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Emergent strings and duality with broken supersymmetry

We explore the dramatic consequences of string-scale supersymmetry breaking. We focus on the $USp(32)$ and $U(32)$ orientifolds of the type IIB and type 0B strings, as well as the $SO(16) \times SO(16)$ projection of the exceptional heterotic string, which provide non-tachyonic settings with no moduli directly in ten dimensions. While deceptively innocuous at the level of worldsheet perturbation theory, dynamical gravitational tadpoles backreact on spacetime in a dramatic fashion. We discuss how branes can tame this effect to a certain extent, finding that spacetime universally breaks down at a finite distance, ending in a strongly coupled, highly curved singularity. Remarkably, the dynamics of branes in these settings remains consistent among different complementary regimes despite the absence of supersymmetric protection. We connect the resulting picture with a number of swampland criteria, including the weak gravity, de Sitter and distance conjectures, which are realized via novel mechanisms and provide tantalizing hints for a candidate S-dual heterotic construction of the $USp(32)$ orientifold with “brane supersymmetry breaking”.

Type of contribution

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