Astronomy and Astrophysics 2016 vol.596

Planck intermediate results: XLI. A map of lensing-induced B -modes

Ade P., Aghanim N., Ashdown M., Aumont J., Baccigalupi C., Banday A., Barreiro R., Bartolo N., Basak S., Battaner E., Benabed K., Benoit-Lévy A., Bernard J., Bersanelli M., Bielewicz P., Bock J., Bonaldi A., Bonavera L., Bond J., Borrill J., Bouchet F., Boulanger F., Burigana C., Butler R., Calabrese E., Cardoso J., Catalano A., Chiang H., Christensen P., Clements D., Colombi S., Colombo L., Combet C., Crill B., Curto A., Cuttaia F., Danese L., Davis R., De Bernardis P., De Zotti G., Delabrouille J., Dickinson C., Diego J., Doré O., Ducout A., Dupac X., Elsner F., Enßlin T., Eriksen H., Finelli F., Forni O., Frailis M., Fraisse A., Franceschi E., Galeotta S., Galli S., Ganga K., Ghosh T., Giard M., Giraud-Héraud Y., Gjerløw E., González-Nuevo J., Górski K., Gruppuso A.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© ESO, 2016.The secondary cosmic microwave background (CMB) B-modes stem from the post-decoupling distortion of the polarization E-modes due to the gravitational lensing effect of large-scale structures. These lensing-induced B-modes constitute both a valuable probe of the dark matter distribution and an important contaminant for the extraction of the primary CMB B-modes from inflation. Planck provides accurate nearly all-sky measurements of both the polarization E-modes and the integrated mass distribution via the reconstruction of the CMB lensing potential. By combining these two data products, we have produced an all-sky template map of the lensing-induced B-modes using a real-space algorithm that minimizes the impact of sky masks. The cross-correlation of this template with an observed (primordial and secondary) B-mode map can be used to measure the lensing B-mode power spectrum at multipoles up to 2000. In particular, when cross-correlating with the B-mode contribution directly derived from the Planck polarization maps, we obtain lensing-induced B-mode power spectrum measurement at a significance level of 12σ, which agrees with the theoretical expectation derived from the Planck best-fit Λ cold dark matter model. This unique nearly all-sky secondary B-mode template, which includes the lensing-induced information from intermediate to small ($10 \leq l \leq 1000$) angular scales, is delivered as part of the Planck 2015 public data release. It will be particularly useful for experiments searching for primordial B-modes, such as BICEP2/Keck Array or LiteBIRD, since it will enable an estimate to be made of the lensing-induced contribution to the measured total CMB B-modes.

http://dx.doi.org/10.1051/0004-6361/201527932

Keywords

Cosmic background radiation, Cosmology: observations, Gravitational lensing: weak, Polarization