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A systematic approach to Kähler moduli stabilisation. (English) Zbl 1454.83150

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Summary: Achieving full moduli stabilisation in type IIB string compactifications for generic Calabi-Yau threefolds with hundreds of Kähler moduli is notoriously hard. This is due not just to the very fast increase of the computational complexity with the number of moduli, but also to the fact that the scalar potential depends in general on the supergravity variables only implicitly. In fact, the supergravity chiral coordinates are 4- cycle volume moduli but the Kähler potential is an explicit function of the 2-cycle moduli and inverting between these two variables is in general impossible. In this paper we pro- pose a general method to fix all type IIB Kähler moduli in a systematic way by working directly in terms of 2-cycle moduli: on one side we present a 'master formula' for the scalar potential which can depend on an arbitrary number of Kähler moduli, while on the other we perform a computer-based search for critical points, introducing a hybrid Genetic/Clustering/Amoeba algorithm and other computational techniques. This allows us to reproduce several known minima, but also to discover new examples of both KKLT and LVS models, together with novel classes of LVS minima without diagonal del Pezzo divisors and hybrid vacua which share some features with KKLT and other with LVS solutions.

MSC:

83E50 Supergravity
83E30 String and superstring theories in gravitational theory
81T60 Supersymmetric field theories in quantum mechanics
81T33 Dimensional compactification in quantum field theory
53B35 Local differential geometry of Hermitian and Kählerian structures

Keywords:

supergravity models; superstring vacua; flux compactifications

Software:

Calabi-Yau database; CICY Quotients; cohomCalg; fminsearch; PALP

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