

Géométrie Algébrique et Géométrie Complexe

23 novembre au 27 novembre 2015

Programme des exposés de l'après-midi

Chiara Camere

Titre : Non-symplectic automorphisms of fourfolds of $K3^{[2]}$ -type

Résumé : In this talk I will first explain the classification of non-symplectic automorphisms of prime order of fourfolds of $K3^{[2]}$ -type and review some examples. In the second part of the talk I will discuss complex ball quotients arising as moduli spaces of pairs of a fourfold of $K3^{[2]}$ -type and a non-symplectic automorphism of prime order. This is joint work with S. Boissière and A. Sarti.

Olivier Debarre

Titre : Variétés dont la cohomologie est celle d'un tore

Résumé : Fabrizio Catanese a remarqué qu'une variété compacte kählérienne dont la cohomologie singulière entière est celle d'un tore complexe est en fait isomorphe à un tore. Avec Zhi Jiang, Martí Lahoz et William Sawin, nous montrons que ce n'est plus nécessairement le cas si on remplace les coefficients entiers par des coefficients rationnels. De façon plus générale, nous étudions la structure des variétés compactes kählériennes dont la cohomologie singulière entière est celle d'un tore complexe et construisons de nombreux exemples.

Thibaut Delcroix

Titre : Métriques de Kähler-Einstein sur les compactifications de groupes

Résumé : Wang et Zhu ont caractérisé l'existence de métriques de Kähler-Einstein sur les variétés toriques Fano en termes du barycentre du polytope associé. L'objectif de cet exposé est de présenter un résultat similaire pour les compactifications $G \times G$ -équivariantes Fano d'un groupe réductif G . Je présenterai le polytope moment associé à une telle variété et comment le barycentre de ce polytope par rapport à la mesure de Duistermaat-Heckman est lié à l'existence de métriques de Kähler-Einstein. La condition nécessaire et suffisante d'existence de métriques de Kähler-Einstein ainsi obtenue est vérifiable en pratique et donne de nouveaux exemples de variétés de Kähler-Einstein Fano (par exemple la compactification magnifique du groupe semisimple adjoint $\mathrm{PSL}(3, \mathbb{C})$).

Jérémy Guéré

Titre : Mirror Symmetry for singularities

Résumé : In 2007, Fan, Jarvis, and Ruan constructed an analogue of the Gromov-Witten (GW) theory of hypersurfaces in weighted projective spaces. The new theory is attached to quasi-homogeneous polynomial singularities and is usually called Fan-Jarvis-Ruan-Witten theory (FJRW). It is part of the general picture of Witten, where GW and FJRW theories arise as two distinct GIT quotients of the same model. I will first explain this idea under the light of mirror symmetry. Then I will present FJRW theory and the geometric problem it illustrates.

In particular, I will highlight a geometric property called concavity. For now, it is a necessary condition for explicit results on GW theory of hypersurfaces. But on the FJRW side, the situation has recently changed and I will describe my method based on Koszul cohomology to overcome this difficulty. As a consequence, I obtain a mirror symmetry theorem without concavity.

Ariyan Javanpeykar

Titre : The Lang-Vojta conjecture and arithmetic finiteness results for smooth hypersurfaces

Résumé : In 1983, Faltings proved the arithmetic Shafarevich conjecture for curves : for a finite set S of finite places of a number field K and an integer $g > 1$, the set of isomorphism classes of curves of genus g over K with good reduction outside S is finite. The aim of this talk is to explain that Faltings's finiteness theorem for curves fits in well with the Lang-Vojta conjecture. Moreover, we shall consider analogues of Faltings's finiteness theorems for hypersurfaces. We will prove, assuming the conjecture of Lang-Vojta, the analogous finiteness statement for smooth hypersurfaces of fixed degree and fixed dimension by constructing a moduli space for "hypersurfaces with level structure". Unconditionally, we prove the Shafarevich conjecture for hypersurfaces of Hodge level at most one, and some hypersurfaces of Hodge level 2. This is joint work with Daniel Loughran.

Victor Lozovanu

Titre : A Reider-type theorem for higher syzygies on abelian surfaces

Résumé : In this talk I would like to present a joint work with Alex Küronya about syzygies of ample line bundles on abelian surfaces. We study criteria for property N_p , introduced in the 80's by Green and Lazarsfeld, in terms of non-existence on the surface of elliptic curves of small degree. The main focus of the talk is to present the main ideas of how one can tackle such a problem, in which euclidean and convex geometry of Newton– Okounkov polygons play an essential role. This is due to the fact that first one can use these convex sets to describe the local positivity properties of the line bundle and second to find effective divisors with prescribed singularities.

Nicolas Perrin

Titre : Positivity of Quantum K-theory for grassmannians

Résumé : This is a joint work with A. Buch, P.-E. Chaput and L. Mihalcea. In this talk I shall explain that rational connectedness results as well as a good control on the singularities of some subvarieties of the variety of rational curves lying on a grassmannian (and some other rational homogeneous spaces) imply positivity results in quantum K-theory.

Matt Young

Titre : Cohomological Hall modules and Donaldson-Thomas theory with classical structure groups

Résumé : Given a complex reductive group G , there is expected to be a generalization of Donaldson-Thomas theory whose goal is to count, in an appropriate sense, stable principal G -bundles over a Calabi-Yau threefold. The standard Donaldson-Thomas theory arises when G is a general linear group. I will present some recent results on such a generalization when G is a classical group using the framework of quiver representations. The key new tool is a representation of Kontsevich and Soibelman's cohomological Hall algebra which is constructed from the cohomology of moduli stacks of quiver theoretic analogues of G -bundles. Conjecturally, the desired G -Donaldson-Thomas invariants are encoded in degrees of the generators of this representation. I will describe a number of situations where this conjecture has been confirmed.

Tony Yue Yu

Titre : Enumeration of curves via non-archimedean geometry

Résumé : I will begin by explaining motivations from mirror symmetry. Then I will present some new results concerning non-archimedean geometry. As an application, I will talk about the enumeration of curves in log Calabi-Yau surfaces. This gives rise to new geometric invariants inaccessible by classical methods. An explicit example for a del Pezzo surface will be presented, which verifies the conjectured wall-crossing formula.