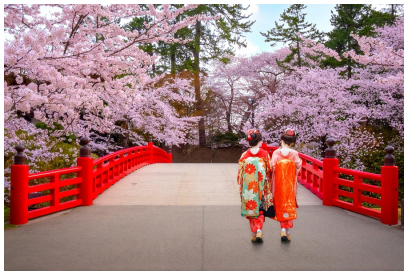

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A novel method for joint systematic correction and foreground cleaning and its application to the estimation of cosmic birefringence in Simons Observatory and LiteBIRD.

mercredi 29 mars 2023 11:35 (15 minutes)

The primordial B modes signal in the CMB is very faint and polluted by other polarised astrophysical signals. The future and present experiments that aim at constraining the tensor to scalar ratio are limited by the efficiency with which they are able to remove this contaminating signal. Furthermore, exquisite knowledge of the instrument is necessary to understand possible systematic effects that could bias the data. The interplay between systematic effects and foreground cleaning can be critical in the estimation of cosmological parameters.
I developed a generalisation of a parametric component separation method that allows for the estimation of systematic parameters alongside foreground spectral indices while taking into account their possible interplay, and that is described in Arxiv:2212.08007. I can then retrieve a CMB map that is foreground cleaned and corrected for systematic effects. Moreover the statistical error on the estimation of systematic parameters and spectral indices can be evaluated and propagated to the cosmological parameter estimation, making this method statistically robust.
In particular I focus on the joint estimation of the tensor to scalar ratio and isotropic cosmic birefringence. The latter is completely degenerate with the polarisation angle of the telescope. I demonstrate that using a calibration prior and the generalised component separation I am able to constrain the tensor to scalar ratio and the birefringence angle using the example of the Simons Observatory Small Aperture Telescopes or LiteBIRD. Moreover the tensor to scalar ratio can be retrieved without bias possibly caused by the polarisation angle of the telescope. And that, regardless of the priors'precisions or possible systematic biases. This method could then be used as an efficient, multi-frequency, foreground-robust, self-calibration.

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