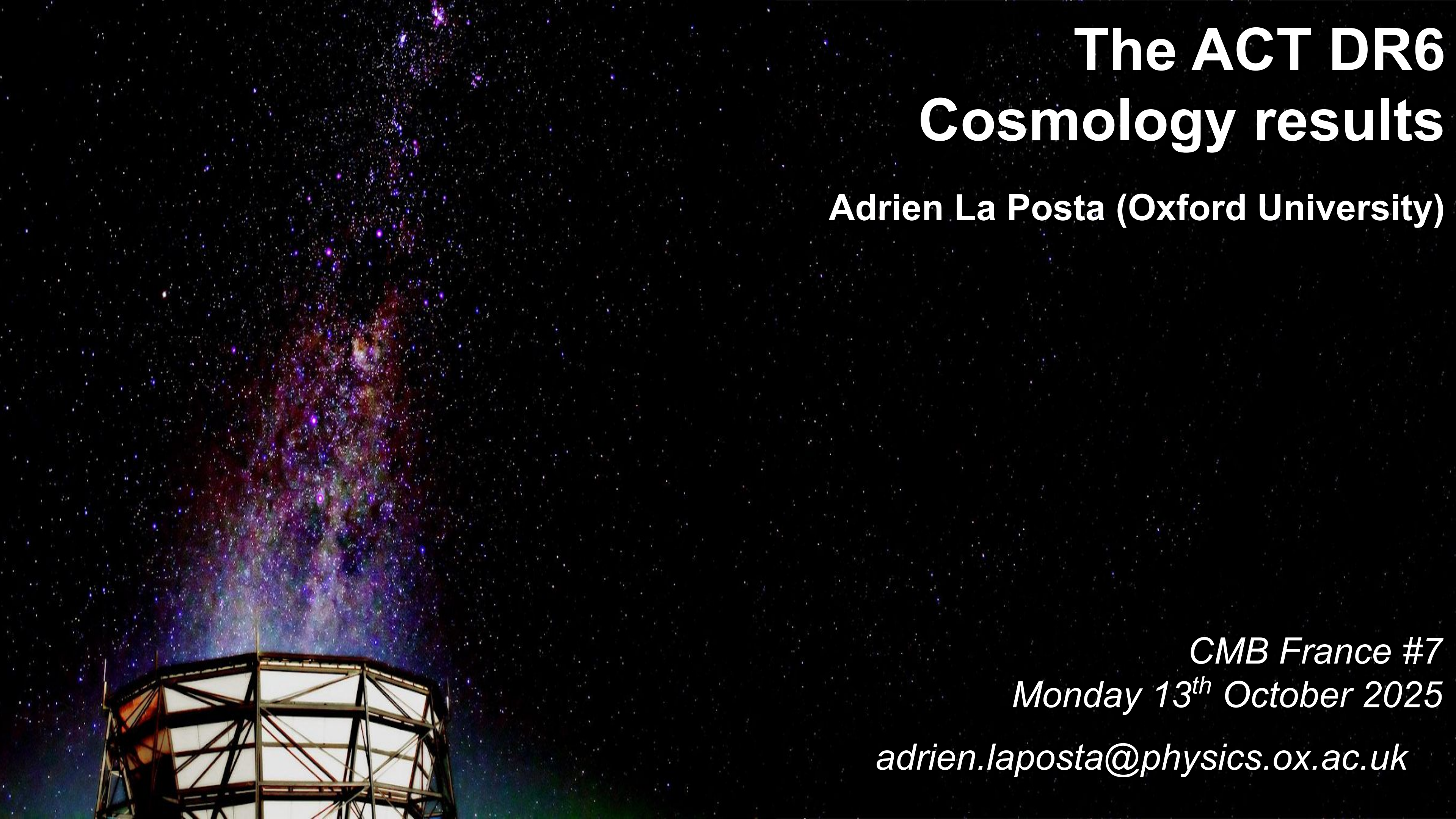


The ACT DR6 Cosmology results

Adrien La Posta (Oxford University)

CMB France #7
Monday 13th October 2025

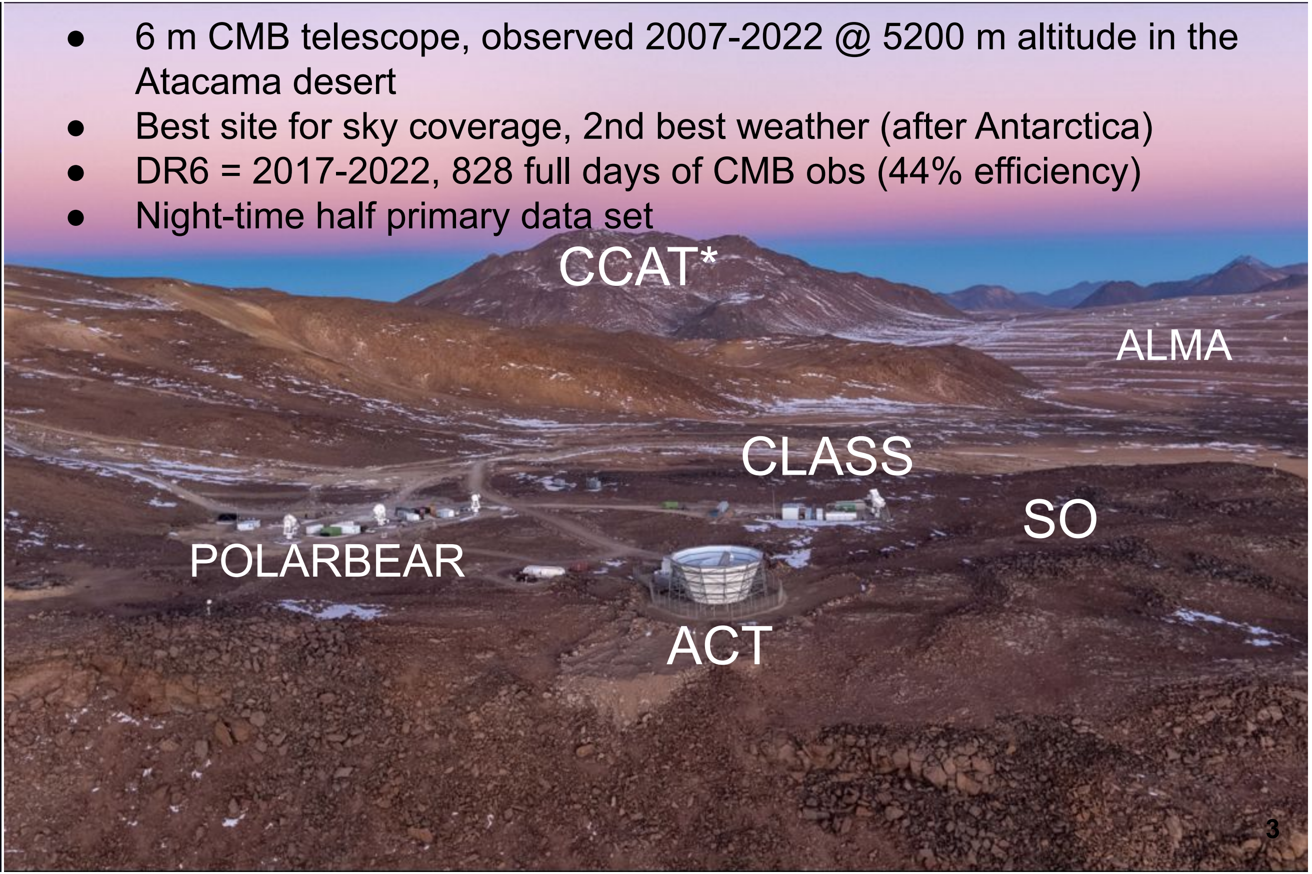
adrien.laposta@physics.ox.ac.uk

The ACT Collaboration

160 collaborators at 60 institutions

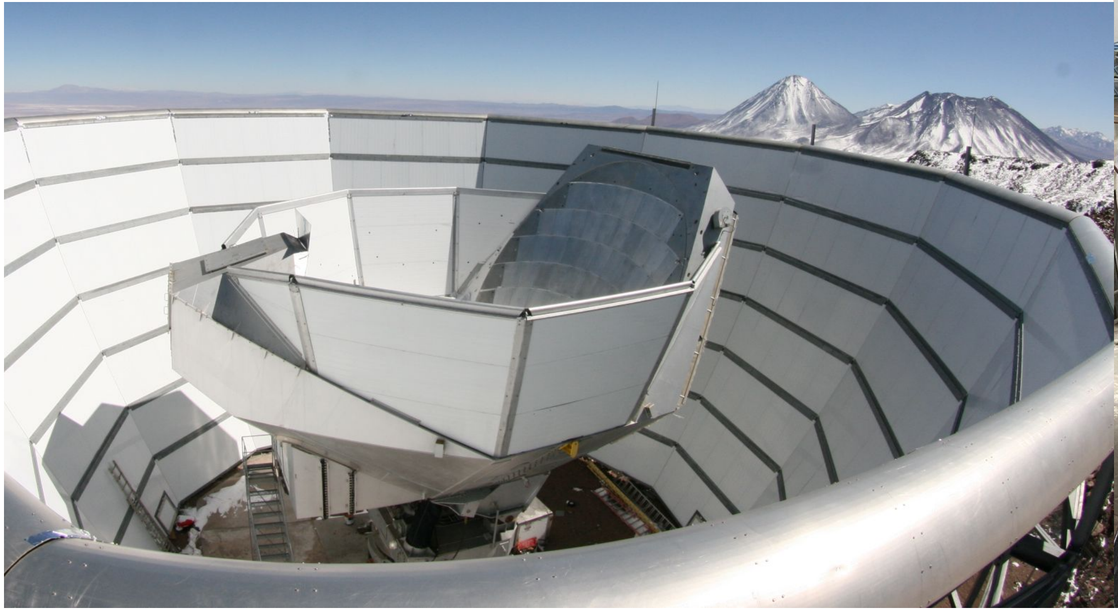
The Atacama Cosmology Telescope

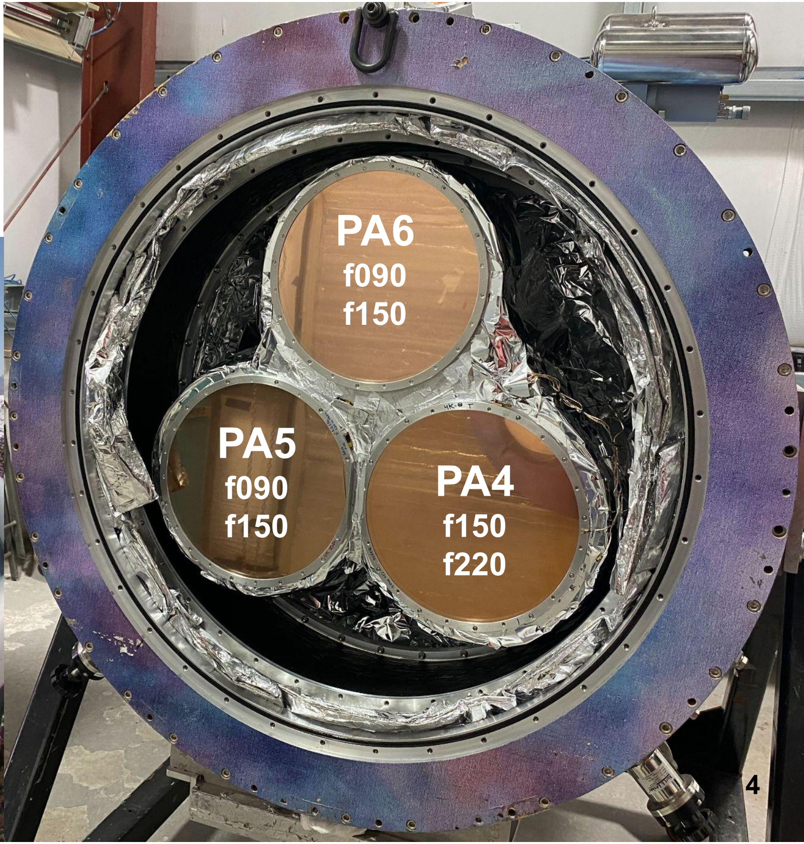
- 6 m CMB telescope, observed 2007-2022 @ 5200 m altitude in the Atacama desert
- Best site for sky coverage, 2nd best weather (after Antarctica)
- DR6 = 2017-2022, 828 full days of CMB obs (44% efficiency)
- Night-time half primary data set



Closer look

- 3 dichroic detector arrays for DR6: PA4, PA5 and PA6
- 3750 working detectors (70% yield) at 100 mK
- 3 broad bands: f090 (77 – 112 GHz),
  f150 (124 – 172 GHz) and f220 (182 – 277 GHz)
- Combined sensitivity of 6.2 μK√s,
  and 1.4’ FWHM @ f150





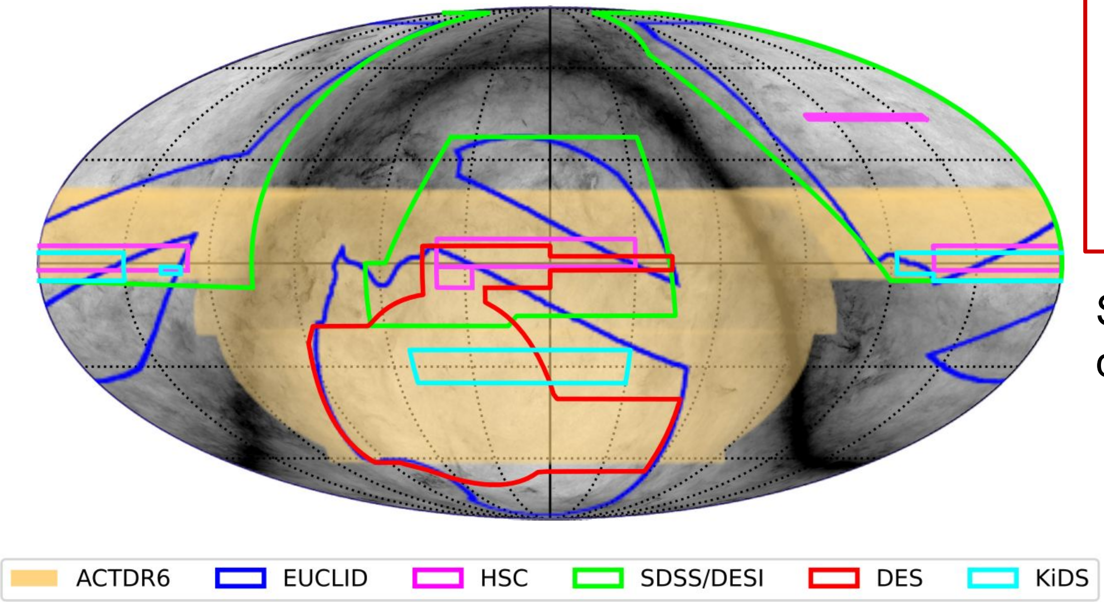
Survey and primary CMB DR6 release

45% sky coverage and large overlap with other surveys

Many papers exploiting this overlap via CMB lensing/Compton-y correlations with LSS

Coulton et al. 2023

Qu et al., Madhavacheril et al. 2023

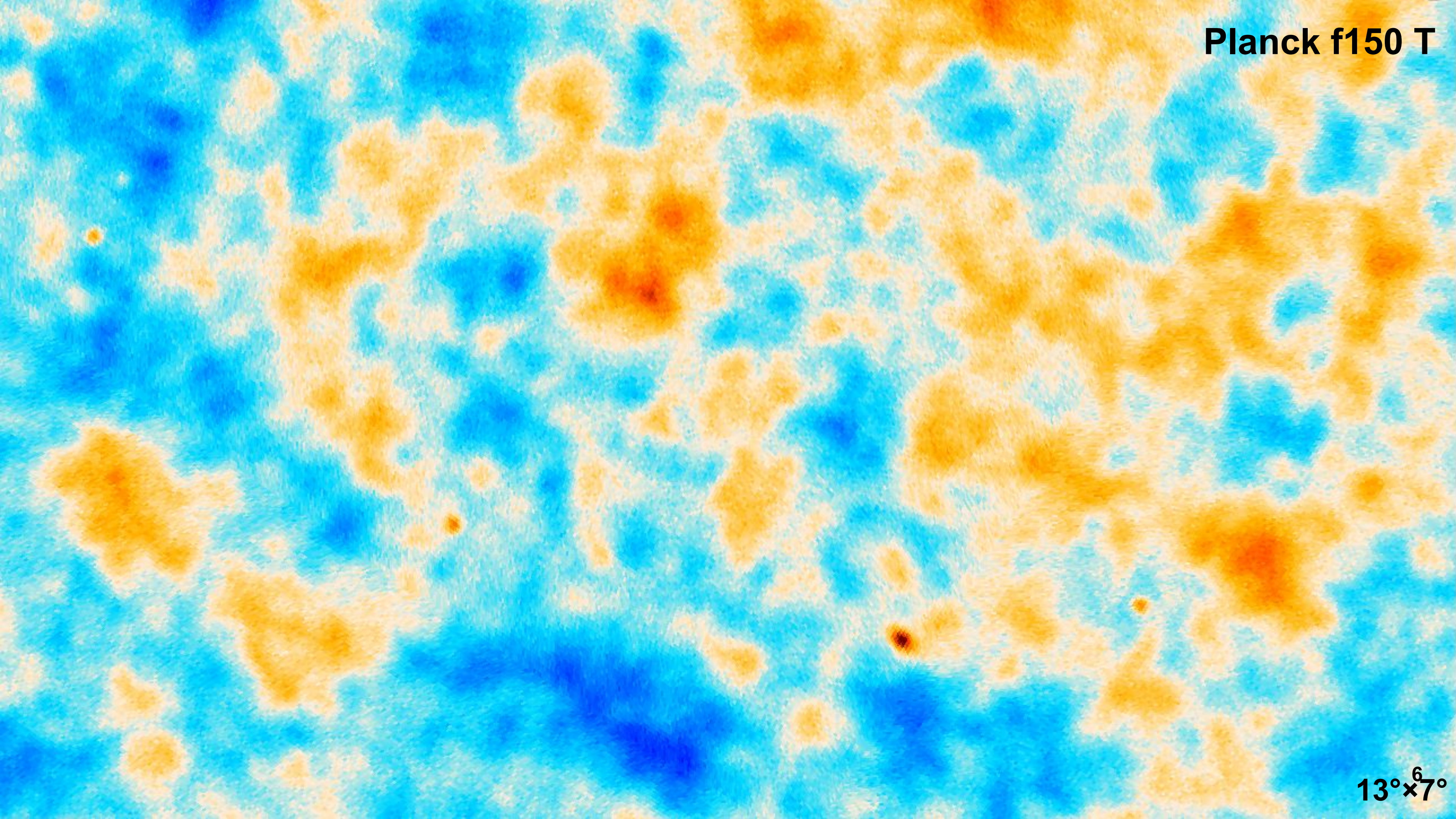


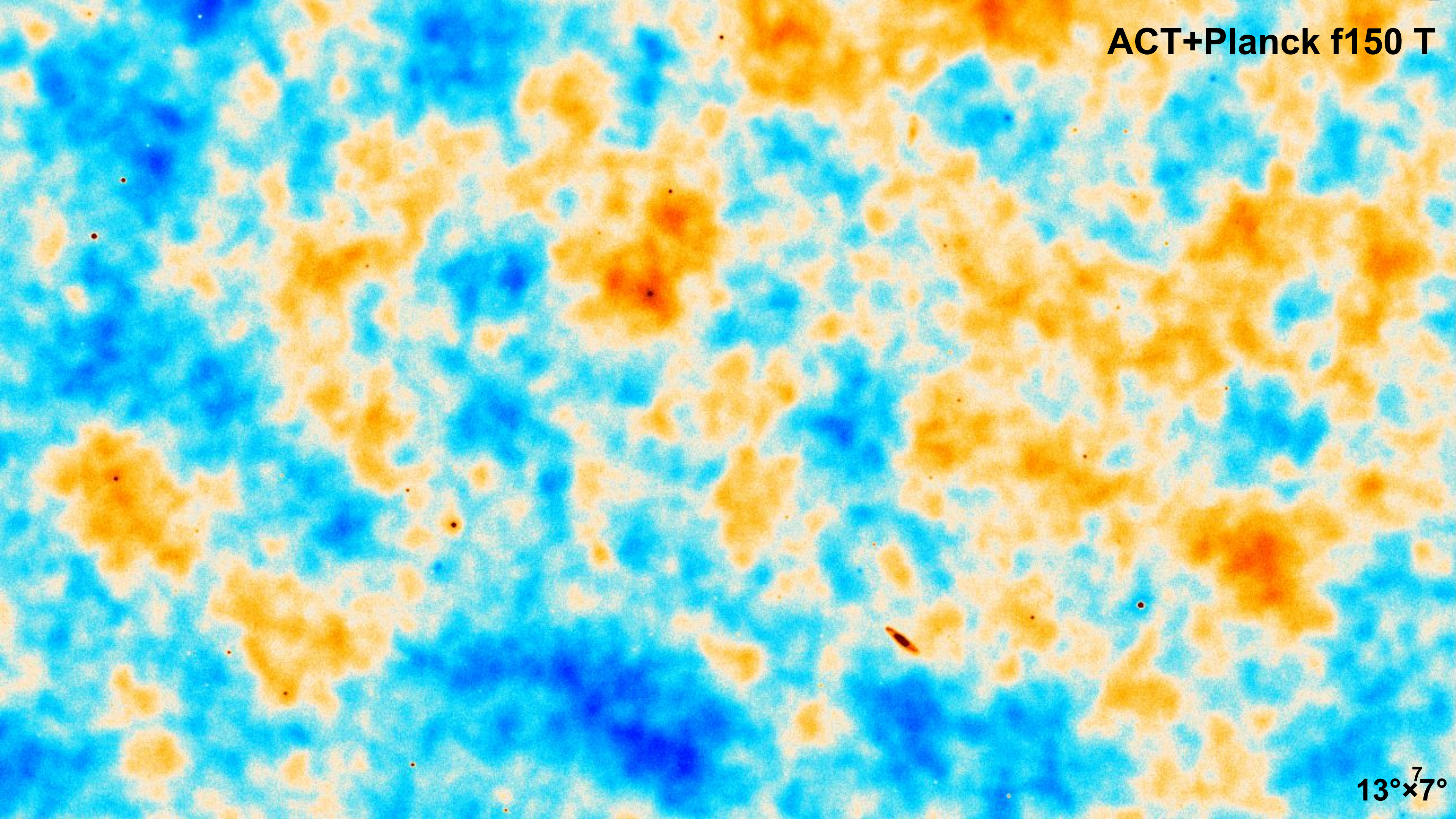
This talk is about the ACT DR6 cosmological results

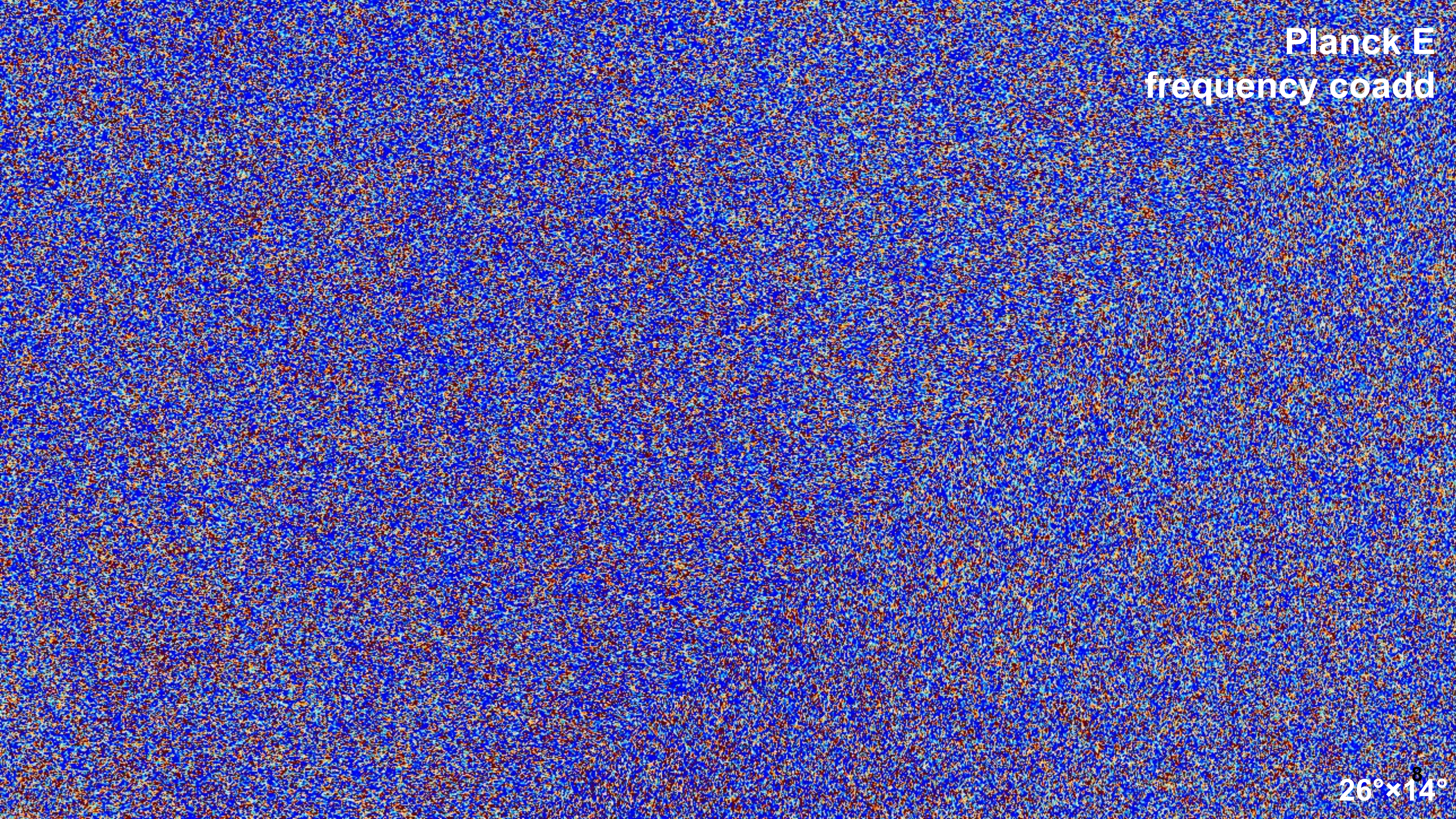
- *Naess et al. 2025*, The Atacama Cosmology Telescope: DR6 maps
- *Louis et al. 2025*, The Atacama Cosmology Telescope: DR6 Power Spectra, Likelihoods and ΛCDM Parameters
- *Calabrese et al. 2025*, The Atacama Cosmology Telescope: DR6 Constraints on Extended Cosmological Models

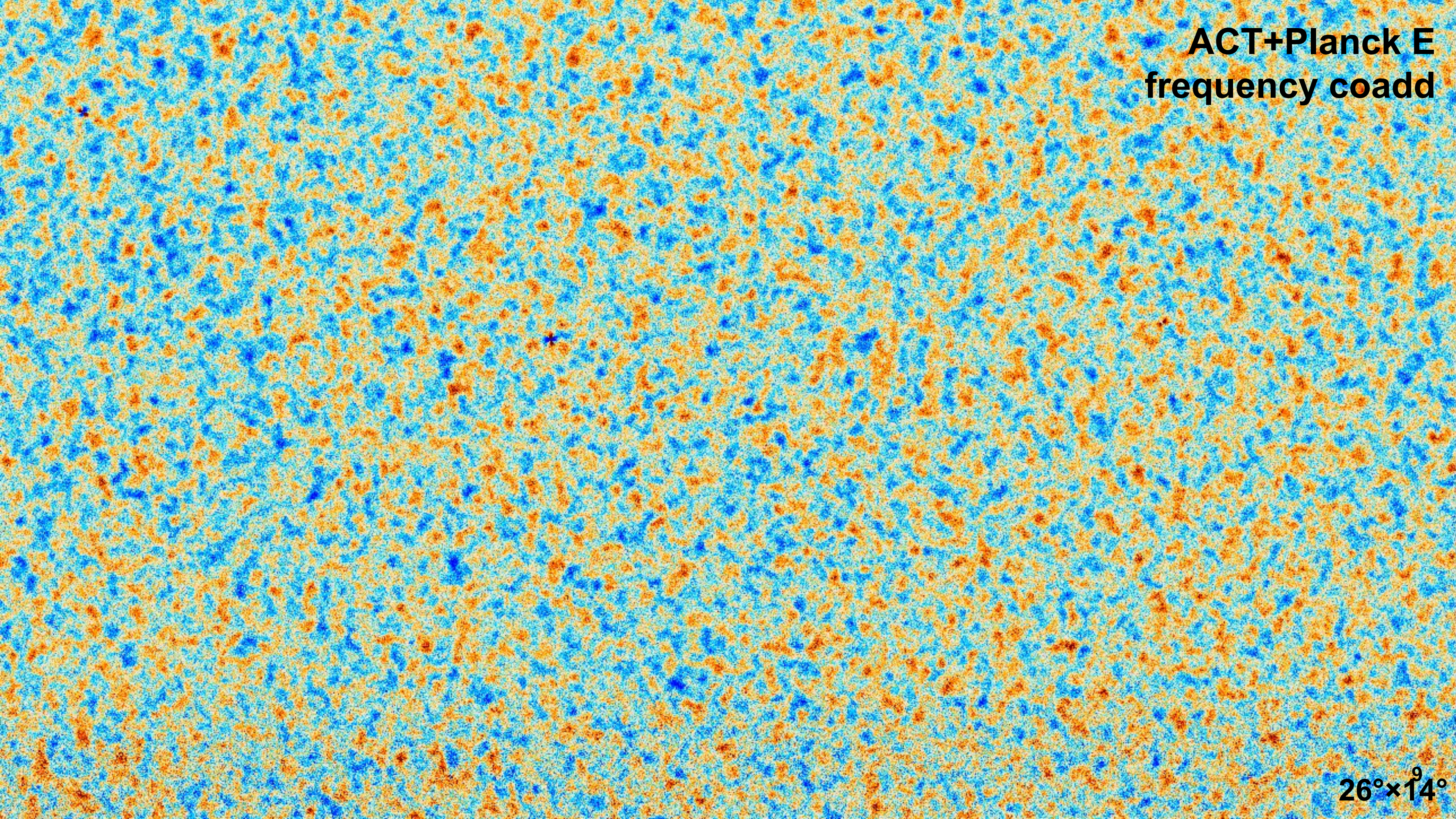
See Benjamin's talk for a detailed description of foreground modelling

- *Beringue et al. 2025, The Atacama Cosmology Telescope: DR6 Power Spectrum Foreground Model and Validation*


Planck f150 T
13°×7°

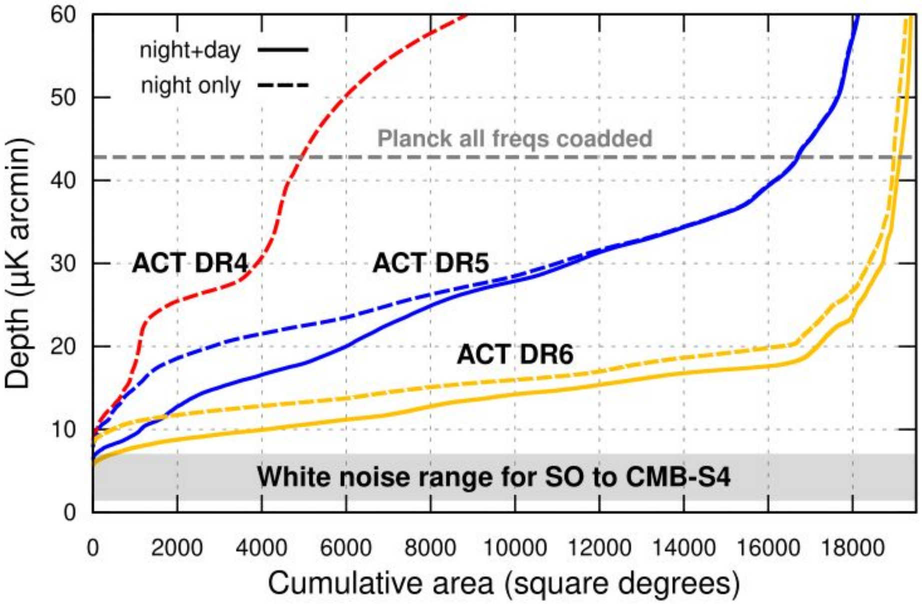

ACT+Planck f150 T
13°×7°


Planck E
frequency coadd
26°×14°

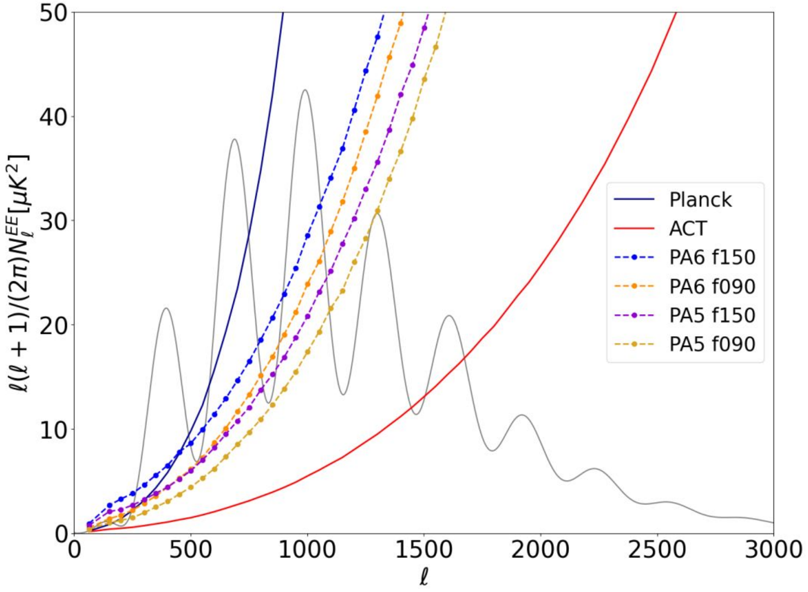

ACT+Planck E
frequency coadd
26°×14°

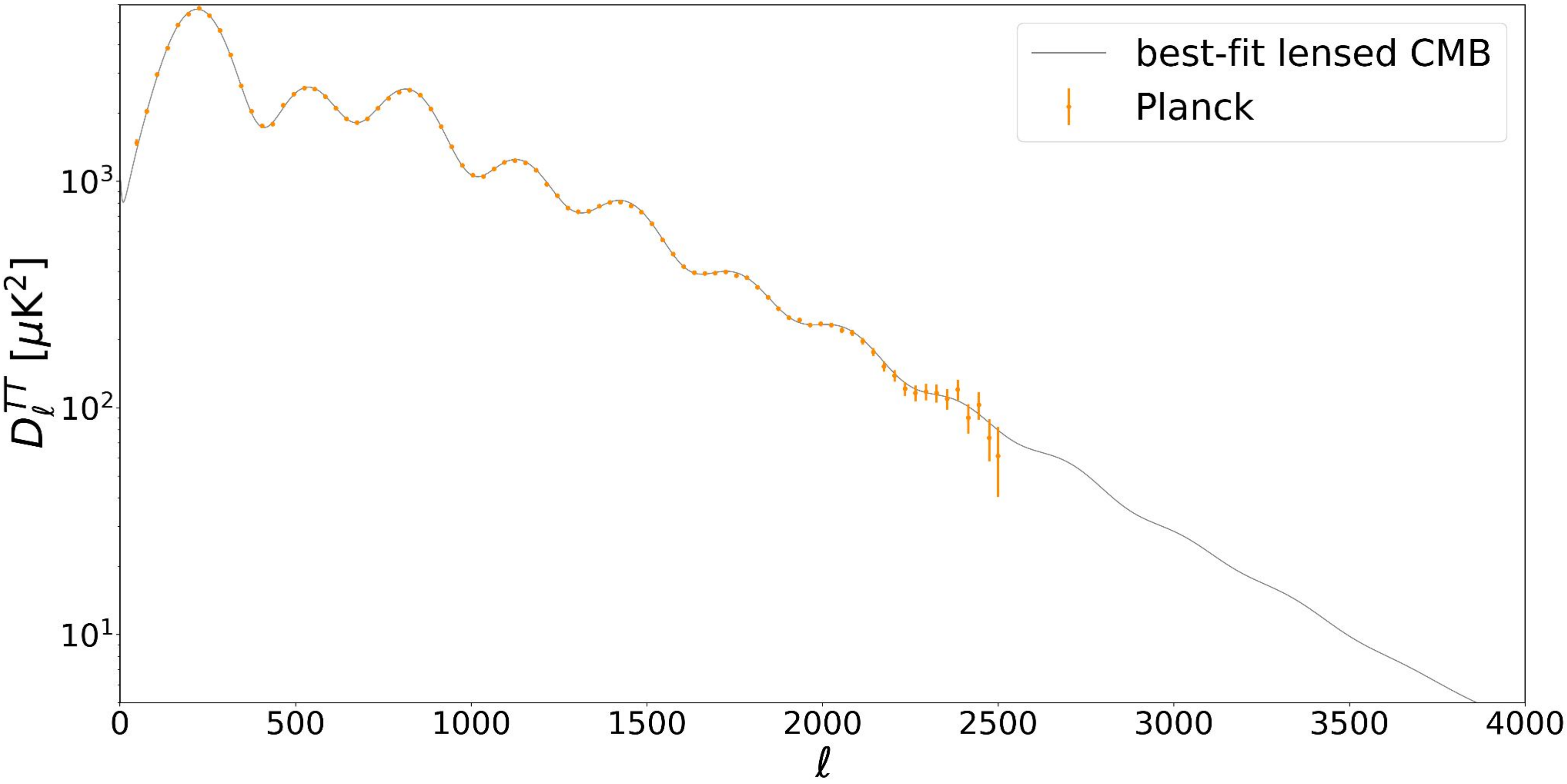
Sensitivity of DR6 data

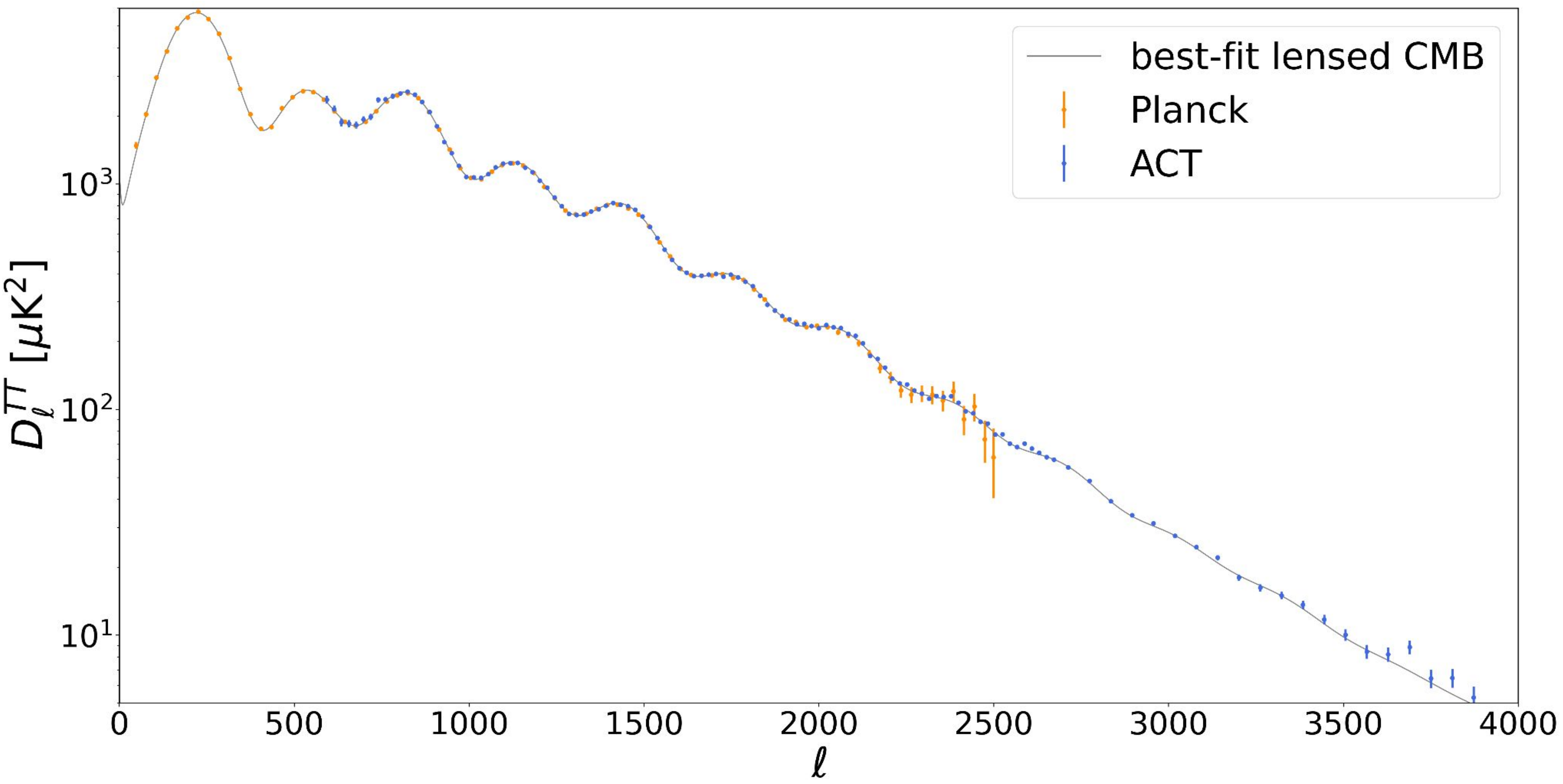
Deeper than Planck over 19000 square degrees (45% of the sky, on small scales)

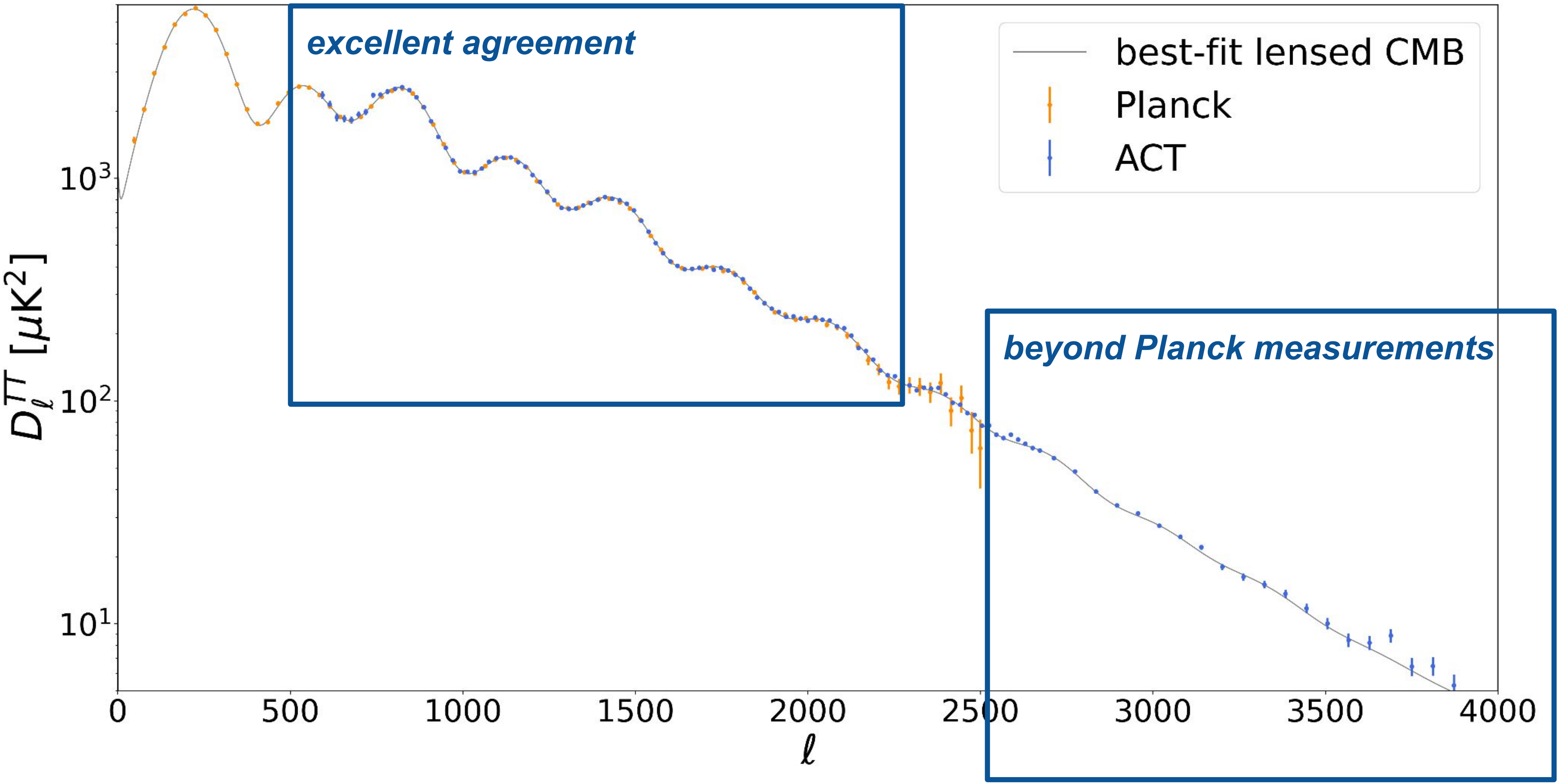


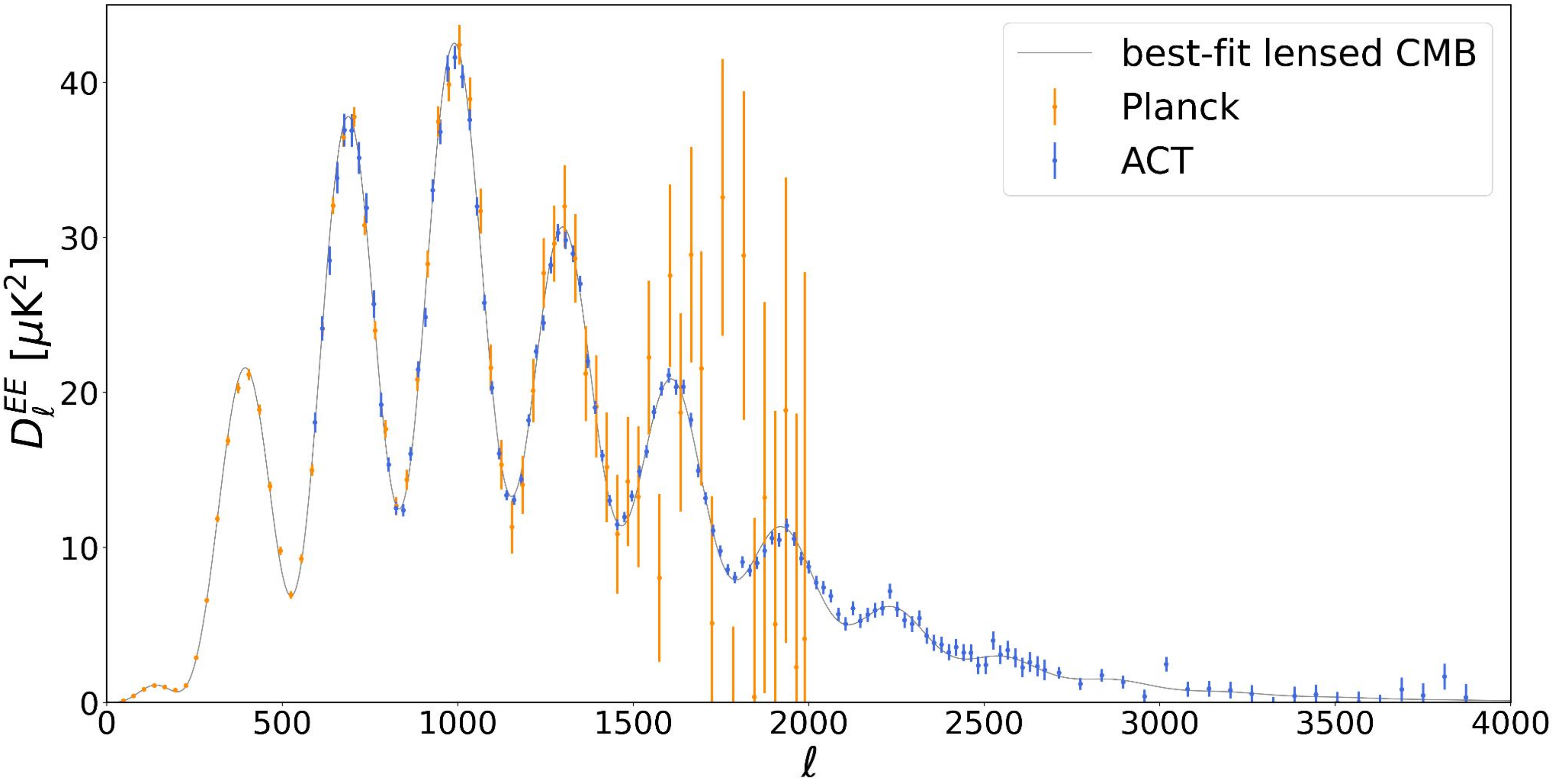
ACT DR6 polarization power spectra are signal dominated up to ell=1500 (0.1 deg)

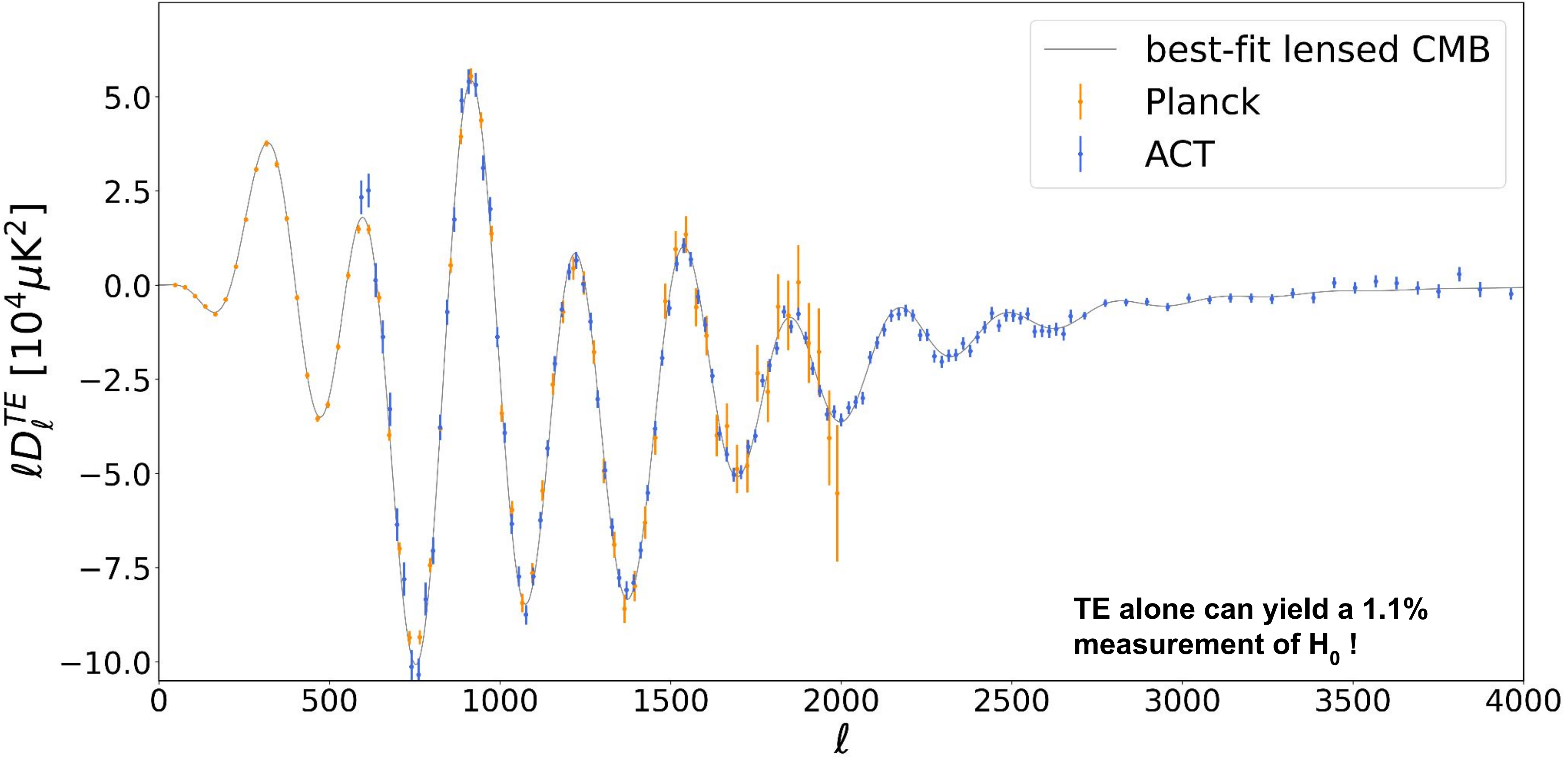



best-fit lensed CMB
Planck
10^3
10^2
10^1
D_ℓ^{TT} [μK^2]
0
500
1000
1500
2000
2500
3000
3500
4000
ℓ


best-fit lensed CMB
Planck
ACT
D_ℓ^{TT} [μK^2]
10^3
10^2
10^1
0
500
1000
1500
2000
2500
3000
3500
4000
ℓ


excellent agreement
beyond Planck measurements
best-fit lensed CMB
Planck
ACT
D_ℓ^{TT} [μK^2]
10^3
10^2
10^1
0
500
1000
1500
2000
2500
3000
3500
4000
ℓ


best-fit lensed CMB
Planck
ACT
D_ℓ^{EE} [μK^2]
40
30
20
10
0
0
500
1000
1500
2000
2500
3000
3500
4000
ℓ



TE alone can yield a 1.1% measurement of H_0 !

ACT DR6 Cosmology results

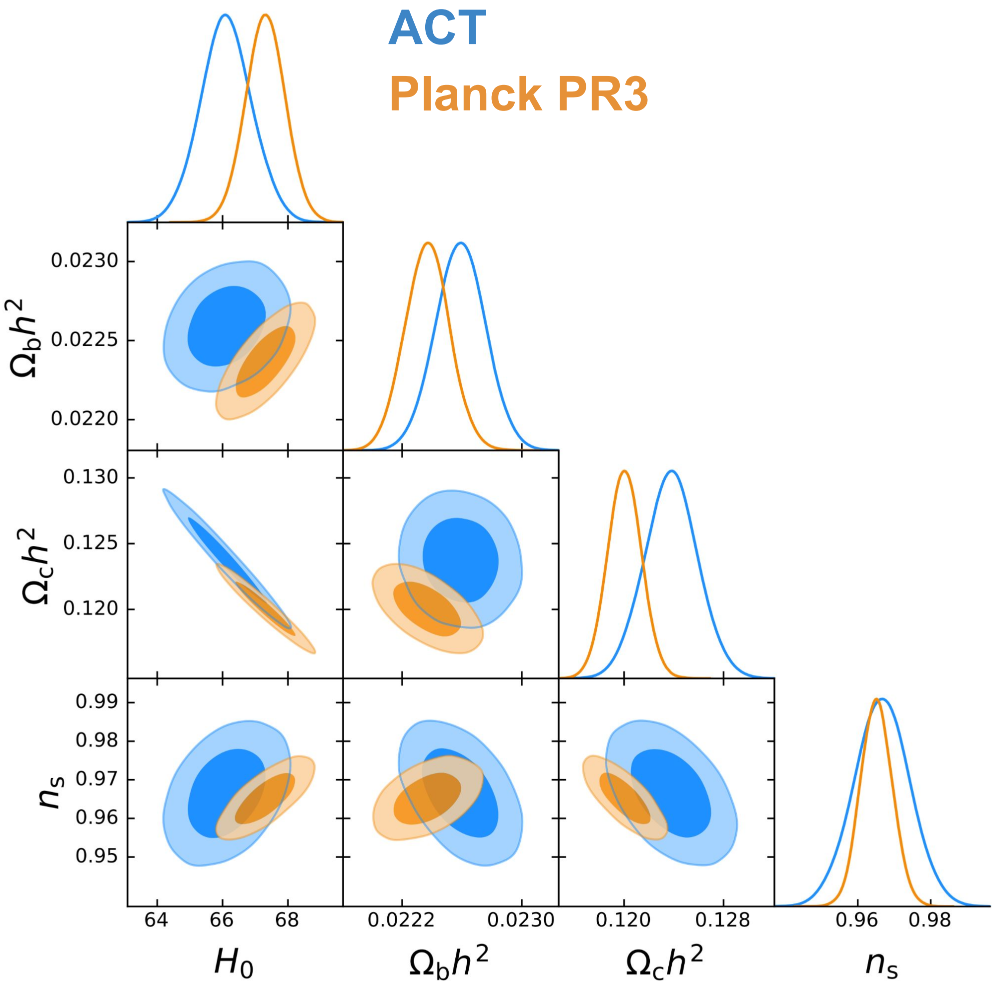
→ Is LCDM a good model for ACT DR6 ?

→ Are we consistent with other cosmological datasets ?

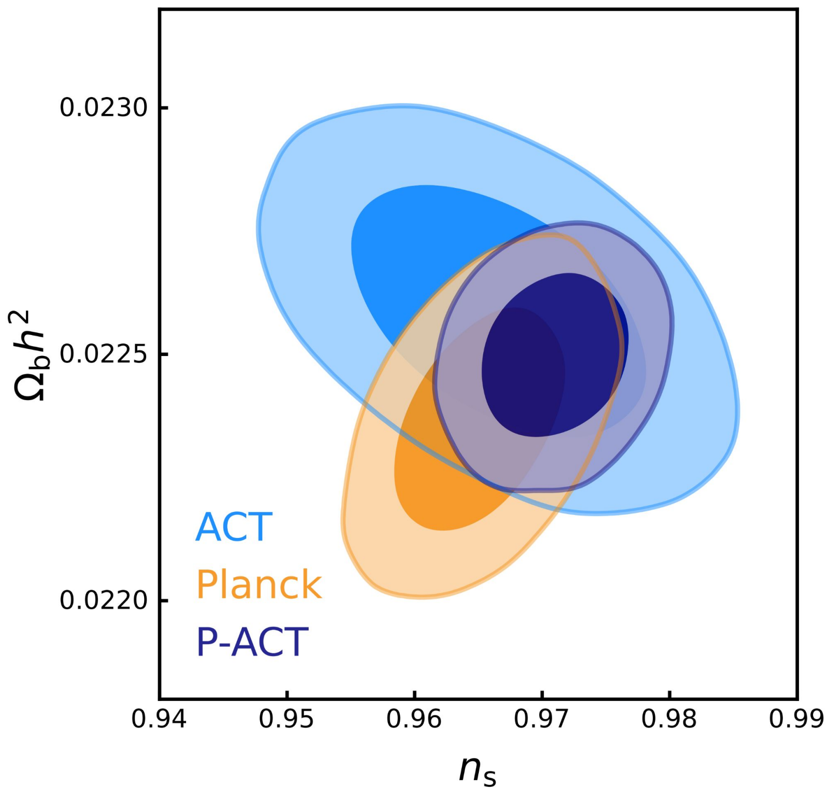
→ What's our measurement of H_0 and does DR6 bring new insights on BSM extensions ?

Constraints on LCDM

excellent agreement between Planck PR3 and ACT DR6 within LCDM (**1.6 σ**)
LCDM is a good model to describe ACT DR6 data (PTE=67%)



The P-ACT combined dataset



ACT

Planck PR3

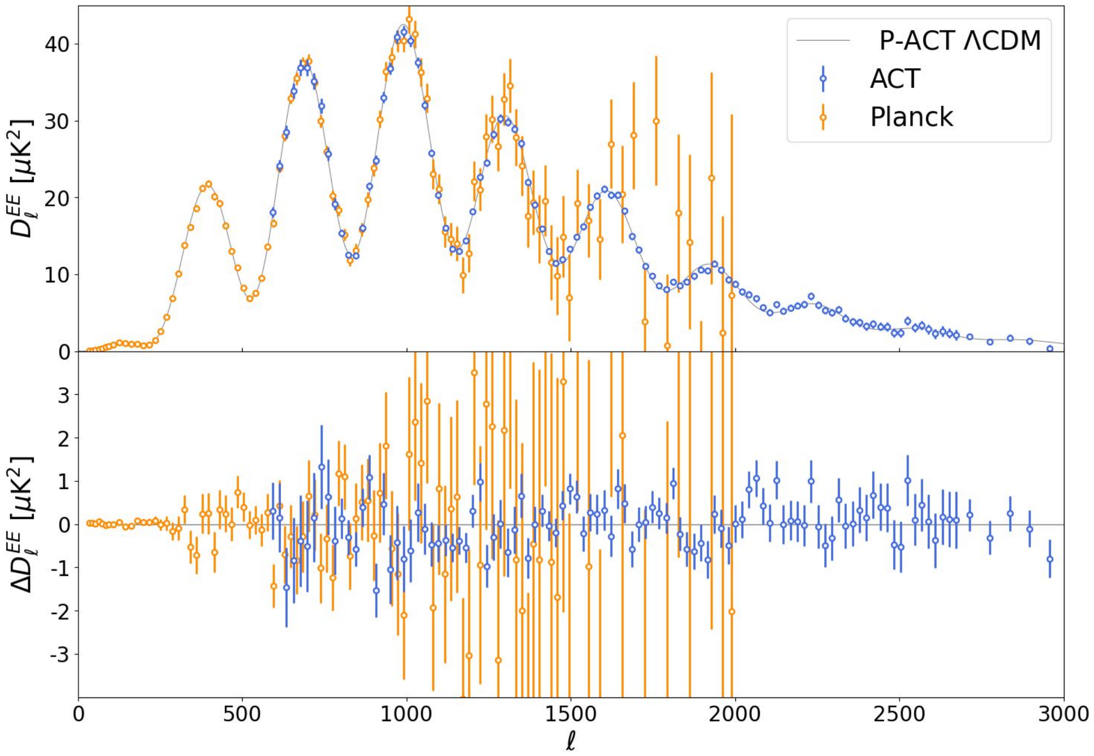
P-ACT (ACT + Planck)

P-ACT = Planck + ACT is our baseline CMB data combination taking advantage of both survey strengths

The P-ACT cosmological model

the combined model is a good fit to both ACT and Planck data

χ^2(ACT) = 1598/1617 (63%)
χ^2(P-ACT) = 1842/1897 (81%)



The P-ACT cosmological model

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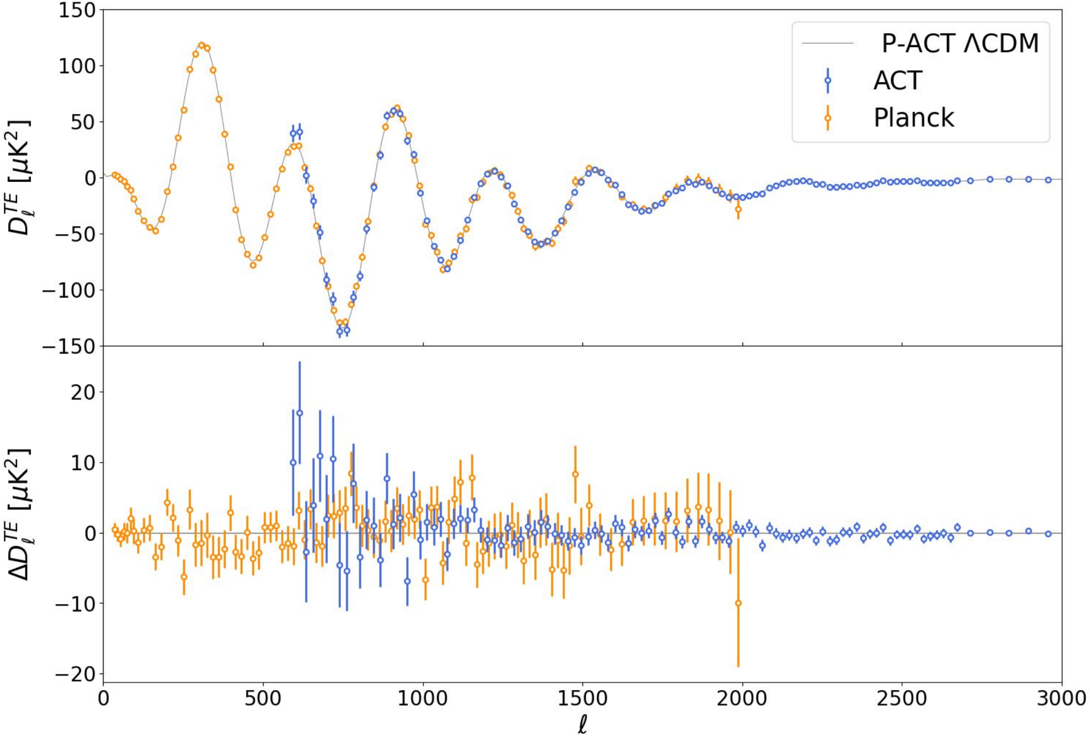
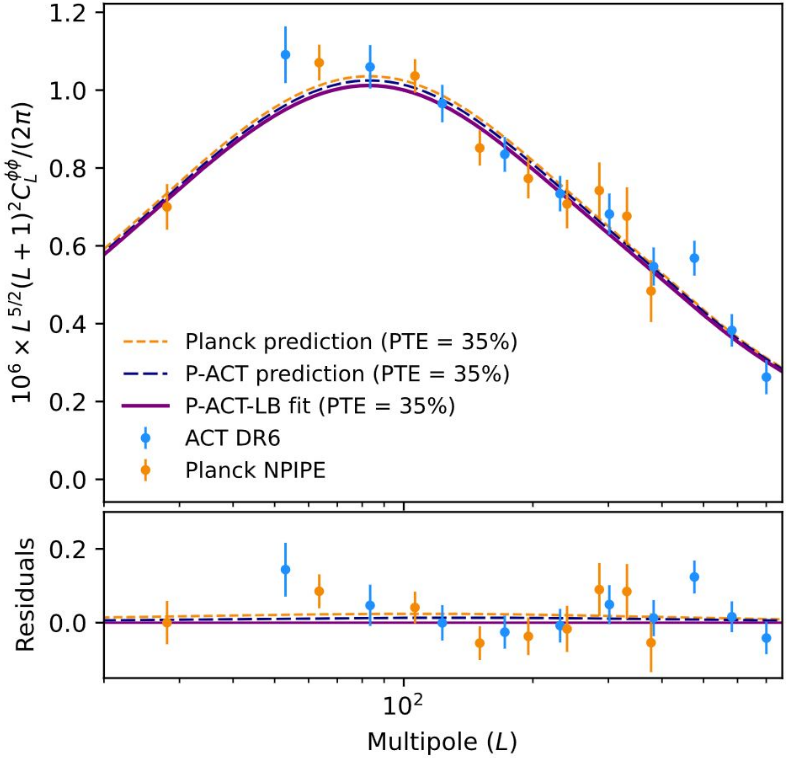
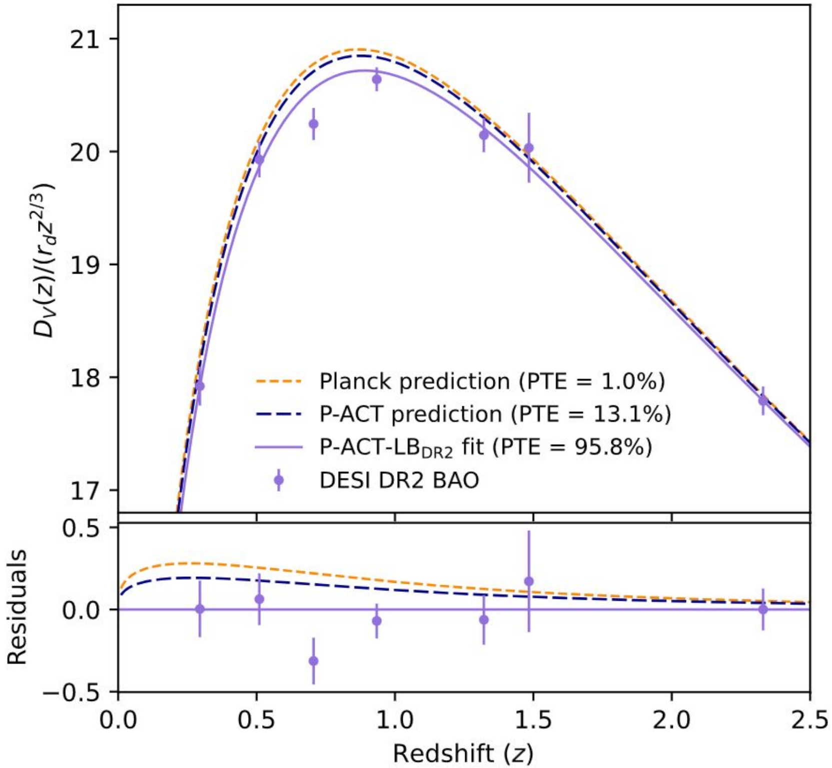


Can we predict large scale structure observables ?

CMB lensing power spectrum

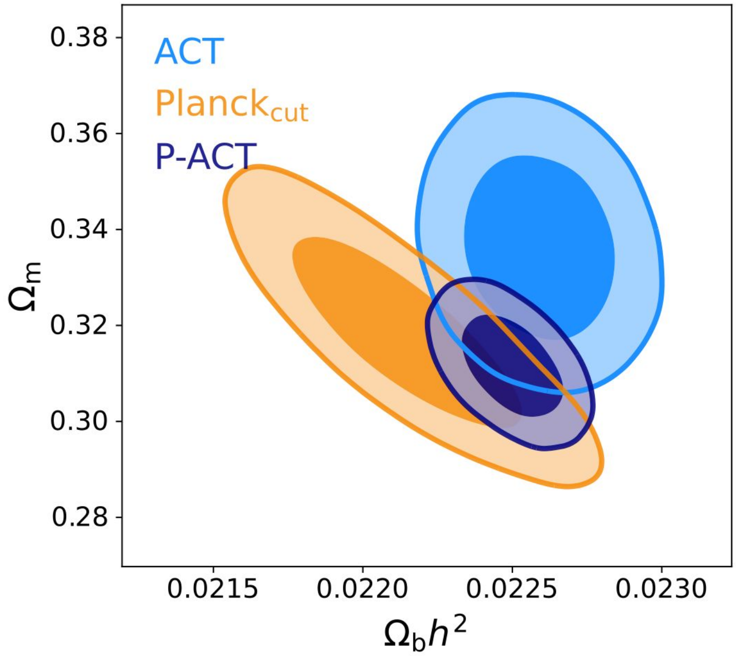


DESI BAO

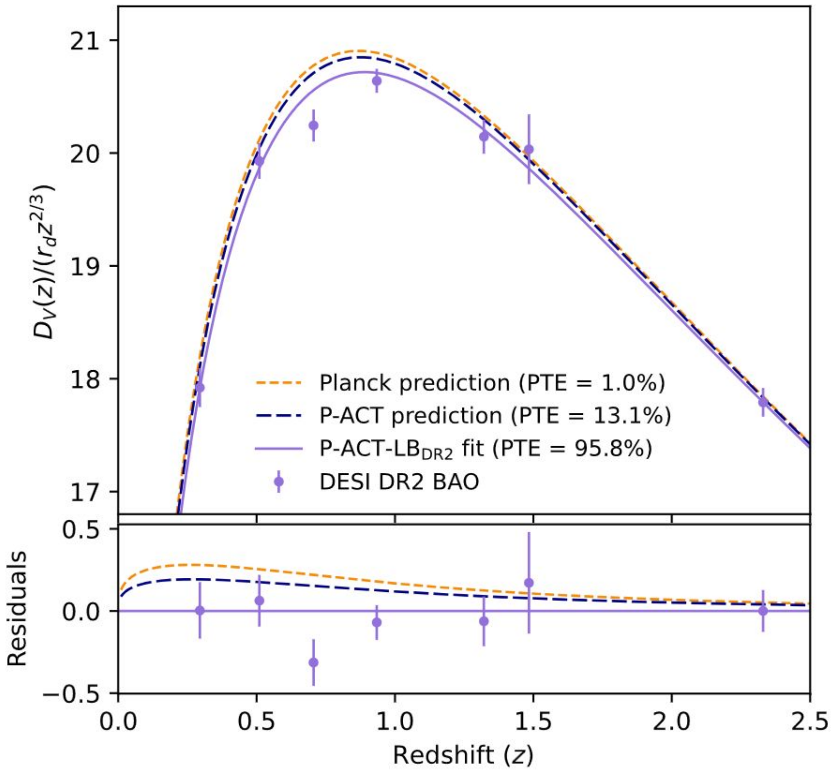


P-ACT-LB = CMB + CMB lensing + BAO(DESI)

Comparison with DESI DR2



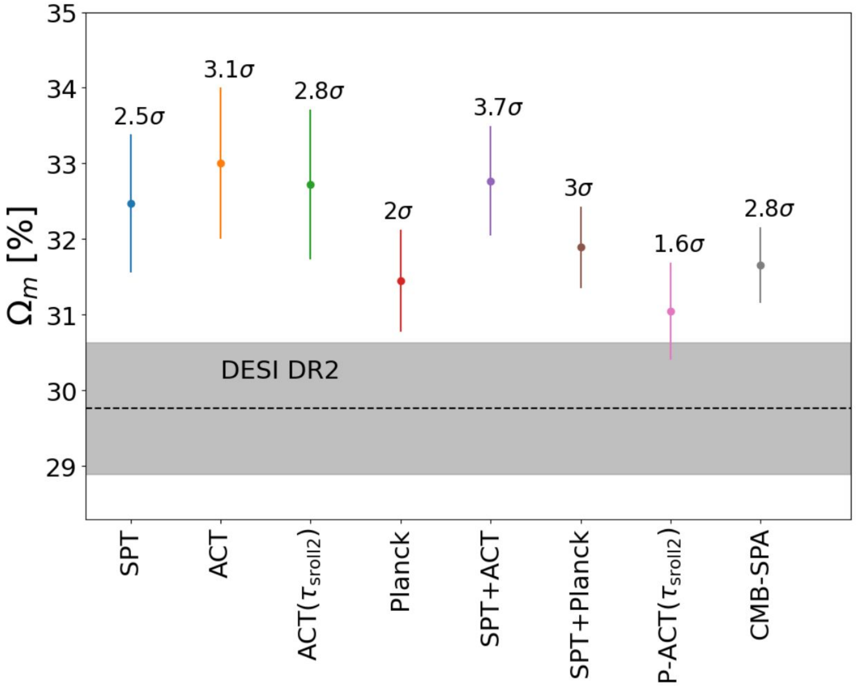
DESI BAO



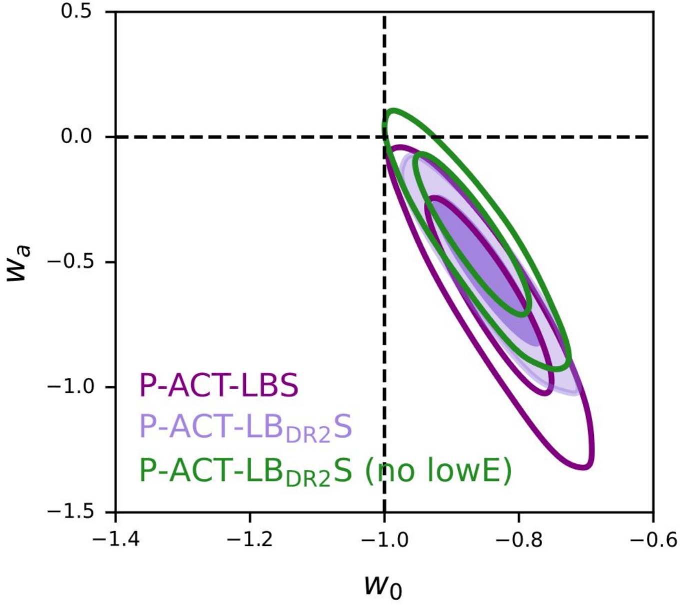
P-ACT-LB = CMB + CMB lensing + BAO

Comparison with DESI DR2

Matter density from CMB datasets



DE equation of state

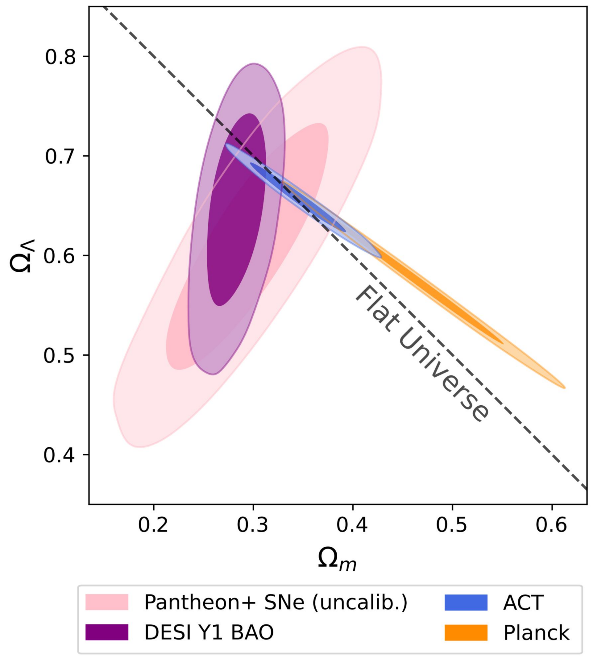


$\tau_{sroll2} = 0.0566 \pm 0.0058$
$\tau_{PR4} = 0.051 \pm 0.006$

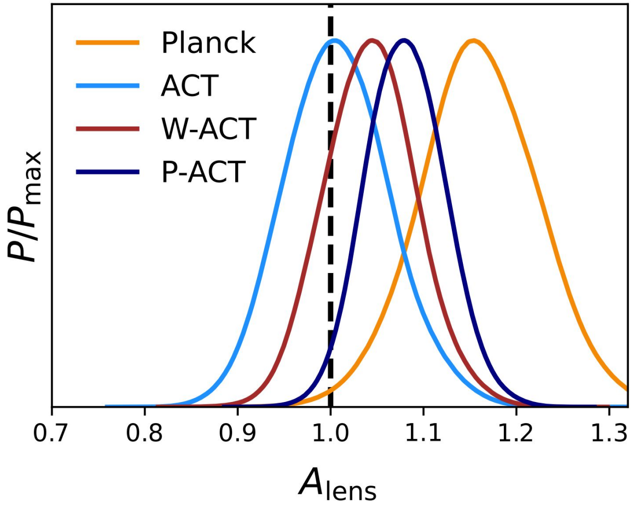
P-ACT-LBS = CMB + CMB lensing + BAO + SN

Simplest extensions to the standard model

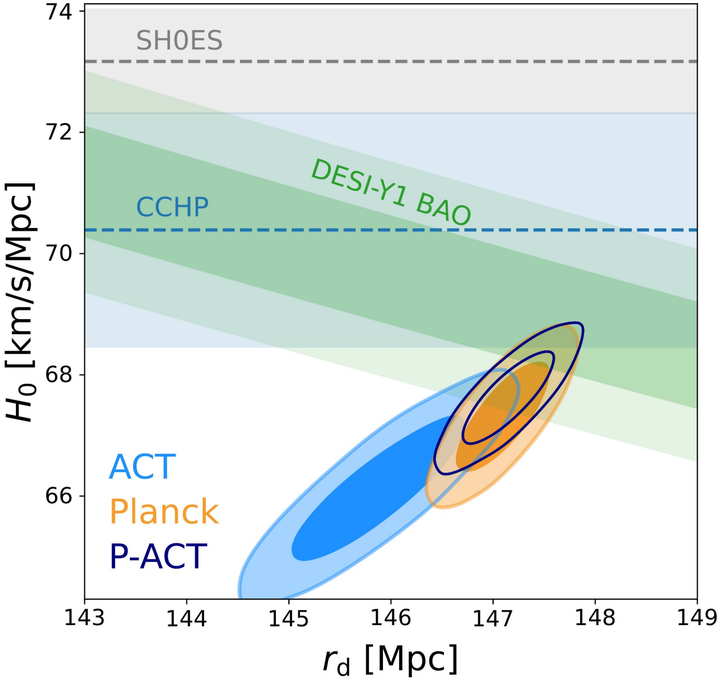
$\Omega_K \Lambda CDM$



$\Lambda CDM + A_{lens}$

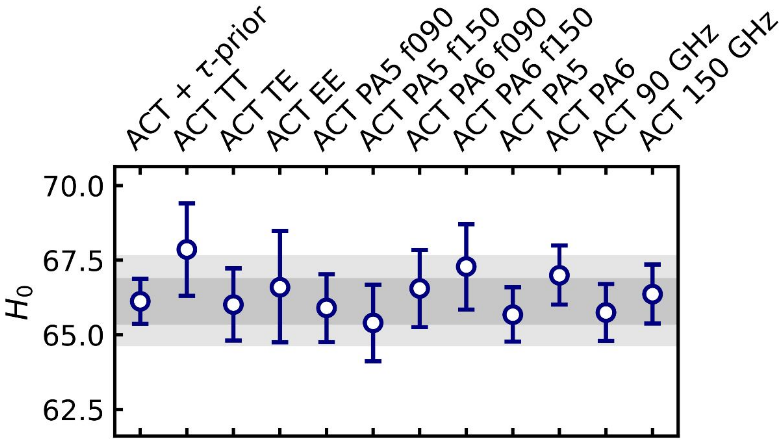


What about the Hubble constant ?

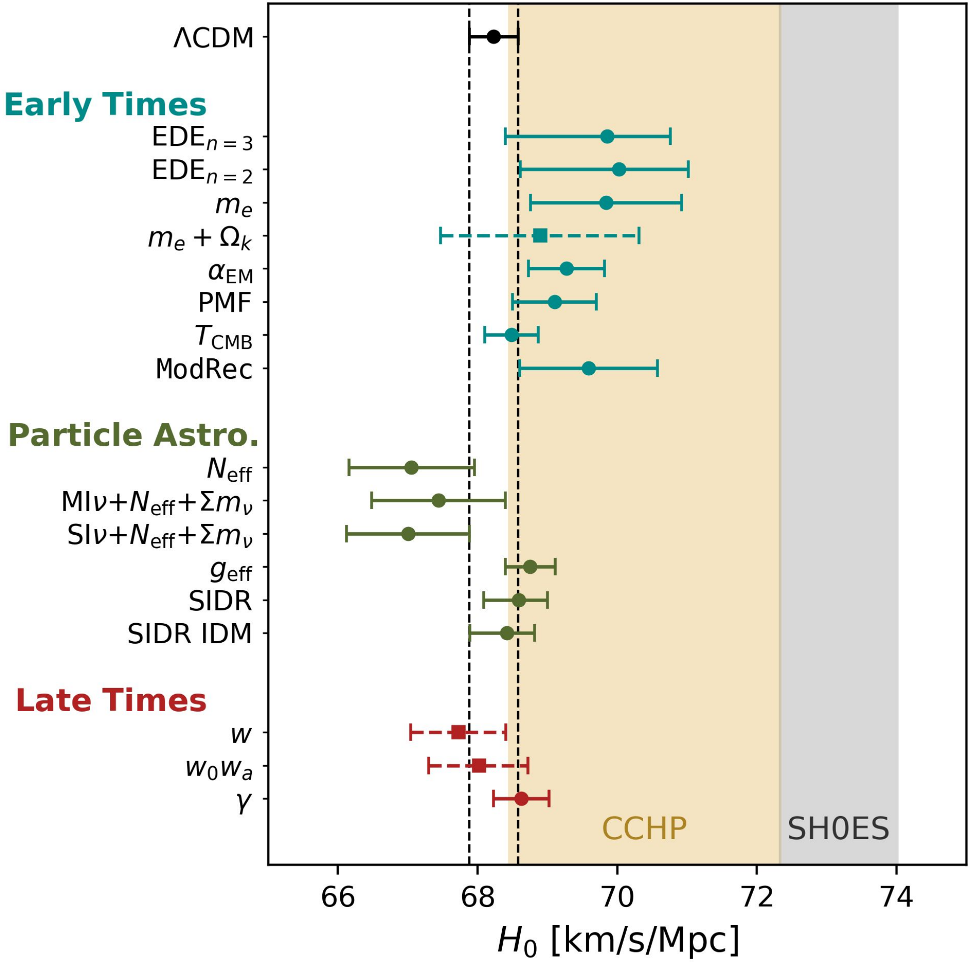


H_0^{ACT} = 66.11 ± 0.79 km/s/Mpc
$H_0^{P\text{-}ACT}$ = 67.62 ± 0.50 km/s/Mpc

Stability of the measured expansion rate with data splits



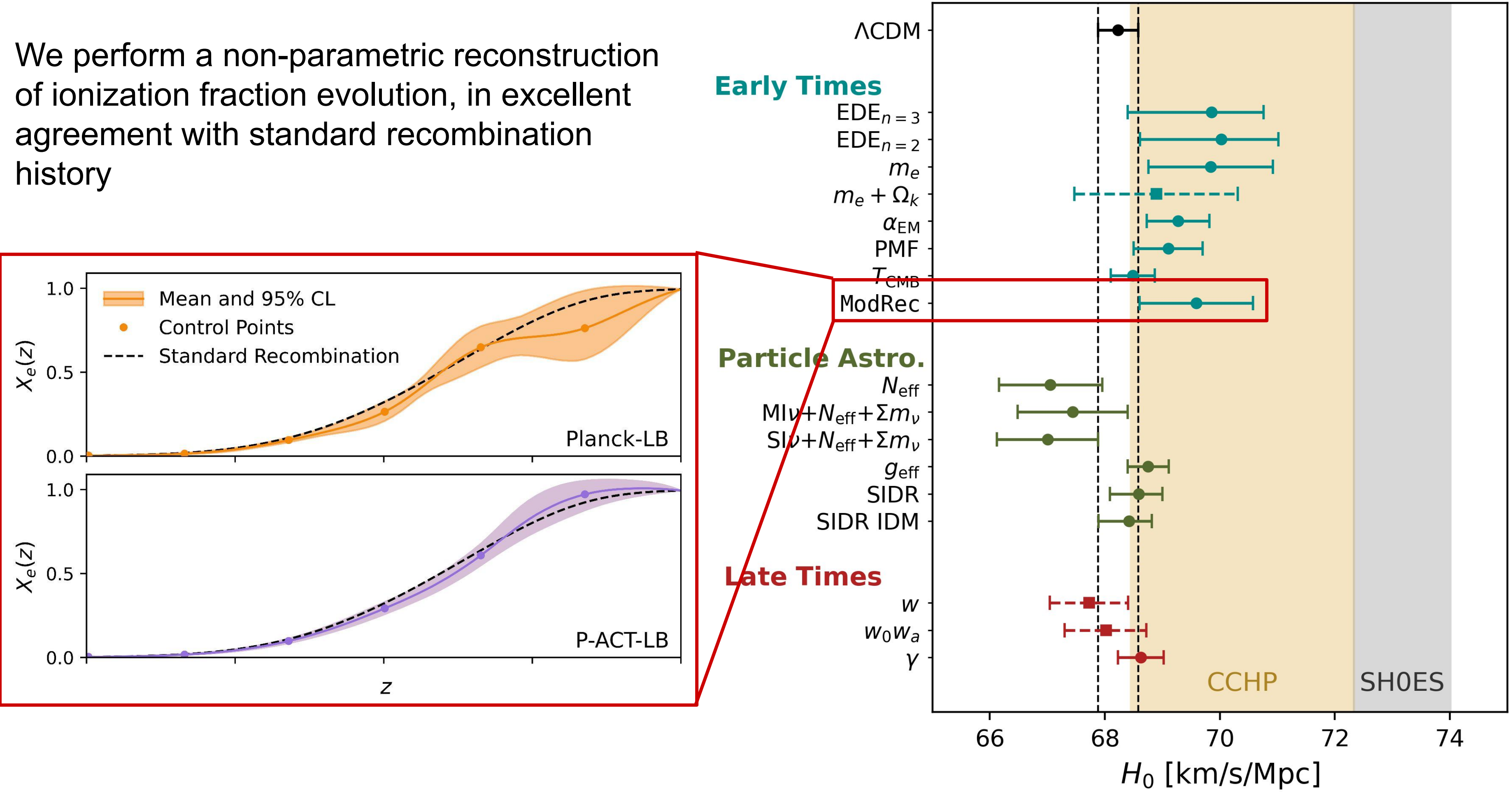
Could the Hubble tension be solved with new physics ?



None of the tested BSM scenario is able to rise up the value of the Hubble constant enough

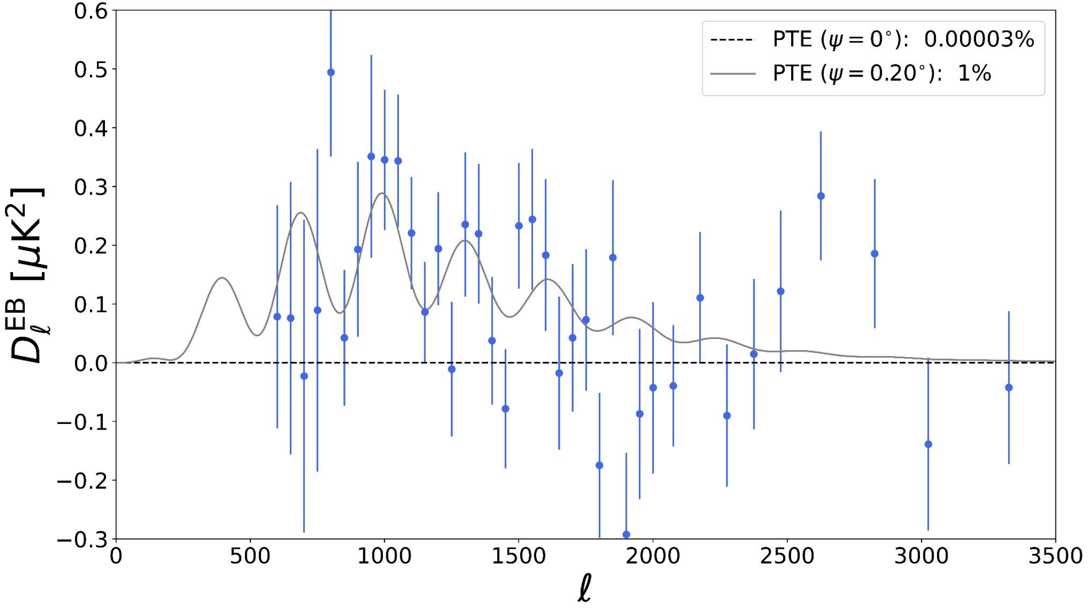
Could the Hubble tension be solved with new physics ?

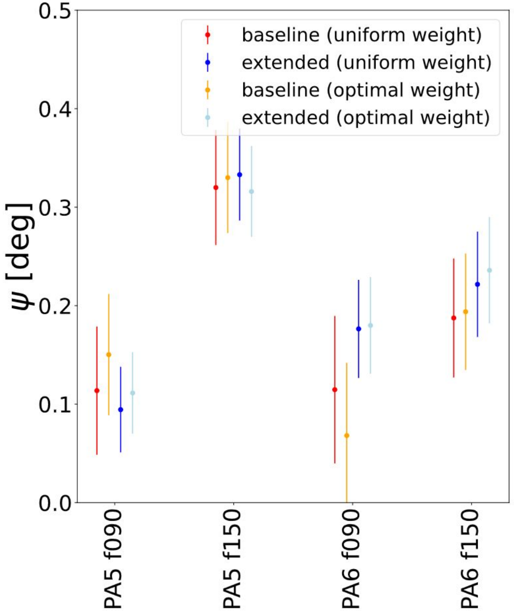
We perform a non-parametric reconstruction of ionization fraction evolution, in excellent agreement with standard recombination history



A few highlights: the EB nulling angle

Non zero-EB in CMB may be a hint for parity violating physics (or miscalibration of polarization angles…)



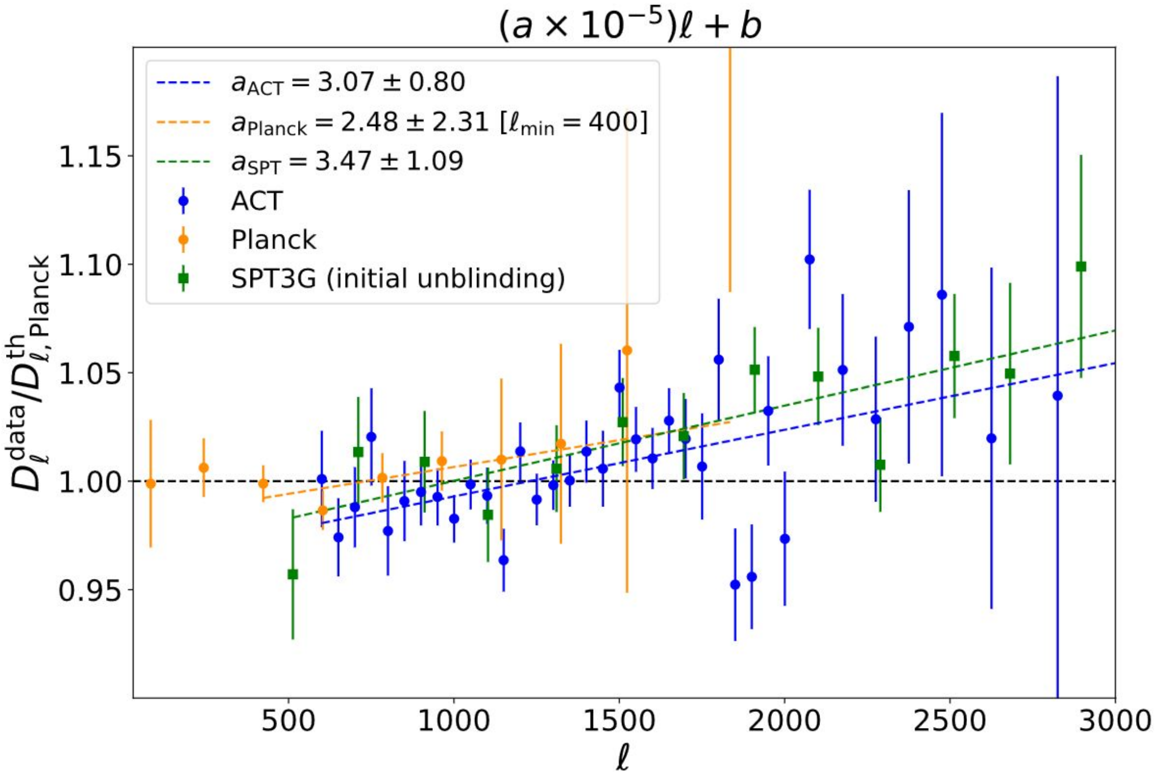


$\Psi_{PA5} = 0.25 +/- 0.11°$
$\Psi_{PA6} = 0.14 +/- 0.11°$
$\Psi_{ACT} = 0.20 +/- 0.08°$

(stat + optics)

A few highlights: new high resolution dataset from SPT

Ratio of EE spectra to a model based on Planck cosmology

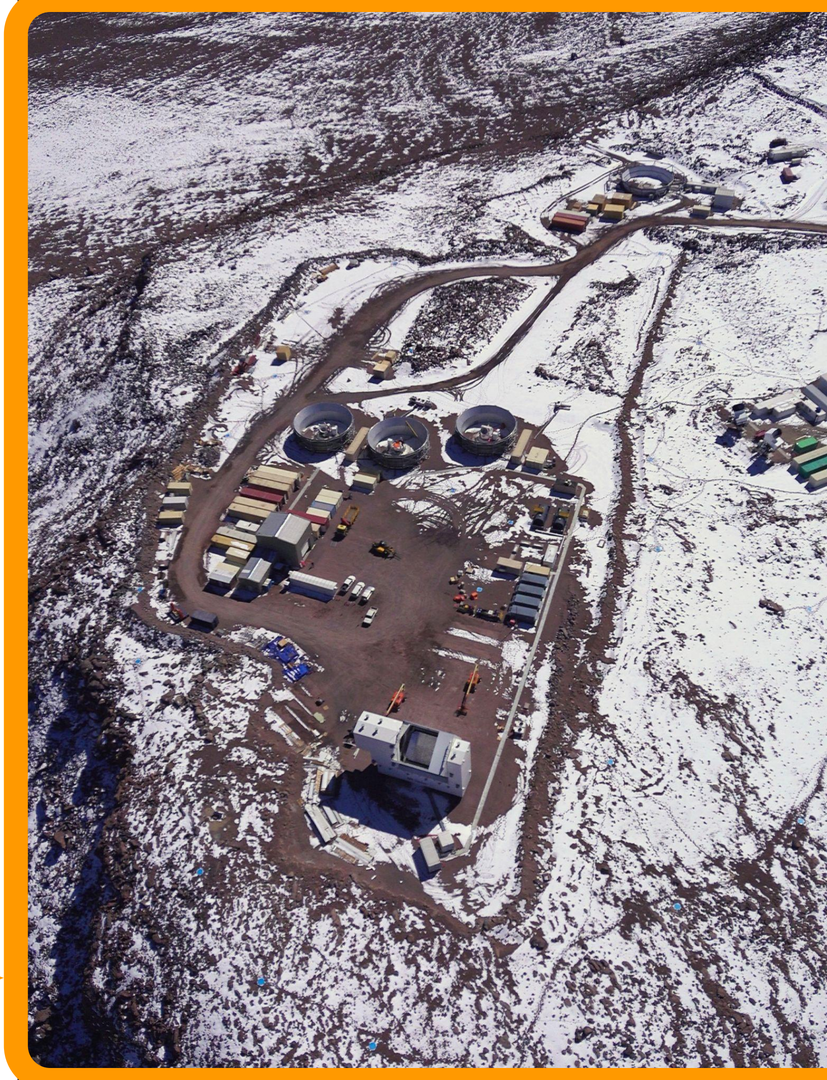


consistent slope seen in two independent experiments ?

Main takeaways

- ACT DR6 provides a new high-SNR measurement of polarization on ~40% of the sky
- DR6 is consistent with other CMB experiments and the LCDM model, providing no evidence for anomalous lensing, non-zero curvature and many other extended models
- The combined CMB dataset (P-ACT) is very constraining on cosmological models taking advantage of a wide range of angular scales
- Data, codes and results are all publicly available !

Simons Observatory is on the way ! →



credit: POLOCALC/HoverCal drone team

ACT DR6 – Maps, Likelihoods, Code, Notebooks

LAMBDA legacy archive (lambda.gsfc.nasa.gov)

- Maps (frequency, coadd, ILC, null tests)
- MCMC chains, power spectra

NERSC (/global/cfs/cdirs/cmb/data/act_dr6/dr6.02)

In addition to all products on LAMBDA:

- Single-pass maps for time-domain studies
- Noise models and simulations
- Products to reproduce spectra and likelihood

PSpipe repository (Simons Observatory)
(https://github.com/simonsobs/PSpipe)

- Code to reproduce spectra and likelihood

ACT DR6 Jupyter Notebooks
(https://github.com/ACTCollaboration/DR6_Notebooks)

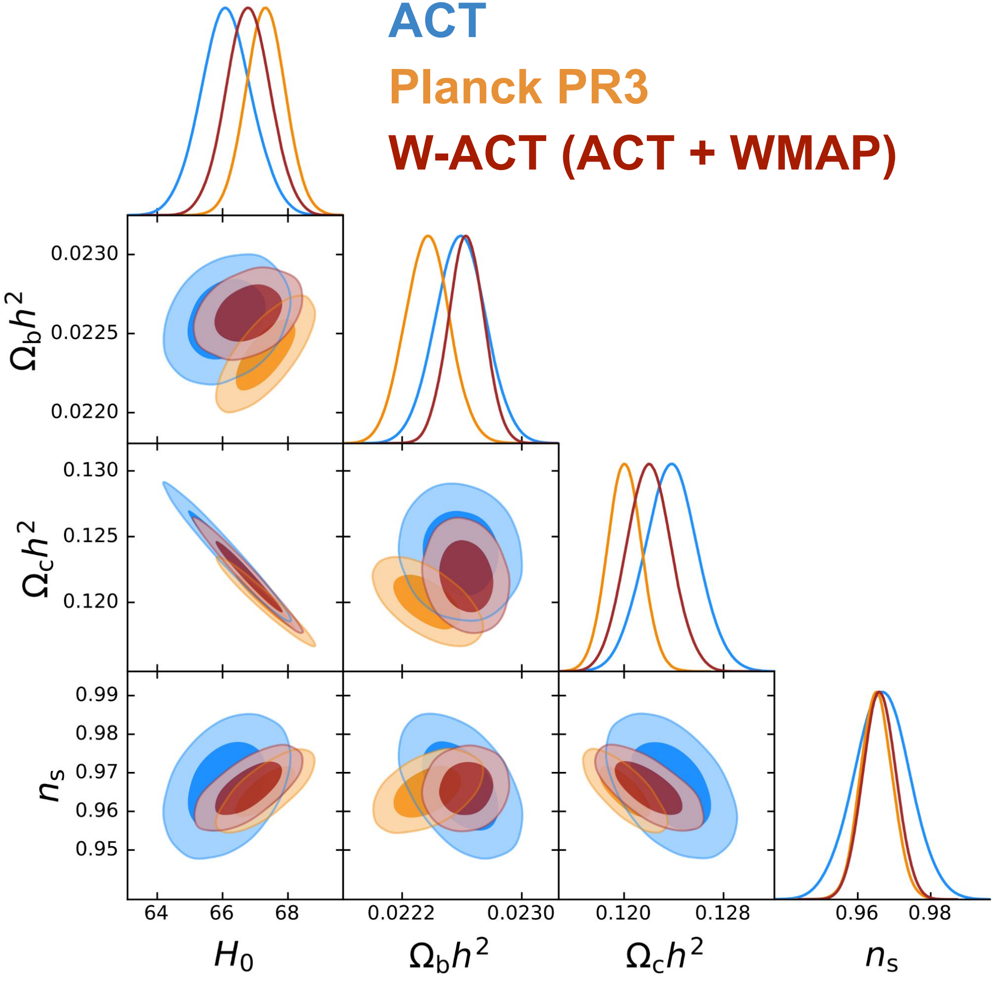
- Explanatory tutorials for DR6 data products

Bonus slides gallery

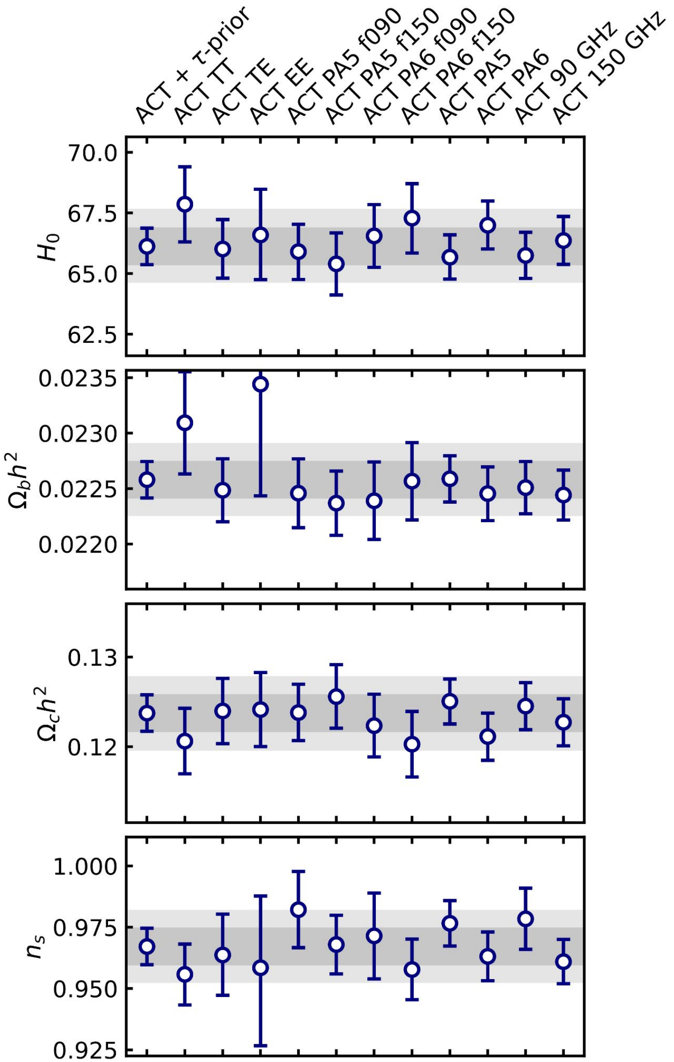
More results

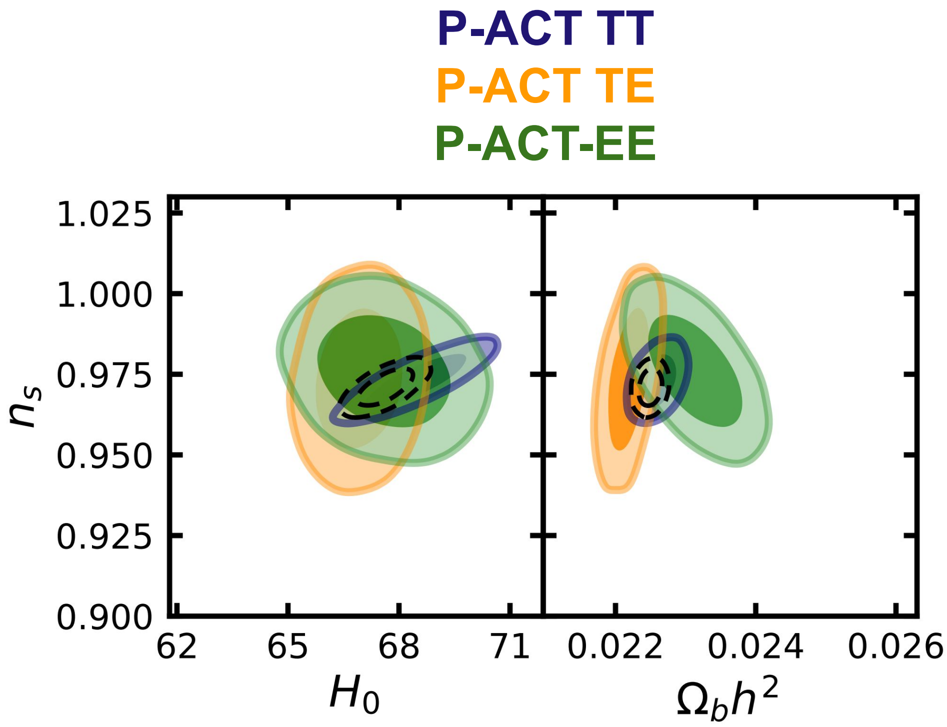
Constraints on LCDM from W-ACT

W-ACT = WMAP + ACT
provides cosmological constraints independent from Planck
(e.g. H_0 = 66.8 ± 0.7 km/s/Mpc)



Parameter stability



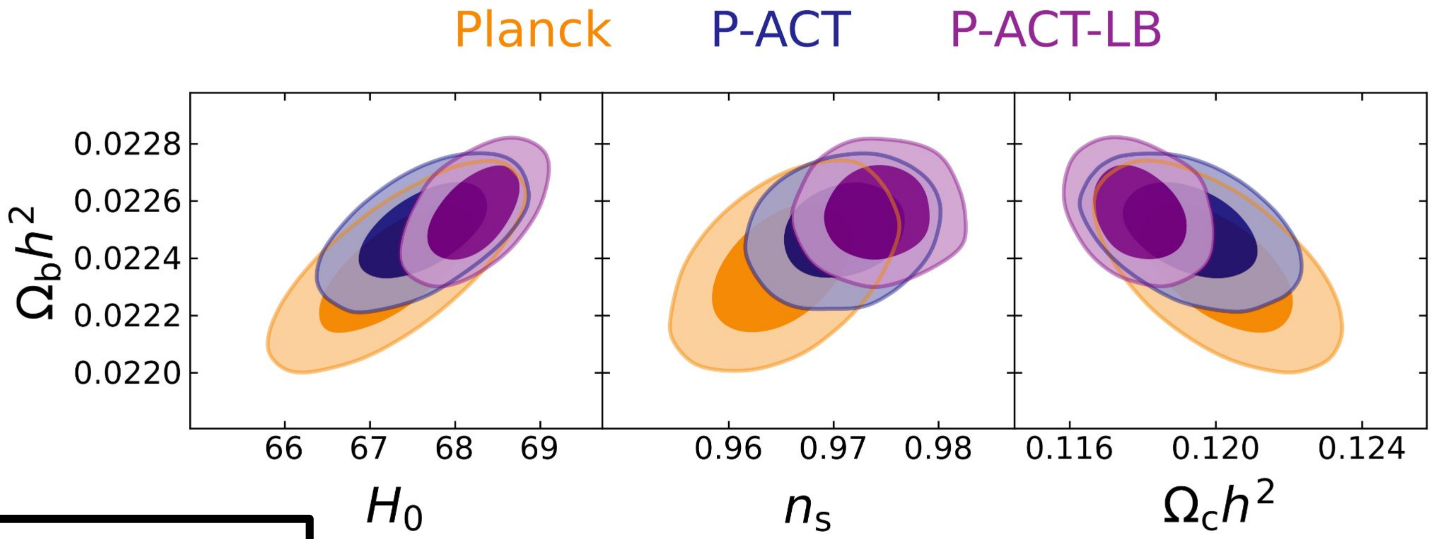


P-ACT TT
P-ACT TE
P-ACT-EE
1.025
1.000
0.975
0.950
0.925
0.900
n_s
62
65
68
71
H_0
0.022
0.024
0.026
$\Omega_b h^2$

Combination with late-time probe (DESI BAO and CMB lensing)

Combining with CMB lensing and DESI-Y1 BAO gives state-of-the art constraints on the ΛCDM model parameters

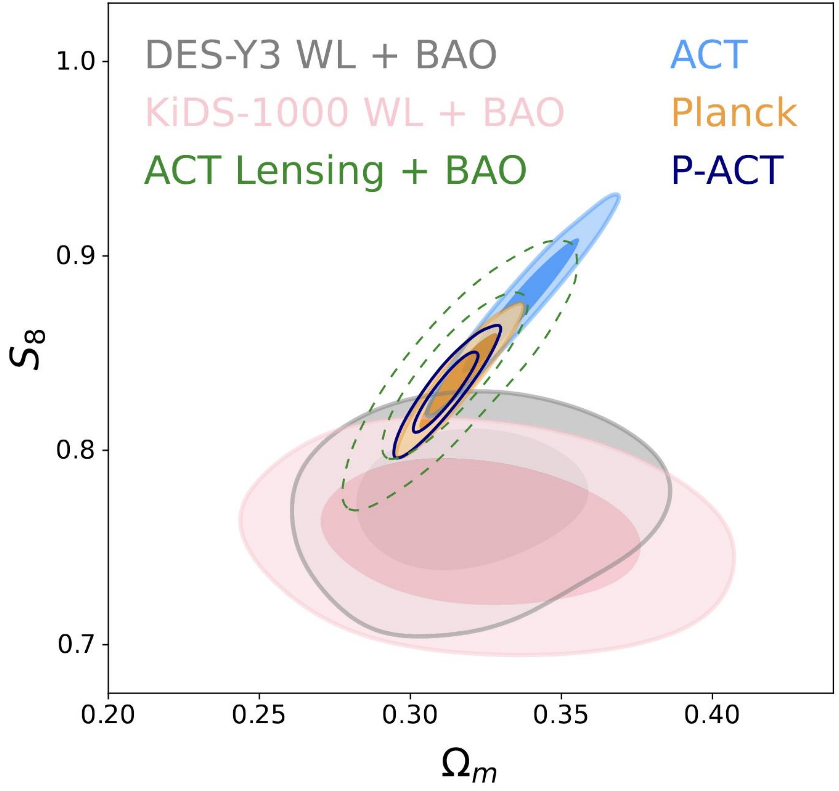
0.5% measurement of the expansion rate H_0 = *68.22 ± 0.36 km/s/Mpc*



PTE(ΛCDM) = 11% (1.2σ)
H_0 = 68.22 ± 0.36 km/s/Mpc

Amplitude of matter fluctuations S_8

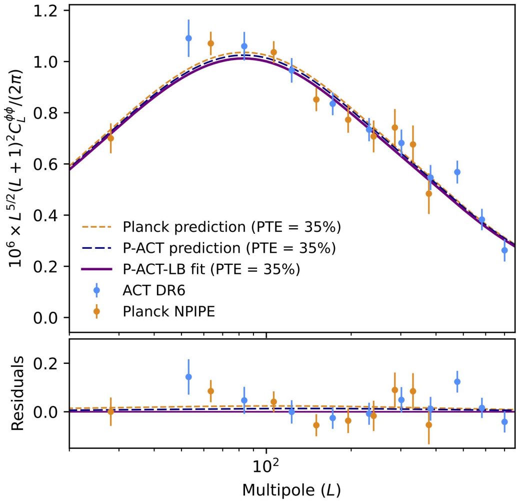
P-ACT: $S_8 = 0.830 \pm 0.014$
DES+KiDS: $S_8 = 0.797 +0.017 -0.014$
HSC-Y3 (ξ): $S_8 = 0.769 +0.031 -0.034$



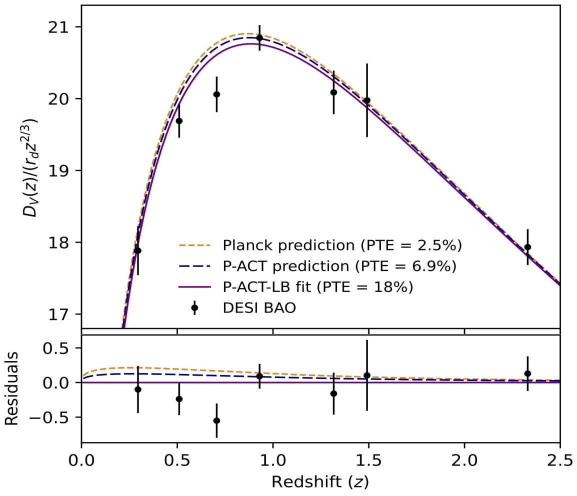
Cosmological concordance

- Predictions of the best-fit P-ACT ΛCDM model agree well with direct low-redshift measurements
- ΛCDM gives an excellent joint fit to these datasets

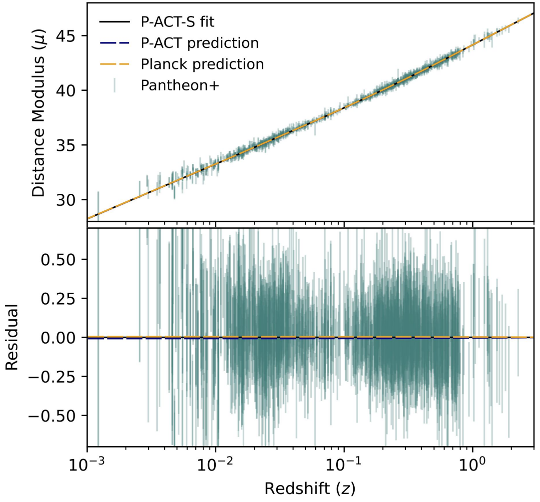
CMB Lensing (ACT DR6 + Planck PR4)



BAO (DESI Y-1)



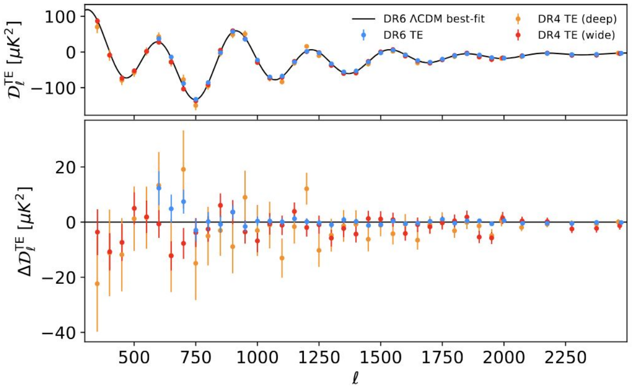
SNIa (Pantheon+)

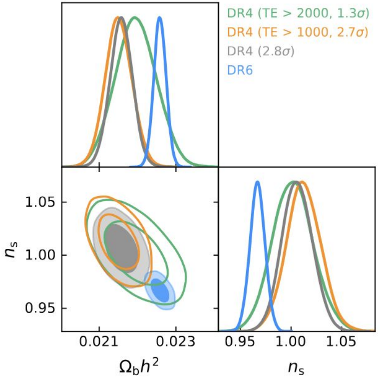


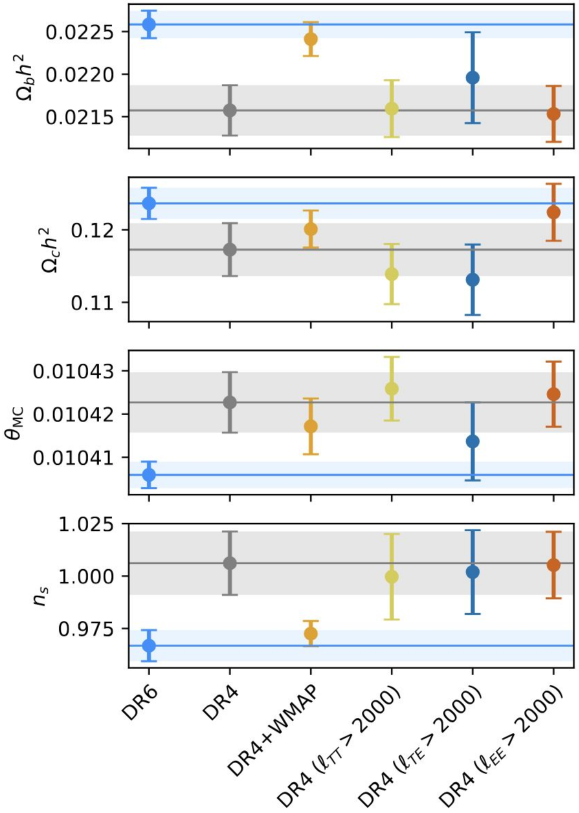
Low-redshift observations help the CMB by breaking geometric degeneracies, this is most effective in constraints on extensions to ΛCDM

DR6 versus DR4 cosmology

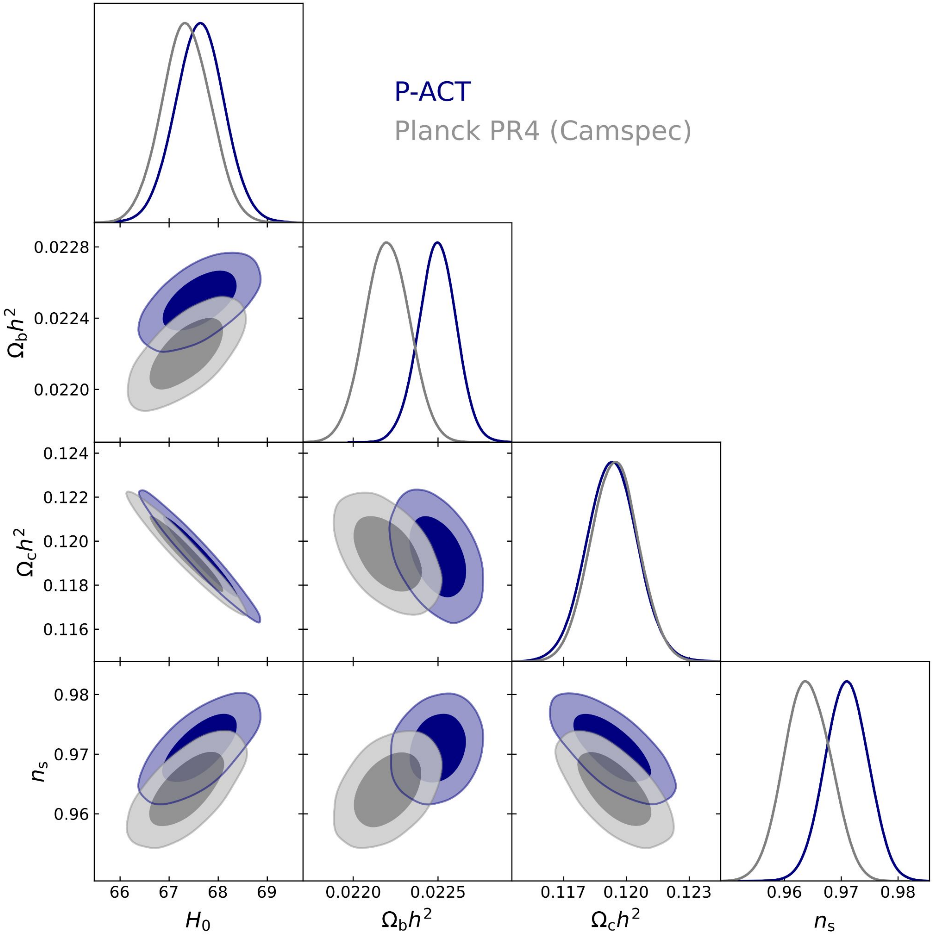
- very good agreement between DR6 and DR4 baseline result obtained from ACT+WMAP
- some differences with DR4 ACT-alone cosmology
- mainly driven by TE data at multipoles <2000 (where residuals are mostly negative, disfavoring the DR6 LCDM cosmology)
- we speculate beam leakage modelling might be playing a role







Comparison with Planck PR4 (NPIPE)



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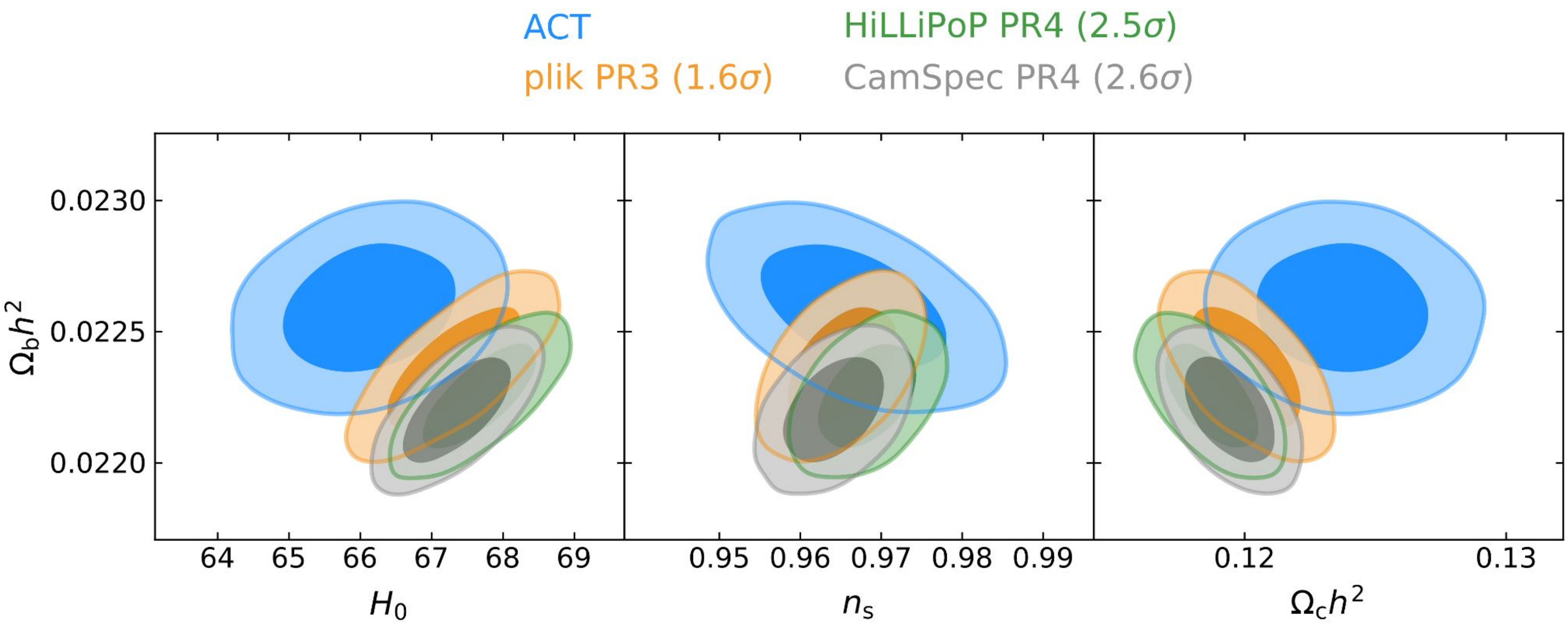
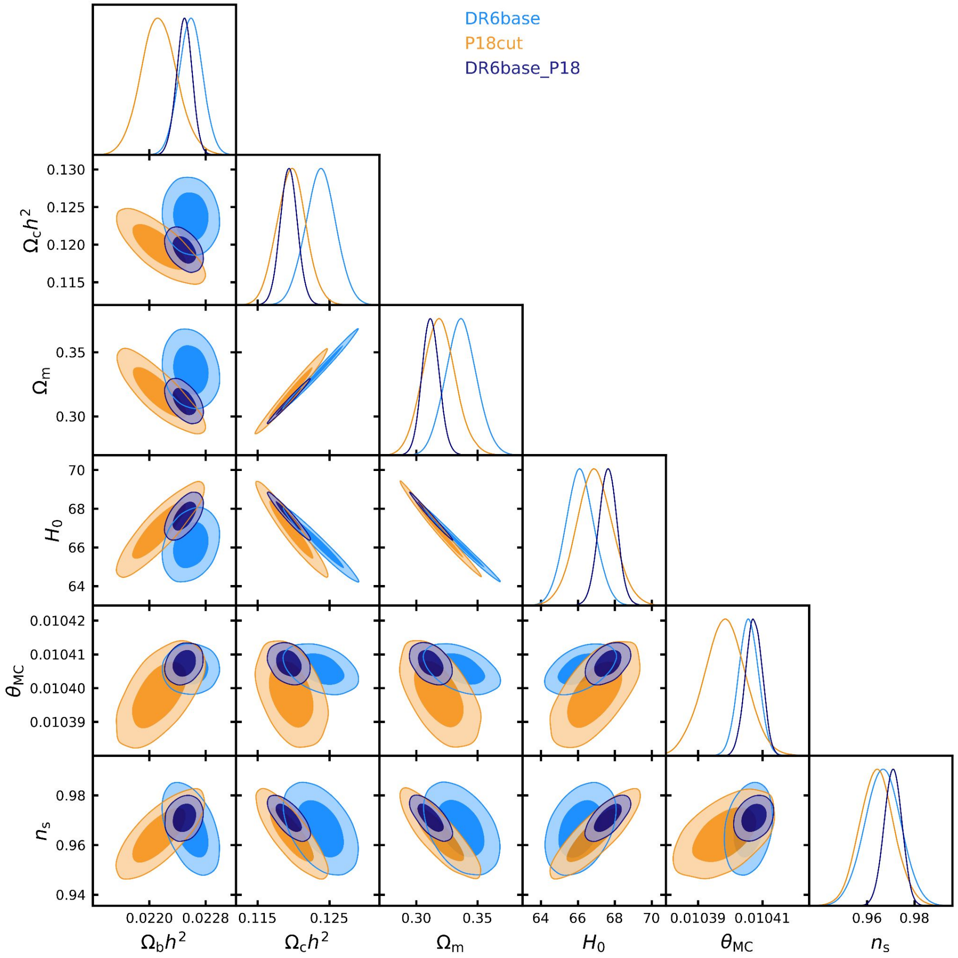
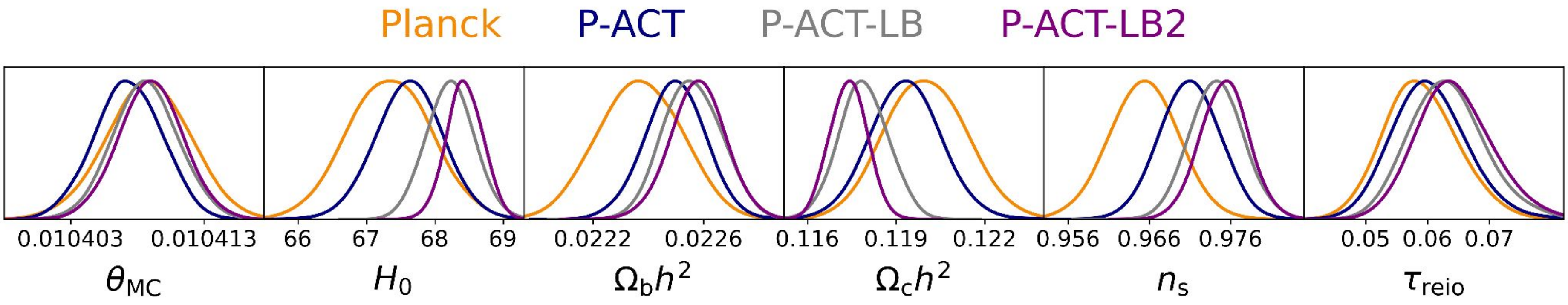
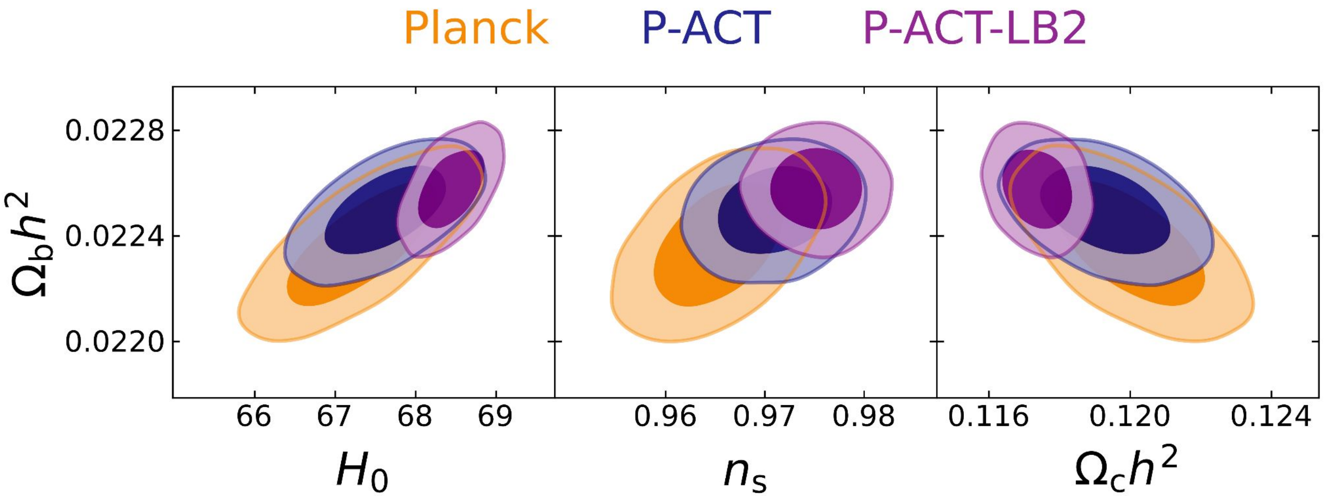


Planck cut versus ACT DR6

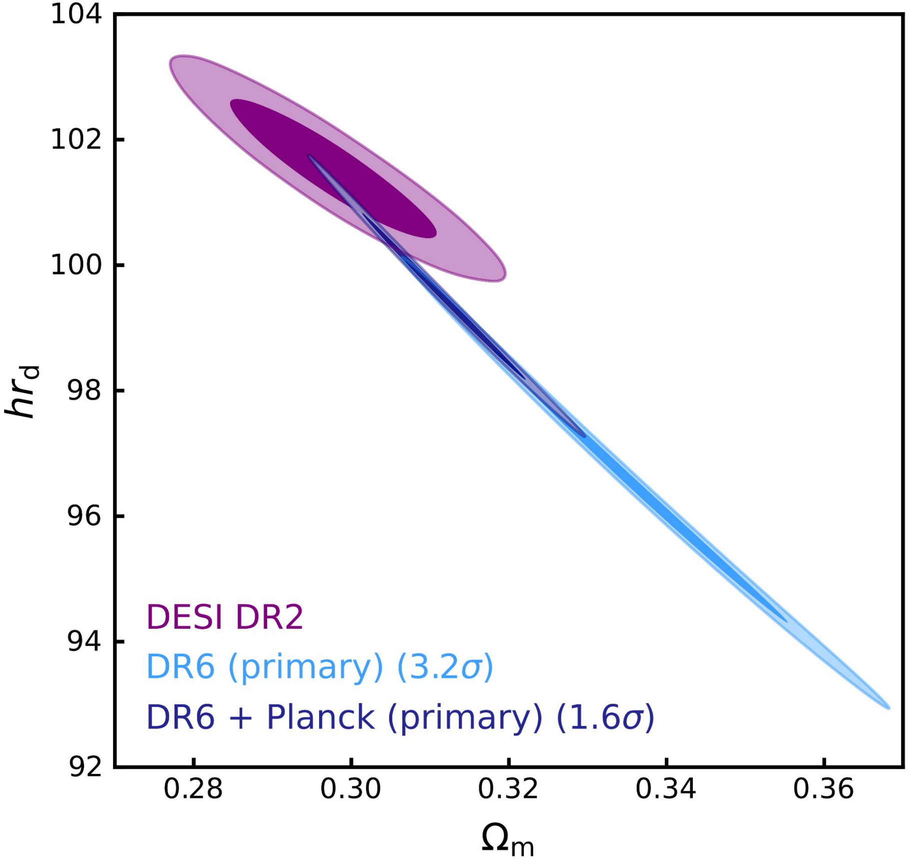


Update with DESI DR2 results

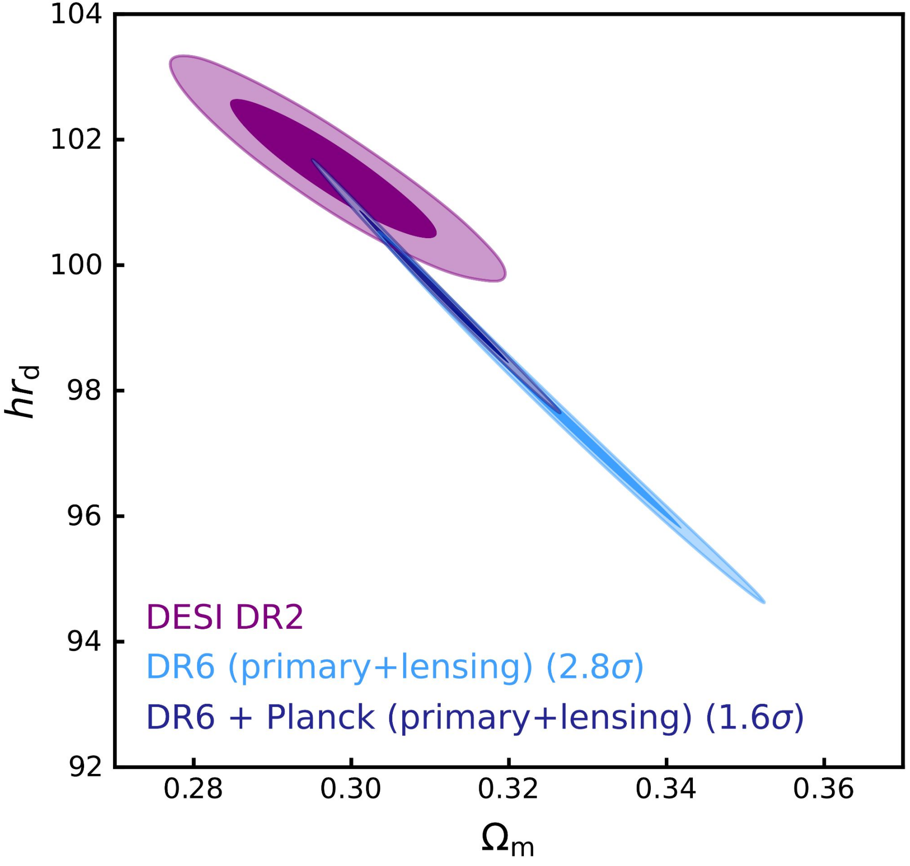




DESI DR2 versus primary CMB



DESI DR2 versus primary CMB + CMB lensing



DESI DR2 versus primary CMB + CMB lensing

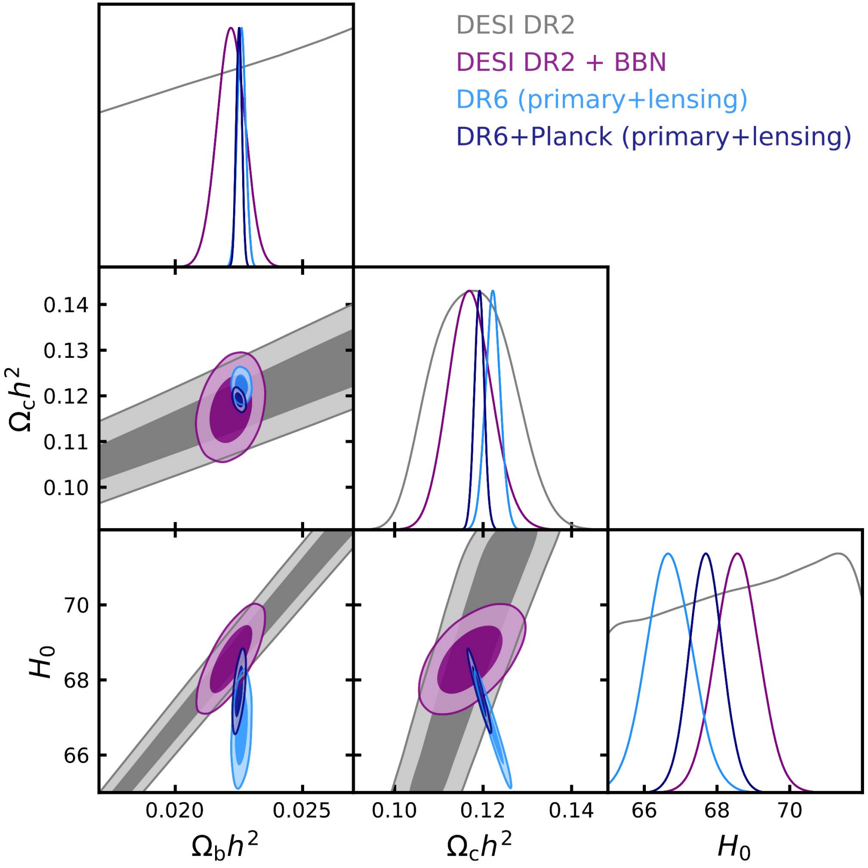
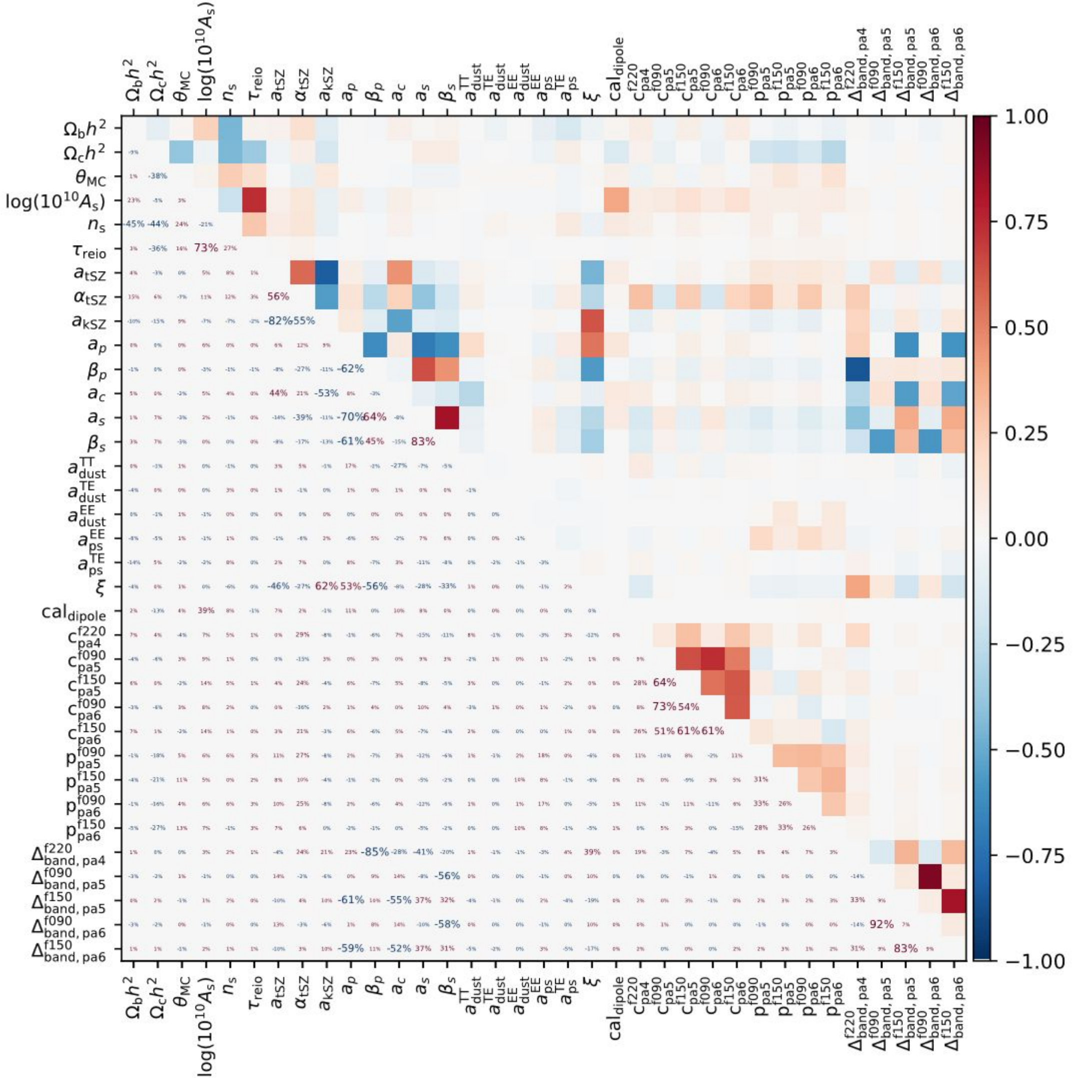


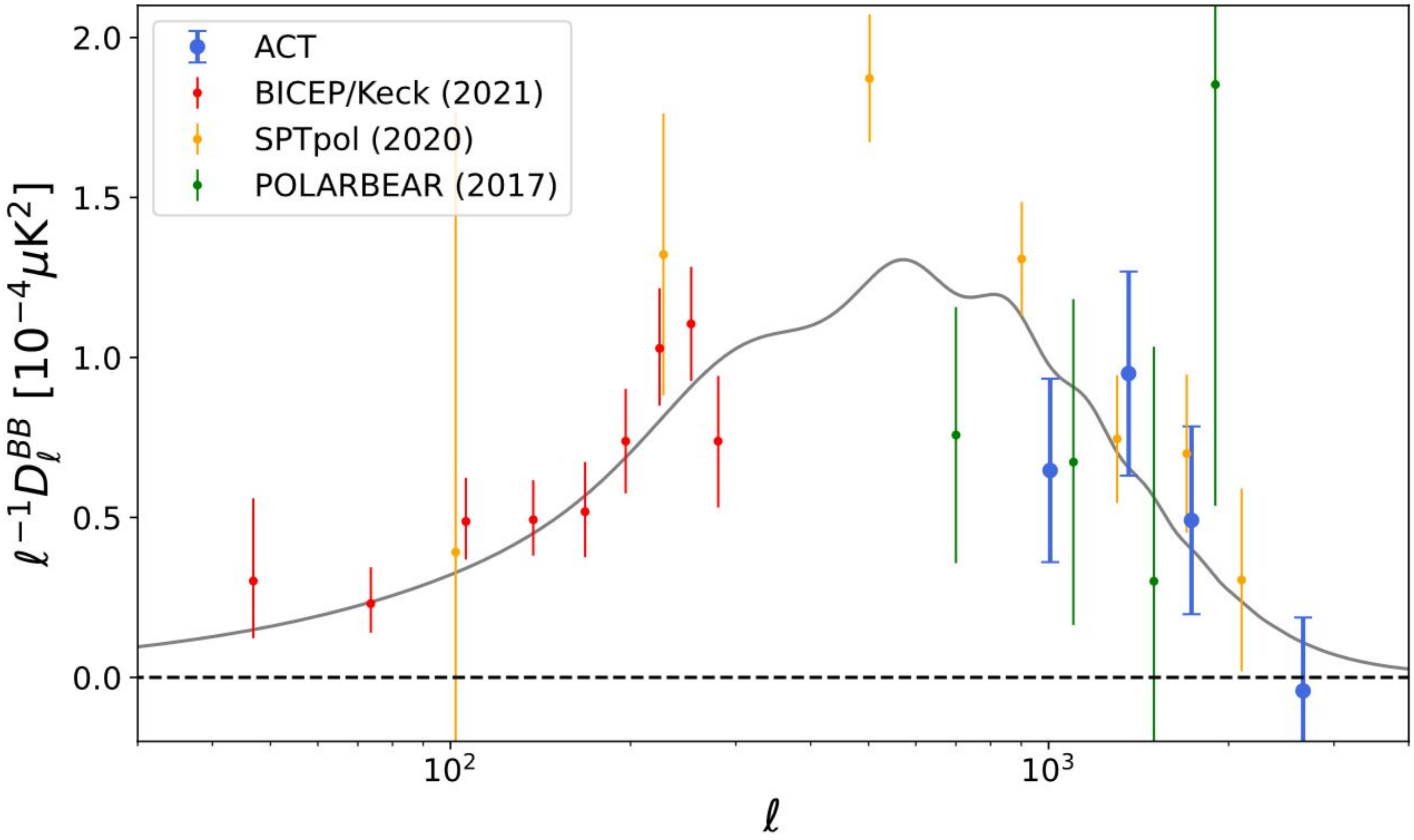
Table with main parameters

Parameter	ACT	Planck	W-ACT	P-ACT	P-ACT-LB	P-ACT-LB2
Sampled						
$10^4\theta_{MC}$	104.056 ± 0.031	104.088 ± 0.031	104.066 ± 0.029	104.073 ± 0.025	104.086 ± 0.025	104.090 ± 0.024
$10^2\Omega_b h^2$	2.259 ± 0.017	2.237 ± 0.015	2.263 ± 0.012	2.250 ± 0.011	2.256 ± 0.011	2.258 ± 0.010
$10^2\Omega_c h^2$	12.38 ± 0.21	12.00 ± 0.14	12.20 ± 0.18	11.93 ± 0.12	11.79 ± 0.09	11.74 ± 0.06
$\log(10^{10}A_s)$	3.053 ± 0.013	$3.054^{+0.012}_{-0.013}$	$3.057^{+0.010}_{-0.012}$	3.056 ± 0.013	$3.060^{+0.011}_{-0.012}$	$3.062^{+0.010}_{-0.012}$
n_s	0.9666 ± 0.0077	0.9651 ± 0.0044	0.9660 ± 0.0046	0.9709 ± 0.0038	0.9743 ± 0.0034	0.9752 ± 0.0030
τ [%]	$5.62^{+0.53}_{-0.63}$	$5.90^{+0.55}_{-0.65}$	$5.71^{+0.54}_{-0.64}$	$6.03^{+0.55}_{-0.65}$	$6.32^{+0.55}_{-0.66}$	$6.43^{+0.55}_{-0.67}$
Derived						
H_0 [km/s/Mpc]	66.11 ± 0.79	67.31 ± 0.61	66.78 ± 0.68	67.62 ± 0.50	68.22 ± 0.36	68.43 ± 0.27
Ω_m [%]	33.7 ± 1.3	31.58 ± 0.85	32.6 ± 1.1	31.16 ± 0.71	30.32 ± 0.48	30.03 ± 0.35
Ω_b [%]	5.17 ± 0.12	4.937 ± 0.070	5.075 ± 0.098	4.920 ± 0.063	4.847 ± 0.044	4.821 ± 0.033
Ω_c [%]	28.3 ± 1.2	26.50 ± 0.78	27.37 ± 0.96	26.10 ± 0.65	25.34 ± 0.44	25.07 ± 0.32
Ω_Λ [%]	66.3 ± 1.3	68.41 ± 0.85	67.4 ± 1.1	68.83 ± 0.71	69.67 ± 0.48	69.97 ± 0.35
$10^2\Omega_m h^2$	14.70 ± 0.21	14.31 ± 0.13	14.53 ± 0.18	14.25 ± 0.12	14.11 ± 0.08	14.061 ± 0.063
$n_s - 1$ [%]	-3.34 ± 0.77	-3.49 ± 0.44	-3.40 ± 0.46	-2.91 ± 0.38	-2.57 ± 0.34	-2.48 ± 0.30
σ_8	0.8263 ± 0.0074	0.8151 ± 0.0066	0.8221 ± 0.0070	0.8149 ± 0.0063	0.8126 ± 0.0046	$0.8119^{+0.0042}_{-0.0049}$
S_8	0.875 ± 0.023	0.836 ± 0.016	0.857 ± 0.020	0.830 ± 0.014	0.8169 ± 0.0087	0.8122 ± 0.0071
Age [Gyr]	13.801 ± 0.023	13.800 ± 0.024	13.788 ± 0.019	13.789 ± 0.018	13.772 ± 0.015	13.767 ± 0.014
$10^4\theta_\star$	104.075 ± 0.031	104.109 ± 0.031	104.085 ± 0.029	104.094 ± 0.025	104.107 ± 0.025	104.111 ± 0.024
$10^4 Y_{He}$	2459.50 ± 0.71	2458.55 ± 0.64	2459.66 ± 0.51	2459.10 ± 0.48	2459.37 ± 0.46	2459.45 ± 0.43
$10^{10}\eta_b$	6.185 ± 0.046	6.124 ± 0.041	6.196 ± 0.033	6.159 ± 0.030	6.177 ± 0.029	6.182 ± 0.028
z_{reio}	$7.88^{+0.54}_{-0.61}$	$8.15^{+0.55}_{-0.62}$	$7.93^{+0.54}_{-0.61}$	8.23 ± 0.59	$8.47^{+0.54}_{-0.61}$	$8.57^{+0.54}_{-0.62}$
$z_\star$	1089.96 ± 0.30	1089.92 ± 0.29	1089.75 ± 0.24	1089.68 ± 0.21	1089.47 ± 0.18	1089.40 ± 0.15
$r_{s,\star}$ [Mpc]	143.32 ± 0.54	144.43 ± 0.31	143.74 ± 0.45	144.53 ± 0.29	144.85 ± 0.22	144.96 ± 0.17
z_d	1060.72 ± 0.39	1059.94 ± 0.29	1060.67 ± 0.28	1060.17 ± 0.23	1060.21 ± 0.23	1060.21 ± 0.22
r_d [Mpc]	145.88 ± 0.56	147.09 ± 0.30	146.30 ± 0.46	147.14 ± 0.29	147.45 ± 0.23	147.57 ± 0.19
$-2\ln\mathcal{L}^{MAP}_{posterior}$	1929.71	996.82	3934.93	2180.49	2216.71	2214.72
χ^2_{MFLike}	1590.91 (1651)	…	1592.20 (1651)	1597.72 (1651)	1598.13 (1651)	1599.93 (1651)
$\chi^2_{Planck-high\ell}$	…	583.16 (613)	…	221.51 (252)	221.02 (252)	221.44 (252)
$\chi^2_{Planck-lowT}$	…	23.45 (28)	…	22.46 (28)	22.11 (28)	21.71 (28)
χ^2_{WMAP}	…	…	2017.02 (1945)	…	…	…
$\chi^2_{CMBlens}$	…	…	…	…	19.63 (19)	19.64 (19)
$\chi^2_{DESI-BAO}$	…	…	…	…	15.48 (12)	11.77 (13)

Parameter correlations

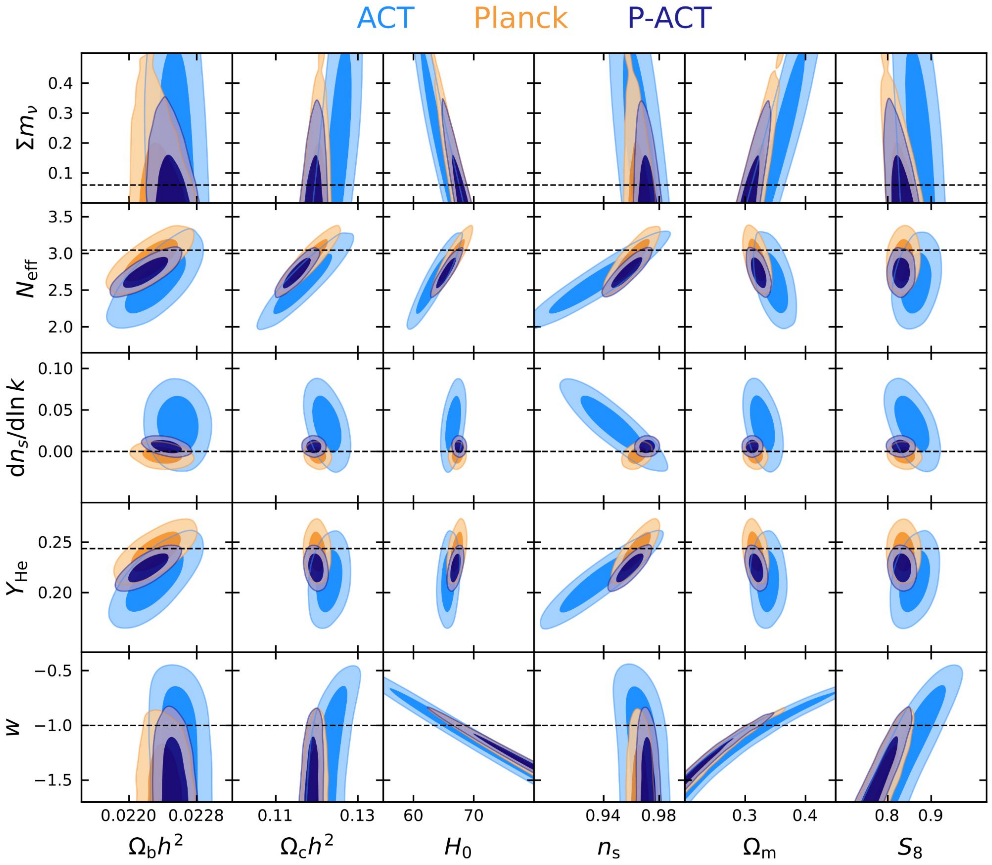


B-modes power spectrum

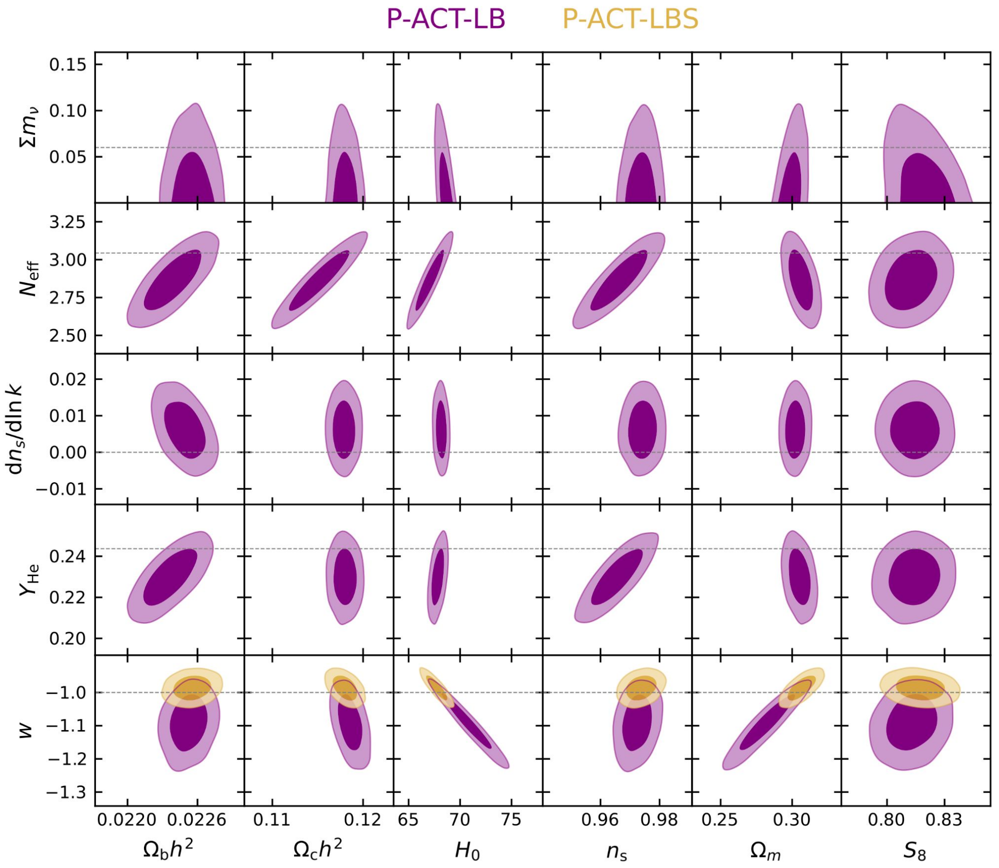


More extended models

Single parameter extensions



Standard model one parameter extensions



Improved sensitivity to new physics with ACT DR6

Improved sensitivity from ACT DR6 data

Three types of models which would be still allowed by Planck data

Free-streaming dark radiation

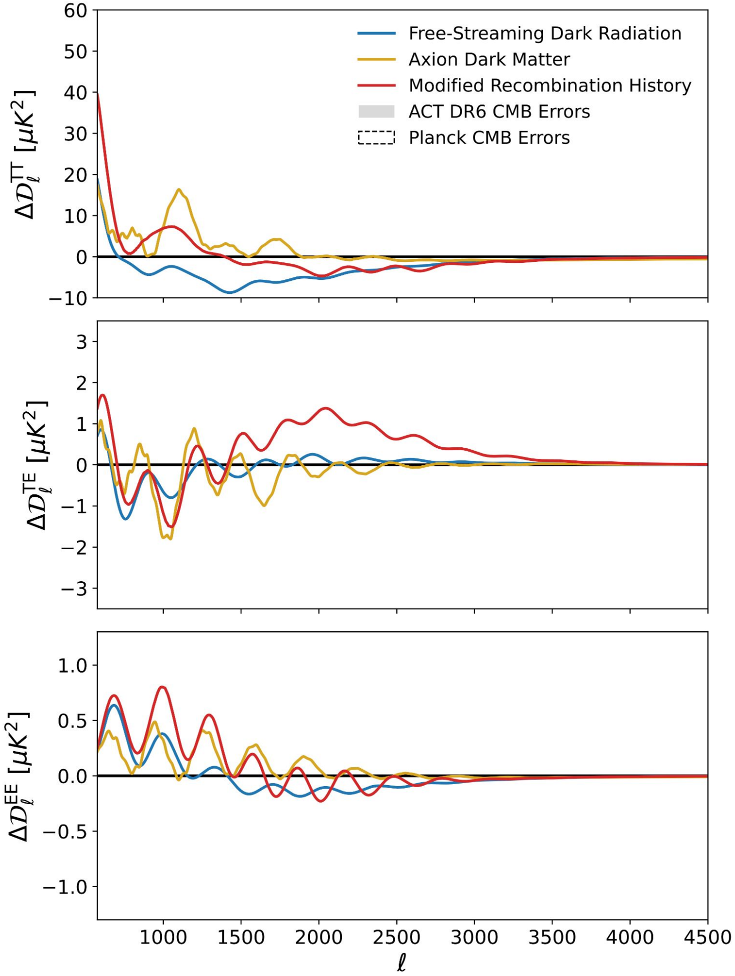
$$N_{\rm eff} = 3.4$$

Axion-like particles contributing to Dark Matter

$$\Omega_{\rm ax}/(\Omega_{\rm ax}+\Omega_{\rm c}) = 5\% \quad (m_{\rm ax} = 10^{-26}\ {\rm eV})$$

Modified recombination history

$$\Delta X_e/X_e = -20\% \quad \text{at} \quad z \sim 1470$$



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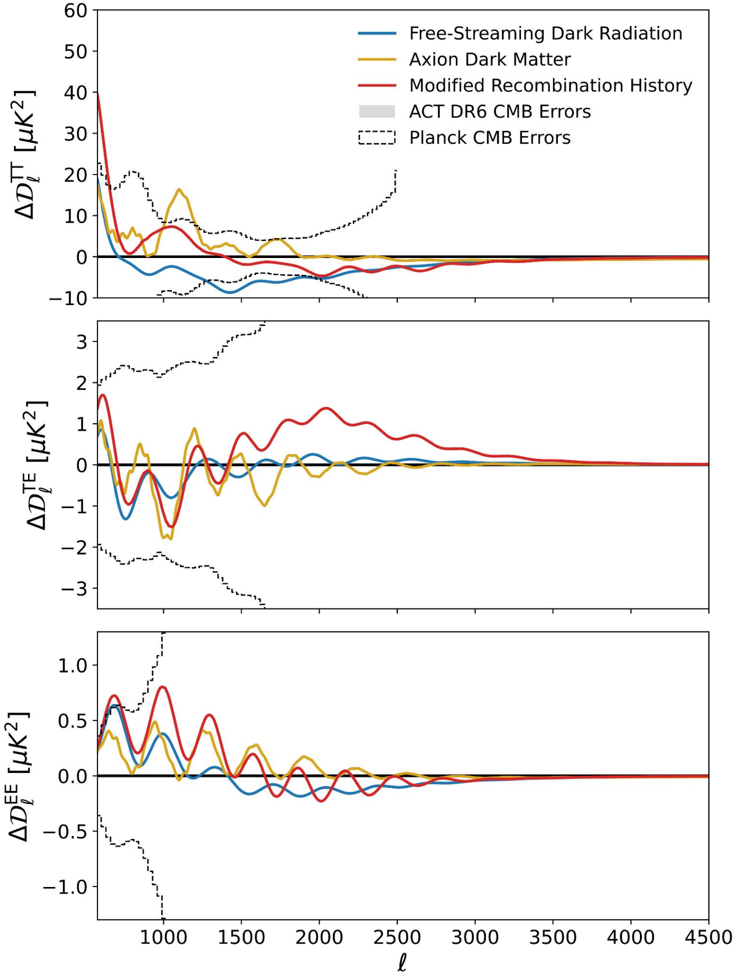

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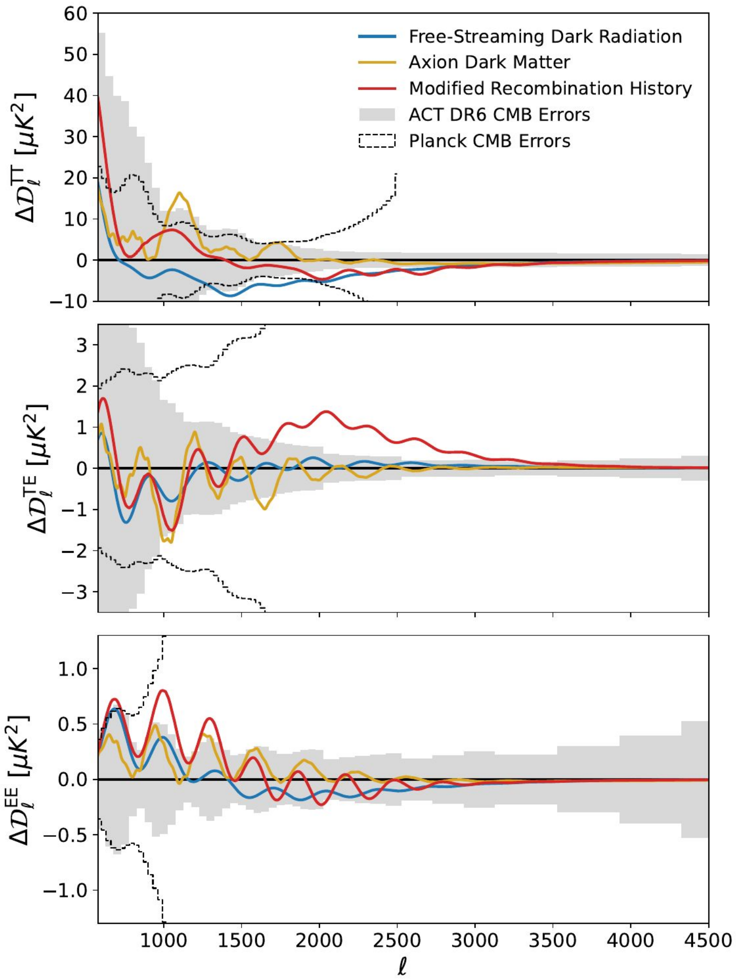

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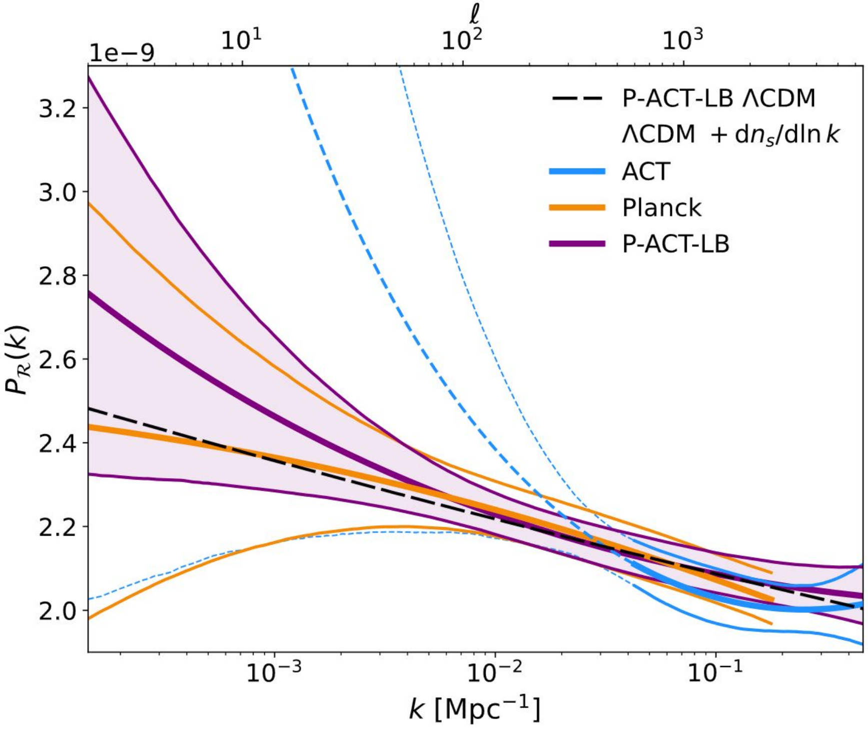
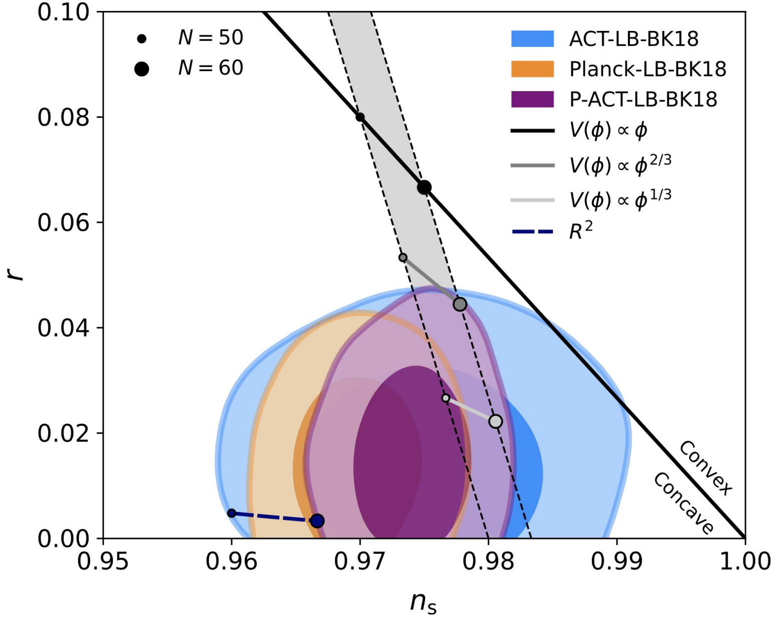
Primordial fluctuations

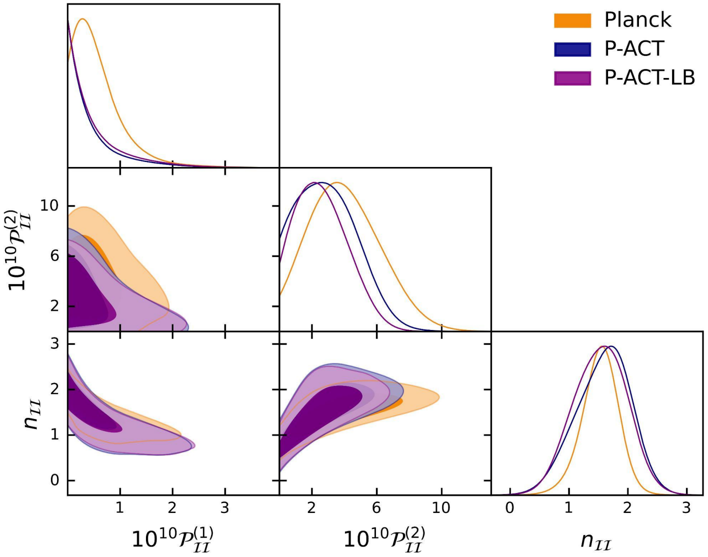
Running of the spectral index:

$$\mathrm{d}n_s/\mathrm{d}\ln k = 0.0062 \pm 0.0052$$ (P-ACT-LB)

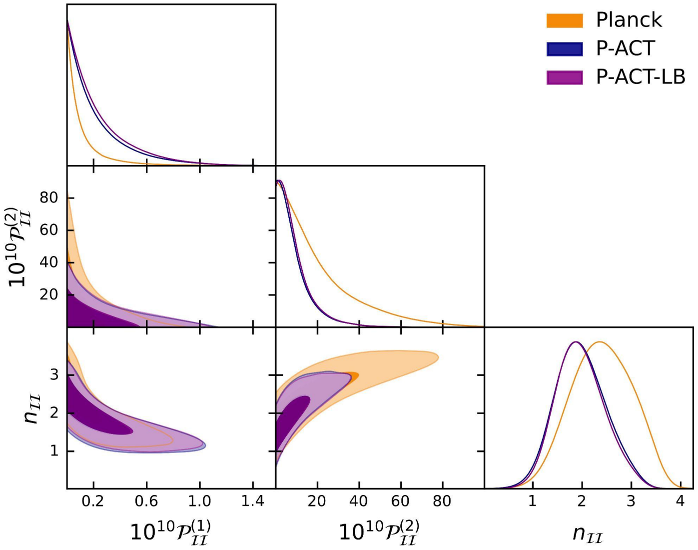




Primordial fluctuations - isocurvature perturbations



Neutrino density isocurvature



CDM density isocurvature

Particle cosmology

No evidence for new light, relativistic species

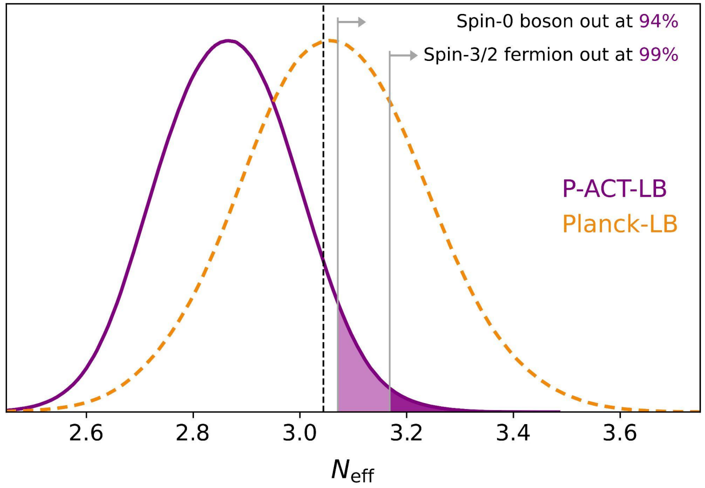
Free-streaming:

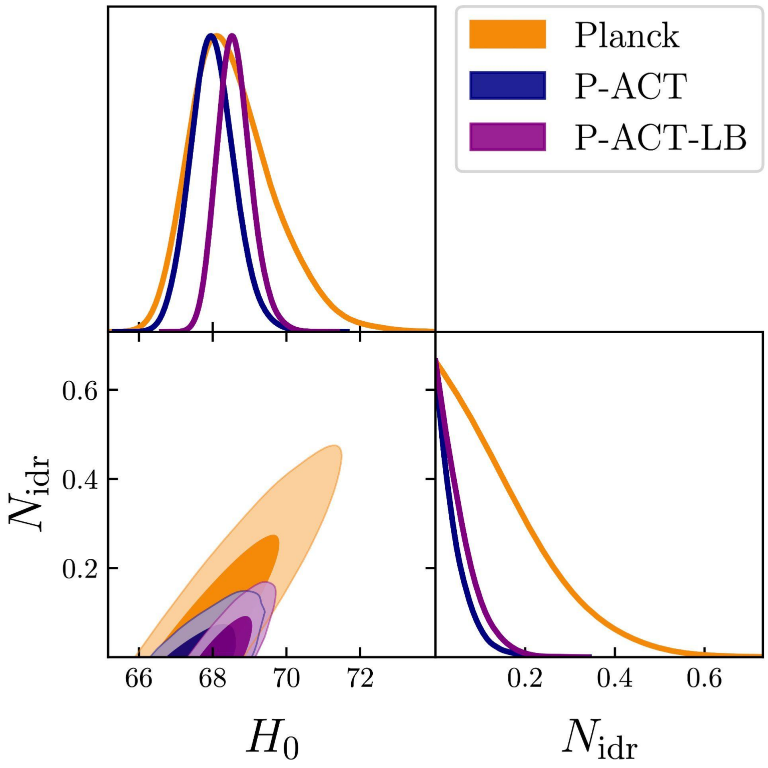
$N_{eff} = 2.86 \pm 0.13$ (68%, P-ACT-LB)

$N_{eff} = 2.89 \pm 0.11$ (68%, P-ACT-LB-BBN)

Self-interacting:

$N_{idr} < 0.134$ (95%, P-ACT-LB)





Also no evidence for neutrino self-interactions or DM-DR interactions

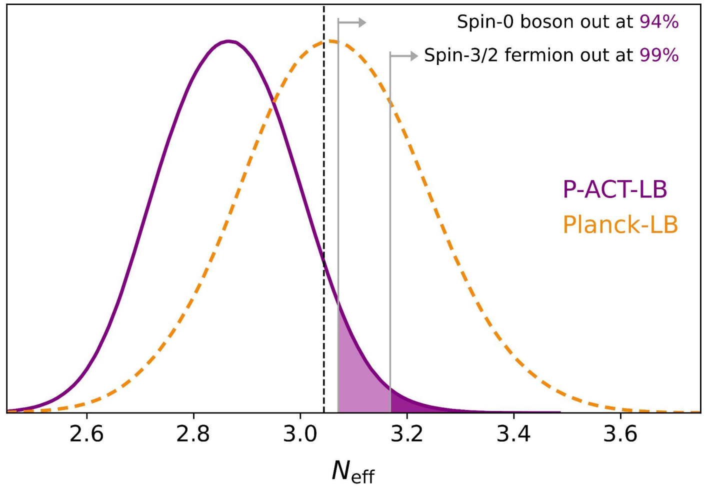
Particle cosmology

No evidence for new light, relativistic species

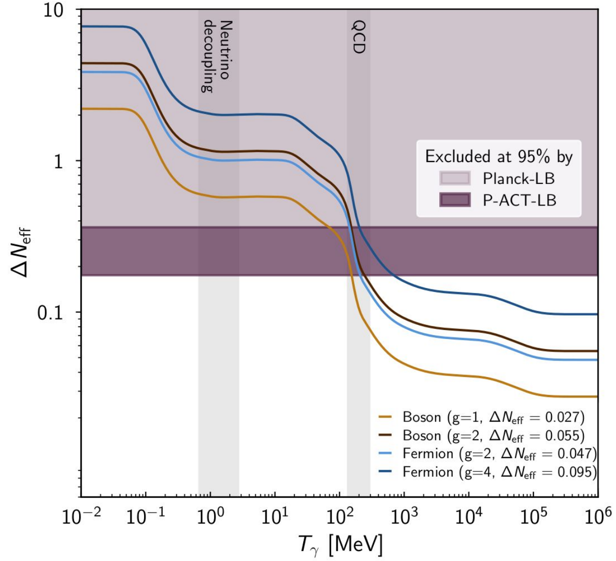
Free-streaming:

N_{eff} = 2.86 ± 0.13 (68%, P-ACT-LB) consistent with the standard model value (3.044)

Constraints on N_{eff}



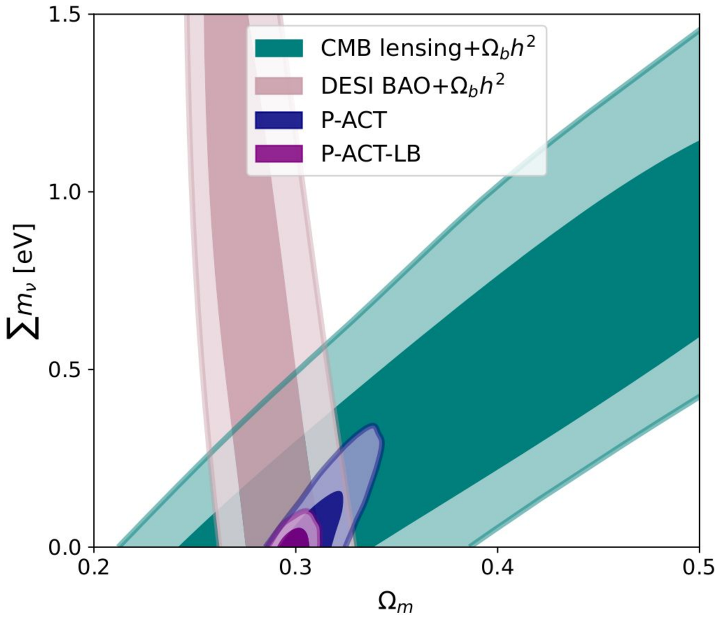
Constraints on ΔN_{eff}>0

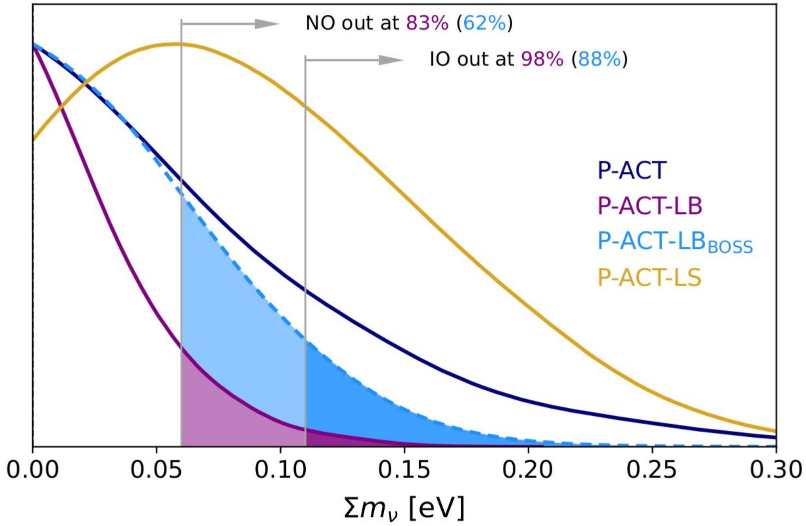


Neutrino mass constraints

Using DESI-Y1

Σm_ν < 0.089 eV (95%, P-ACT-LB)
Σm_ν < 0.088 eV (95%, WMAP + ACT-LB)

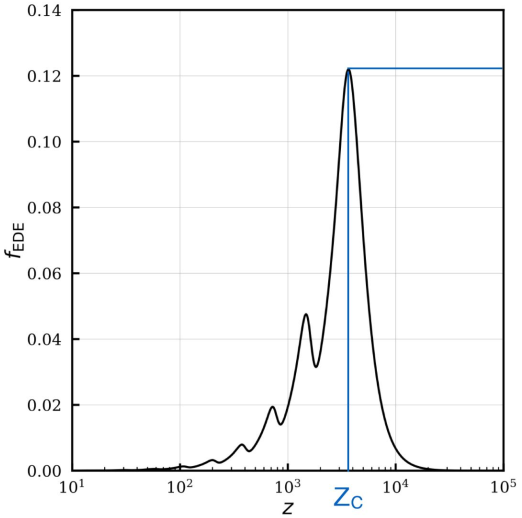




Pre-recombination new physics

No evidence for an early dark energy (EDE) component:

A mild hint (2-3σ) of EDE was seen in ACT DR4 (Hill+2022); the new ACT DR spectra show that this was a statistical fluctuation.



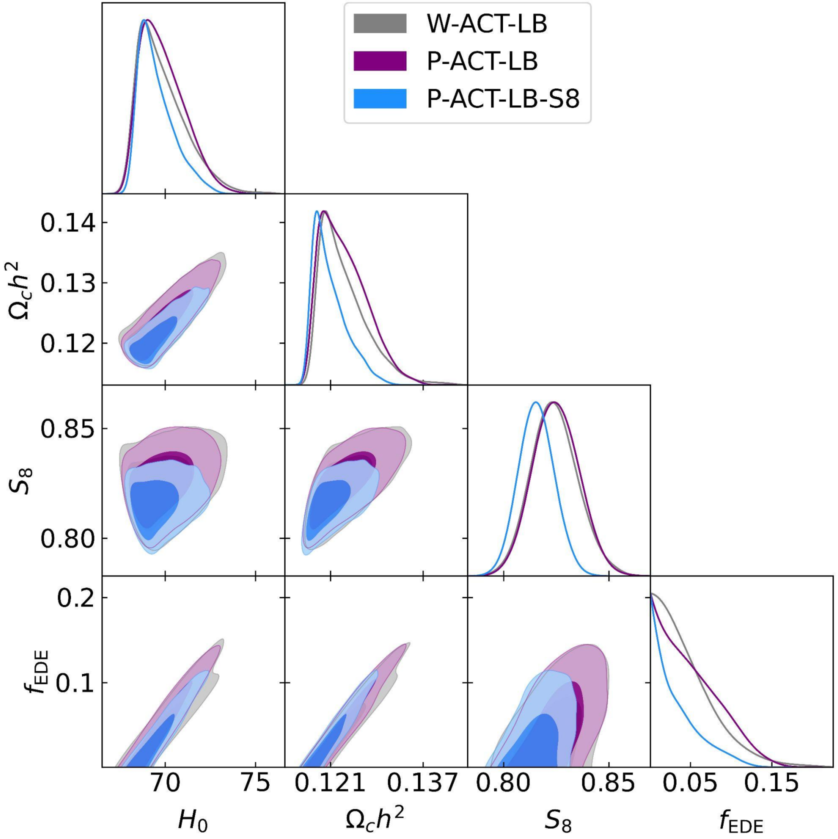
Maximal contribution:

$$f_{\rm EDE}(z_c) \equiv (\rho_{\rm EDE}/3M_{pl}^2 H^2)|_{z_c}$$

which occurs at redshift z_c

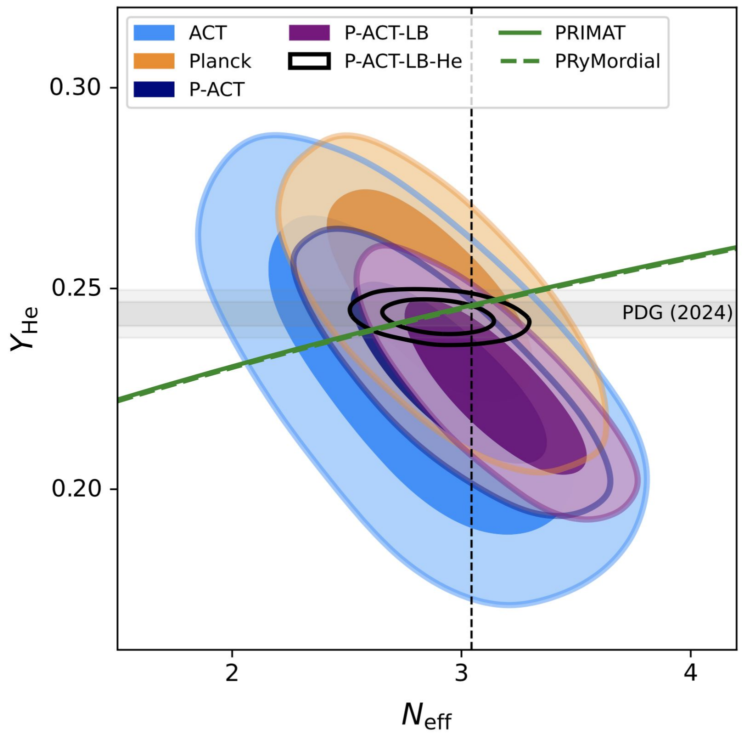
Final parameter: $\theta_i = \phi_i/f$ (initial field displacement)

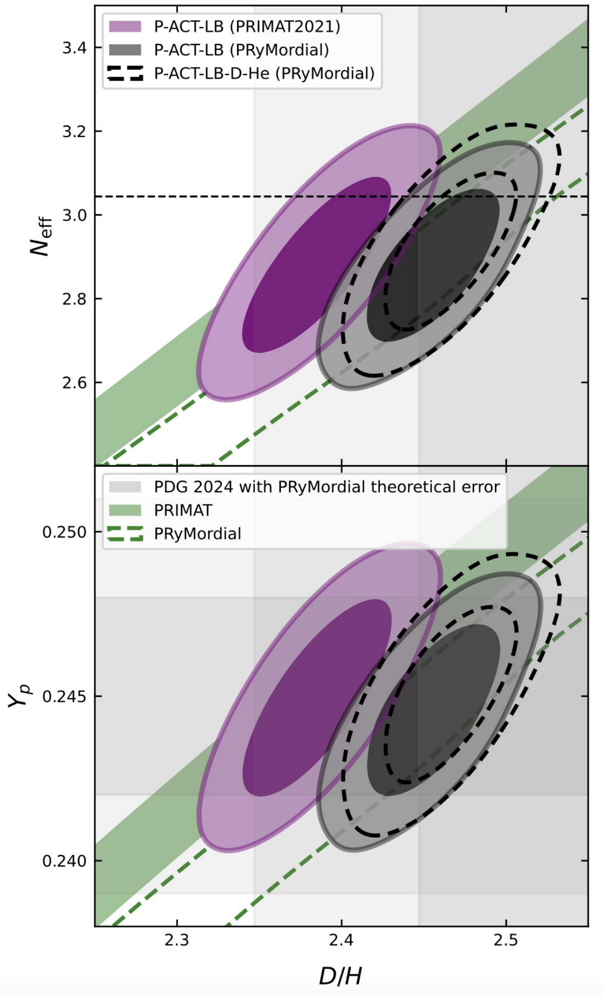
→ $\{f_{\rm EDE}, z_c, \theta_i\}$



Max. preference: $\Delta\chi^2 = 6.6$ (1.7σ)

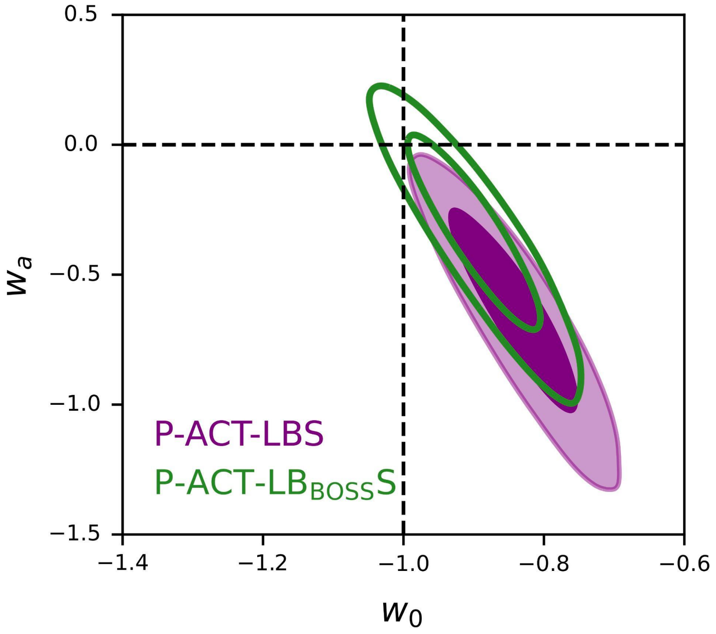
Big Bang Nucleosynthesis





Late-time DE equation of state

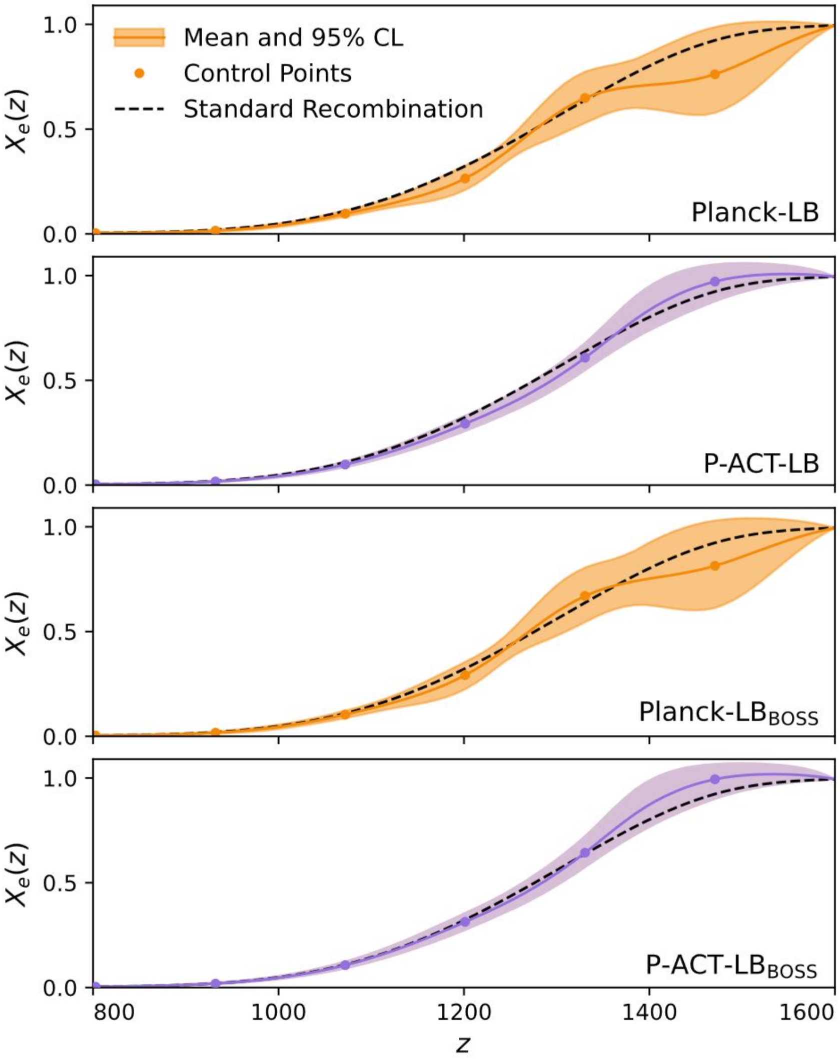
From primary CMB data, we find no evidence for non-standard dark energy; hints of non-standard evolution are driven by low-redshift data and consistent with previous analyses of DESI and SNIa data.



P-ACT-LBS consistent with Λ at 2.2σ
[P-LBS (in)consistent with Λ at 2.5σ (DESI+2024)]

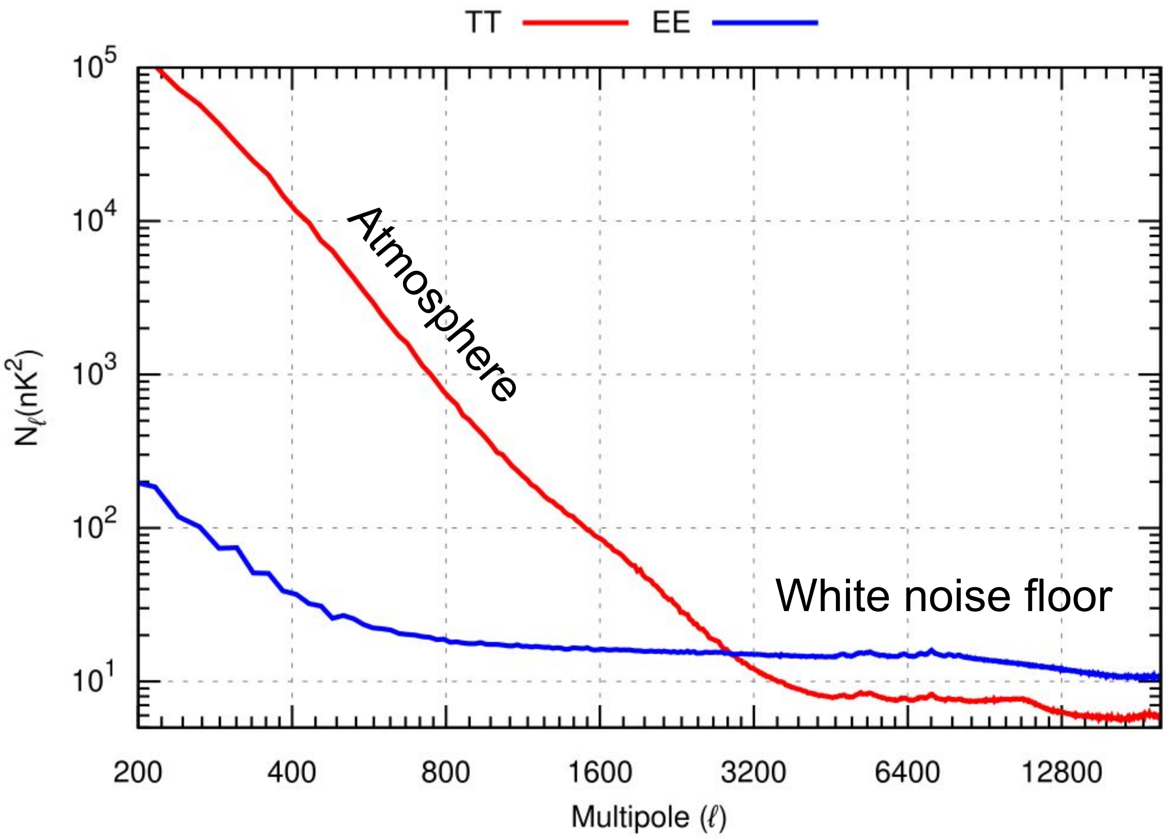
$$\left.\begin{aligned} w_0 &= -0.837 \pm 0.061 \\ w_a &= -0.66^{+0.27}_{-0.24} \end{aligned}\right\} \text{(68\%, P-ACT-LBS)}$$

Recombination history constraints



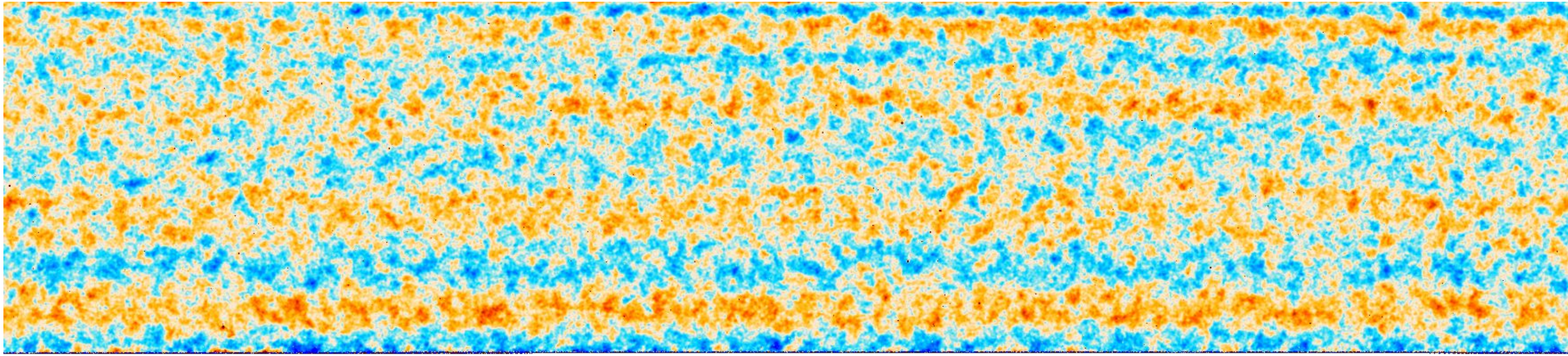
Analysis details

Atmospheric noise

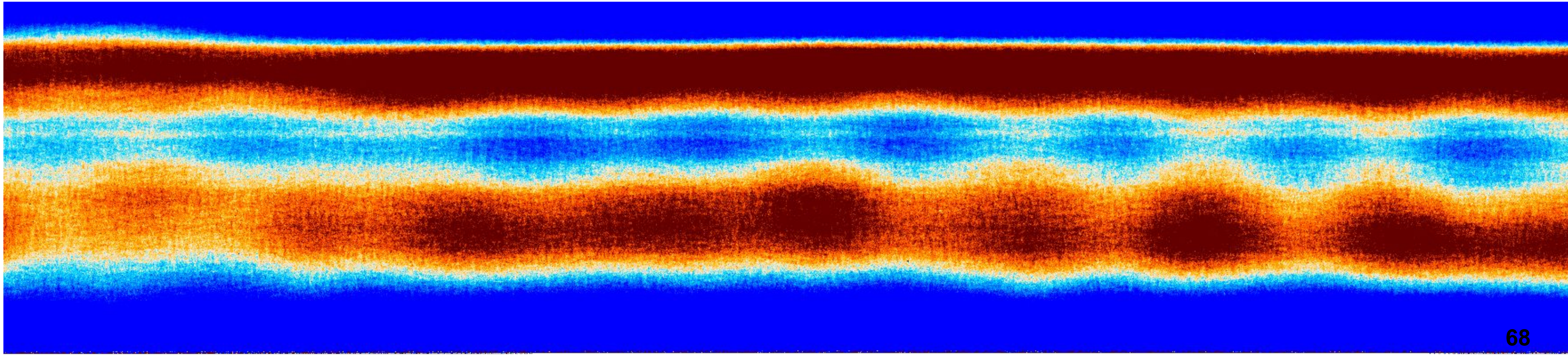


Azimuth synchronous pickup

T



Q

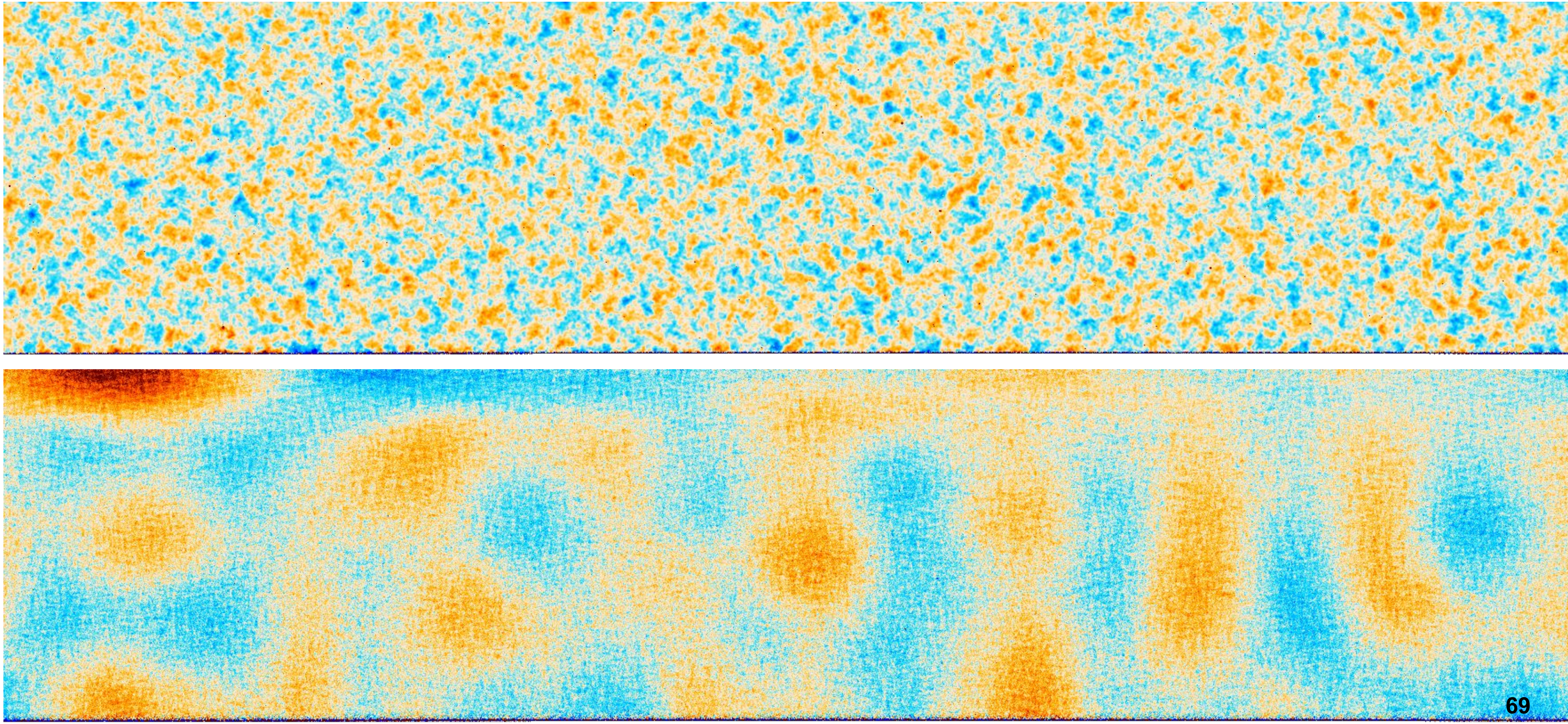


Azimuth synchronous pickup

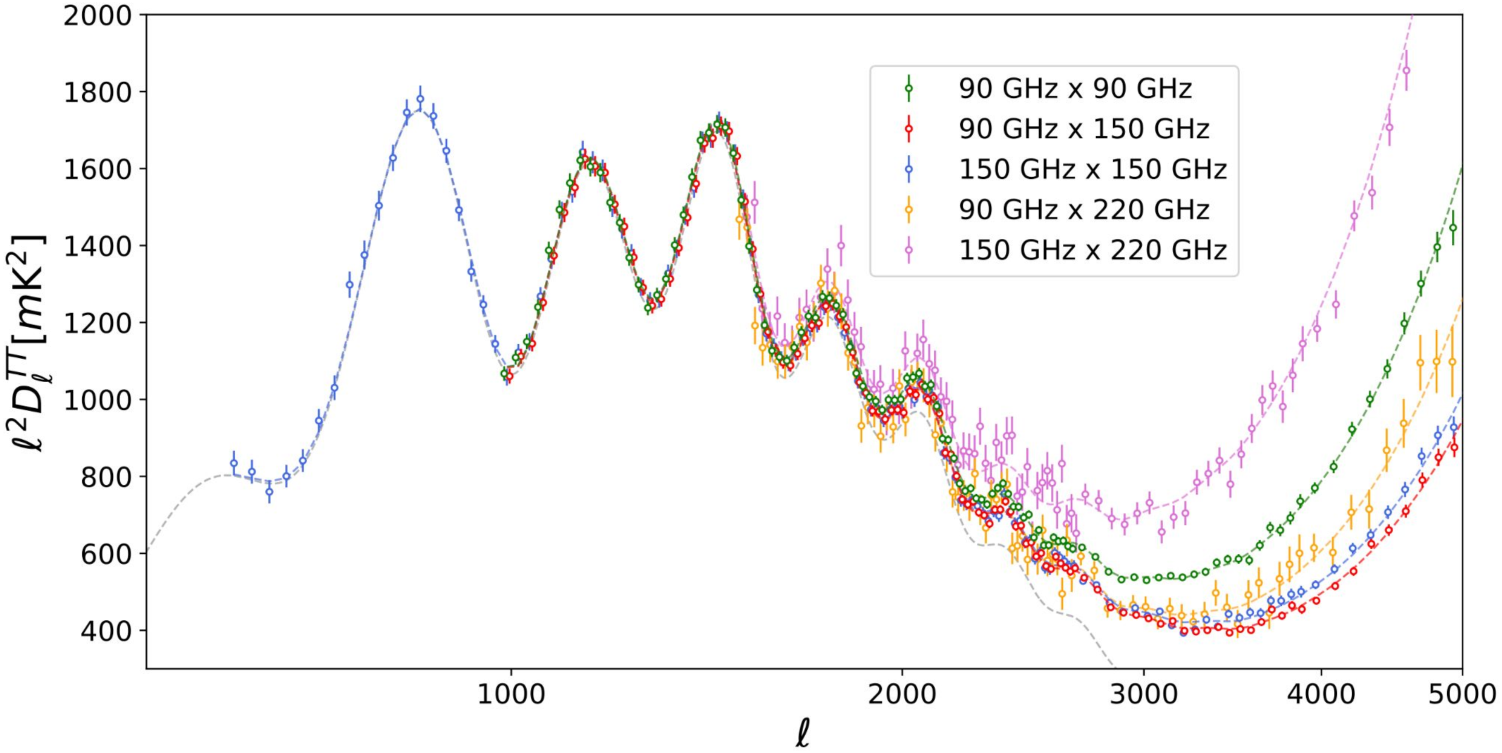
After removing |m|<5

T

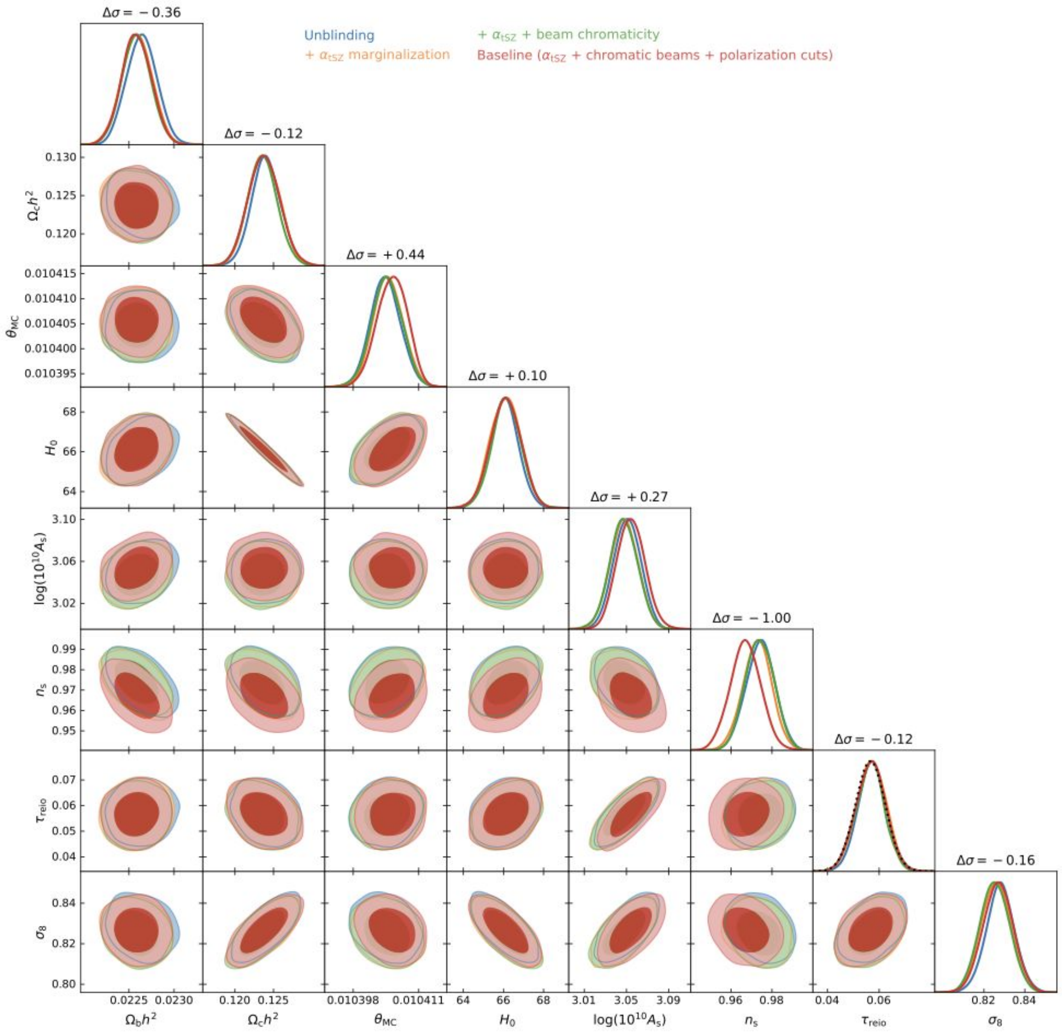
Q



Our data look like this (almost)

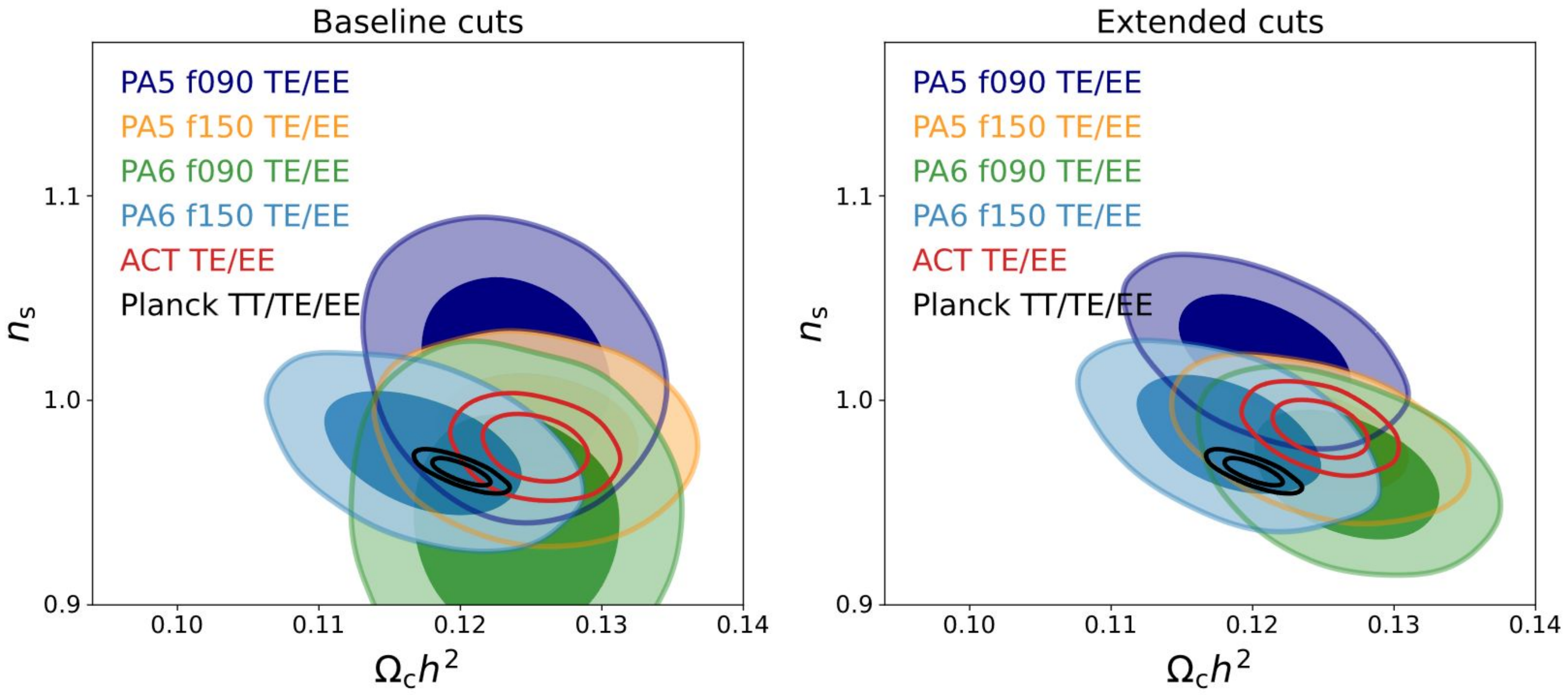


Unblinding



Unblinding
+ α_{tSZ} marginalization
+ α_{tSZ} + beam chromaticity
Baseline (α_{tSZ} + chromatic beams + polarization cuts)
$\Delta\sigma = -0.36$
$\Delta\sigma = -0.12$
$\Delta\sigma = +0.44$
$\Delta\sigma = +0.10$
$\Delta\sigma = +0.27$
$\Delta\sigma = -1.00$
$\Delta\sigma = -0.12$
$\Delta\sigma = -0.16$
$\Omega_b h^2$
$\Omega_c h^2$
θ_{MC}
H_0
$\log(10^{10} A_s)$
n_s
τ_{reio}
σ_8

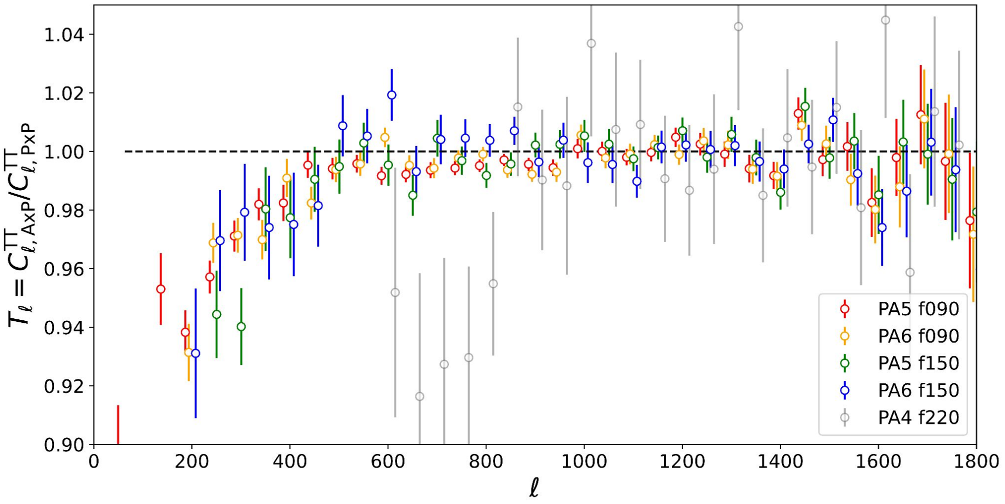
Unblinding


Baseline cuts
Extended cuts
PA5 f090 TE/EE
PA5 f150 TE/EE
PA6 f090 TE/EE
PA6 f150 TE/EE
ACT TE/EE
Planck TT/TE/EE
n_s
$\Omega_c h^2$
1.1
1.0
0.9
0.10
0.11
0.12
0.13
0.14

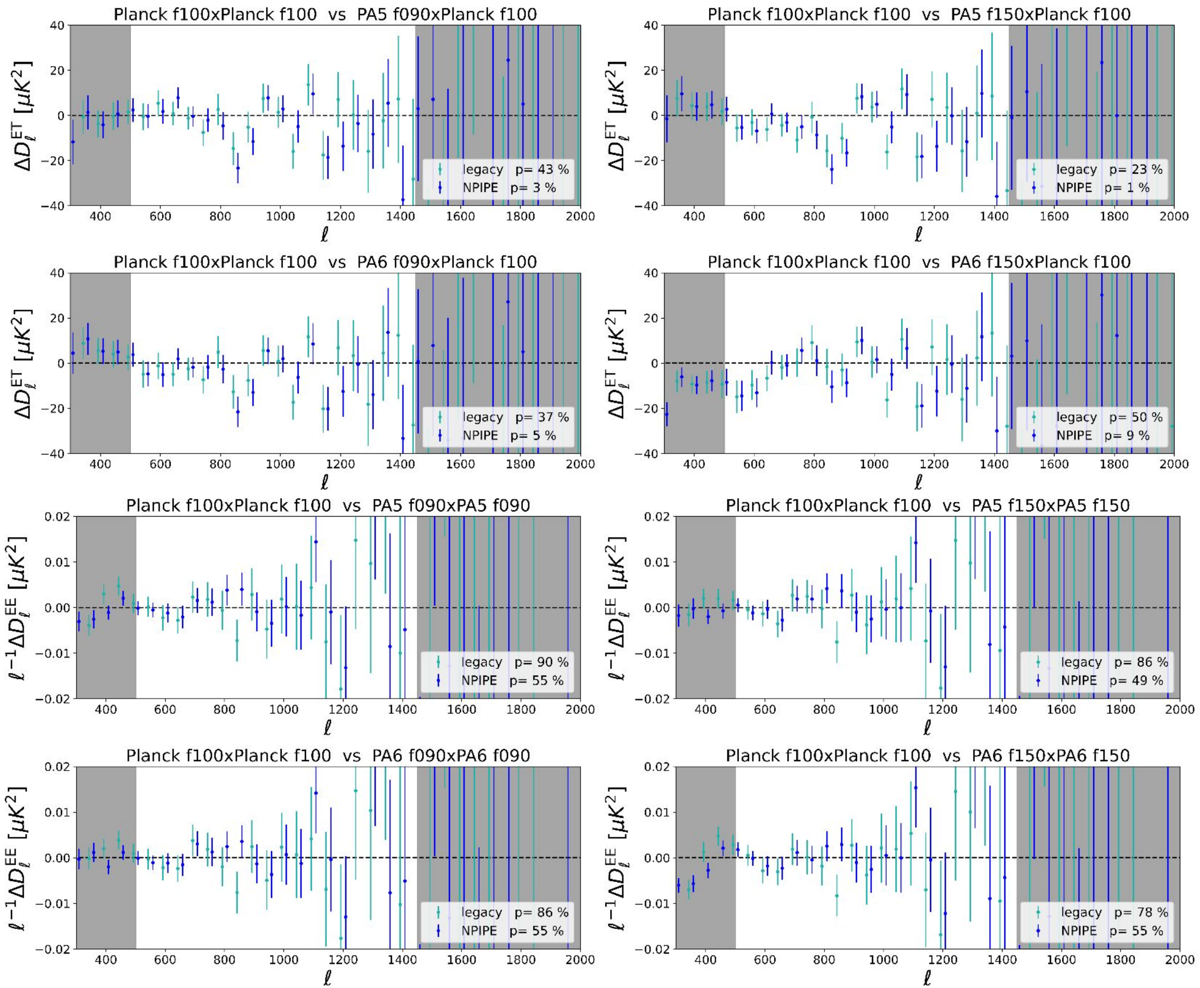
Large scale power loss

Ground pick-up, or azimuth synchronous signals (reflection on the environment)

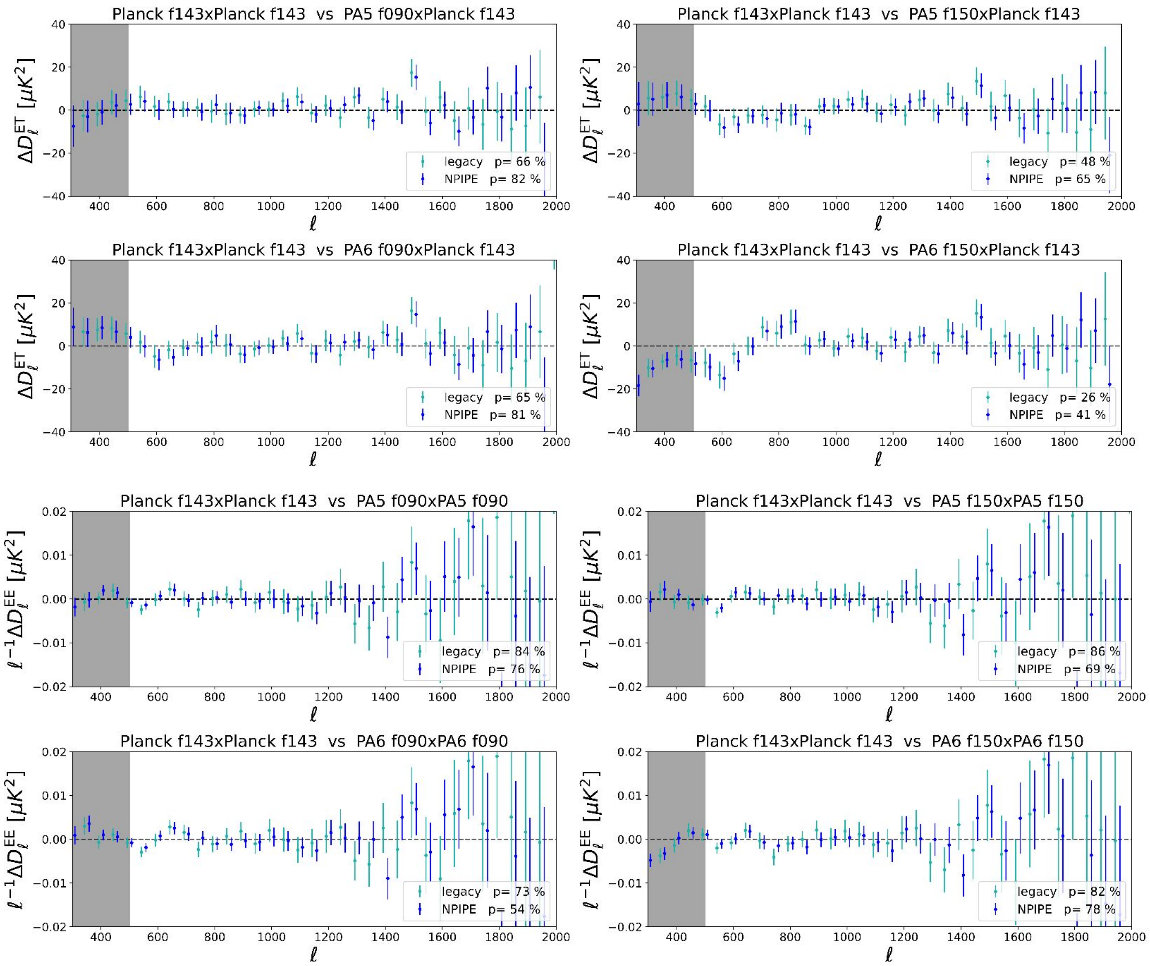
Mismodeling of detector gains (*Naess & Louis 2022*) can lead to **large scale biases** in ML mapmaking



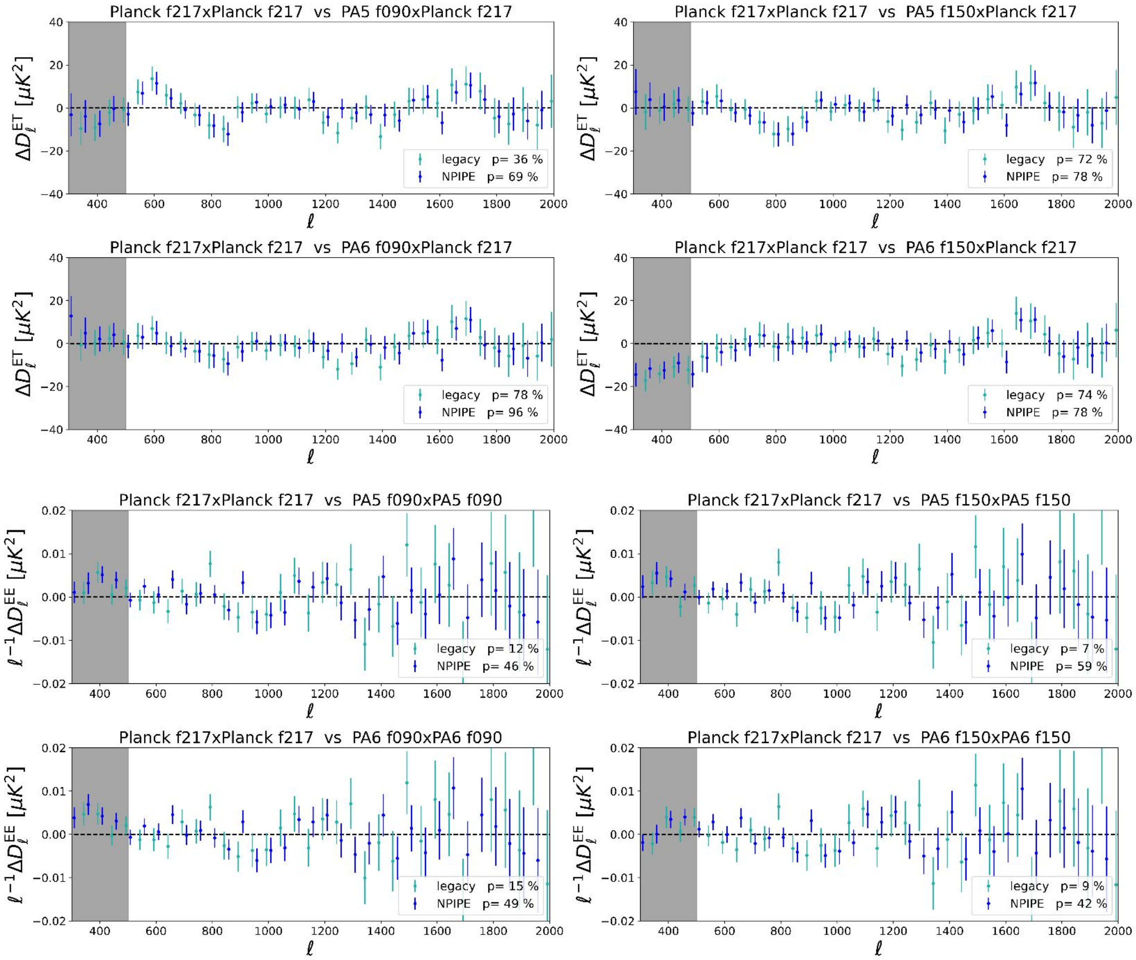
ACT and Planck on the same patch



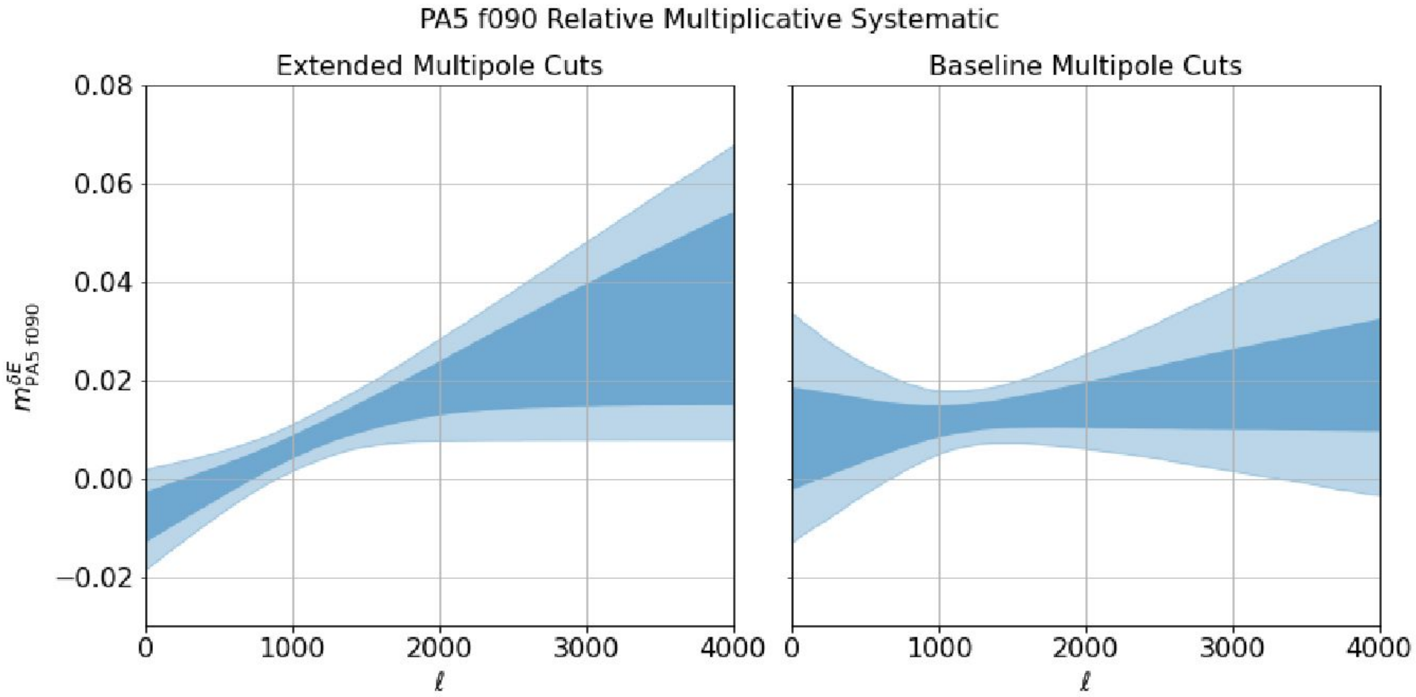
ACT and Planck on the same patch



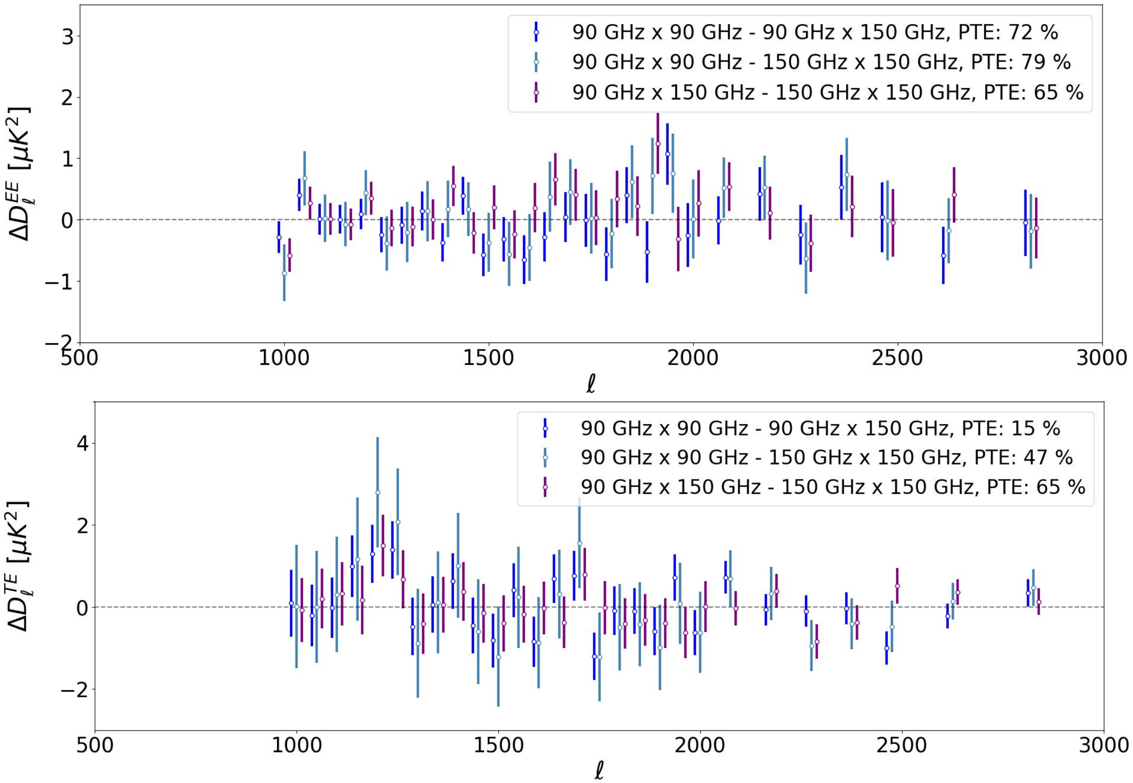
ACT and Planck on the same patch



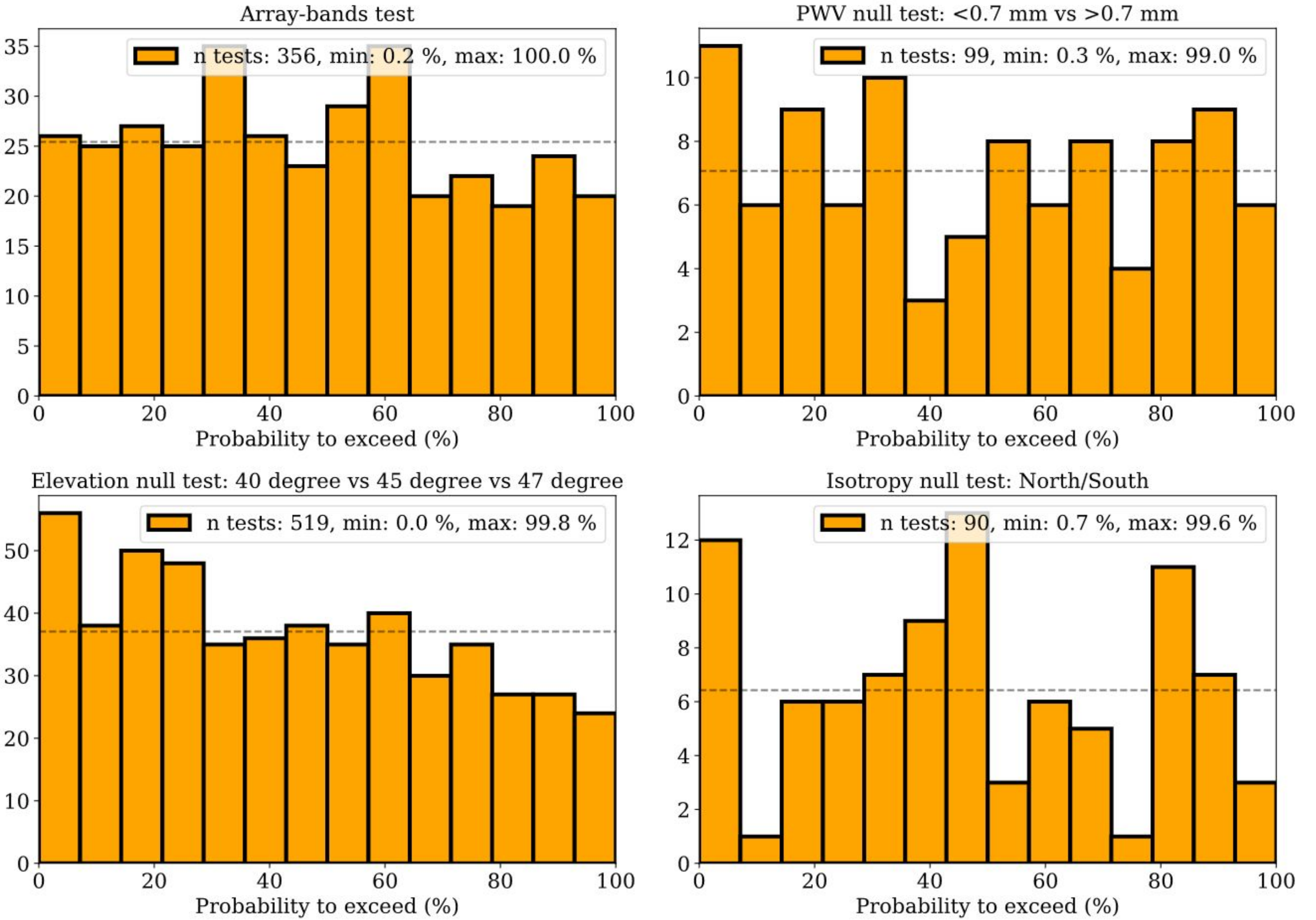
PA5 F090 relative multiplicative systematic



Frequency null tests

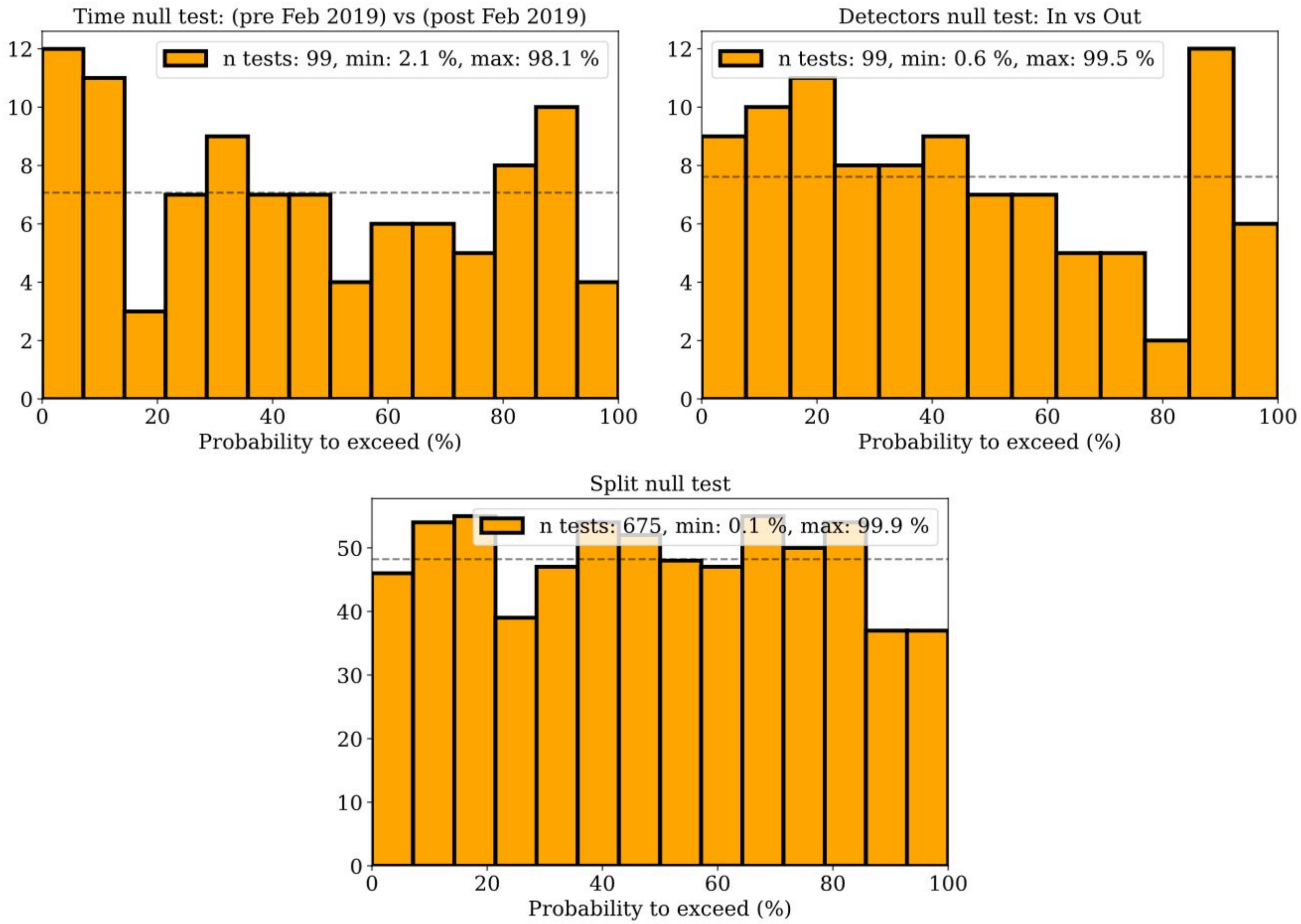


Null tests



Array-bands test
n tests: 356, min: 0.2 %, max: 100.0 %
Probability to exceed (%)
PWV null test: <0.7 mm vs >0.7 mm
n tests: 99, min: 0.3 %, max: 99.0 %
Probability to exceed (%)
Elevation null test: 40 degree vs 45 degree vs 47 degree
n tests: 519, min: 0.0 %, max: 99.8 %
Probability to exceed (%)
Isotropy null test: North/South
n tests: 90, min: 0.7 %, max: 99.6 %
Probability to exceed (%)

Null tests


Time null test: (pre Feb 2019) vs (post Feb 2019)
n tests: 99, min: 2.1 %, max: 98.1 %
Probability to exceed (%)
Detectors null test: In vs Out
n tests: 99, min: 0.6 %, max: 99.5 %
Probability to exceed (%)
Split null test
n tests: 675, min: 0.1 %, max: 99.9 %
Probability to exceed (%)

Foreground model

Parameter	Description	Priors	
		Simulations	Data
$a_{\rm tSZ}$	Thermal SZ amplitude at $\ell = 3000$ at 150 GHz		≥ 0
$\alpha_{\rm tSZ}$	Thermal SZ template shape		
$a_{\rm kSZ}$	Kinematic SZ amplitude at $\ell = 3000$		≥ 0
a_c	Clustered CIB amplitude at $\ell = 3000$ at 150 GHz		≥ 0
β_c	Clustered CIB spectral index		
ξ	tSZ-CIB correlation scale at $\ell = 3000$ at 150 GHz	$-1 \leq \xi \leq 1$	$0 \leq \xi \leq 0.2$
a_p	Poisson CIB amplitude $\ell = 3000$ at 150 GHz		≥ 0
β_p	Poisson CIB spectral index	$\beta_p \equiv \beta_c$	$\beta_p \equiv \beta_c$
a_s^{TT}	Unresolved radio sources in TT at $\ell = 3000$ at 150 GHz		≥ 0
β_s	Radio sources spectral index	≤ 0	≤ 0
a_g^{TT}	Galactic dust amplitude in TT at $\ell = 500$ at 150 GHz	$(8.83 \pm 0.32)\,\mu\mathrm{K}^2$	$(7.95 \pm 0.32)\,\mu\mathrm{K}^2$
a_s^{TE}	Unresolved radio sources in TE at $\ell = 3000$ at 150 GHz		
a_g^{TE}	Galactic dust amplitude in TE at $\ell = 500$ at 150 GHz	$(0.43 \pm 0.03)\,\mu\mathrm{K}^2$	$(0.42 \pm 0.03)\,\mu\mathrm{K}^2$
a_s^{EE}	Unresolved radio sources in EE at $\ell = 3000$ at 150 GHz		> 0
a_g^{EE}	Galactic dust amplitude in EE at $\ell = 500$ at 150 GHz	$(0.165 \pm 0.017)\,\mu\mathrm{K}^2$	$(0.168 \pm 0.017)\,\mu\mathrm{K}^2$

Foreground model