Multiple Inflation and the *WMAP* Glitches

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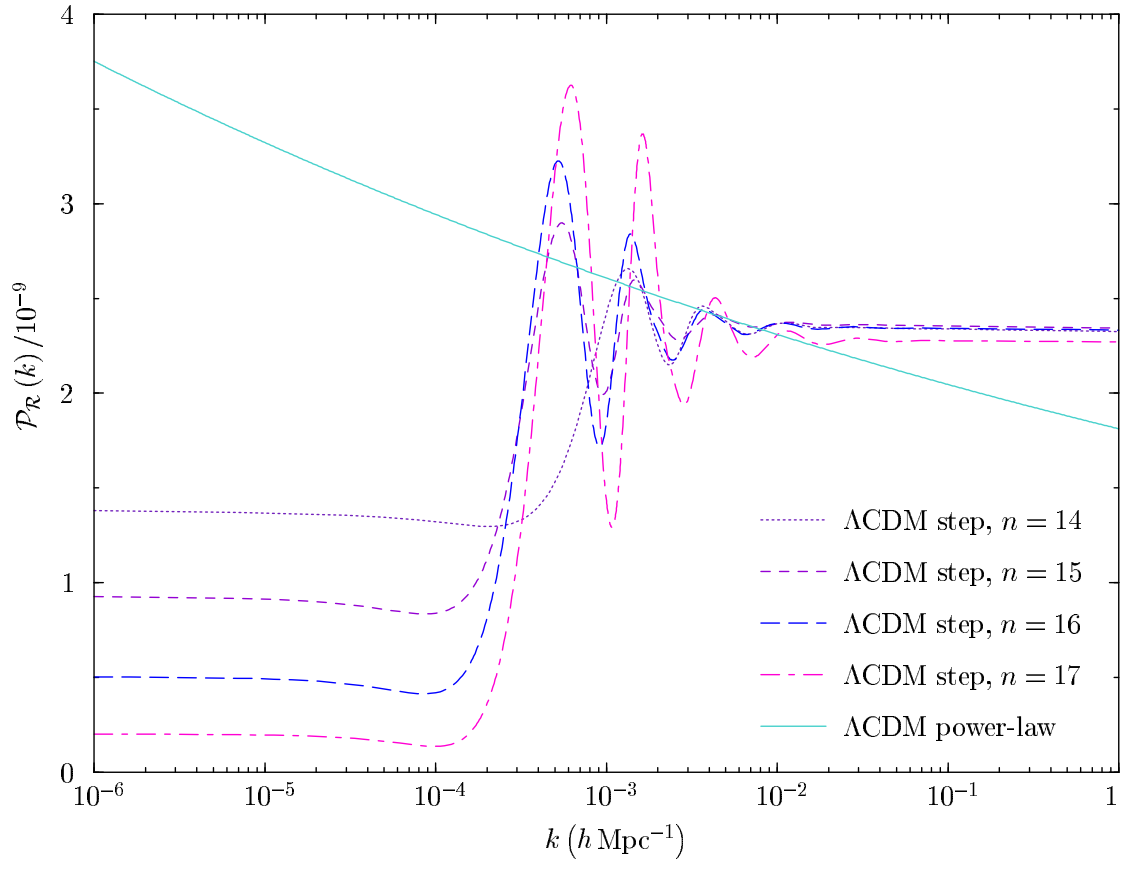
Multiple Inflation Adams, Ross and Sarkar (1997)

Single field inflation produces a *smooth* primordial power spectrum.

However realistic SUSY theories contain many other scalar fields.

In the ‘multiple inflation’ scenario flat direction fields undergo phase transitions *during* inflation.

Each phase transition changes the inflaton mass, to which $\mathcal{P}_{\mathcal{R}}(k)$ is very sensitive.



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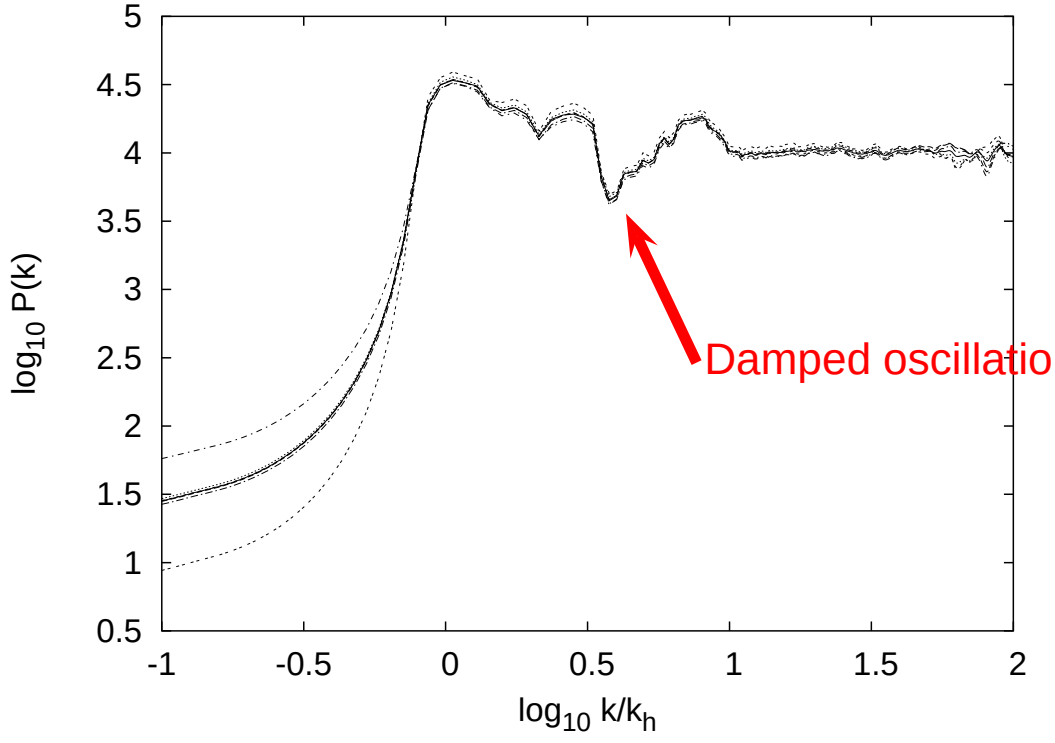
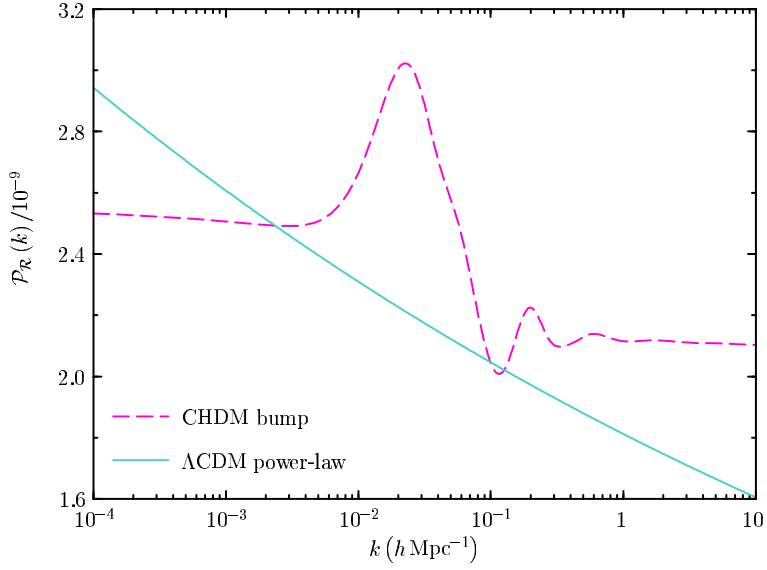


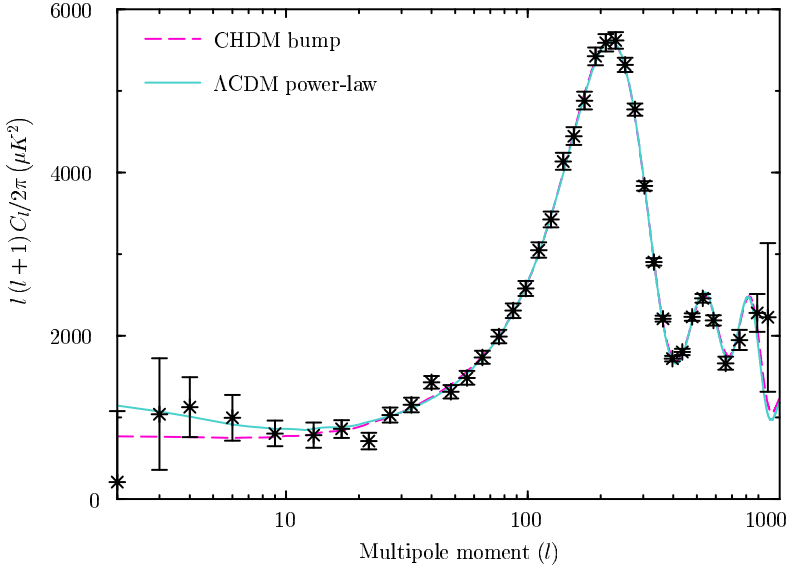
Shafieloo and Souradeep (2003)

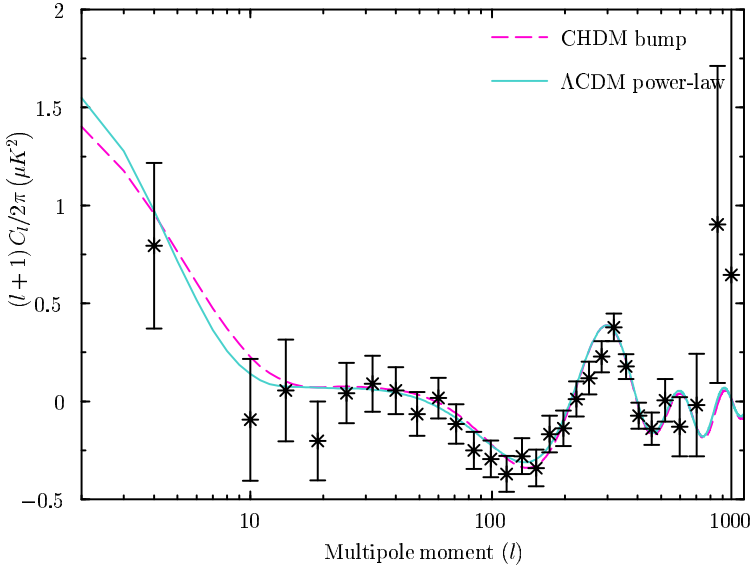
Looks *very similar* to spectrum recovered by deconvolution of the *WMAP* data!

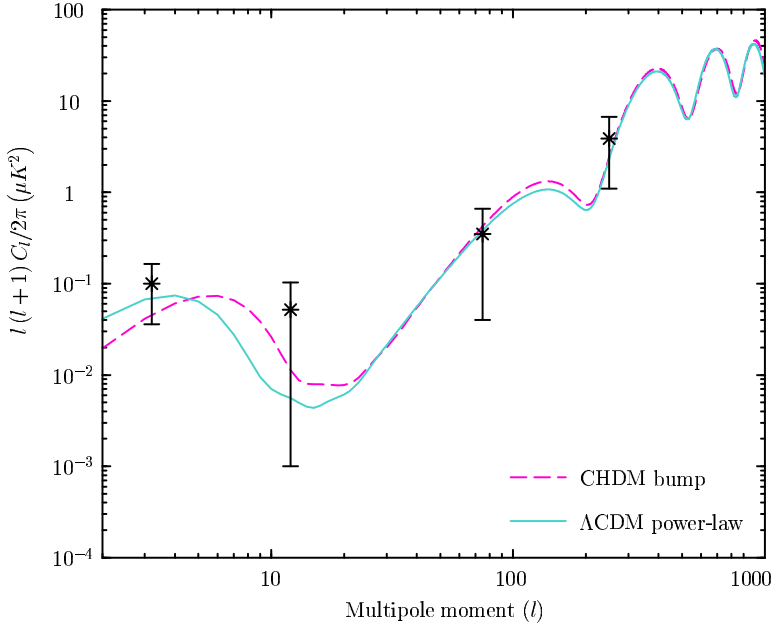
Two successive phase transitions give 'bump' in $\mathcal{P}_{\mathcal{R}}(k)$.

Allows EdeS model ($\Omega_m = 1, \Omega_\Lambda = 0, h = 0.44$) to fit WMAP data.



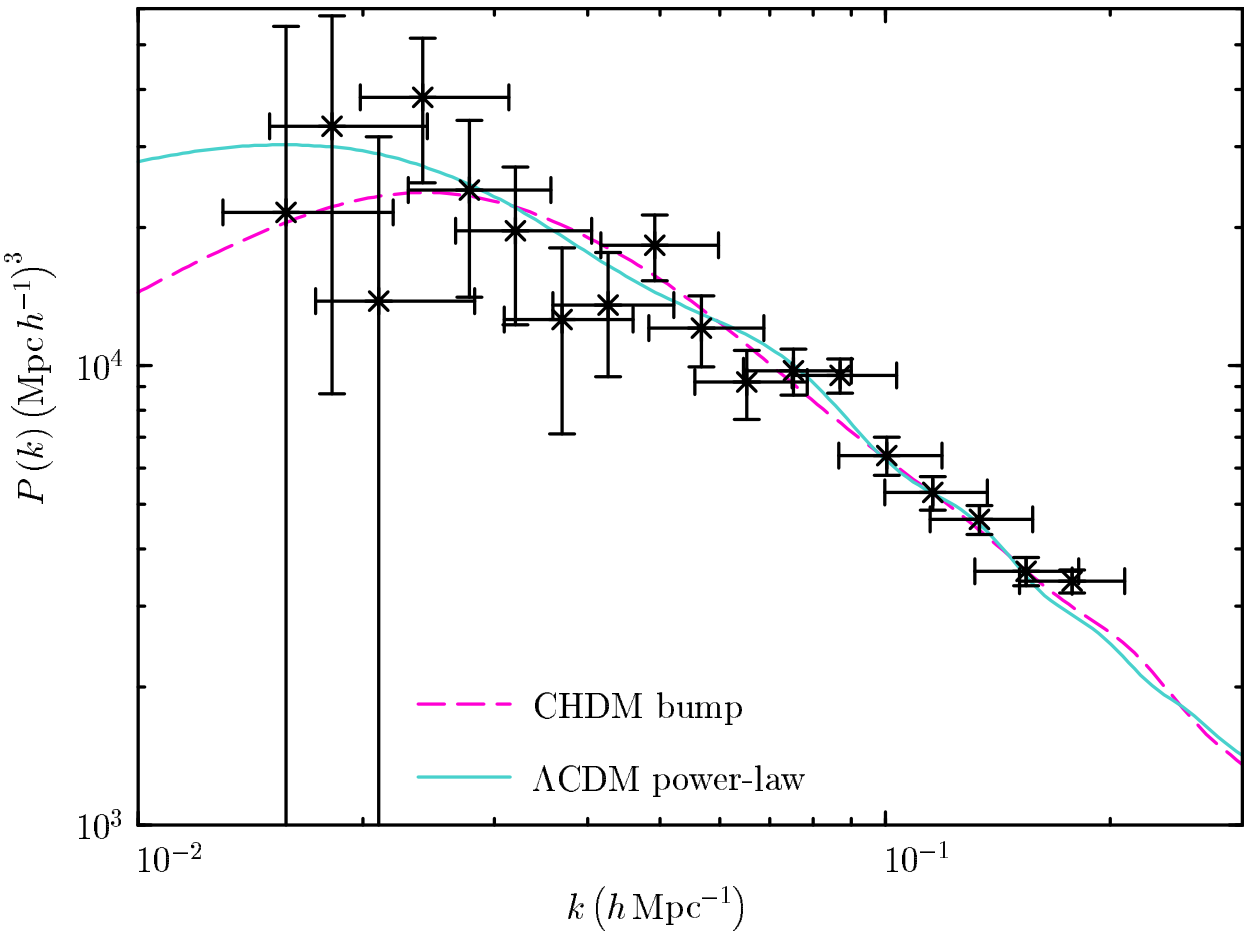






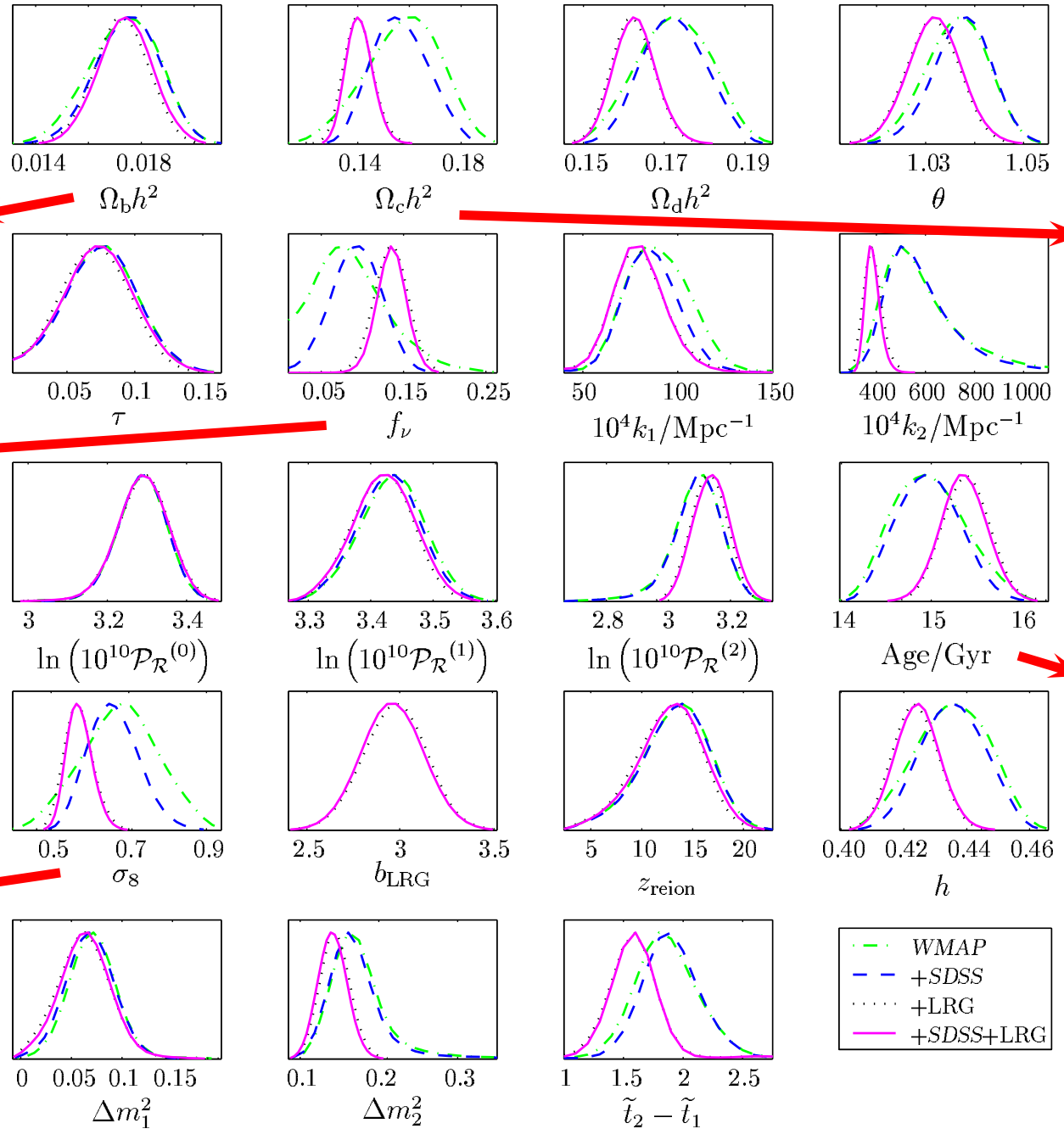
A pure CDM universe has excessive power on small scales.

However, a HDM component suppresses structure formation below the free-streaming scale.



Obtain good fit to SDSS data with 3 ν of mass 0.5 eV $\Rightarrow \Omega_\nu \simeq 0.1$.

Likelihood analysis: CHDM model ('bump' spectrum)



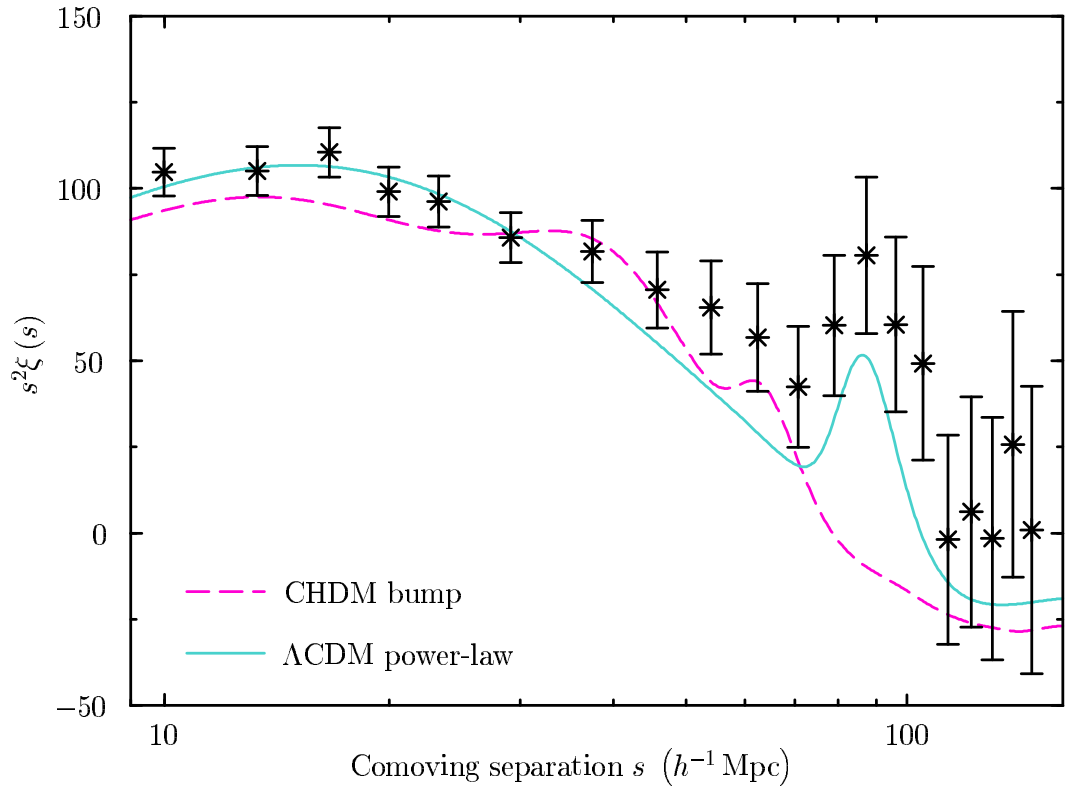
Agrees with BBN

50% higher than usual 'WMAP value' for CDM abundance

To fit LSS data requires 0.5 eV mass neutrinos

Consistent age for the universe

Consistent with data on clusters and weak lensing



EdeS cosmology with $h \sim 0.5$ *can* match the angular size of the first acoustic peak at $z \sim 1000$, but *not* that of the baryonic peak at $z \sim 0.35$.

However, if we are situated in a rapidly expanding underdense void it could mimic the effects of a cosmological constant.

In particular, the angular diameter distance @ $z = 0.35$ of an inhomogeneous LTB model ($h \sim 0.7$ for $z < 0.08$, then $h \to 0.5$) is similar to that of ΛCDM!
Biswas, Mansouri and Notari (2006)

Conclusions

The extraction of cosmological parameters from CMB and LSS data is very sensitive to the assumed spectrum of primordial density perturbations.

Since we do not have a ‘Standard Model’ for the physics of inflation we should not *assume* that $\mathcal{P}_{\mathcal{R}}(k)$ is scale-invariant.

WMAP results alone do *not* require dark energy, if we are prepared to accept BSI inflation.