You	Can KAM Work for Rough Systems?	余国巍 Guowei Yu Seminar Room 216
9:50-10:20	茶歇 Tea Break		
10:20-11:10	Pedro Salomao	Birkhoff conjecture and finite energy foliations in Hill's lunar problem	
11:10-12:00	董长光 Changguang Dong	Cohomological Equations for algebraic systems without Accessibility	
14:00-14:50	李琼玲 Qiongling Li	Harmonic metric on nilpotent Higgs bundles over noncompact surfaces	王文龙 Wenlong Wang Seminar Room 214
14:50-15:20	茶歇 Tea Break		
15:20-16:10	师子鸣 Ziming Shi	The method of homotopy formula and some applications	
16:10-17:00	周茂林 Maolin Zhou	On Asymmetric Water Waves	

October 16th (Friday)

Time	Speaker	Title	Host
9:00-9:50	Raul Ures	Entropy and semiconjugacy on surfaces	周茂林 Maolin Zhou Seminar Room 216
9:50-10:20	茶歇 Tea Break		
10:20-11:10	王文龙 Wenlong Wang	Metric Extension Problem under Curvature Conditions	
11:10-12:00	Ilya Kossovskiy	Stokes Phenomenon in CR geometry	

Abstracts

1. **Speaker:** Changguang Dong (Nankai University)

Title: Cohomological Equations for algebraic systems without Accessibility

Abstract. The cohomological equation is a basic tool in smooth dynamics. For partially hyperbolic systems, periodic cycle functionals along stable and unstable paths provide natural obstructions to solvability. When accessibility fails, however, reconstructing a transfer function along these paths leaves a transverse regularity problem.

In this talk, I will present a criterion for smooth solvability modulo constants over every ergodic automorphism of a compact nilmanifold: it is enough that the cycle functionals vanish on null-homotopic stable–unstable cycles. I will also discuss an analogous result for compact homogeneous maps and flows under exponential mixing and a property (T) hypothesis on the subgroup generated by the stable and unstable directions.

The talk is based on joint work with Weisheng Wu.

2. **Speaker:** Ilya Kossovskiy (Southern University of Science and Technology)

Title: Stokes Phenomenon in CR geometry

Abstract. In our joint work with Shafikov (JEMS, 2016), we proved that the formal versus holomorphic equivalence problems in CR geometry are distinct.

This shows, in particular, that CR geometry enjoys the Stokes Phenomenon: the existence of additional holomorphic invariants supplementing a formal normal form.

Describing the Stokes phenomenon explicitly has been an open problem since then.

In our joint work with Laurent Stolovitch, we make a significant progress in solving this problem. In particular, we show that the respective (formal versus holomorphic) moduli space of analytic CR hypersurfaces in C^2 is, somewhat surprisingly, finite-dimensional (and generically empty). The construction that we use is based on the Multisummability theory in Dynamical Systems.

3. **Speaker:** Qionglin Li (Nankai University)

Title: Harmonic metric on nilpotent Higgs bundles over noncompact surfaces

Abstract. In non-abelian Hodge theory, a harmonic metric is the key link between a Higgs bundle and a flat connection. We study the existence of a harmonic metric of a generically regular nilpotent Higgs bundle over a noncompact hyperbolic Riemann surface. The proof extends the Kalka–Yang theorem for prescribed curvature equation to a coupled system using sub/supersolutions and comparison principles. As an application, the branch set of an equivariant branched minimal disk in hyperbolic 3-space is the critical set of a holomorphic self-map of unit disk.

4. **Speaker:** Pedro Salomao (Southern University of Science and Technology)

Title: Birkhoff conjecture and finite energy foliations in Hill's lunar problem

Abstract. Hill's lunar problem is a classical model in celestial mechanics that describes the motion of the Moon under the combined gravitational influence of the Earth and the Sun. Introduced by George W. Hill in the nineteenth century, it arises as a limiting case of the restricted three-body problem and remains a fundamental model in celestial mechanics. In this talk, I will discuss recent results on the global dynamics of Hill's lunar problem obtained using techniques from contact and symplectic topology. Below the critical energy, I will explain how strict convexity of the regularized energy hypersurfaces leads to disk-like global surfaces of section, confirming a conjecture of Birkhoff for Hill's problem. As a consequence, the dynamics can be described by an area-preserving return map on a disk. I will also discuss the dynamics slightly above the critical energy, where the topology of the regularized energy hypersurface changes. In this case, finite energy foliations provide a global organization of the flow by pseudo-holomorphic curves, leading to strong dynamical consequences, including the existence of infinitely many periodic orbits and infinitely many trajectories connecting the Lyapunov orbits. The talk is based on joint work with Lei Liu (Shandong University).

5. **Speaker:** Ziming Shi (Southern University of Science and Technology)

Title: The method of homotopy formula and some applications

Abstract. The homotopy formula is a powerful tool in several complex variables. In this talk, we will introduce the basics of the method, and then discuss its connection to two fundamental problems in complex analysis and geometry: the global regularity of the Cauchy-Riemann ($\bar{\partial}$) equation, and the deformation theory of complex structures on manifolds with boundary.

6. **Speaker:** Raul Ures (Southern University of Science and Technology)

Title: Entropy and semiconjugacy on surfaces

Abstract. How much of a dynamical system is determined by its topology and its entropy? A pseudo-Anosov map of a closed surface provides a geometric model based on expansion and contraction and minimizes topological entropy within its isotopy class. A theorem of Handel shows that any homeomorphism in this class with the same entropy admits a semiconjugacy to the model: a continuous surjection that sends orbits to orbits, possibly identifying distinct points.

In this talk, I will explain how minimizing entropy constrains the information that this correspondence loses. We prove that, for an infinitely differentiable diffeomorphism isotopic to a pseudo-Anosov map and having the same topological entropy, every fiber of Handel's semiconjugacy is cellular: it is the intersection of a nested sequence of closed topological disks. In particular, all fibers are connected. We also prove that the model's maximal-entropy measure has a unique invariant lift and that the semiconjugacy itself is a measure-theoretic isomorphism between these measures. These results connect the topology of the fibers with the statistical behavior of the dynamics.

This is joint work with Pablo D. Carrasco, Federico Rodriguez Hertz, and Jana Rodriguez Hertz.

7. **Speaker:** Wenlong Wang (Nankai University)

Title: Metric Extension Problem under Curvature Conditions

Abstract. Gromov asked whether every smooth metric on the boundary of a compact manifold extends to a metric of positive scalar curvature on the whole manifold. In this talk, I will first review the resolution of this question and its application to the non-fill-in problem, based on joint work with Prof. Yuguang Shi and Guodong Wei. I will then discuss recent progress on the metric extension problem under stronger curvature conditions, based on joint work with Jintian Zhu. We prove that extensions exist with any prescribed positive lower bound for Ricci curvature, but may fail to exist under positive sectional curvature. For negative sectional curvature, we identify a global obstruction and prove solvability for a class of manifolds. This class includes handlebodies and disk bundles over closed negatively curved manifolds and is closed under boundary connected sums.

8. **Speaker:** Jiangong You (Nankai University)

Title: Can KAM Work for Rough Systems?

Abstract. We develop a perturbative KAM reducibility theory for one-frequency $SL(2, \mathbb{R})$ cocycles based on an admissible Fourier length ℓ . The regularity relevant to the iteration is measured by positive adapted Fourier width rather than ordinary smoothness in the Euclidean Fourier variable $|n|$. The same length governs Fourier decay, truncation and resonance scales, and the arithmetic condition controlling the small divisors. This framework contains the classical analytic and Gevrey settings, while nonradial choices of ℓ allow classical nowhere differentiable Weierstrass-type perturbations and continuous perturbations outside every positive Hölder class. As spectral applications, we obtain purely absolutely continuous spectrum for every phase and $1/2$ -Hölder continuity of the integrated density of states for the associated quasiperiodic Schrödinger operators. The Aubry dual has pure point spectrum for Lebesgue almost every dual phase, with eigenfunctions exponentially localized in the metric induced by ℓ . We also construct nowhere differentiable quasiperiodic potentials with purely absolutely continuous Cantor spectrum. This is a joint work with Xueyin Wang.

9. **Speaker:** Maolin Zhou (Nankai University)

Title: On Asymmetric Water Waves

Abstract. This talk is concerned with the first construction of asymmetric travelling-wave solutions to the two-dimensional water-wave equations, both with and without surface tension.