



Contribution ID: 223

Type: **not specified**

## Cosmic expansion versus motion: Probing the difference

*Thursday 15 June 2023 15:00 (1h 20m)*

General inhomogeneous cosmologies give rise to differential cosmic expansion which differs from that of Friedmann-Lemaître-Robertson-Walker (FLRW) models. Even models with an average isotropic homogeneous isotropic expansion law on  $> 100/h$  Mpc scales will generically have expansion laws which differ from FLRW plus local Lorentz boosts. That is, they differ from the conventional “kinematic interpretation”. Strong evidence ( $\sim 5.1$  sigma) against the kinematic interpretation has been provided by Secrest et al (2022), combining the Ellis-Baldwin test on 1.36 million distant quasars with similar studies of radio galaxies. There is a correlation with CMB anomalies.

Such signatures are a generic expectation in models which differ from FLRW, exhibiting backreaction, including the timescape cosmology. The particular features of nonkinematic differential expansion, regardless of the backreaction scheme, can be isolated by constructing toy Lambda-Szekeres models which asymptote to FLRW/Lambda CDM on  $> 100/h$  Mpc scales but exhibit nonkinematic differential expansion on smaller scales.

In this talk I will discuss ongoing work with the goal of constraining such toy models by local peculiar velocity data, and then using such models to probe the Ellis-Baldwin test, which in itself challenges the standard cosmology.

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