Fake Moduli Stabilization Part II

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Abstract

We explicitly show how moduli stabilization is realized geometrically in M-theory compactified on T^4/Z_2 x 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 eleven-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 are 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 x K3.
This is the second of two coordinated talks. Raphaël Dulac will present Part I, focusing on the fully backreacted flux construction and the resulting tadpole contribution. In this talk, I will present Part II, focusing on the one-parameter family of supersymmetric solutions that move away from the Lorentz-invariant warped-product point, and on the sense in which moduli stabilization follows from imposing a Lorentz-invariant warped-product ansatz. Based on work to appear with Iosif Bena, Raphaël Dulac and Mariana Graña.

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