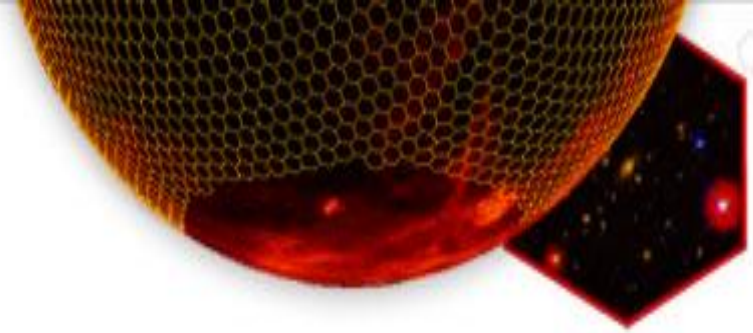

MEASURING BARYON ACOUSTIC OSCILLATIONS WITH DES

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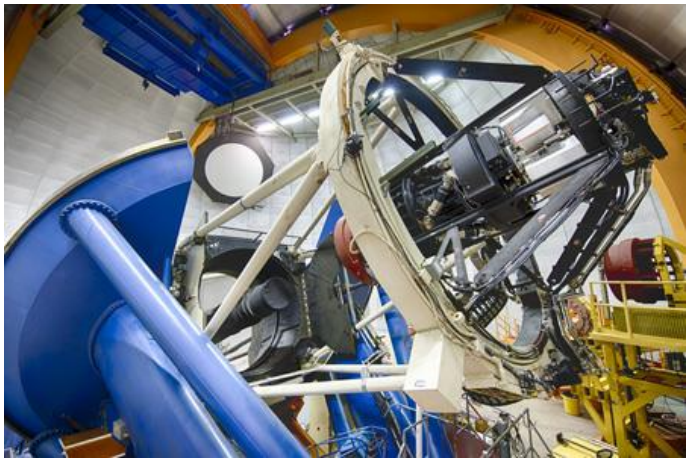
Azores School of Observational Cosmology

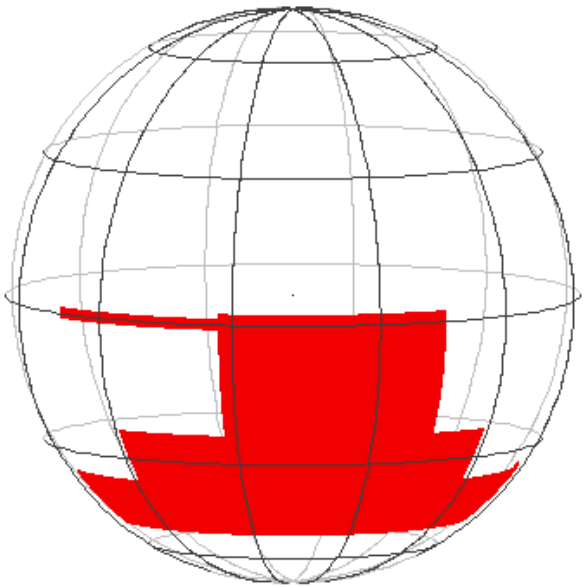
THE DARK ENERGY SURVEY

DES – PHOTOMETRIC SURVEY

DES combines four probes of Dark Energy:

- Type Ia Supernovae (SN)
- Baryon Acoustic Oscillations (BAO)
- Galaxy Clusters (GC)
- Weak Gravitational Lensing (WL)





Aardvark and Buzzard – DES simulations:

- 10313 sq. degrees (quarter of sky), including mask to 5000 sq. degree , DES footprint.
- 1.36 billion galaxies to the DES 5-sigma limit

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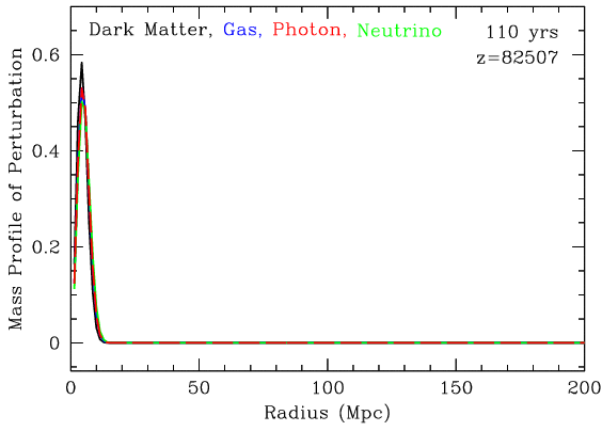
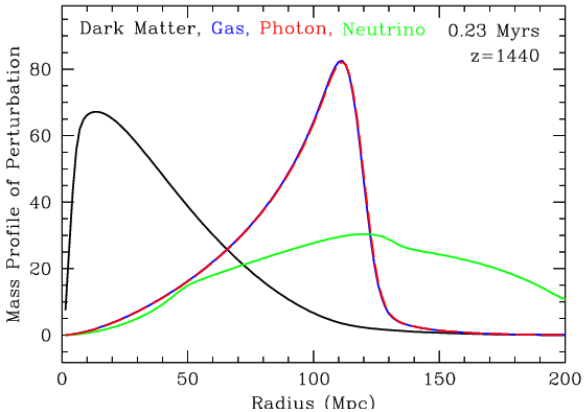
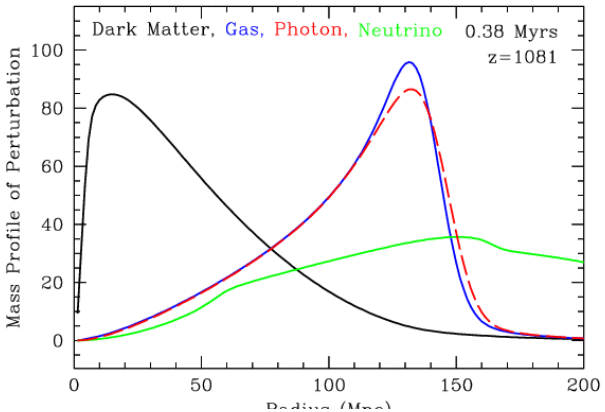
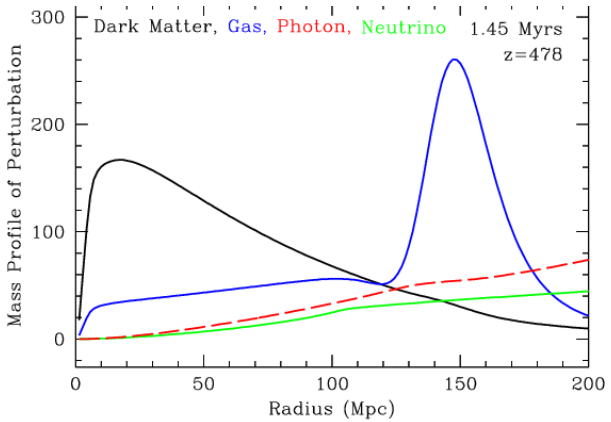
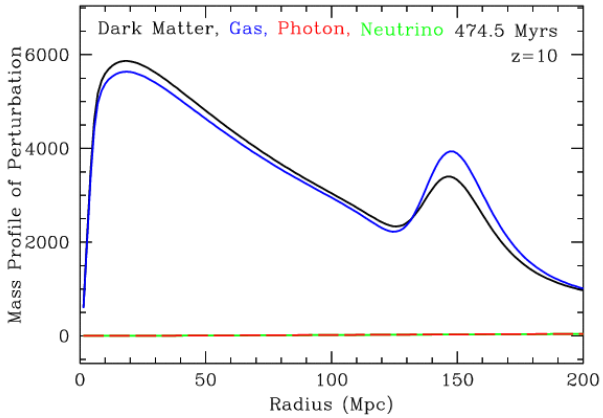
BARYON ACOUSTIC OSCILLATIONS (BAO)

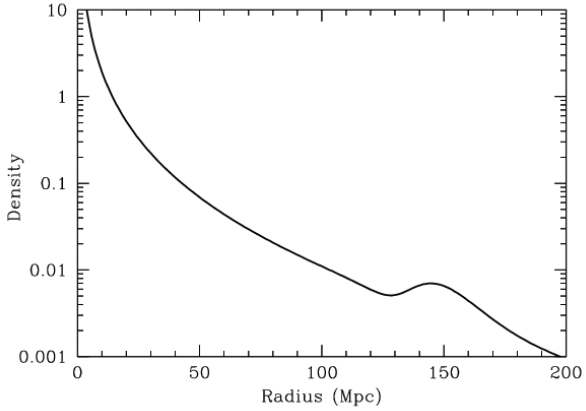












- The detection of BAO in the distribution of galaxies is a powerful prediction of the ΛCDM model.

Eisenstein - http://scholar.harvard.edu/deisenstein/

PLG method

- Divide the full galaxy sample in redshift bins.
- Compute the angular two-point correlation function in each redshift bin.
- Parametrize the correlation function using the expression:

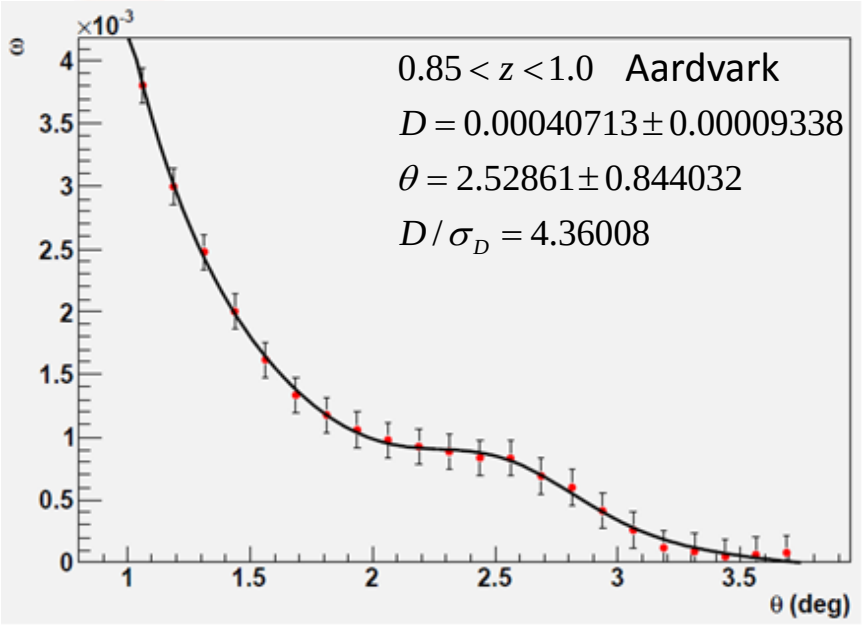
$$\omega(\theta) = A + B\theta^{-C} + D\exp - \frac{(\theta - \theta_{FIT})^2}{2\sigma^2}$$

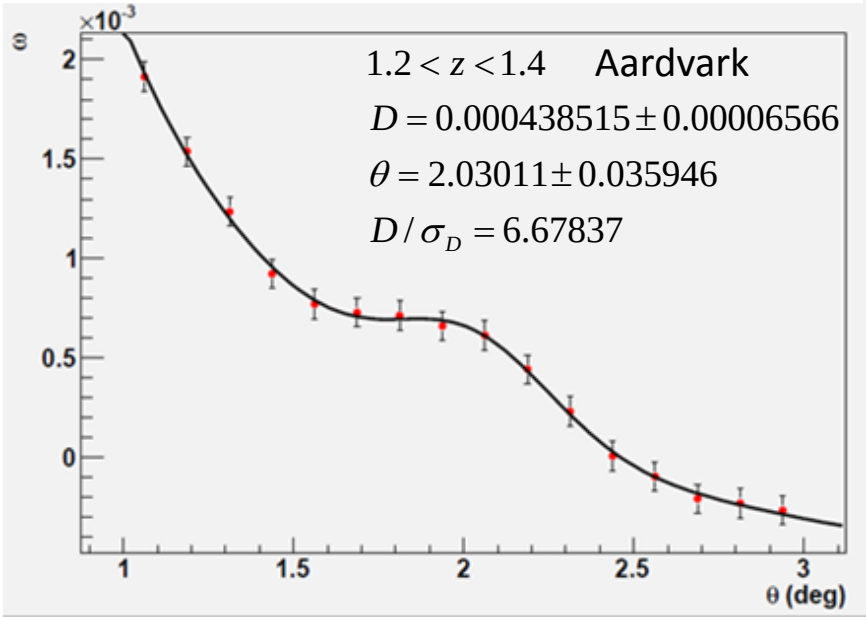
- The BAO scale is estimated using the parameter θ_{FIT} , and correcting it for the projection effect.
- Fit cosmological parameters to the evolution of the corrected θ_{BAO} with z. The θ_{BAO} is related to cosmology by:

$$\theta_{BAO}(z) = \frac{r_s}{d_A(z)} \quad \text{where} \quad r_s(z_{dec}) = \frac{c}{\sqrt{3}} \int_0^{1/(1+z_{dec})} \frac{da}{a^2 H(a)\sqrt{1+(3\Omega_b / 4\Omega_\gamma)}} Mpc/h$$

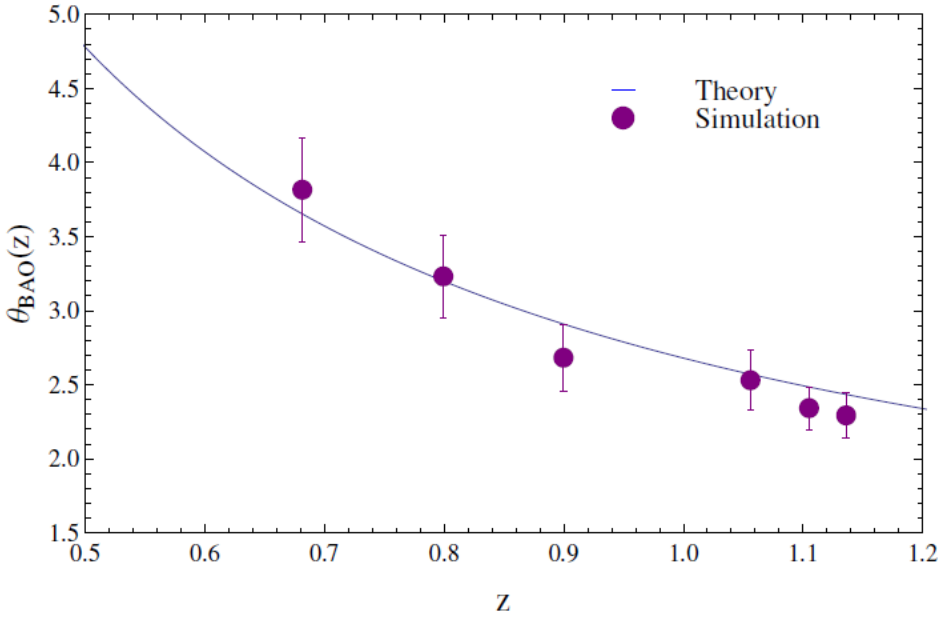
[Sanchez et al. 2011]

THE DARK ENERGY SURVEY

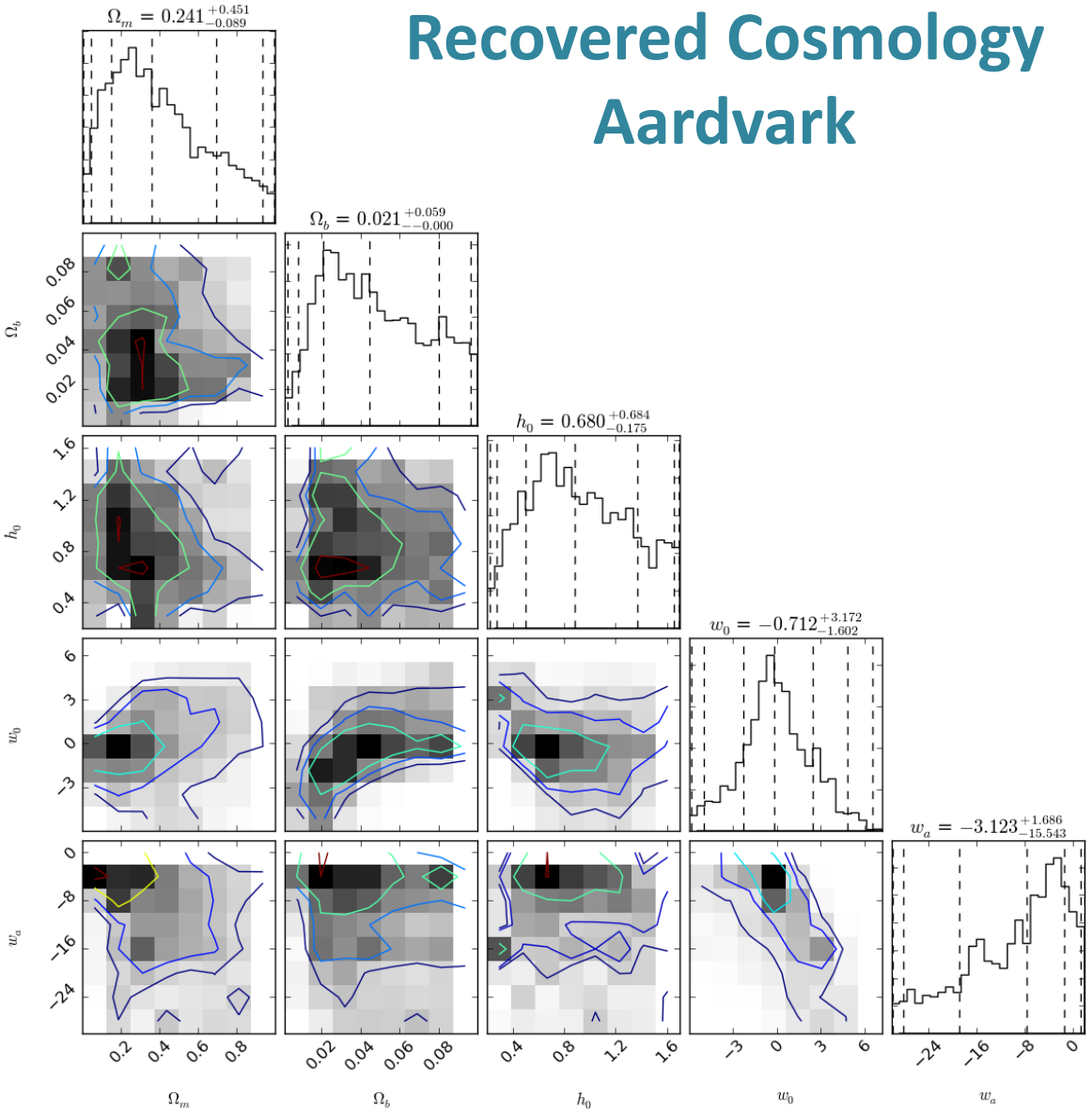




BAO peak



Recovered Cosmology Aardvark



Ω_m	$0.241^{+0.451}_{-0.089}$	0.23
Ω_b	$0.021^{+0.059}_{-0.050}$	0.042
h_0	$0.680^{+0.684}_{-0.175}$	0.72
w_0	$-0.712^{+3.172}_{-1.602}$	-1
w_a	$-3.123^{+1.686}_{-15.543}$	0