Non-Kahler Calabi-Yau Geometry and Pluriclosed Flow

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Abstract:

Hermitian, pluriclosed metrics with vanishing Bismut-Ricci form give a natural extension of Calabi-Yau metrics to the setting of complex, non-K"ahler manifolds, and arise independently in mathematical physics. We reinterpret this condition in terms of the Hermitian-Einstein equation on an associated holomorphic Courant algebroid, and thus refer to solutions as Bismut Hermitian-Einstein. This implies Mumford-Takemoto slope stability obstructions, and using these we exhibit infinitely many topologically distinct complex manifolds in every dimension with vanishing first Chern class which do not admit Bismut Hermitian-Einstein metrics. This reformulation also leads to a new description of pluriclosed flow in terms of Hermitian metrics on holomorphic Courant algebroids, implying new global existence results, in particular on all complex non-K"ahler surfaces of Kodaira dimension \$\kappa = 0\$. On complex manifolds which admit Bismut-flat metrics we show global existence and convergence of pluriclosed flow to a Bismut-flat metric, which in turn gives a classification of generalized Kähler structures on these spaces.