

Twisted Kodaira-Spencer classes and their use in the study of invariants of surfaces in \mathbb{P}^4

(joint work Igor Reider)

Let X be a projective surface. A twisted Kodaira-Spencer class is an element of the cohomology group $H^1(T_X(-D))$, with D “sufficiently positive”. We study the connection between the existence of a non-trivial twisted class and the geometry of X . In particular, we show that, for a minimal general type surface satisfying $c_2/c_1^2 < 5/6$, the non-vanishing of $H^1(T_X(-K_X))$ imposes the existence of configurations of rational curves on the surface.

The techniques used to obtain this result are based on the interpretation of a non-trivial twisted class as an extension —a short exact sequence of locally free sheaves on X —, and on the detailed study of this sequence.

The above point of view and techniques are applied to the study of surfaces in \mathbb{P}^4 . Indeed, a surface of non-negative Kodaira dimension contained in a hypersurface of degree ≤ 5 displays a natural non-trivial twisted class, allowing us to address the Hartshorne-Lichtenbaum problem for, and to slightly control the irregularity of these surfaces.

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