Contribution ID: **177** Type: **not specified**

Robust forecasts on inflationary science from the foreground-obscured, gravitationally lensed CMB polarisation

Thursday 10 September 2015 15:20 (20 minutes)

Recent results from the BICEP2, Keck Array and Planck collaborations demonstrate that Galactic foregrounds are an unavoidable obstacle in the search for evidence of inflationary gravitational waves in the cosmic microwave background (CMB) polarisation. Beyond the foregrounds, the effects of lensing by intervening large-scale structure further obscure all but the strongest inflationary signals permitted by current data. With a plethora of ongoing and upcoming experiments aiming to measure these signatures, careful and self-consistent consideration of experiments' foreground- and lensing-removal capabilities is critical in obtaining credible forecasts of their performance.

I will present a Python-based Fisher framework that performs just this task. Using data-driven foreground models with user-defined components, this tool first estimates the residuals and noise in the CMB maps produced by maximum-likelihood component separation. It then forecasts the ability of experiments to delens these maps, via iterative CMB-only techniques or cross-correlation with external data, and thence constrain inflationary cosmology. Publicly available through an online interface, this tool allows the next generation of CMB telescopes to foreground-proof their designs, optimise their frequency coverage to maximise scientific output, and determine where cross-experimental collaboration would be most beneficial.

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Session Classification: CMB, LSS and cosmological parameters