Added science from improved measurements of T and E modes

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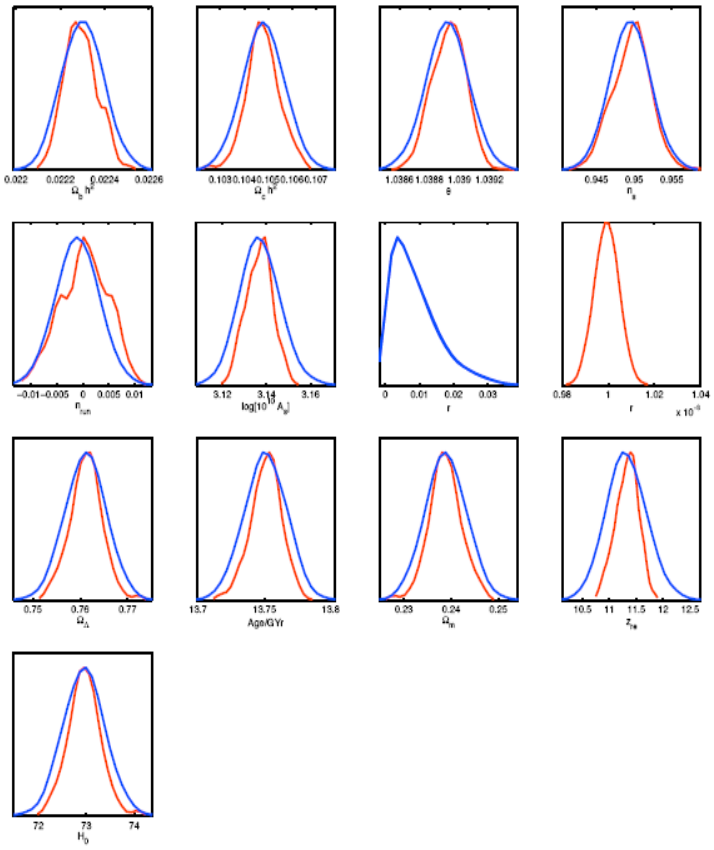
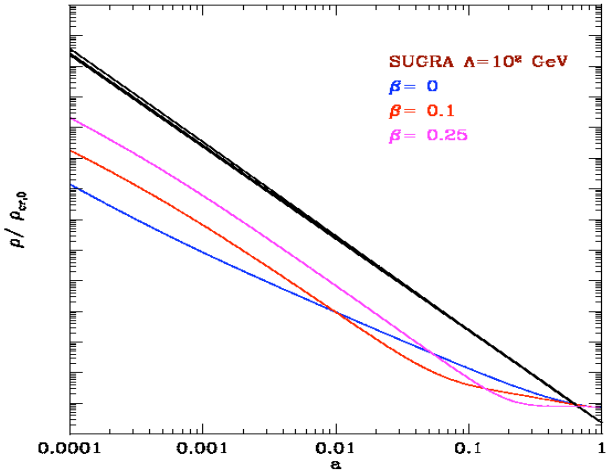
Reionization

- Improved measurements of the reionization peak in the EE power spectrum significantly improves estimates of the reionzation optical depth
- Improved understanding of the reionization history

parameter	Fiducial model	Abrupt reion. (3σ errors)	
		BPol	Planck
n_s	0.95	8.55×10^{-4}	3.91×10^{-3}
τ	0.09	9.82×10^{-4}	4.60×10^{-3}
n_{run}	0.00	2.64×10^{-3}	7.53×10^{-3}
R=T/S	0.0001	9.69×10^{-4}	2.56×10^{-2}
A_S	0.78	4.78×10^{-3}	2.18×10^{-2}



Nature of DE



- DE equation of state
- Anomalous DE & DM scaling (1)
  - Parametrized assuming a constant DM-DE coupling
  - Current limits $\beta < 0.25$
- Constraints on other parameters depend on assumptions on DE: 1σ errors

parameter	BPol	BPol	Planck	Planck
	ΛCDM	cDE	ΛCDM	cDE
$\Omega_b h^2$=.0223	0.00016	0.00017	0.00029	0.00030
$\Omega_c h^2$=1.042	0.0010	0.011	0.0020	0.015
H_0=73.5	4.1	5.0	6.5	7.6
τ=.09	0.0028	0.0029	0.0059	0.0065
n_s=.95	0.0038	0.0043	0.0084	0.0109
A_s=2.7x10^{-9}	1.5x10^{-11}	1.8x10^{-11}	3.0x10^{-11}	3.3x10^{-11}
λ=-8	x	24	x	29
β=.1	x	0.04	x	0.06

(1) Selected bibliogr.: Wetterich 1995 A&A 301; Amendola 1999 PRD60 043501, 2000 PRD62 043511; Gasperini, Piazza, Veneziano 2002 PRD65 023508; Perrotta & Baccigalupi 2002 PRD65 12350; Amendola, Quercellini 2003 PRD69 103524; Mainini, Bonometto 2004 PRL93 121301; Maccio' et al 2004 PRD69 123516 (n-body simulations)

Neutrino masses

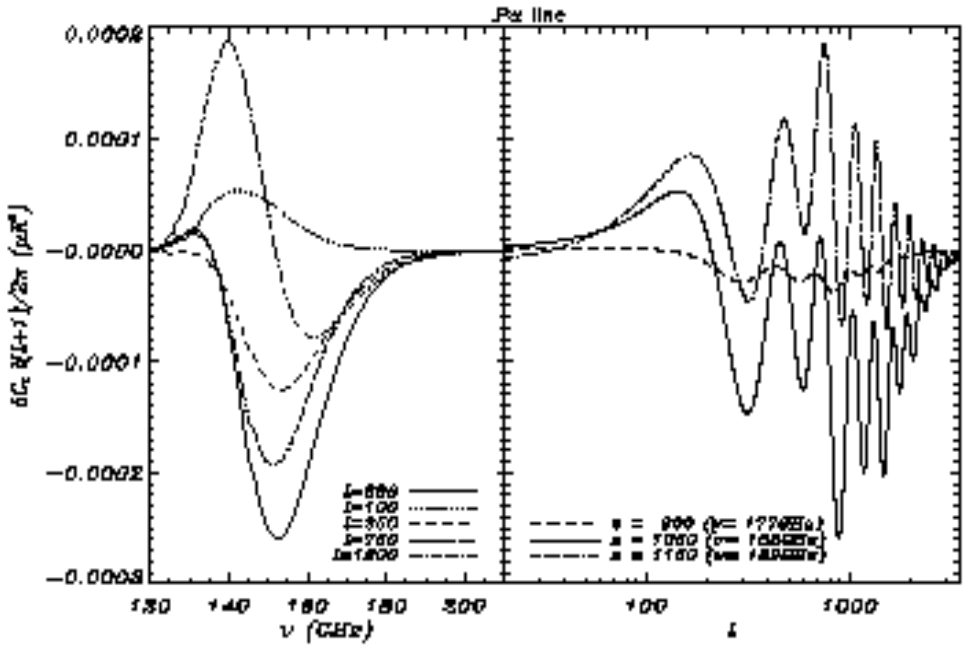
- Σm_ν over all species as extracted from CMB data (assuming equal masses?)
  - Improvement with Bpol because of significant improvement of sensitivity to E-polarization

Experiment	Error on Σm_ν (Ev)
BICEP+QUaD	0.42
BRAIN+ClOVER	0.37
Planck	0.24
BPol	0.10
Cosmic variance limited	0.05

Atmospheric $\Delta m \sim 0.05$ eV: Bpol clearly sensitive to mass hierarchy

Hydrogen recombination lines

- Hydrogen recombination lines leave a small imprint on the power spectrum
- Potentially detectable with Bpol
- Can be used to study the recombination process

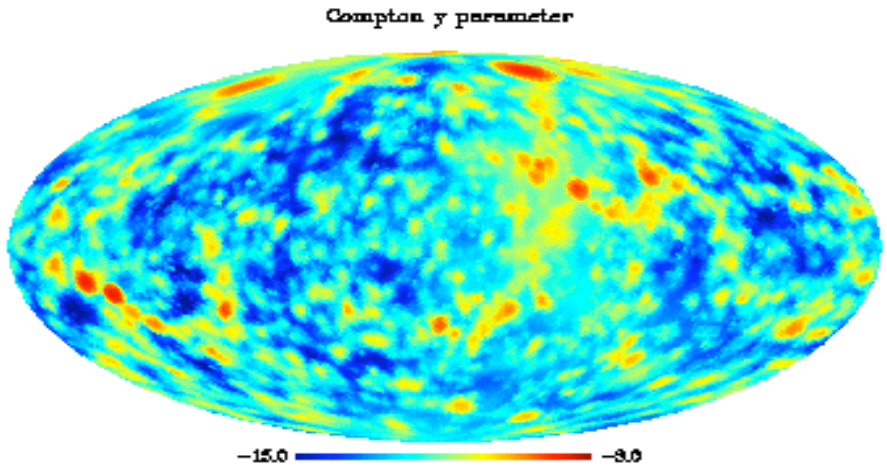


Heavy element abundances

- Transition lines in heavy elements leave an imprint on the power spectrum
- δC_l is proportional with the optical depth and hence the abundance of a given species
- Transition lines in neutral C, O, Si, S, Fe will give constraints on abundances in $1 < z < 50$
- Transitions of ions, CII, NII, OIII will give constraints on abundances in $3 < z < 25$
- Bpol will measure these abundances with error bars one order of magnitude smaller than Planck

The local SZ-effect

- The local Sunyaev-Zeldovich effect occurs when CMB photons are scattered on diffuse hot ionized gas in the local universe.
- Planck will be just at the detection limit for this effect. BPol will allow a more detailed study.
- Measuring the effect will put constraints on the baryon fraction in form of hot ionized gas, potentially solving the missing baryon problem



Predicted SZ effect from local universe

Constraints on Tensor Amplitude

- Tensors produce T & E, with strong correlation. TE for tensors is very different from TE from scalar
- Use T & E independently from B to check consistency. Less issues with foregrounds
- Without BB, $\delta r \sim 0.03$ for CV limited up to $l < 200$, $\delta r \sim 0.05$ $l \geq 20$. Need full sky.
- Planck may confirm it only if $r > 0.1$ (even if it detects B modes)

Questions for discussion

- DE limits vs. lensing
  - How to use cosmic shear C_l
  - Which precision needed ? (N-body simul?)
- DE vs. m_ν
- Other physics?

  e.g. primordial magnetic fields

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