Contribution ID: **276** Type: **Poster**

Testing statistical isotropy and Gaussianity of CMB lensing data from the Atacama Cosmology Telescope.

In this project we focus on testing statistical isotropy and Gaussianity of CMB lensing convergence maps using recently released data of the cosmic microwave background (CMB) radiation from the Atacama Cosmology Telescope
(ACT). The CMB photons are lensed by gravitational potential wells of the
large-scale matter distribution. This CMB temperature data is converted to convergence map by applying the method of quadratic estimator using the pipelines provided by the ACT collaboration. We use the methodology of Minkowski functionals to test Gaussianity and the alpha statistic, which is constructed from the contour Minkowski tensor, to test for statistical isotropy. From our analysis, we find that the convergence map is non-Gaussian, and the nature of non-Gaussianity is of kurtosis type. This finding indicates the effect of gravitational clustering of matter at the resolution of the ACT data. Statistical isotropy is tested by taking small patches of sky regions and comparing with simulated mock data of the convergence map that include instrumental effects. This work is still ongoing.

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Session Classification: Cosmology

Track Classification: Cosmology