Non-Kähler geometry day

Orsay 17 May 2022

Program

9h00-9h30:	*Welcome*
9h30-10h30:	Daniele Angella
10h30-11h00:	*Coffee break*
11h00-12h00:	Alexandra Otiman
12h00-14h00:	*Lunch*
14h00-15h00:	Dan Popovici
15h00-15h30:	*Coffee break*
15h30-16h30:	Sławomir Dinew

Abstract

Daniele Angella. *The Hermitian geometry of the Chern connection*

We consider some problems concerning the geometry of the Chern connection of Hermitian manifolds, e.g.: the existence of metrics with constant Chern-scalar curvature; the generalizations of the Kähler-Einstein condition to the non-Kähler setting; the convergence of the normalized Chern-Ricci flow on compact complex surfaces.

The talk is based on collaborations and discussions with Simone Calamai, Francesco Pediconi, Cristiano Spotti, Valentino Tosatti.

Sławomir Dinew. *The quaternionic Calabi-Yau problem.*

We shall briefly describe the basics of quaternionic geometry. The focus will be on the Alesker-Verbitsky conjecture which is the quaternionic analogue of the Calabi-Yau problem. We shall describe recent partial progress and the resolution of this problem in the hyperkähler case. This is a joint work with M. Sroka.

Alexandra Otiman. *Metric and cohomological properties of Oeljeklaus-Toma manifolds.*

Oeljeklaus-Toma manifolds are higher dimensional analogues of Inoue surfaces and were introduced by Oeljeklaus and Toma in 2005. Their construction has a number theoretical background and they possess remarkable cohomological and metric properties: they are non-Kähler compact complex manifolds, satisfying Hodge decomposition, with de Rham and Dolbeault cohomology describable in terms of number-theoretical invariants. In this talk we give an account of these facts and discuss the existence of special Hermitian metrics by linking them to cohomological and number theoretical properties of the manifolds.

Dan Popovici. *Balanced Hyperbolic and Divisorially Hyperbolic Compact Complex Manifolds.*

This is joint work with Samir Marouani. We introduce two notions of hyperbolicity for compact complex, possibly non-Kähler, n-dimensional manifolds that generalise to the bidegree $(n-1, n-1)$ and the codimension 1 Gromov's classical notion of Kähler hyperbolicity and the classical Kobayashi/Brody hyperbolicity. We term them "balanced hyperbolicity" and "divisorial hyperbolicity" and prove, among other things, that the former implies the latter. In particular, one of our main results is a higher dimensional analogue of Brody's Lemma. We go on to establish various properties of these manifolds, including a Hard Lefschetz-type result and vanishing theorems for harmonic L^2 spaces on the universal covers, while also exhibiting several classes of examples.