

Mini Workshop on Geometry of Moduli Spaces

Date: October 9 (Wed) - 10 (Thu), 2019

Place: Room B301, Graduate School of Science, Kobe Univ.

	10:00-11:00	11:20-12:20	14:00-15:00	15:20-16:20
October 9 (Wed)	Biswas	Saito	Komyo	Kasuya
October 10(The)	Matsubara	Sano	Yoshino	Inaba

October 9 (Wed)

10:00 – 11:00 **Indranil Biswas** (Tata Institute of Fundamental Research)

Symplectic geometry of moduli space of framed Higgs bundles

11:20 – 12:20 **Masa-Hiko Saito** (Kobe University)

Apparent singularities of connections and Higgs bundles on a curve and canonical coordinates of their moduli spaces.
(A joint work with S. Szabo).

14:00 – 15:00 **Arata Komyo** (Kobe University)

Hamiltonian structures of isomonodromic deformations on moduli spaces of parabolic connections

15:20 – 16:20 **Hisashi Kasuya** (Osaka University)

Higgs bundles and flat connections over compact Sasakian manifolds

October 10 (Thu)

10:00 – 11:00 **Yuki Matsubara** (Kobe University)

On the Cohomology of Moduli Space of Parabolic Connections

11:20 – 12:20 **Taro Sano** (Kobe University)

On log deformations of degenerate Calabi-Yau varieties

14:00 – 15:00 **Masaki Yoshino** (RIMS, Kyoto University)

A Kobayashi-Hitchin correspondence between Dirac-type singular mini-holomorphic bundles and HE-monopoles

15:20 – 16:20 **Michi-aki Inaba** (Kyoto University)

Unfolding of the unramified irregular singular generalized isomonodromic deformation

Organizers

Indranil BISWAS (Tata Institute of Fundamental Research)

Michi-aki INABA (Kyoto University)

Masa-Hiko SAITO (Kobe University)

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URL

<http://www2.kobe-u.ac.jp/~mhsaito/1910kobe/index.html>

Titles and Abstracts

Indranil Biswas (Tata Institute of Fundamental Research)

Title: Symplectic geometry of moduli space of framed Higgs bundles

Abstract: We construct a holomorphic symplectic structure on a moduli space of framed Higgs G -bundles and study its properties. This is a Joint work with Marina Logares and Ana Peon.

Michi-aki Inaba (Kyoto University)

Title: Unfolding of the unramified irregular singular generalized isomonodromic deformation

Abstract: The unramified irregular singular generalized isomonodromic deformation, or the Jimbo-Miwa-Ueno equation, can be given as a subbundle with the integrability condition of the tangent bundle of the moduli space of unramified irregular singular connections. We will give an analytic local extension of this subbundle to a subbundle of the tangent bundle of the family of moduli spaces whose generic fiber is the moduli space of regular singular connections and whose special fiber is the moduli space of unramified irregular singular connections. We call this extension an unfolding of the irregular singular generalized isomonodromic deformation. In this talk I will give an idea of the construction of this non-canonical local lift, which can be given systematically.

Hisashi Kasuya (Osaka University)

Title: Higgs bundles and flat connections over compact Sasakian manifolds

Abstract: It is known that on a compact Kahler manifold, there is a correspondence between semisimple flat vector bundles and polystable higgs bundles with vanishing Chern classes via harmonic metrics (Simpson-Corlette). The purpose of this talk is to give the Sasakian (odd dimensional analogue of Kahler geometry) version of this correspondence. We prove that on a compact Sasakian manifold, there is an correspondence between semisimple flat vector bundles and the polystable basic Higgs bundles with vanishing basic Chern classes. (Joint work with Indranil Biswas, arXiv:1905.06178)

Arata Komyo (Kobe University)

Title: Hamiltonian structures of isomonodromic deformations on moduli spaces of parabolic connections

Abstract: We give a Hamiltonian description of the vector field determined by the isomonodromic deformation on a moduli space of parabolic connections. The moduli space of parabolic connections is constructed by Inaba-Iwasak-Saito and Inaba. Hamiltonian description of the isomonodromic deformation on moduli spaces of certain connections was essentially given by Krichever and Hurtubise. We apply their ideas to the moduli space of parabolic connections. First, we give a description of the vector field determined by the isomonodromic deformation as an element of the hypercohomology of a certain complex. Second, we recall the natural symplectic structure of the moduli space of parabolic connections, and we define Hamiltonian functions on étale open sets of the moduli space of parabolic connections. By the description of the isomonodromic deformation, we can show that this symplectic

structure and these Hamiltonian functions give a Hamiltonian description of the isomonodromic deformation.

Yuki Matsubara (Kobe University)

Title: On the Cohomology of Moduli Space of Parabolic Connections

Abstract: We consider the moduli space of logarithmic connections of rank 2 on the projective line minus 5 points with fixed spectral data. We compute the cohomology of such moduli space, and this computation will be used to extend the results of Geometric Langlands correspondence due to D. Arinkin to the case where this type of connections have five simple poles on P^1 . In this talk, I will review the Geometric Langlands Correspondence in the tamely ramified cases, and after that, I will explain how the cohomology of above moduli space will be used.

Masa-Hiko Saito (Kobe University)

Title: Apparent singularities of connections and Higgs bundles on a curve and canonical coordinates of their moduli spaces. (A joint work with S. Szabo).

Abstract: TBA

Taro Sano (Kobe University)

Title: On log deformations of degenerate Calabi-Yau varieties

Abstract: Kawamata–Namikawa developed log deformation theory of normal crossing varieties. By using this, we can construct Calabi-Yau manifolds as smoothings of normal crossing varieties. I'll explain construction of non-Kähler Calabi-Yau 3-folds by this method. If time permits, I'll also mention recent results on smoothing of degenerate CY varieties and its application. This is based on joint work with Kenji Hashimoto.

Masaki Yoshino (RIMS, Kyoto University)

Title: A Kobayashi-Hitchin correspondence between Dirac-type singular mini-holomorphic bundles and HE-monopoles

Abstract: In this talk, we prove an analogue of the Kobayashi-Hitchin correspondence on compact connected 3-folds that is fibered on orbifold Riemann surfaces and satisfy an integrability condition, which contains compact connected Sasakian 3-folds. We define mini-holomorphic bundles on such 3-folds and the algebraic Dirac-type singularities on mini-holomorphic bundles, and prove that there exists a special Hermitian metric (admissible BHE-metric) on a Dirac-type singular mini-holomorphic bundle if the bundle satisfies a slope stability.