Fake Moduli Stabilization Part I

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Abstract

We explicitly show how moduli stabilization is realized geometrically in M-theory compactified on T4/Z2 ×K3, by using the Gibbons-Hawking approximation of the K3 metric. By relating this compactification to certain microstate geometries, we present the explicit solutions in which fully backreacted fluxes on certain four-cycles stabilize three of the compactification moduli. We find that the minimal tadpole contribution of these fluxes is equal to the number of stabilized moduli, and argue that this linear relation holds for more general fluxes. We show that the full even-dimensional solution admits a one-parameter family of supersymmetric solutions, parameterized by the deviation of the moduli from their stabilized values. The warped-product structure of the compactification and the Lorentz invariance of the resulting lower-dimensional spacetime is recovered only when the moduli sit exactly at their stabilized values. Away from this point, supersymmetry is preserved but Lorentz invariance and the warped-product structure of the compactification is broken. This suggests that the standard picture of moduli stabilization, in which one looks for extrema of a scalar potential in the low-energy effective theory, may arise from having imposed Lorentz invariance at the level of the warped compactification ansatz. Our results extend straightforwardly to Type IIB String Theory compactified on orientifolds of T 2 × K 3.

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