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Probing the swampland with dark energy observations of Euclid, SKA, and LSST.

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We explore the ability of future cosmological surveys to put string theory under pressure through the Swampland program. It is well known that constructing consistent string theory solutions in a de Sitter background is tremendously difficult. This led to speculative constraints on the shape of the potential felt by the dark energy scalar field. This is known as the “de-Sitter conjecture” and low-energy effective theories that violate it are believed to live in the Swampland. Future experiments, such as the Vera Rubin Observatory, Euclid or SKA, will set strong constraints on dark energy and we investigated their potential conflict with the Swampland conditions. In particular, we show that the expected constraints on the equation of states of dark energy might be in severe contradiction with the de-Sitter conjecture. Our study is carried out for many different quintessence potentials and a very wide range of initial conditions. The improvements with respect to available measurements are precisely estimated. The analysis is also extended to very long term perspectives.

Based on: Barrau, Renevey, and Martineau, *Astrophysical Journal* 912 (2021) 2, 99

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