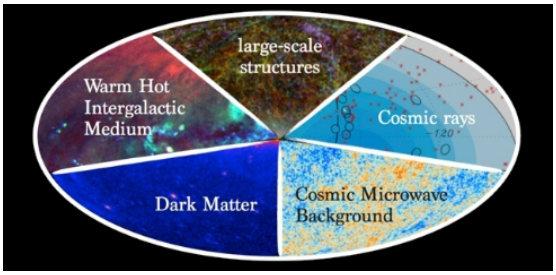

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Probing isotropy of cosmic acceleration by Type Ia supernovae

Monday, 11 April 2016 16:40 (20 minutes)

We present a method to test the isotropy of the magnitude-redshift relation of Type Ia Supernovae (SNe Ia) and single out the most discrepant direction (in terms of the signal-to-noise ratio) with respect to the all-sky data. Our technique accounts for possible directional variations of the corrections for SNe Ia and yields all-sky maps of the best-fit cosmological parameters with arbitrary angular resolution. To show its potential, we apply our method to the recent Union2.1 compilation, building maps with three different angular resolutions. We use a Monte Carlo method to estimate the statistical significance with which we could reject the null hypothesis that the magnitude-redshift relation is isotropic based on the properties of the observed most discrepant directions. We find that, based on pure signal-to-noise arguments, the null hypothesis cannot be rejected at any meaningful confidence level. However, if we also consider that the strongest deviations in the Union2.1 sample closely align with the dipole temperature anisotropy of the cosmic microwave background, we find that the null hypothesis should be rejected at the 95–99 per cent confidence level, slightly depending on the angular resolution of the study. If this result is not due to a statistical fluke, it might either indicate that the SN data have not been cleaned from all possible systematics or even point towards new physics. We finally discuss future perspectives in the field for achieving larger and more uniform data sets that will vastly improve the quality of the results and optimally exploit our method.

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