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Exotic supergravities and the Swampland

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In six dimensions, there is an exotic $N = (4, 0)$ supermultiplet that contains only fields of spin ≤ 2 , but no graviton, and that on a circle reduces to 5D $N = 4$ supergravity. It has been proposed that, if suitable interactions exist, the $(4, 0)$ theory might provide a consistent alternative UV completion for $N = 4$ 5D supergravity, realizing a supersymmetric version of asymptotic safety. In this note we argue that any Lorentz-invariant $(4, 0)$ theory (interacting or not) carries an exact global symmetry when compactified on S^1 , and is therefore incompatible with the Swampland no global symmetries conjecture. Another example of exotic supergravity, the 6D $(3, 1)$ theory, does not have this problem. We study the general case and find that the only exotic spin-2 field that reduces to Einsteinian gravity and has no global symmetries when compactified on a high-dimensional torus is that of the $(3, 1)$ theory. All other possibilities either yield several gravitons or have global symmetries.

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