

DESC Project 311: Forecast for Cosmological Growth-Rate Measurement using Peculiar Velocities From Supernovae

jeudi 8 juin 2023 14:00 (15 minutes)

The goal of the project is to produce realistic forecast for $f\sigma_8$ measurement using peculiar velocities derived from Supernovae Type Ia. We will expand the work done for ZTF by Carreres et al. (<https://arxiv.org/abs/2303.01198>)

It is possible to measure peculiar velocities of Supernovae Type Ia by comparing their estimated distances from the Hubble Diagram with the redshifts of their host galaxies. Knowing the peculiar velocities of a sample of objects is interesting for testing the cosmological model. Analysing the distribution of these velocities enable us to measure the growth-rate of cosmic structure ($f\sigma_8$) which is directly linked to the theory of gravity assumed in the cosmological model.

It is possible to measure the peculiar velocities of galaxies hosting a type Ia supernova by comparing their estimated cosmological redshift inferred from their distance with the galaxy redshift. Using the LSST observing strategy and SNSIM survey simulator (<https://github.com/bastien carreres/snsim>), we simulate realistic light-curves for all the supernovae types. Using a photometric SNe classifier on the simulated light-curves we define the sample for the cosmological analysis, assessing both selection effects and contamination. We recover the supernovae peculiar velocities through the residual of the Hubble Diagram and we measure $f\sigma_8$ parameter using only the velocity information. We plan to test various methods for both measuring the velocities and fitting the cosmology to asses possible biases in the analysis.

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