



Astrophysics > Cosmology and Extragalactic Astrophysics

# Testing homogeneity with the fossil record of galaxies

Alan F. Heavens, Raul Jimenez, Roy Maartens

(Submitted on 29 Jul 2011 (v1), last revised 15 Sep 2011 (this version, v2))

The standard Friedmann model of cosmology is based on the Copernican Principle, i.e. the assumption of a homogeneous background on which structure forms via perturbations. Homogeneity underpins both general relativistic and modified gravity models and is central to the way in which we interpret observations of the CMB and the galaxy distribution. It is therefore important to probe homogeneity via observations. We describe a test based on the fossil record of distant galaxies: if we can reconstruct key intrinsic properties of galaxies as functions of proper time along their worldlines, we can compare such properties at the same proper time for our galaxy and others. We achieve this by computing the lookback time using radial Baryon Acoustic Oscillations, and the time along galaxy world line using stellar physics, allowing us to probe homogeneity, in principle anywhere inside the past light cone. Agreement in the results would be an important consistency test -- although it would not in itself prove homogeneity. Any significant deviation in the results however would signal a breakdown of homogeneity.

Comments: Accepted for publication in JCAP. Matches published version. Minor changes: ref. added and longer discussion on performing the test observationally. Results unchanged

Subjects: **Cosmology and Extragalactic Astrophysics (astro-ph.CO)**; General Relativity and Quantum Cosmology (gr-qc)

Journal reference: JCAP09(2011)035

Cite as: [arXiv:1107.5910](#) [astro-ph.CO]  
(or [arXiv:1107.5910v2](#) [astro-ph.CO] for this version)

## Submission history

From: Raul Jimenez [[view email](#)]

[v1] Fri, 29 Jul 2011 09:45:31 GMT (49kb,D)

[v2] Thu, 15 Sep 2011 08:43:06 GMT (53kb,D)

*Which authors of this paper are endorsers?*

## Download:

- [PDF](#)
- [Other formats](#)

Current browse context:

astro-ph.CO

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1107](#)

Change to browse by:

[astro-ph](#)  
[gr-qc](#)

## References & Citations

- [INSPIRE HEP](#)  
([refers to](#) | [cited by](#))
- [NASA ADS](#)

Bookmark([what is this?](#))

