Contribution ID: **14** Type: **not specified**

On the Robustness of the Constancy of the Supernova Absolute Magnitude Non-parametric Reconstruction & Bayesian approaches

Friday, September 8, 2023 10:00 AM (1 hour)

In this work, we test the robustness of the constancy of the Supernova absolute magnitude MB using Non-parametric Reconstruction Techniques (NRT). We isolate the luminosity distance parameter dL(z) from the Baryon Acoustic Oscillations (BAO) data set and cancel the expansion part from the observed distance modulus dL(z). Consequently, the degeneracy between the absolute magnitude and the Hubble constant H0, is replaced by a degeneracy between MB and the sound horizon at drag epoch rd. When imposing the rd value, this yields the MB(z)=MB+Î´MB(z) value from NRT. We perform the respective reconstructions using the model independent Artificial Neural Network (ANN) technique and Gaussian processes (GP) regression. For the ANN we infer MB=19.22Â±0.20, and for the GP we get MB=19.25Â±0.39 as a mean for the full distribution when using the sound horizon from late time measurements. These estimations provide a 1ÏƒÂ possibility of a nuisance parameter presence Î´MB(z) at higher redshifts. We also tested different known nuisance models with the Markov Chain Monte Carlo (MCMC) technique which showed a strong preference for the constant model, but it was not possible not single out a best fit nuisance model.

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