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Relieving tensions related to the lensing of CMB temperature power spectra

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The angular power spectra of the CMB temperature anisotropies reconstructed from Planck data seem to present 'too much'gravitational lensing distortion. This is quantified by the control parameter A_L that should be compatible with unity for a standard cosmology. With the class Boltzmann solver and the profile likelihood method, we measure for this parameter a 2.6σ shift from 1 using the Planck public likelihoods. We show that, due to strong correlations with the reionization optical depth τ and the primordial perturbation amplitude A_s, a ~ 2σ tension on τ also appears between the results obtained with the low ($\ell \leq 30$) and high ($30 < \ell < 2500$) multipoles likelihoods. With Hillipop, another high-l likelihood built from Planck data, this difference is lowered to 1.3σ. In this case, the A_L value is still discrepant with unity by 2.2σ, suggesting a non-trivial effect of the correlations between cosmological and nuisance parameters.
To better constrain the nuisance foregrounds parameters, we include the very-high-l measurements of the ACT and SPT experiments and obtain $A_L = 1.03 \pm 0.08$. The Hillipop+ACT+SPT likelihood estimate of the optical depth is τ = 0.052 ± 0.035 which is now fully compatible with the low-l likelihood determination. After showing the robustness of our results with various combinations, we investigate the reasons for this improvement, which results from a better determination of the whole set of foregrounds parameters. We finally provide estimates of the ΛCDM parameters with our combined CMB data likelihood.

Summary

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