Astrophysics > Cosmology and Extragalactic Astrophysics

An Estimator for statistical anisotropy from the CMB bispectrum

N. Bartolo (Univ. of Padova and INFN Padova), E. Dimastrogiovanni (Univ. of Padova and INFN Padova), M. Liguori (Institut d' Astrophysique de Paris), S. Matarrese (Univ. of Padova and INFN Padova), A. Riotto (CERN and INFN Padova)

(Submitted on 21 Jul 2011 (v1), last revised 19 Jan 2012 (this version, v2))

Various data analyses of the Cosmic Microwave Background (CMB) provide observational hints of statistical isotropy breaking. Some of these features can be studied within the framework of primordial vector fields in inflationary theories which generally display some level of statistical anisotropy both in the power spectrum and in higher-order correlation functions. Motivated by these observations and the recent theoretical developments in the study of primordial vector fields, we develop the formalism necessary to extract statistical anisotropy information from the three-point function of the CMB temperature anisotropy. We employ a simplified vector field model and parametrize the bispectrum of curvature fluctuations in such a way that all the information about statistical anisotropy is encoded in some parameters lambda_{LM} (which measure the anisotropic to the isotropic bispectrum amplitudes). For such a template bispectrum, we compute an optimal estimator for lambda_{LM} and the expected signal-to-noise ratio. We estimate that, for f_{NL} ~ 30, an experiment like Planck can be sensitive to a ratio of the anisotropic to the isotropic amplitudes of the bispectrum as small as 10%. Our results are complementary to the information coming from a power spectrum analysis and particularly relevant for those models where statistical anisotropy turns out to be suppressed in the power spectrum but not negligible in the bispectrum.

Comments:	25 pages, LaTeX file. Matches version accepted for publication in JCAP; some references added; Appendix C added to explain the order of the Edgeworth expansion employed
Subjects:	**Cosmology and Extragalactic Astrophysics (astro-ph.CO)**
Cite as:	**arXiv:1107.4304 [astro-ph.CO]**
	(or **arXiv:1107.4304v2 [astro-ph.CO]** for this version)

Submission history

From: Nicola Bartolo [view email]
[v1] Thu, 21 Jul 2011 16:02:31 GMT (35kb)
[v2] Thu, 19 Jan 2012 16:42:46 GMT (38kb)

Which authors of this paper are endorsers?