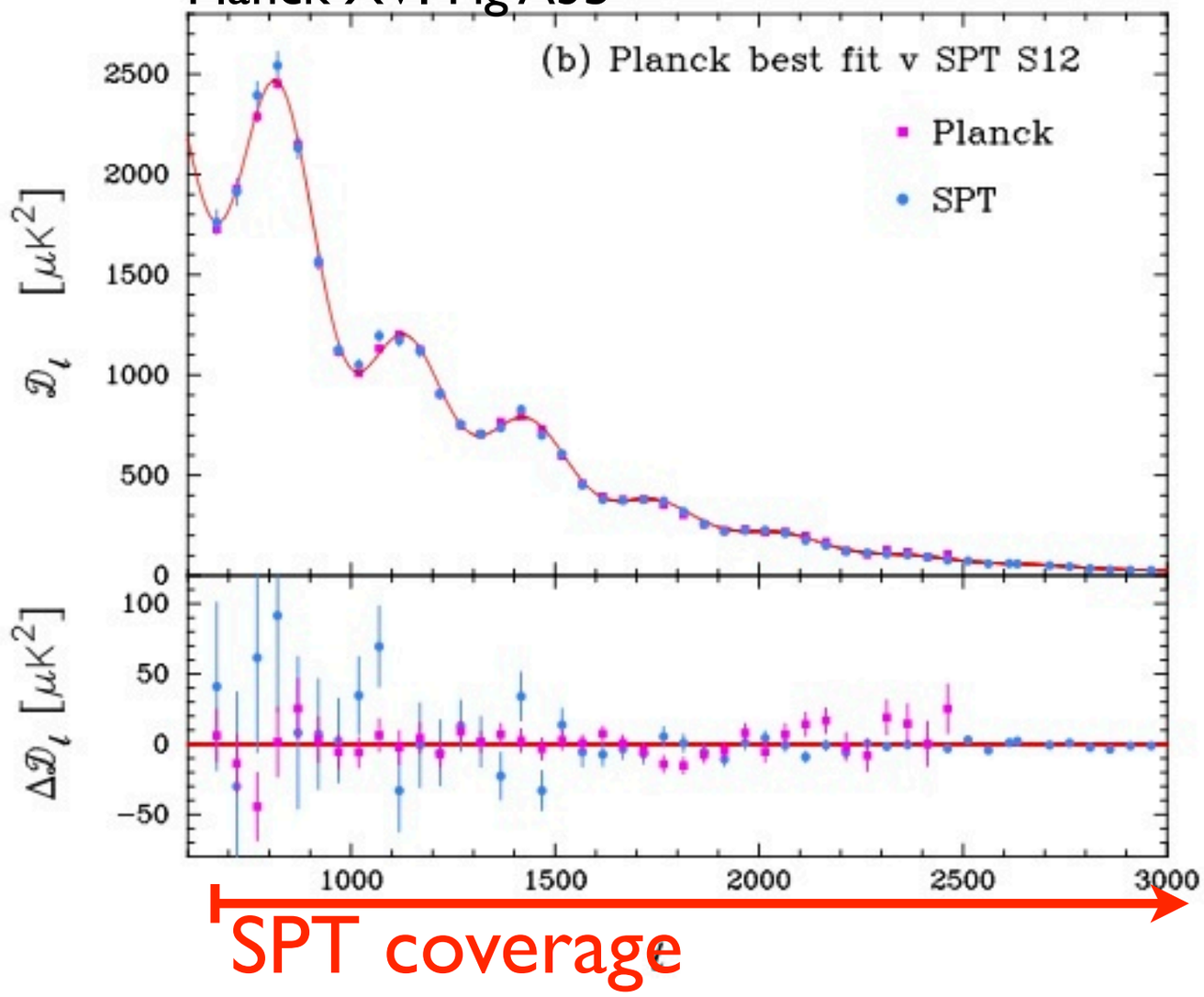
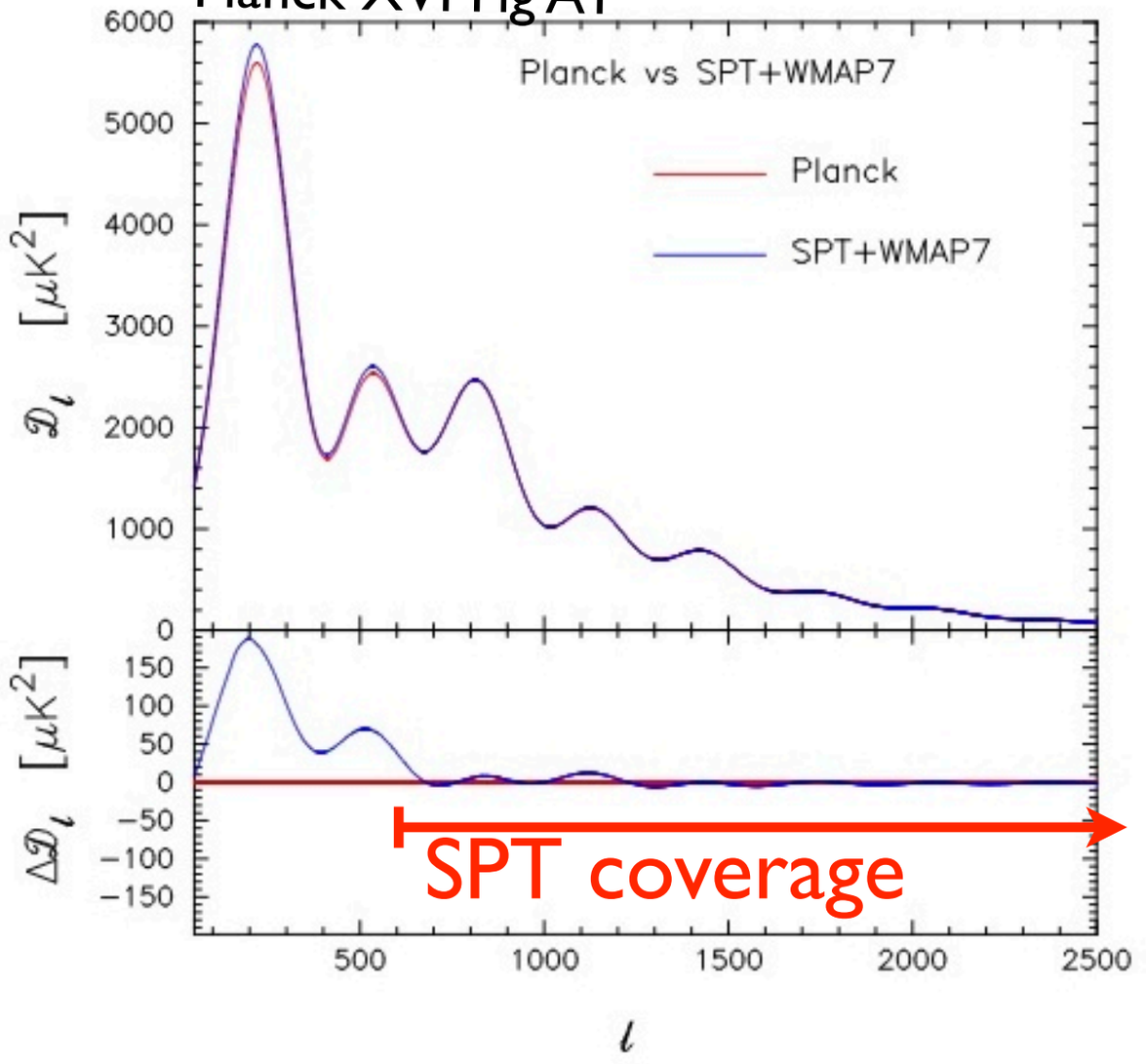
Planck is a magnificent success. Congratulations!

- **CMB data sets in amazing agreement, but details to sort out.**
- **Panel guidelines from George and Dick,**
  "John, you should address SPT vs Planck"
- **Higher Ω_M?**
- **CMB vs Cluster cosmology?**
- **What's next for CMB?**
  Lyman's talk - Very exciting future of CMB lensing and polarization
  and it's coming very soon!

Planck XVI Fig A3b

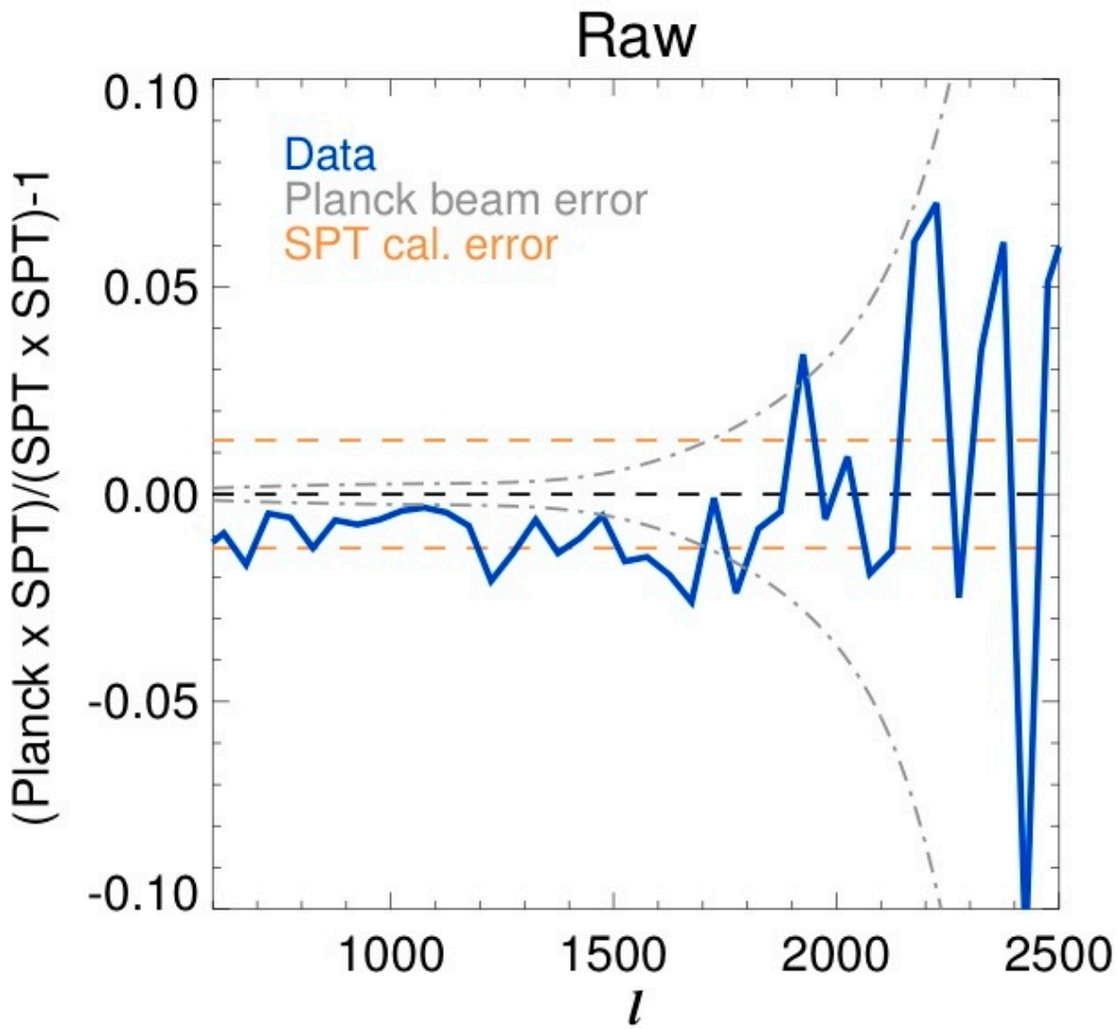


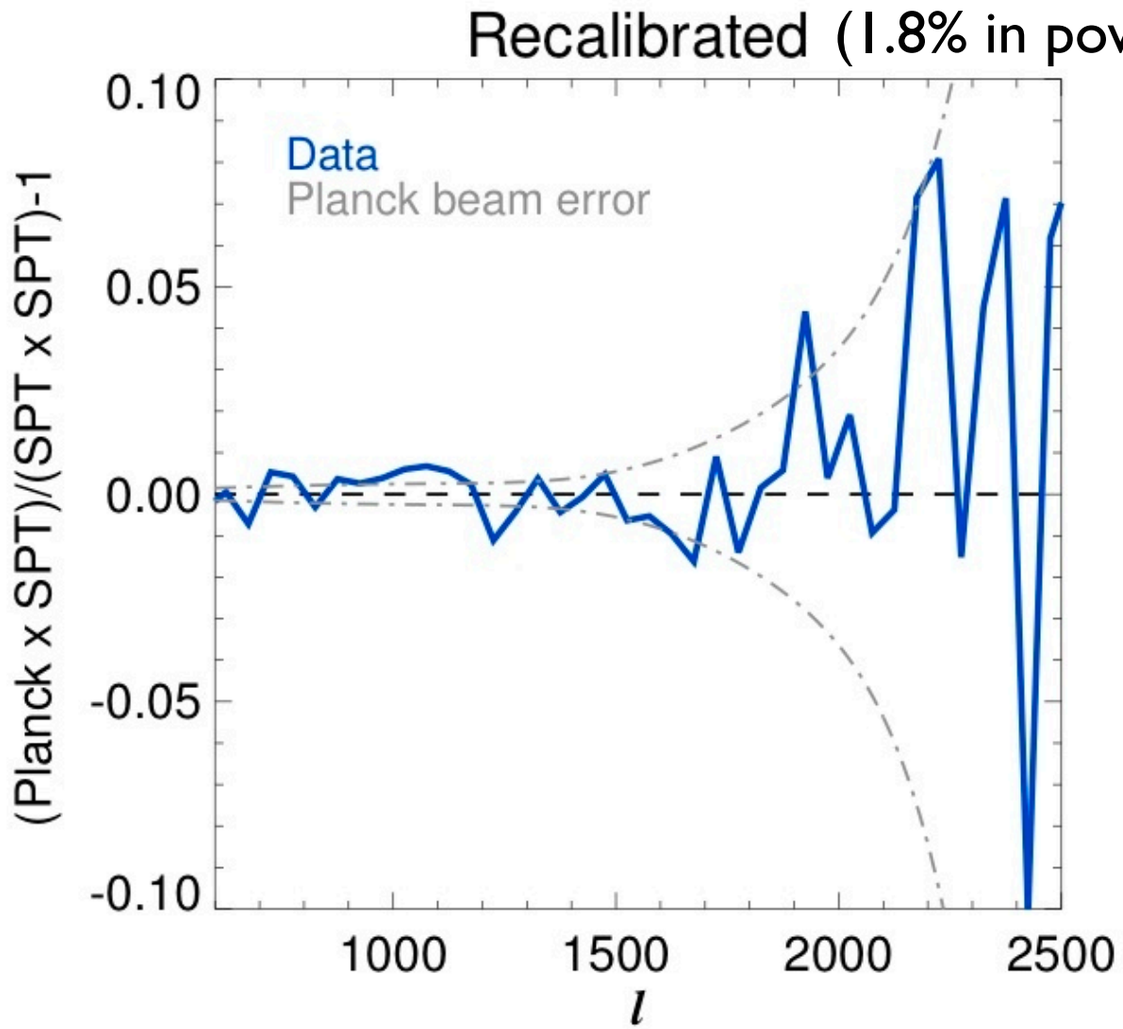
Planck XVI Fig A1



- **Overall beautiful agreement of Planck and SPT in overlap and beyond**
  - SPT bandpowers consistent with Planck data and also WMAP with similar PTE
- Planck XVI appendix → SPT has excess power over $600 < \ell < 1100$?
  - the "Excess" is not significant
  - No significant cirrus dust contamination (new analysis based on Planck dust maps < 0.5%)
  - Sample variance?
- But, cosmological parameters are different between Planck+SPT and WMAP7+SPT, **in particular higher Ω_M, WHY?**
  - Planck shows more smoothing of peaks, i.e., larger lensing (high A_{Lens}),
  - WMAP first peak higher than Planck

Planck 143GHz - SPT comparison in SPT 2500 deg^2 area





Planck XVI Fig A5

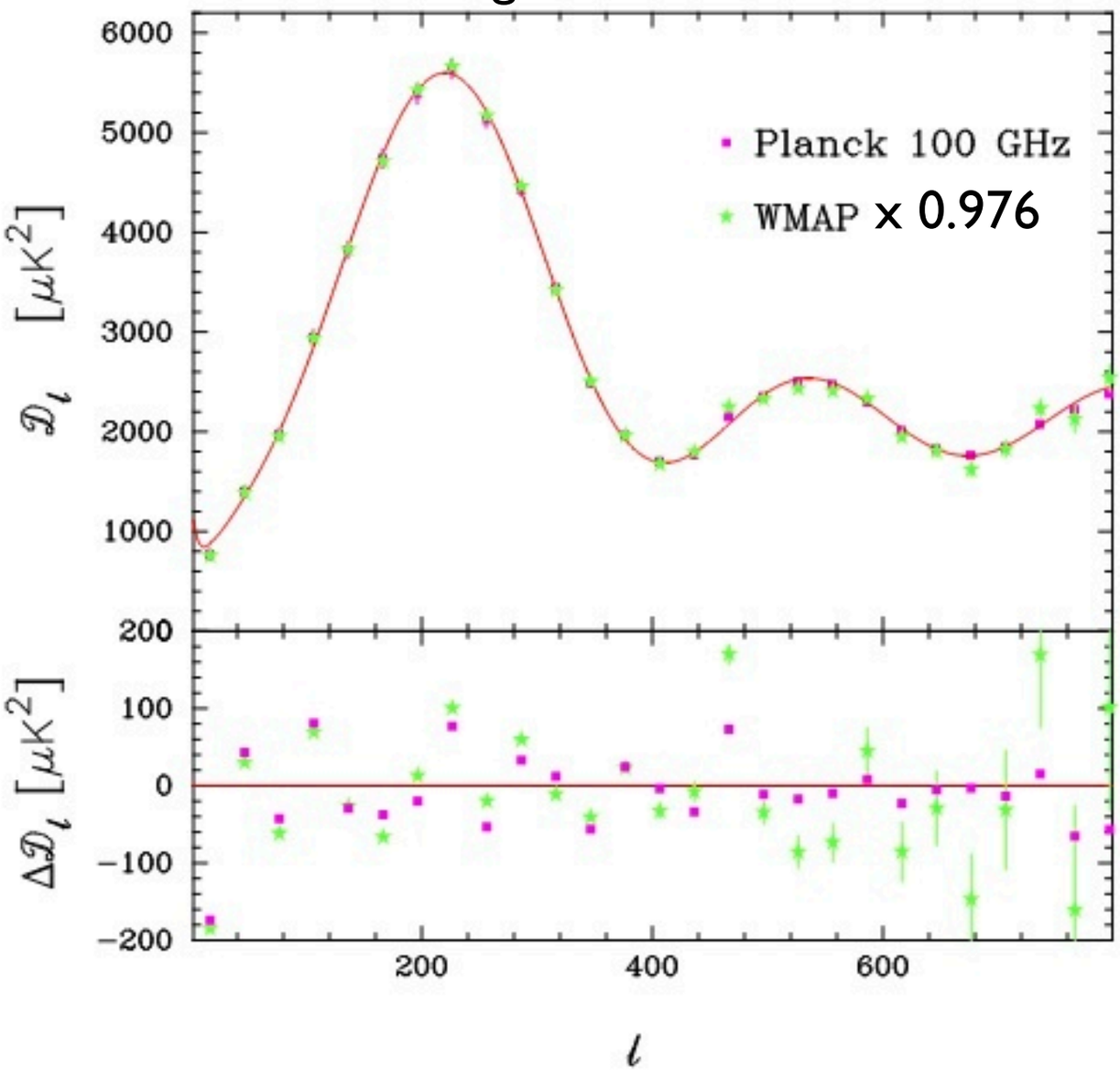
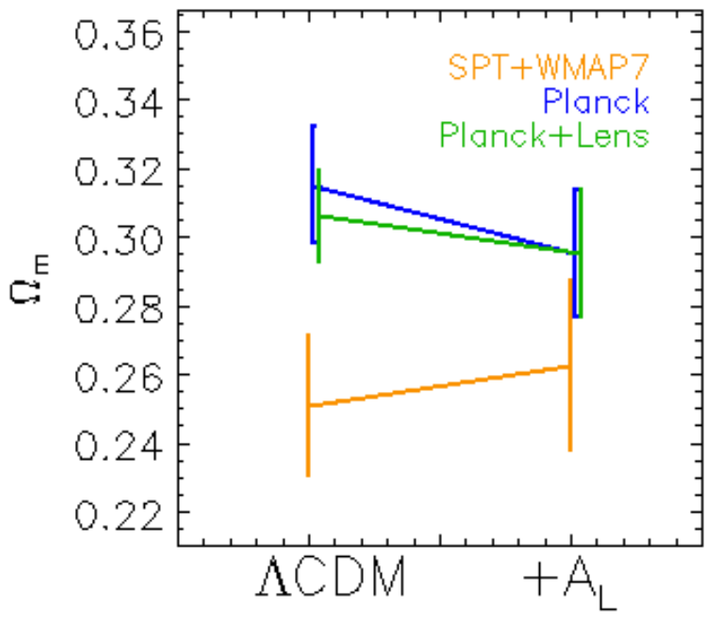


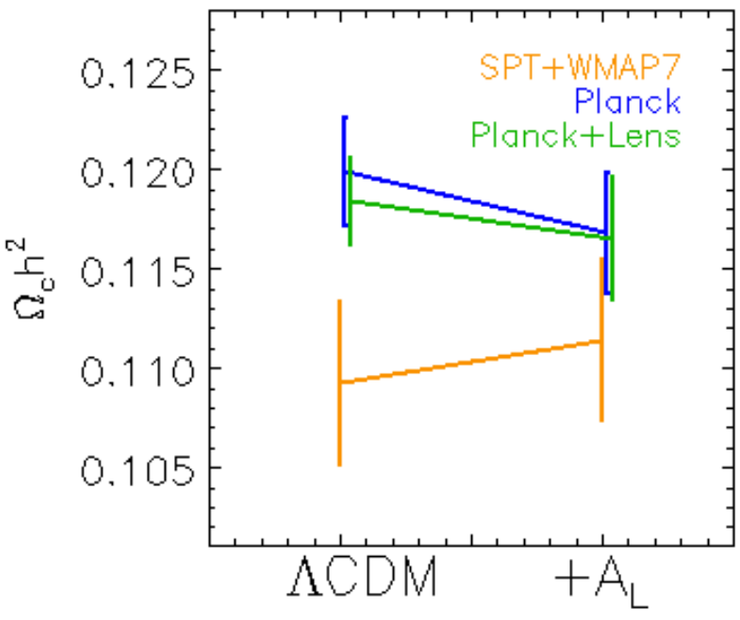
Fig. A.5. Comparison of the *Planck* and *WMAP* power spectra. The green points show the combined *WMAP* V+W spectrum computed on the same mask used for the 100 × 100 GHz *Planck* spectrum (with a combined *WMAP*+*Planck* mask for point source holes) after rescaling by a multiplicative factor of 0.976. The pink points show the *Planck* 100 × 100 GHz spectrum computed on the same mask. The red line shows the best-fit *Planck*+WP+highL base ΛCDM model. The lower panel shows the residuals with respect to this model. The error bars on the *WMAP* points show errors from instrumental noise alone.

Impact of smoothing (A_{Lens})

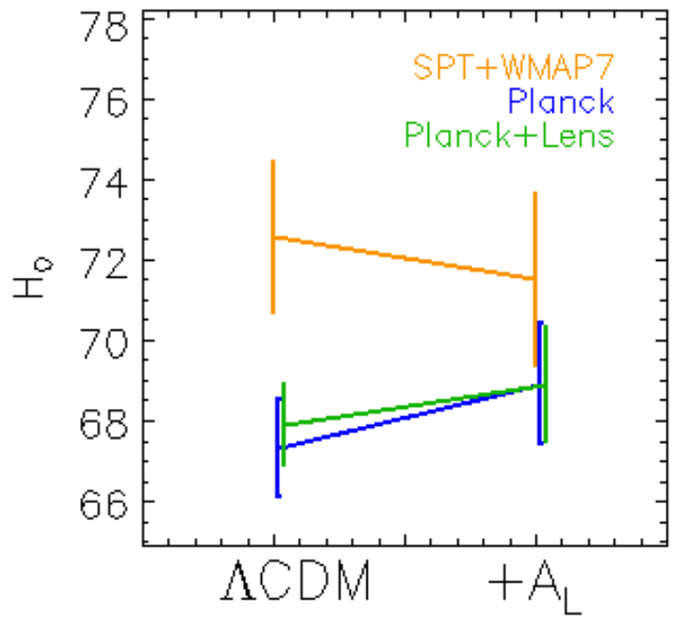
Ω_M



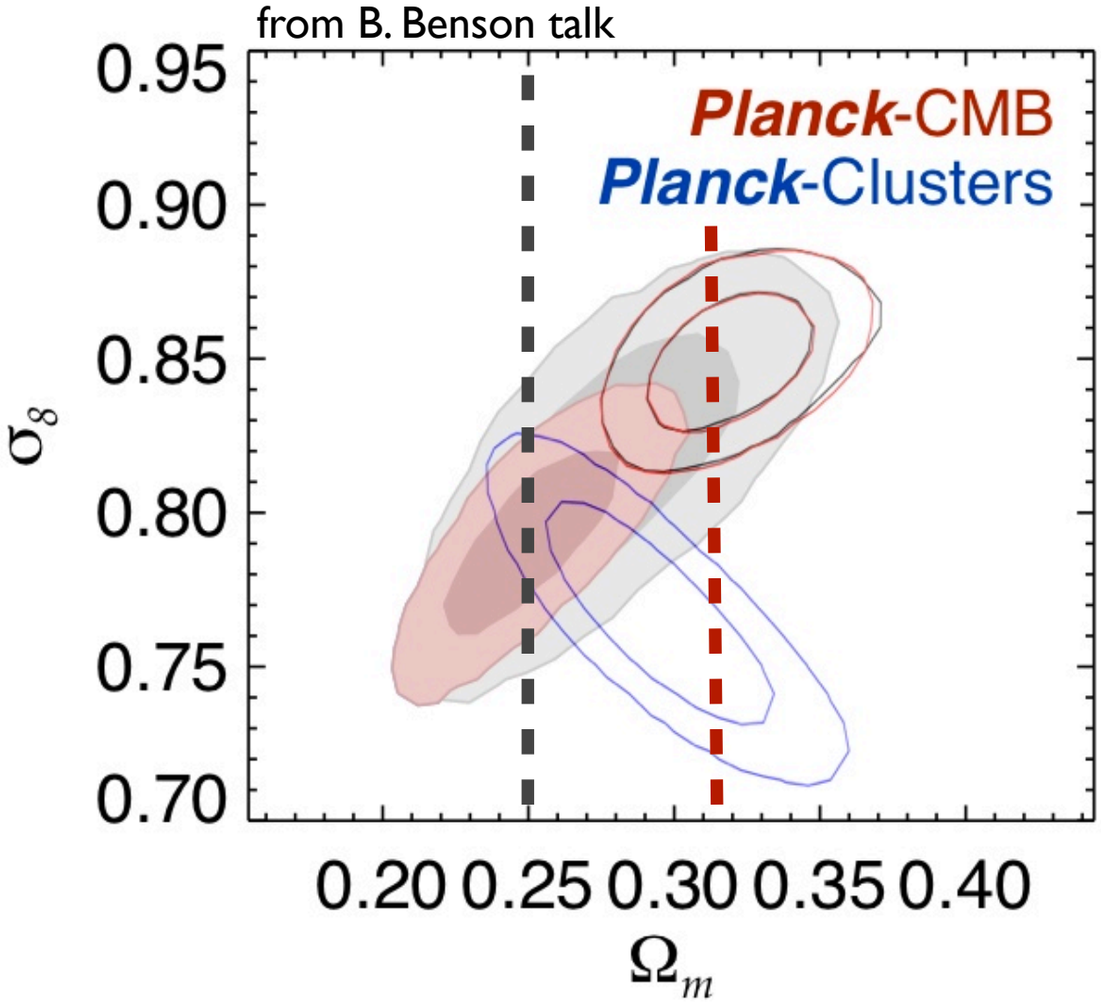
$\Omega_c h^2$



H_o



from B. Benson talk



Clusters are giving consistent σ_8 constraints independent of method and experiment.

E.g., SZ counts, SZ bispectrum, SZ power spectrum, X-ray counts, and weak lensing from ACT, Planck, SPT, Chandra, XMM, etc.

But in clear tension with σ_8 derived from Planck CMB power spectrum.

- **Yes, cluster cosmology is messy compared to CMB, but ignore clusters at your peril.**
- **What does it take to bring clusters and CMB into agreement?**
  - Masses too low by ~45%? ~~Missing 2/3 of the massive clusters~~? Planck Ω_M too high by ~15%?
    Ongoing major campaigns will sort out mass calibration of SZ selected clusters, factor of 2 offset seems unlikely.
  - **Will we need new physics?** I.e., $\Sigma m_\nu \sim 0.2$eV
    Will learn a lot more from upcoming CMB lensing polarization measurements.