

Planck 2015 results: XV. Gravitational lensing

Ade P., Aghanim N., Arnaud M., Ashdown M., Aumont J., Baccigalupi C., Banday A., Barreiro R., Bartlett J., Bartolo N., Basak S., Battaner E., Benabed K., Benoît A., Benoit-Lévy A., Bernard J., Bersanelli M., Bielewicz P., Bock J., Bonaldi A., Bonavera L., Bond J., Borrill J., Bouchet F., Boulanger F., Bucher M., Burigana C., Butler R., Calabrese E., Cardoso J., Catalano A., Challinor A., Chamballu A., Chiang H., Christensen P., Church S., Clements D., Colombi S., Colombo L., Combet C., Couchot F., Coulais A., Crill B., Curto A., Cuttaia F., Danese L., Davies R., Davis R., De Bernardis P., De Rosa A., De Zotti G., Delabrouille J., Désert F., Diego J., Dole H., Donzelli S., Doré O., Douspis M., Ducout A., Dunkley J., Dupac X., Efstathiou G., Elsner F.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016 EDP Sciences. We present the most significant measurement of the cosmic microwave background (CMB) lensing potential to date (at a level of 40σ), using temperature and polarization data from the Planck 2015 full-mission release. Using a polarization-only estimator, we detect lensing at a significance of 5σ . We cross-check the accuracy of our measurement using the wide frequency coverage and complementarity of the temperature and polarization measurements. Public products based on this measurement include an estimate of the lensing potential over approximately 70% of the sky, an estimate of the lensing potential power spectrum in bandpowers for the multipole range $40 \leq L \leq 400$, and an associated likelihood for cosmological parameter constraints. We find good agreement between our measurement of the lensing potential power spectrum and that found in the Λ CDM model that best fits the Planck temperature and polarization power spectra. Using the lensing likelihood alone we obtain a percent-level measurement of the parameter combination $\sigma_8 \omega_{0.25m} = 0.591 \pm 0.021$. We combine our determination of the lensing potential with the E-mode polarization, also measured by Planck, to generate an estimate of the lensing B-mode. We show that this lensing B-mode estimate is correlated with the B-modes observed directly by Planck at the expected level and with a statistical significance of 10σ , confirming Planck's sensitivity to this known sky signal. We also correlate our lensing potential estimate with the large-scale temperature anisotropies, detecting a cross-correlation at the 3σ level, as expected because of dark energy in the concordance Λ CDM model.

<http://dx.doi.org/10.1051/0004-6361/201525941>

Keywords

Cosmic background radiation, Cosmological parameters, Cosmology: observations, Gravitational lensing: weak, Large-scale structure of Universe