

A detailed 3D cutaway rendering of the Planck satellite, showing its complex internal structure, including the central core, various instrument modules, and the large cylindrical structure that houses the High Frequency Instrument (HFI).

Implications for Cosmology

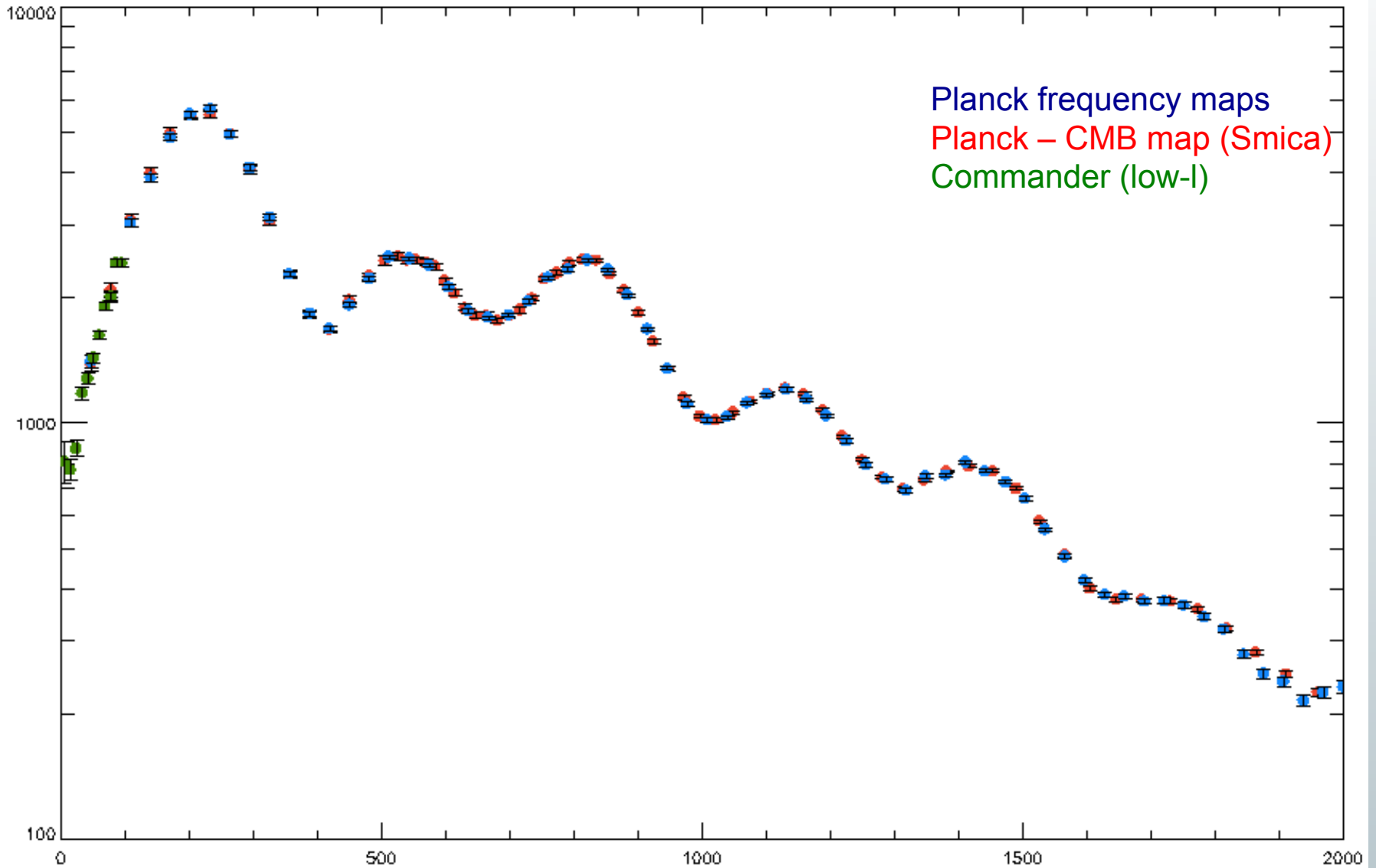
Comparison with other experiments

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On behalf of the Planck collaboration



Planck vs Planck



Planck collaboration: CMB power spectra & likelihood

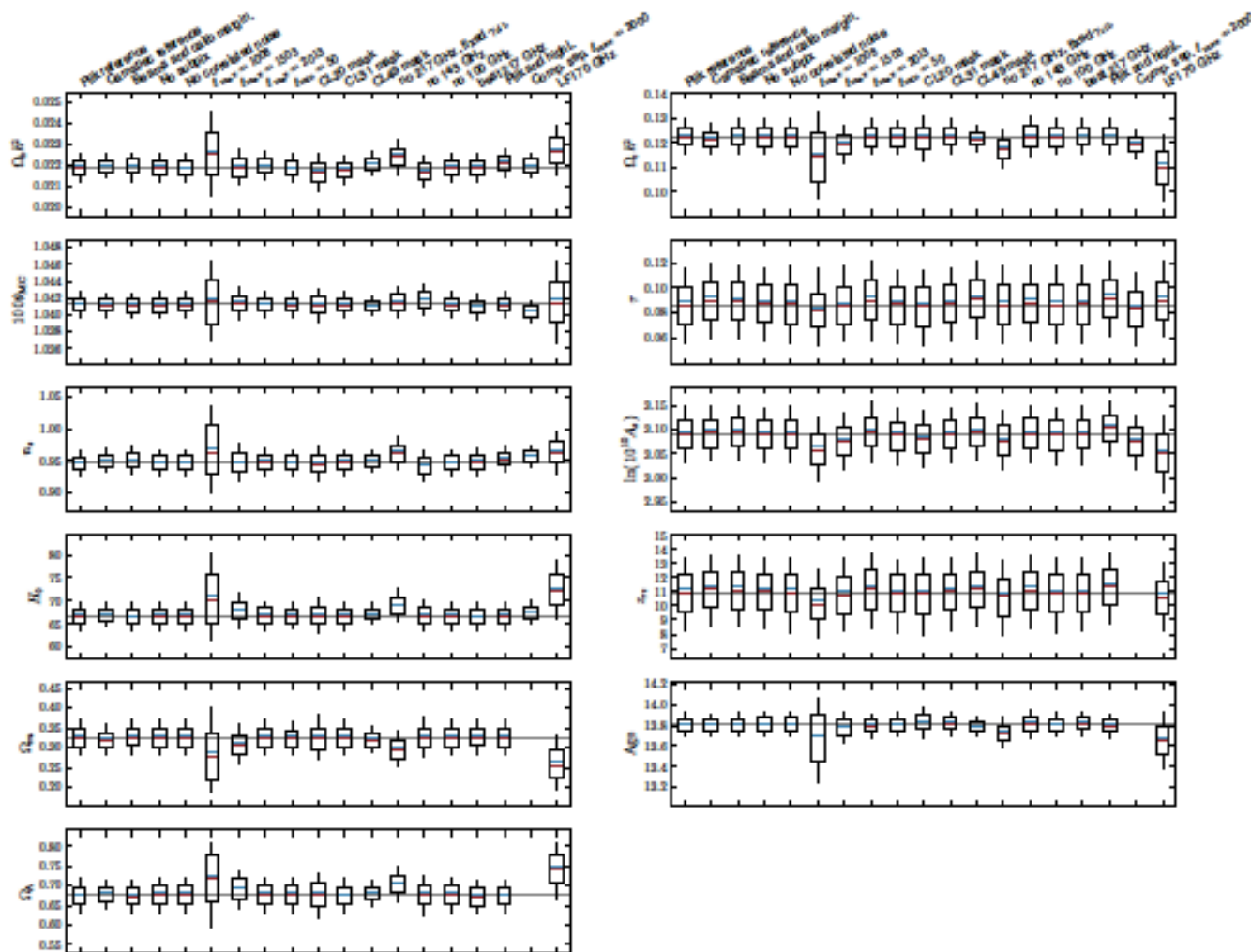
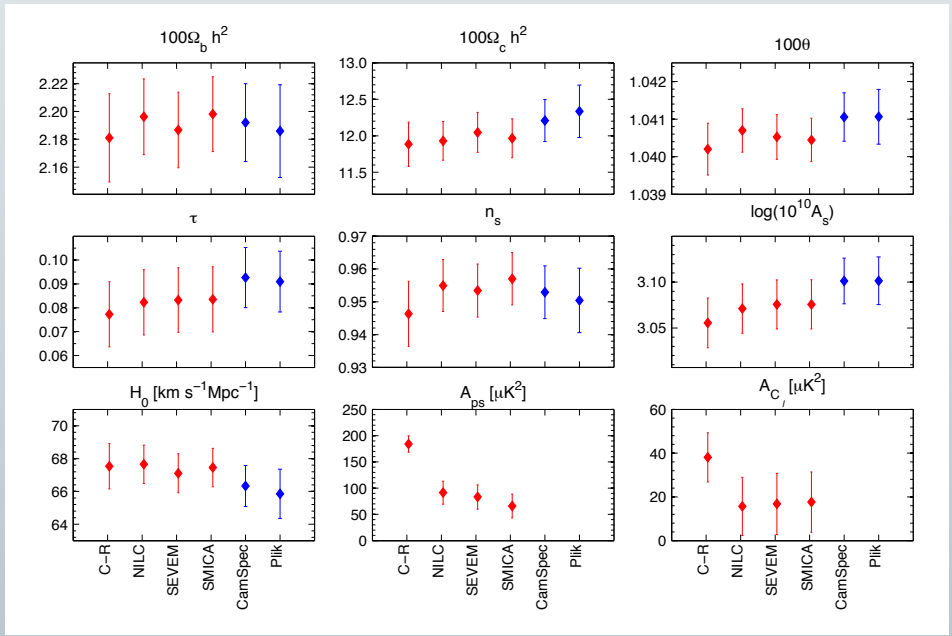
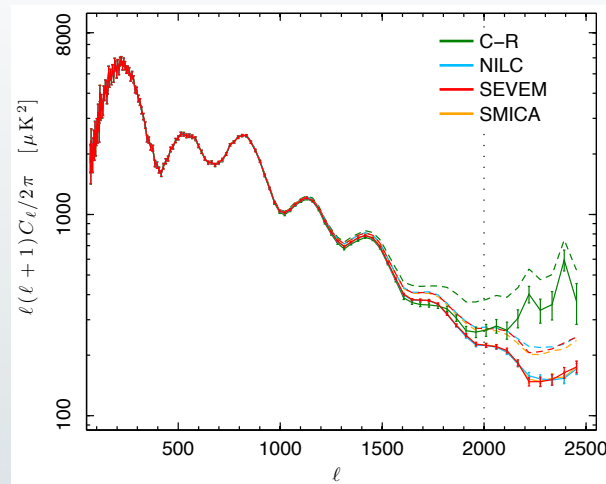
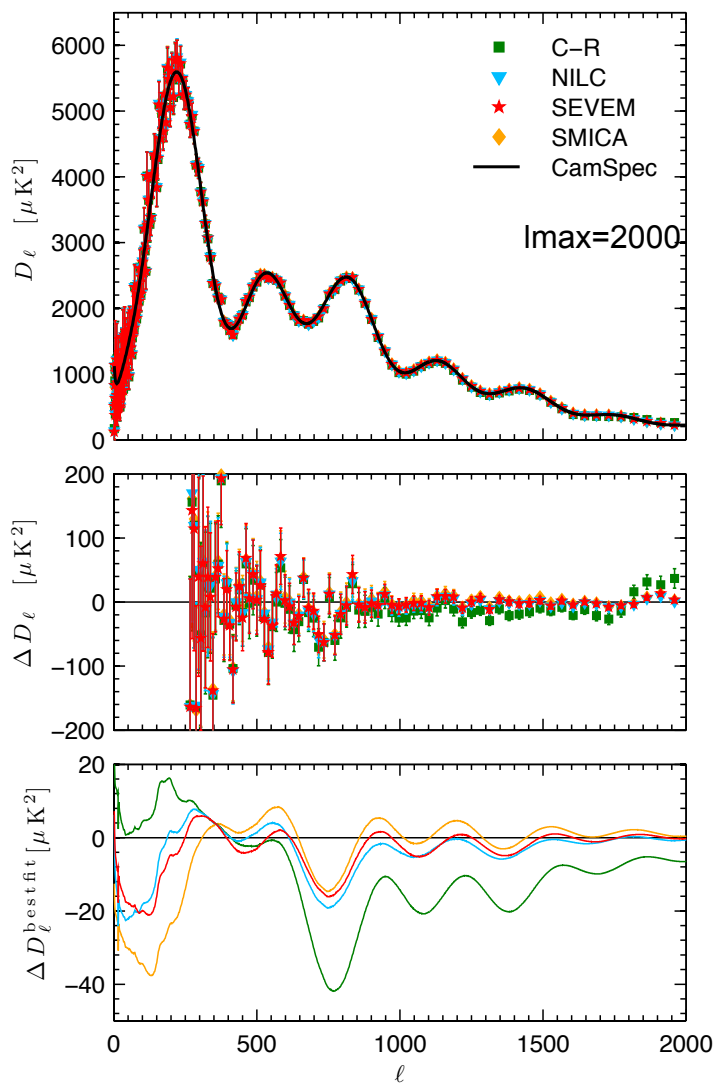
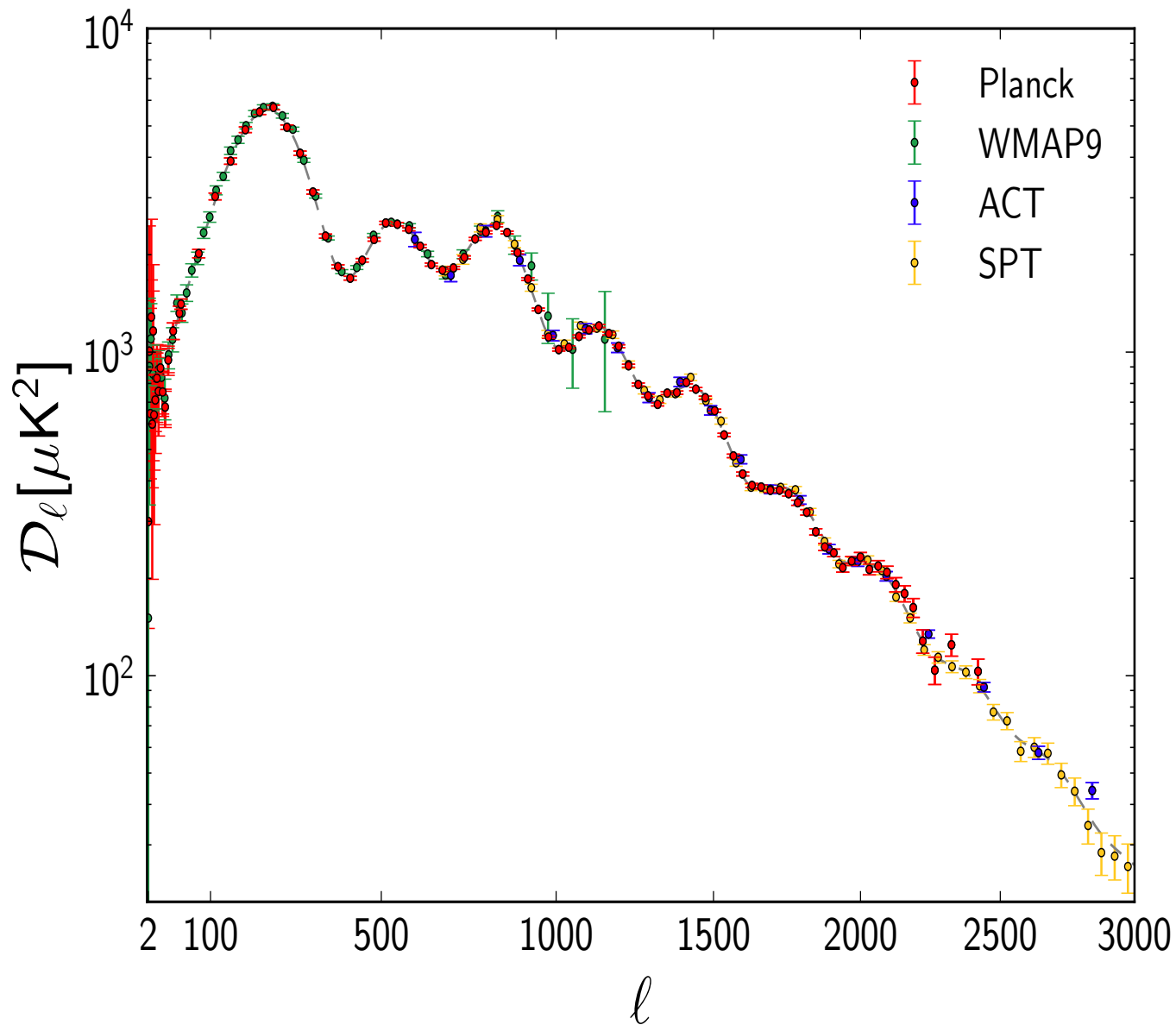


Figure 24. Comparison of the distributions of cosmological parameters in the reference case (left) with a set of validation test cases. The red line indicates the median and blue the mean, computed from the posterior histograms. The box shows the 68% confidence interval; the outer line the 95% interval.



Planck, WMAP9, SPT, ACT



Λ CDM Parameters, WMAP & Planck

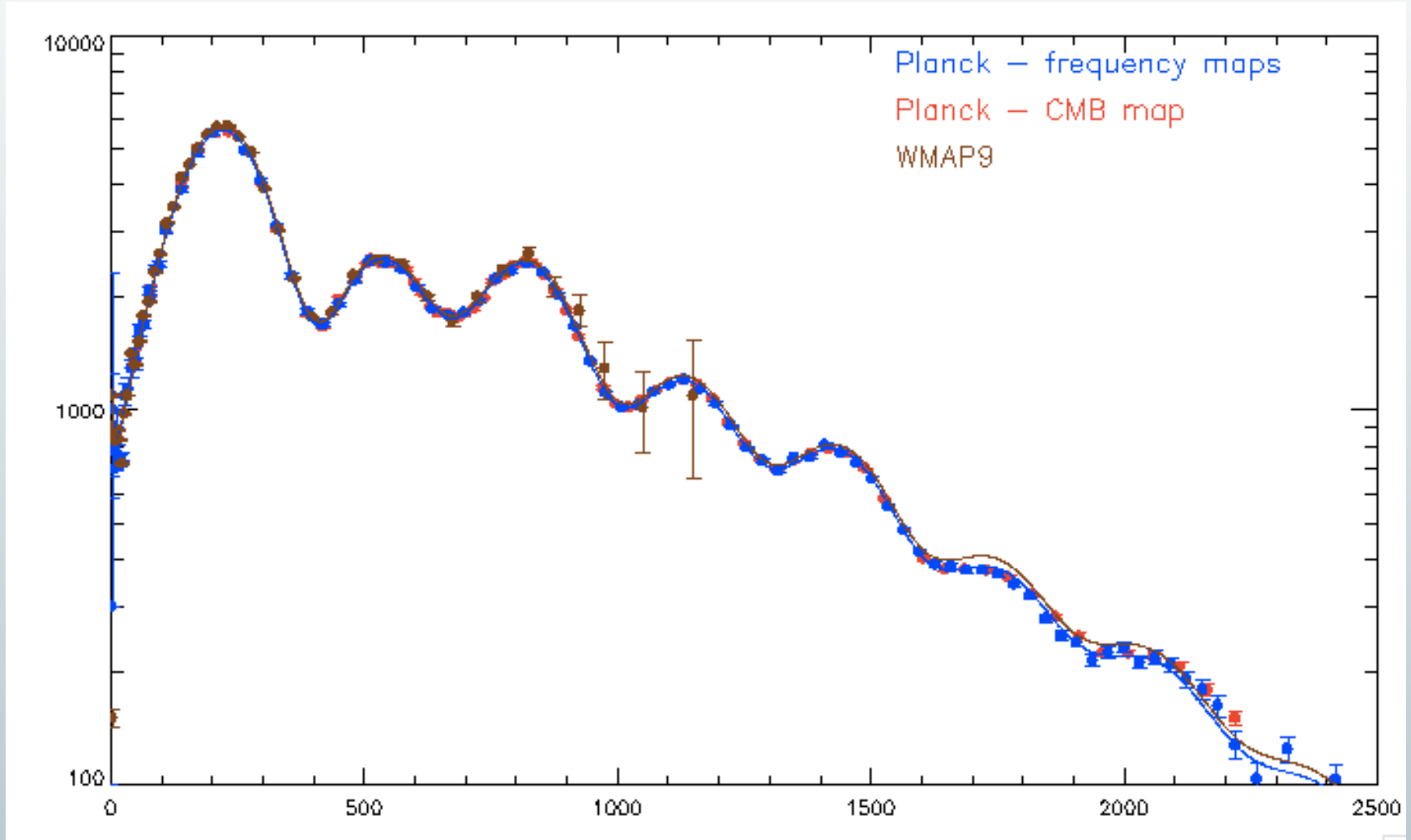
Parameter	<i>Planck</i> ("CMB+Lens")	WMAP (9-year)	Uncertainty ratio (<i>Planck</i> /WMAP)	Shift (WMAP sigma)	Shift (Planck sigma)
Fit parameters					
$\Omega_b h^2$	0.02217 ± 0.00033	0.02264 ± 0.00050	0.66	-0.9	-1.36
$\Omega_c h^2$	0.1186 ± 0.0031	0.1138 ± 0.0045	0.69	+1.1	+1.6
Ω_Λ	0.693 ± 0.019	0.721 ± 0.025	0.76	-1.1	-1.4
n_s	0.9635 ± 0.0094	0.972 ± 0.013	0.72 ^a	-0.7	-0.97
τ	0.089 ± 0.032	0.089 ± 0.014	2.28 ^a	0	-0.97
$10^9 \Delta_{\mathcal{R}}^2$...	2.41 ± 0.10 (4.1%)			0
$\ln(10^{10} A_s)$	3.085 ± 0.057 (1.8%)	...	0.44 ^a		
Derived parameters					
t_0 (Gyr)	13.796 ± 0.058	13.74 ± 0.11	0.53	+0.5	+0.94
H_0 (km/s/Mpc)	67.9 ± 1.5	70.0 ± 2.2	0.68	-1.0	-1.5
σ_8	0.823 ± 0.018	0.821 ± 0.023	0.78	+0.1	+0.13
$100 \theta_*$	1.04141 ± 0.00067	1.0390 ± 0.0023	0.29	+1.0	+3.4

^aThese parameter uncertainties benefit most from polarization data to constrain τ .

However the shifts in parameters are not independent they talk to the spectra
the net result is more significant

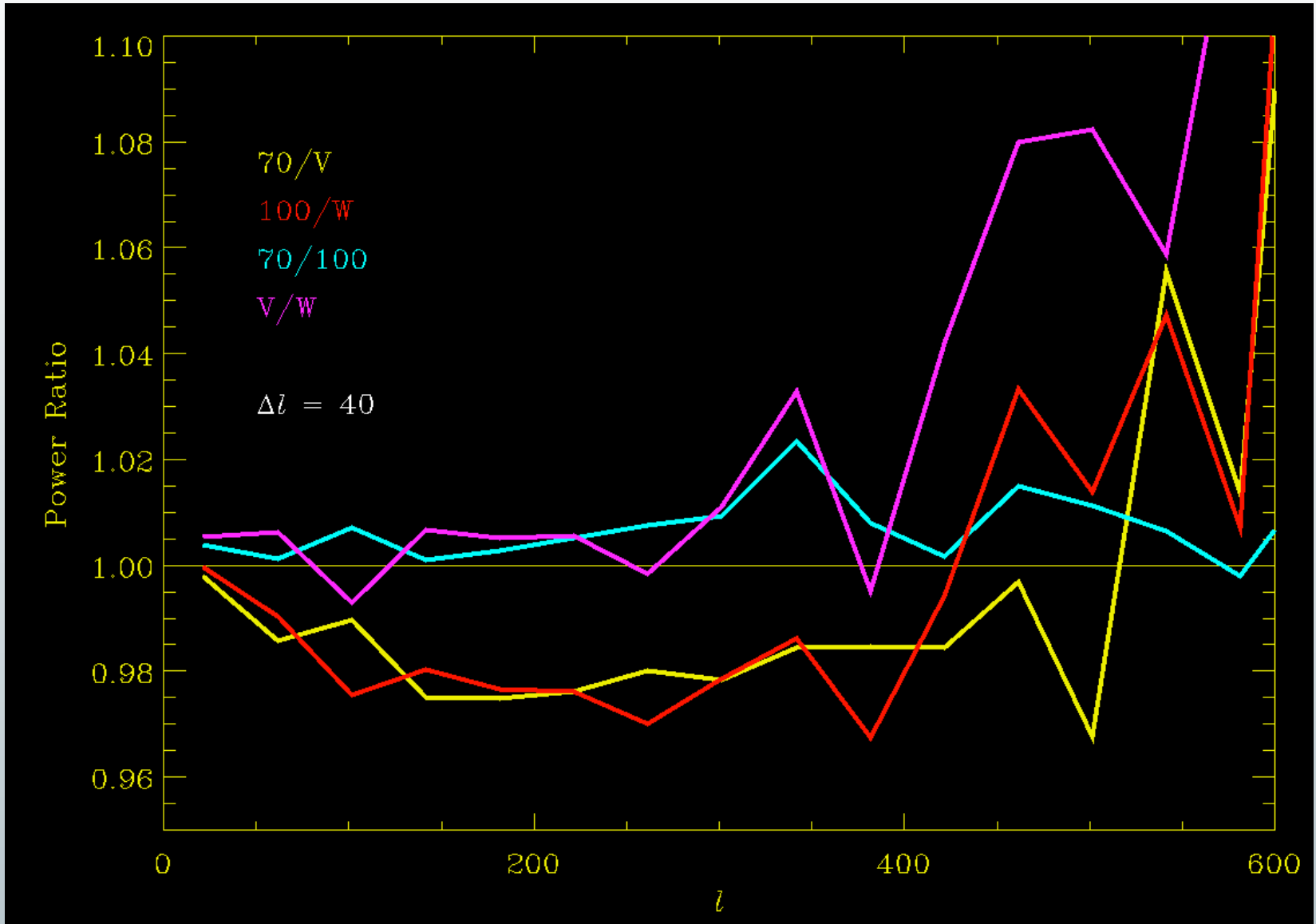


Planck vs WMAP9



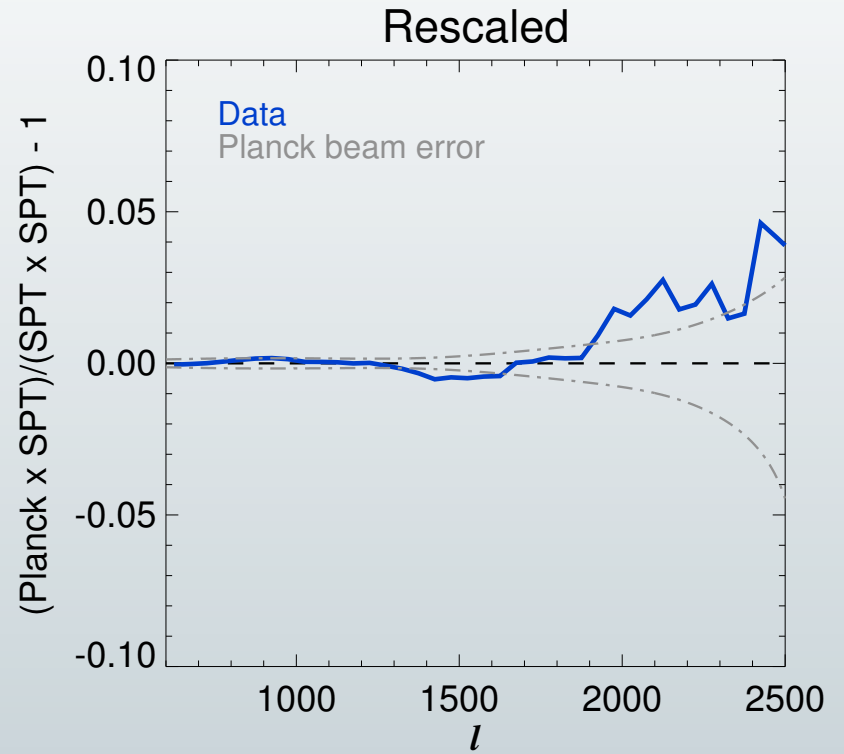
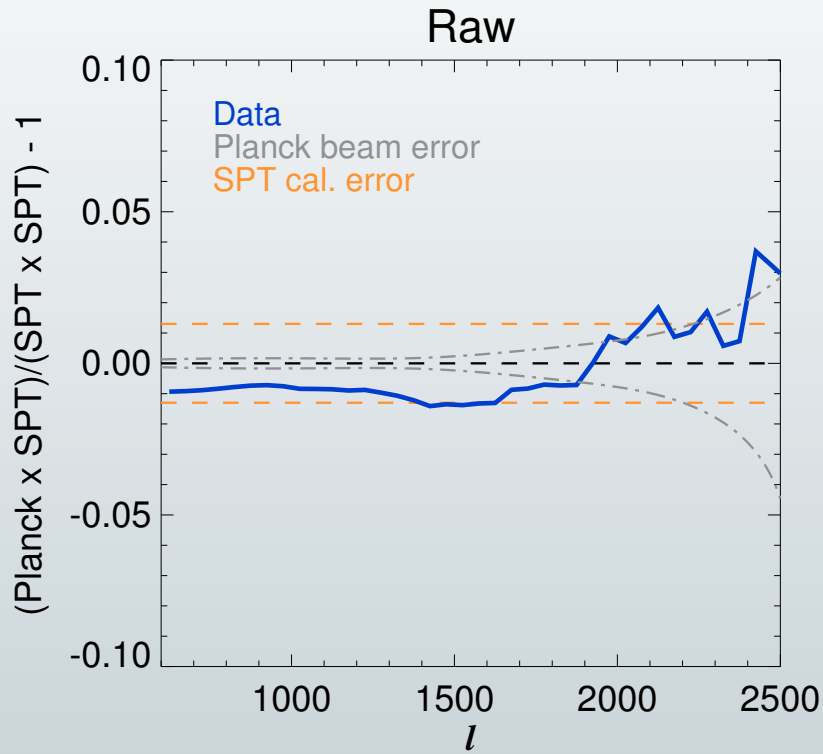


Planck vs WMAP9





Planck vs SPT

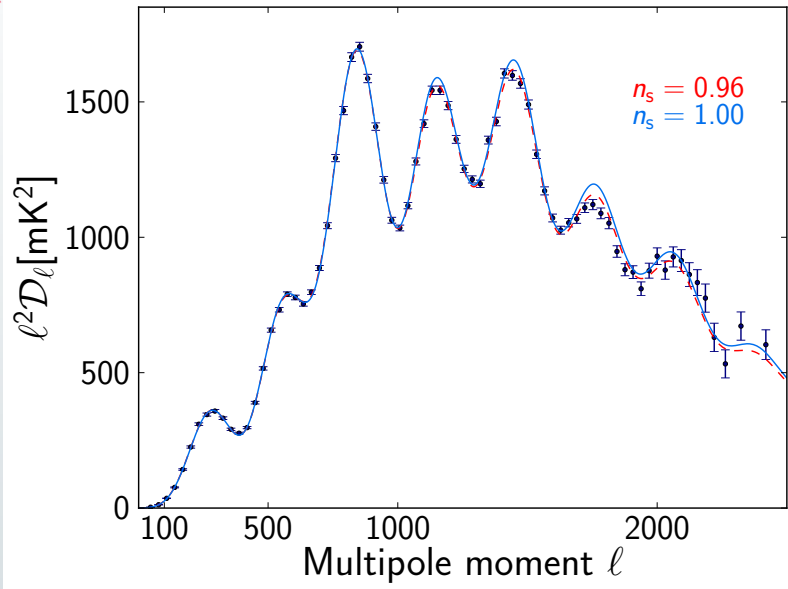


Courtesy of SPT+Planck team



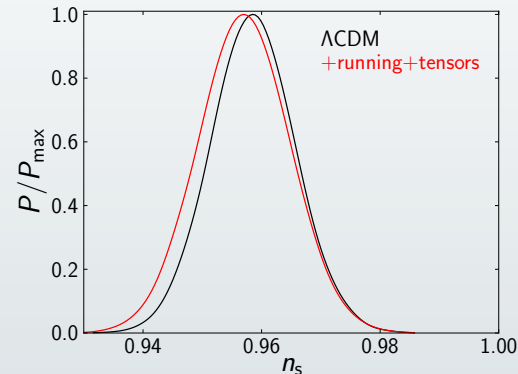
Extensions to Λ CDM model

Early-Universe physics: n_s , dn_s/dk and r



6σ departure
from scale
invariance

$$n_s = 0.9603 \pm 0.0073$$

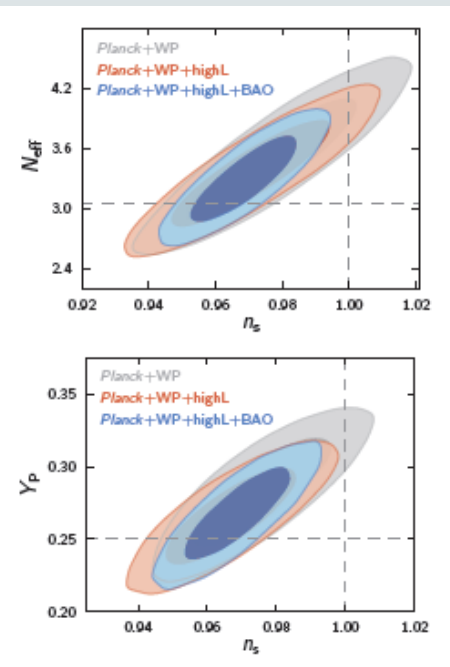
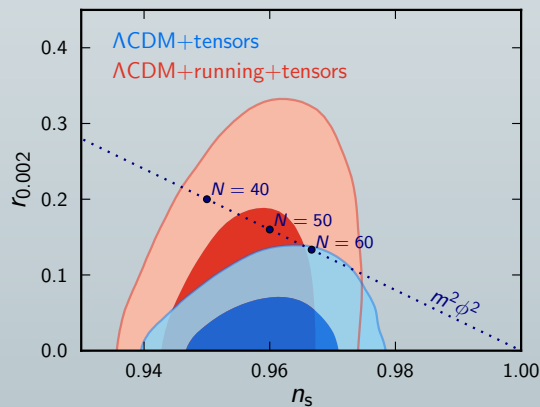
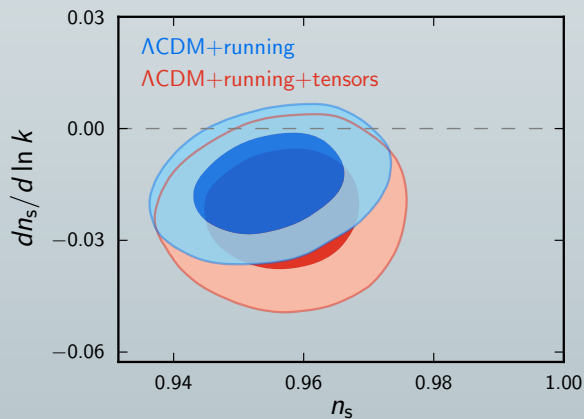


$l < 50$

$$dn_s / d \ln k = -0.0134 \pm 0.0090$$

$$r < 0.11 \quad V_*$$

$$V = (1.94 \times 10^{16} \text{ GeV})^4 (r_{0.002} / 0.12)$$



3σ