DARK ENERGY
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INSTRUMENT

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DESI VI. Cosmological constraints - Aug 2024 XII ICNFP @ Crete, Greece, 2024

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- at $z < 0.6$ where SDSS currently has a larger $V_{\rm eff}$, we use the SDSS results at $z_{\rm eff} = 0.15, 0.38$ and 0.51 in place of the DESI BGS and lowest-redshift LRG points;
- at $z > 0.6$ where DESI has $V_{\rm eff}$ larger than that of SDSS, we use the DESI results from LRGs over $0.6 < z < 0.8$, the LRG+ELG combination over $0.8 < z < 1.1$, and ELGs and QSOs at higher redshifts; and
- for the Lyα BAO we use the combined DESI+SDSS result from Eqs. (3.3) and (3.4) above.

The composite BAO dataset:

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BAO dataset from DESI + SDSS

Combing DESI and SDSS to get the most precise BAO measurements ever made.

However, bear in mind:

- This is not the same as combining at the likelihood level
- This combined sample should be selected by choosing the results from the survey covering the larger effective volume at a given redshift — to avoid double-couting.

The composite BAO dataset:
(DESI + SDSS)

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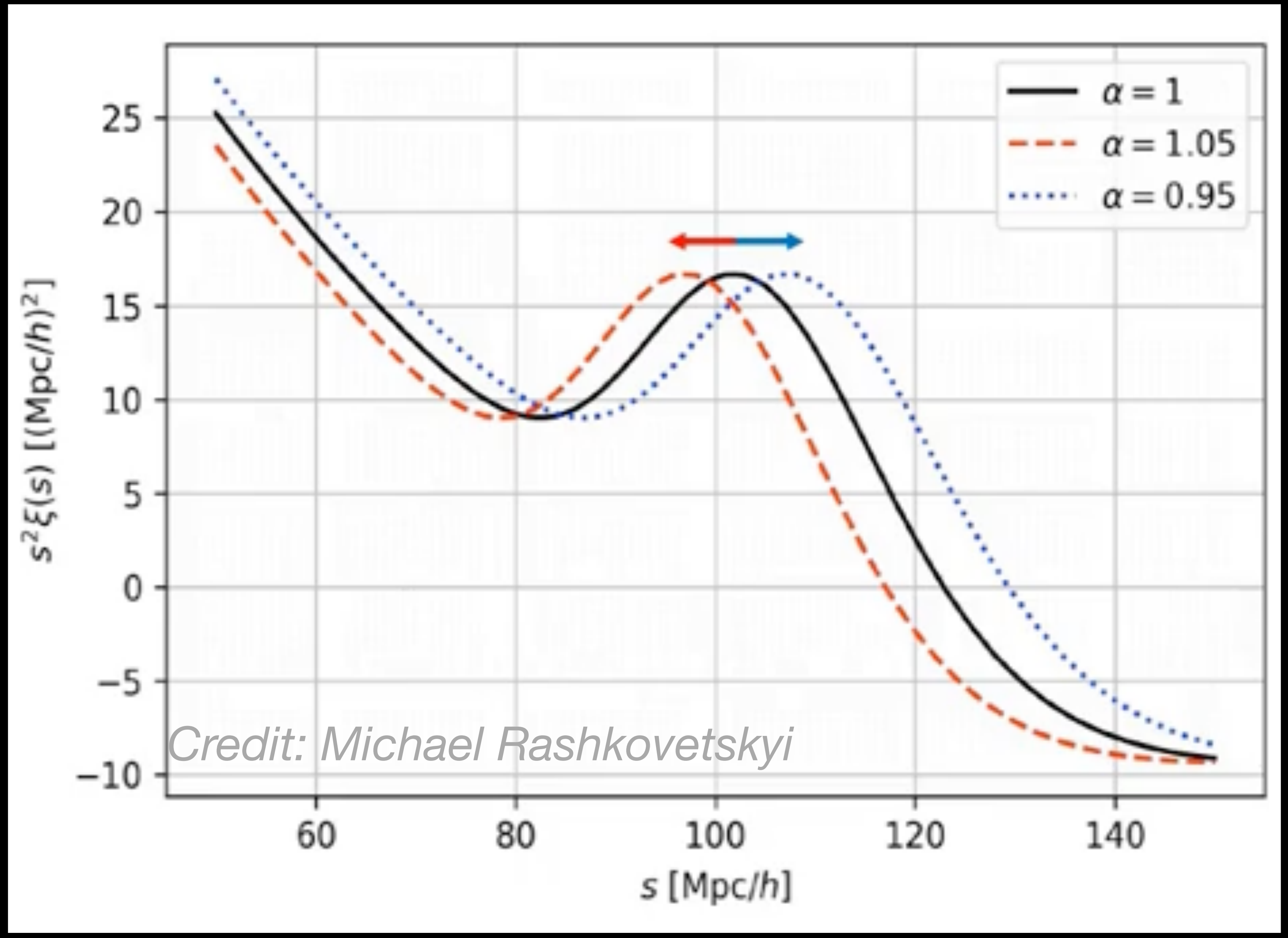
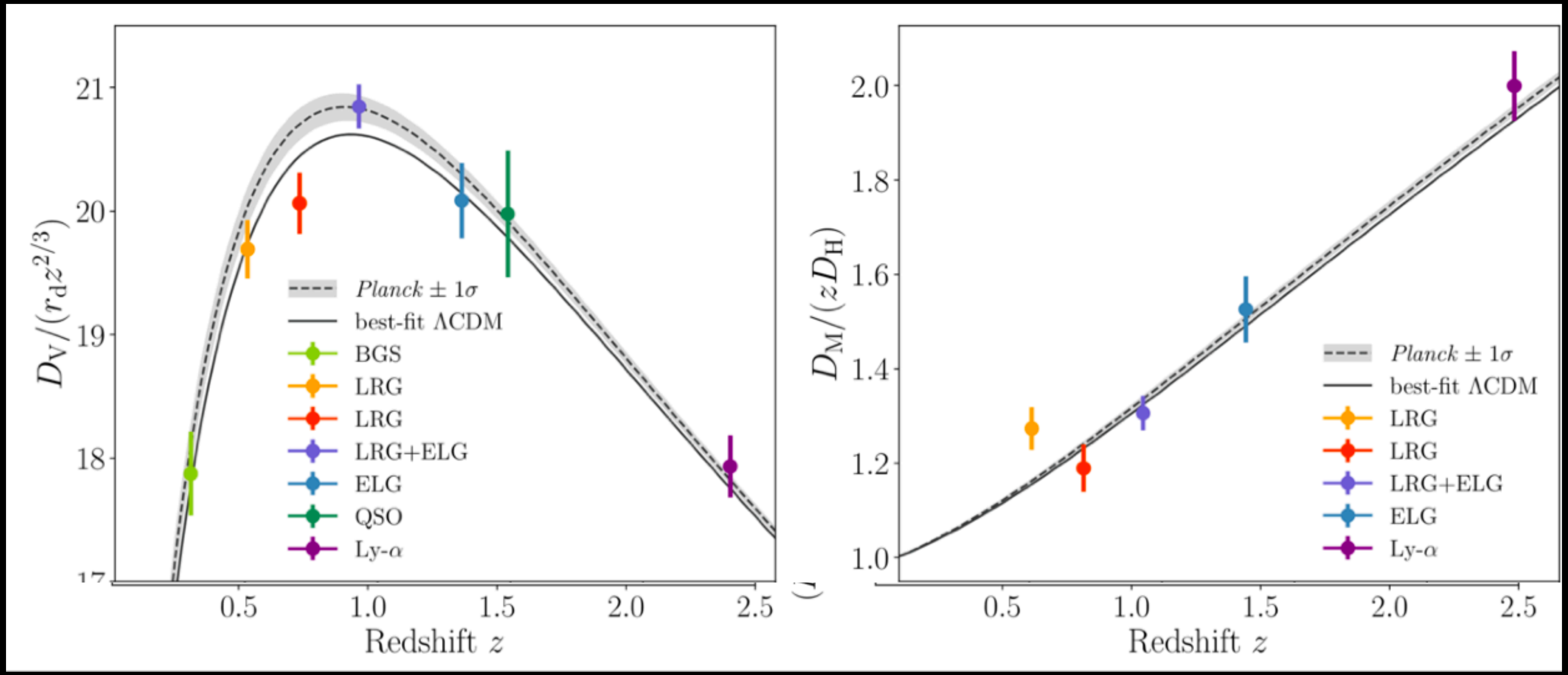
Distance Measurements

Relation between BAO parameters, e.g., $(\alpha_{\parallel}, \alpha_{\perp})$ and distances (D_M, D_H, D_V)





$$\frac{D_M(z)}{r_d} \equiv \frac{D_A(z)\,(1+z)}{r_d} = \alpha_{\perp}\frac{D_M^{\rm fid}(z)}{r_d^{\rm fid}}$$ → comoving angular diameter distance $D_M(z)$

$$\frac{D_H(z)}{r_d} \equiv \frac{c}{H(z) r_d} = \alpha_{\parallel}\frac{D_H^{\rm fid}(z)}{r_d^{\rm fid}}$$ → Hubble distance $D_H(z)$

$$\frac{D_V(z)}{r_d} \equiv \frac{[zD_M^2(z)D_H(z)]^{1/3}}{r_d} = \alpha_{\rm iso}\frac{D_V^{\rm fid}(z)}{r_d^{\rm fid}}$$ → spherically-averaged distance $D_V(z)$