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Cosmic acceleration with a negative cosmological constant in higher dimensions

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We study gravitational theories with a cosmological constant and the Gauss-Bonnet curvature squared term and analyze the possibility of de Sitter expanding spacetime with a constant internal space. We find that there are two branches of the de Sitter solutions: Both the curvature of the internal space and the cosmological constant are (1) positive and (2) negative. From the stability analysis, we show that the de Sitter solution of the case (1) is unstable, while that in the case (2) is stable. Namely de Sitter solution in the present system is stable if the cosmological constant is negative. We extend our analysis to the gravitational theories with higher-order Lovelock curvature terms. Although the existence and the stability of the de Sitter solutions are very complicated and highly depend on the coupling constants, there exist stable de Sitter solutions similar to the case (2) in general. We also find de Sitter solutions with Hubble scale much smaller than the scale of a cosmological constant, which may explain a discrepancy between an inflation energy scale and the Planck scale.

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