Contribution ID: **3**   Type: **not specified**

Bayesian treatment of distance errors in the cosmic distance ladder

Thursday 30 May 2019 12:15 (15 minutes)

We propose two methods for robustly estimating extragalactic distance errors thopughout the cosmic distance ladder. Frequentist methods they fail to explain both the scatter between different measurements and the effects of skewness in the metric distance probability distribution. We compare the performance of frequentist methods versus our proposed measures for estimating the true variance of redshift-independent extragalactic distances. We also develop a predictive Bayesian model for distance errors for Tully-Fisher relation (TF) derived distances. We are then able to predict distance errors for almost 900 galaxies in the NED-D catalog and 200 galaxies in the HyperLEDA catalog which do not report TF distance modulus errors. Our goal is that our pre-computed errors are used in catalog-wide applications that require acknowledging the true variance of extragalactic distance measurements.

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Session Classification: Cosmology