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Balancing in relative canonical resolutions and a unirational moduli space of K3 surfaces

I report on work of two of my students: Christian Bopp and Michael Hoff. Given a curve C of genus g together with a rational function $f : C \rightarrow \mathbb{P}^1$ of degree d the canonical model lies on a rational normal scroll X , and the resolution of \mathcal{O}_C as an \mathcal{O}_X -module is built with certain vector bundle N_i on \mathbb{P}^1 . It is interesting to ask whether the splitting type of the N_i is balanced for a general pair (C, f) , since then jump loci lead to interesting subspaces of the Hurwitz scheme $H_{g,d}$. By experiment Bopp and Hoff discovered that the second syzygy bundle N_2 is not balanced for $(g, d) = (9, 6)$ for finite fields. In the talk I will explain how their proof in characteristic zero builds upon a moduli space of certain lattice polarized K3 surfaces.