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Model-independent cosmological constraints from the CMB

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We analyse CMB data in a manner which is as model-independent as possible. We encode the effects of late-time cosmology into a single parameter which describes the distance to the last scattering surface, similar to the shift parameter, and exlude low multipoles, up to l 40 from the analysis. We consider the WMAP five-year as well as ACBAR 2008 observations. We obtain constraints on !b, !m and ns, which can be applied as priors in other analysis without committing to a specific model of the late universe.
Synopsis of the talk
The cosmic microwave background (CMB) is one of the most important cosmological probes. The pattern of acoustic oscillations of the baryon-photon plasma is imprinted on the CMB at the time of decoupling, and then rescaled (and on large scales modified) as the CMB photons propagate from the last scattering surface to the observer. The CMB is thus sensitive to cosmological parameters in two ways, via the physics at decoupling and via evolution in the later universe. While the physics at decoupling (essentially atomic physics and general relativity in the linear regime) is well understood, the evolution at late times deviates from the predictions of the linearly perturbed FRW models with radiation and matter. The difference may be due to an exotic matter component with negative pressure, deviation of gravity from general relativity or a breakdown of the homogeneous and isotropic approximation. It is not known which of these possibilities is correct, and there are large differences between the various models. It is therefore worthwhile to analyse the CMB in a manner which is as independent of the details of late-time cosmology as possible. On the one hand, this makes it clear what constraints all models of late-time cosmology, whatever their details, have to satisfy in order to agree with the CMB observations. On the other hand, such analysis gives limits on the physical parameters at decoupling that are independent of the details of late-time cosmology.This is particularly important for cosmological parameters such as the density of baryons or dark matter which are used as constraints on particle physics models involving e.g. supersymmetry or baryogenesis, which have otherwise nothing to do with latetime cosmology. Such a separation of constraints is possible because the physics after decoupling affects the CMB in a rather limited manner, by changing the angular scale of the CMB pattern (apart from the low multipoles). We analyse the CMB by encoding this effect in a single parameter, the angular diameter distance to the last scattering surface. We also aim to be transparent about how the different cosmological parameters enter the analysis, and which assumptions are made. Therefore, I will begin with a short discussion about how the early and late physics affects the CMB and explain our assumptions. I will then present the results of the analysis of the WMAP 5-year and ACBAR 2008 data and give constraints on cosmological parameters, and finally, I will discuss the results and conclude.

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