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The origin of slow-roll inflation in the perspective of string theory

For two decades, the full moduli stabilization remains an intriguing problem in string theory. In type-IIB string theory, the extra six compactified dimensions are described by the three-fold Calabi-Yau (CY_3) manifold whose independent hodge numbers ($h^{1,1}$, $h^{2,1}$) give the number of closed string moduli. In the superstring theory, there exist some fermionic moduli fields which come from the open string sector as well as bosonic moduli fields which come from the closed string sector due to compactification [1]. The closed string moduli parameterize the moduli spaces, originating from the fluctuations of the size and the shape of the CY manifold. Some of the closed string moduli (Complex structure and Dilaton) are supersymmetrically stabilized through the circulating fluxes along the cycle in compactified space [2]. In our model, all open string moduli are assumed to be stabilized by the fluxes [3,4]. The remaining closed string moduli, which are known as the Kahler structure moduli, remain unstabilized at tree-level. The dynamics of the Kahler moduli describe the change in size in the volume of CY_3 manifold. Working in the LVS [5], we have derived the inflaton potential through the Kahler moduli stabilization in the framework of type-IIB/F theory with three intersecting D7 branes [4,6,7]. Here one of the Kahler moduli is treated as an inflaton field [3]. In this configuration, three Kahler moduli exist along the three transverse volumes of the D7 branes [4]. One Kahler modulus, which gives the constant uplifting term in the effective potential [3,8], appears in superpotential through the non-perturbative correction by taking either gaugino or instanton effect [3,8,9]. Other two Kahler moduli are stabilized by perturbative corrections [10]. It is observed that the slow-roll inflation owes its origin to the increasing volume of the compactified space (CY_3). With a certain choice of the parameter space, we can calculate [3] the cosmological parameters following the paper [11]: scalar spectral index (n_s)=$0.9652-0.9662$, tensor to scalar ratio (r)=$5.8\times10^{-4}-6.2\times10^{-4}$, number of e-folds ($N$)=$55.0-56.74$, tensor spectral index (n_t)=$(-7.28\times10^{-4})-(-7.76\times10^{-5})$, at $k=0.001-0.009\ Mpc^{-1}$. Also we get cosmological constant, ~10^{-6}. Our future plan is to calculate the by adding matter fields [4] and incorporating back reactions through gaugino condensations [12].

References:

1. Becker K. et al., Cambridge University Press, 12, 2006
2. Giddings S. B. et al., Phys. Rev. D, 66 (2002) 106006
3. Let A. et al., EPL 139 (2022) 59002.
4. Antoniadis I. et al., Eur. Phys. J. C, 78 (2018) 766.
5. Balasubramanian V. et al., JHEP, 03 (2005) 007.
6. Antoniadis I. et al., Int. J. Mod. Phys. A, 34 (2019) 1950042.
7. Antoniadis I. et al., Eur. Phys. J. C, 80 (2020) 1014.
8. Basiouris V. and Leontaris G. K., Phys. Lett. B, 810 (2020) 135809
9. Basiouris V. and Leontaris G. K., Fortschr. Phys., 70 (2022) 2100181.
10. Antoniadis I. et al., JHEP, 01 (2020) 149
11. Sarkar A. et al., JCAP 11 (2021) 029.
12. Bena I. et al, JHEP 10 (2019) 200

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