

Collapsing Ricci-flat metrics on K3 surfaces

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Abstract

In the 1970s, Yau proved that a compact Kahler manifold with vanishing first Chern class admits a Ricci-flat Kahler metric. The proof is an abstract existence theorem via the method of a priori estimates. There are no explicit solutions known, however, near the boundary of the moduli space, one can hope to obtain a more detailed geometric understanding of Yau's metrics. In this talk, I will give some general background of moduli problems in geometry, and discuss some known examples of degeneration of Yau's metrics on K3 surfaces. I will then discuss a new construction of families of Ricci-flat Kahler metrics on K3 surfaces which collapse to an interval, with Tian-Yau and Taub-NUT metrics occurring as bubbles. There is a corresponding singular fibration from the K3 surface to the interval, with regular fibers diffeomorphic to either 3-tori or Heisenberg nilmanifolds. This is joint work with Hans-Joachim Hein, Song Sun, and Ruobing Zhang.