Cosmological Constraints From Clustering Shells

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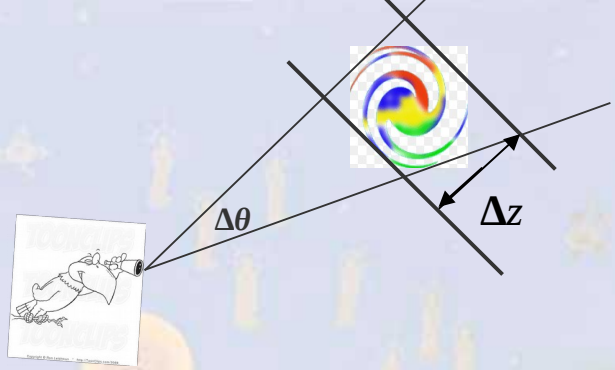
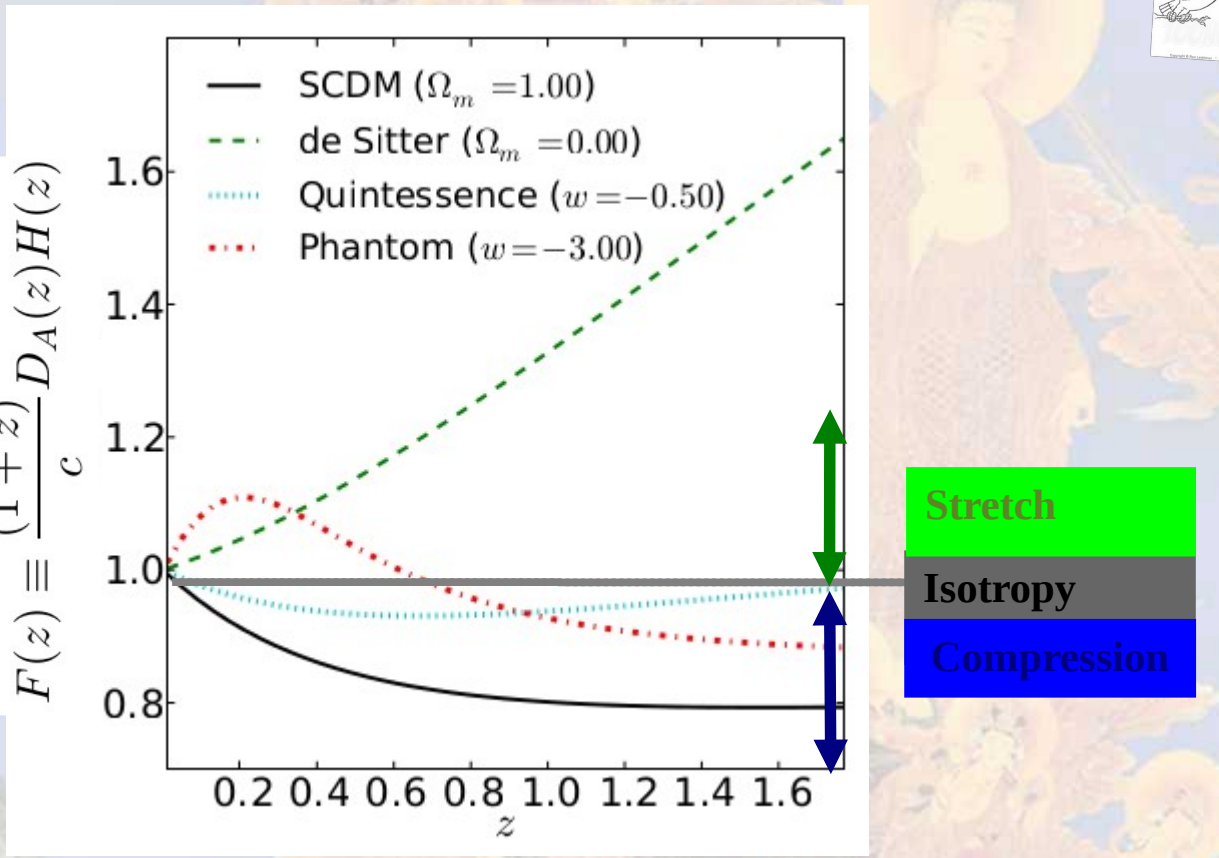
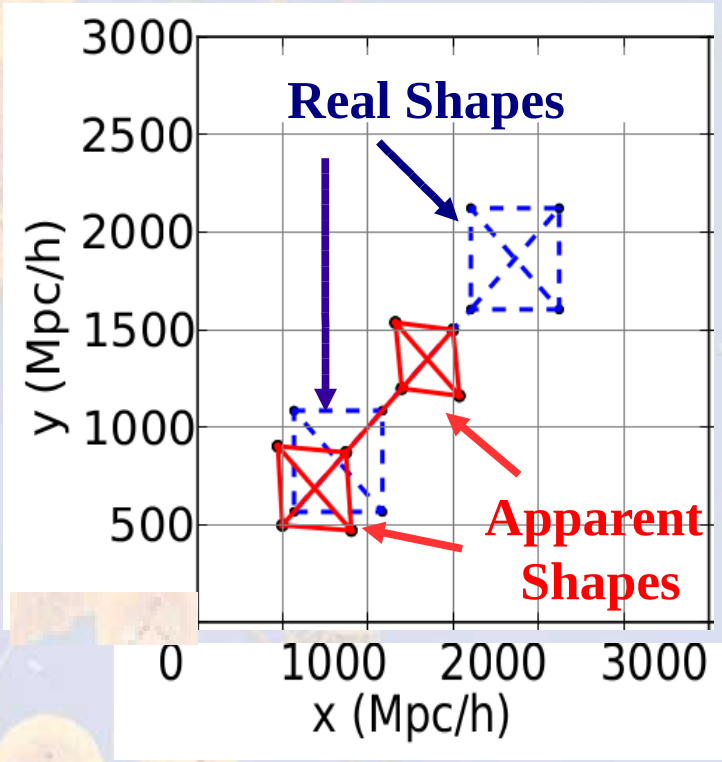
KIAS

Alcock-Paczynski Test





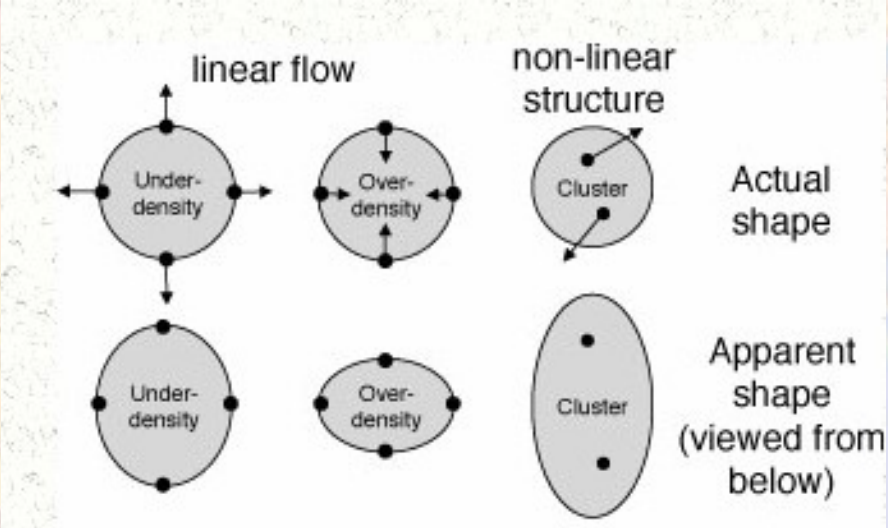


– If we adopt a wrong cosmology to compute distances from redshifts, shapes of objects appear stretched/compressed along the LOS.

– Attention: **the apparent anisotropy evolves with redshift**

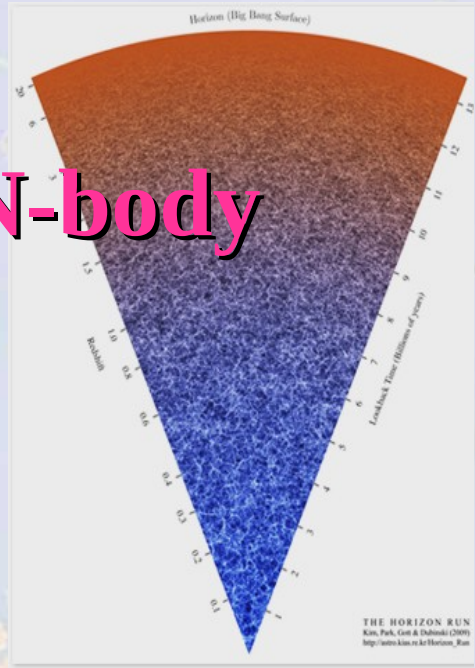
Redshift Space Distortion

$$r = \int_0^{z_{\rm cosmo}+\Delta z} \frac{dz'}{H(z')}, \quad \Delta z = \frac{v_{\rm LOS}}{c}(1+z_{\rm cosmo})$$



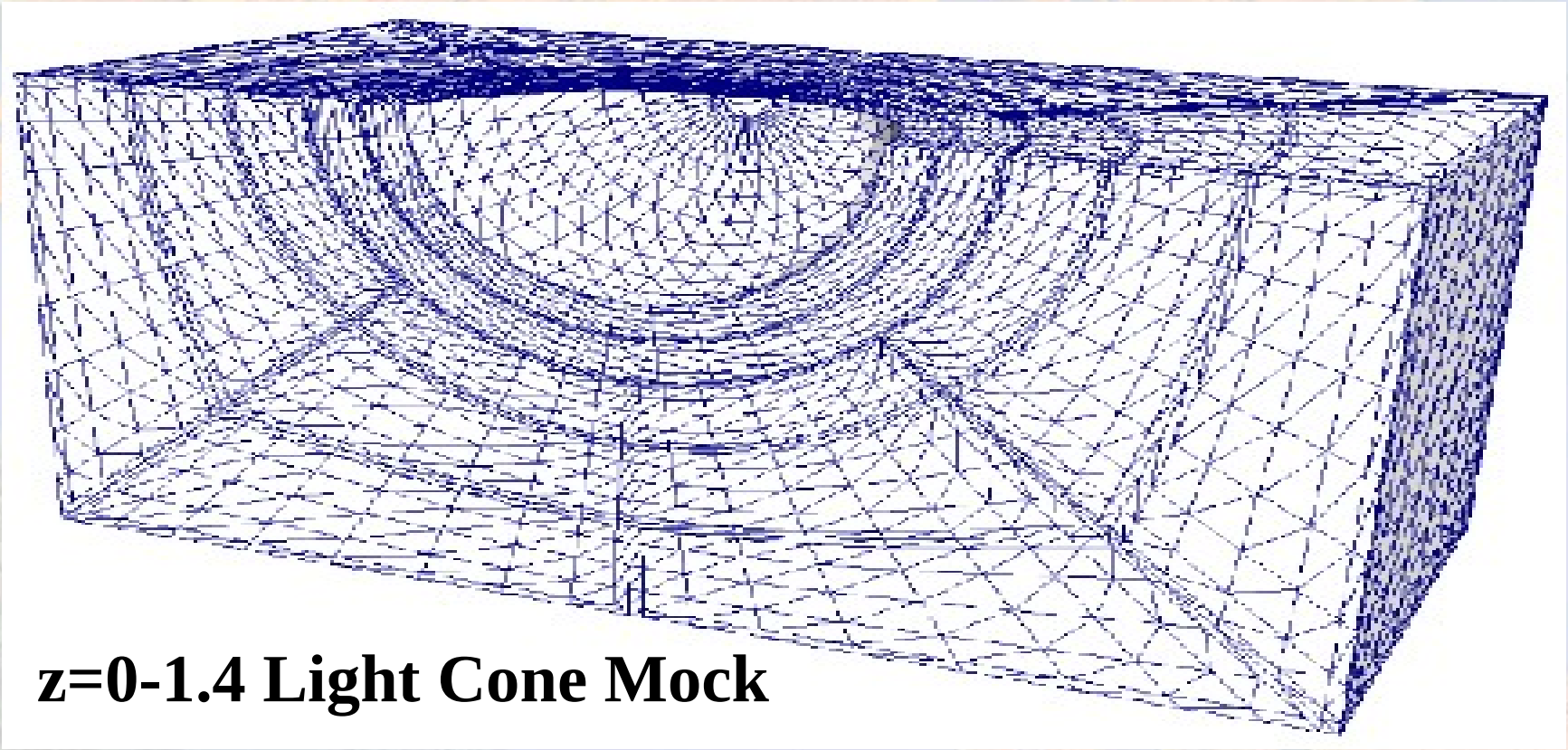
- Finger-of-god/large-scale-flow introduces distortion @ small/large scales
- **Maybe the redshift evolution of RSD is less significant than AP?!**

Proof-of-Concept on Horizon Run 3 N-body



Step 1. Adopting a cosmology, reconstructing the galaxy density gradient field in redshift shells

Step 2. Looking at the anisotropy of the gradient field as a function of redshift

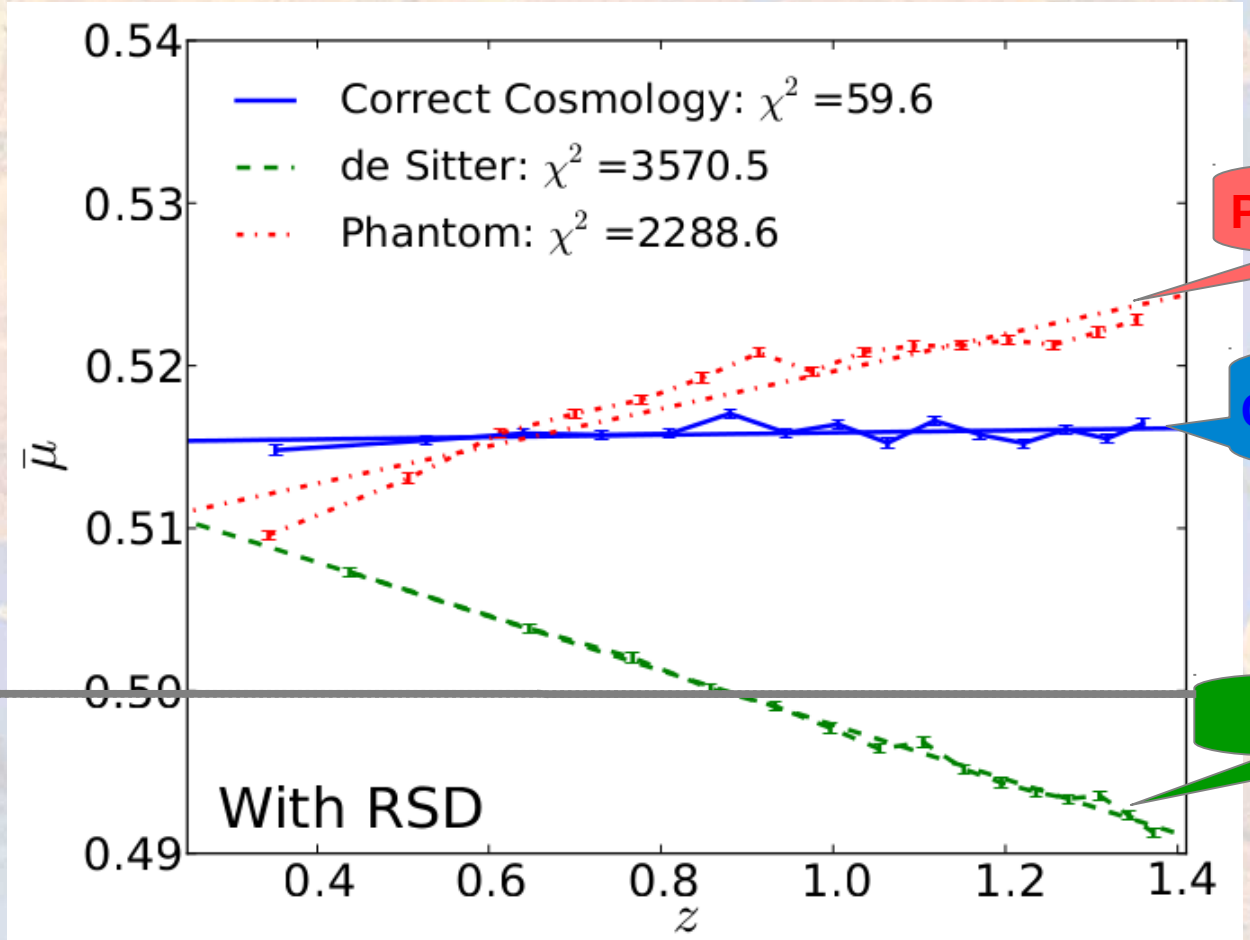


z=0-1.4 Light Cone Mock

Proof-of-Concept on Horizon Run 3 N-body

In correct cosmology, magnitude of anisotropy maintains a constant

In wrong cosmologies, magnitude of anisotropy evolves with z



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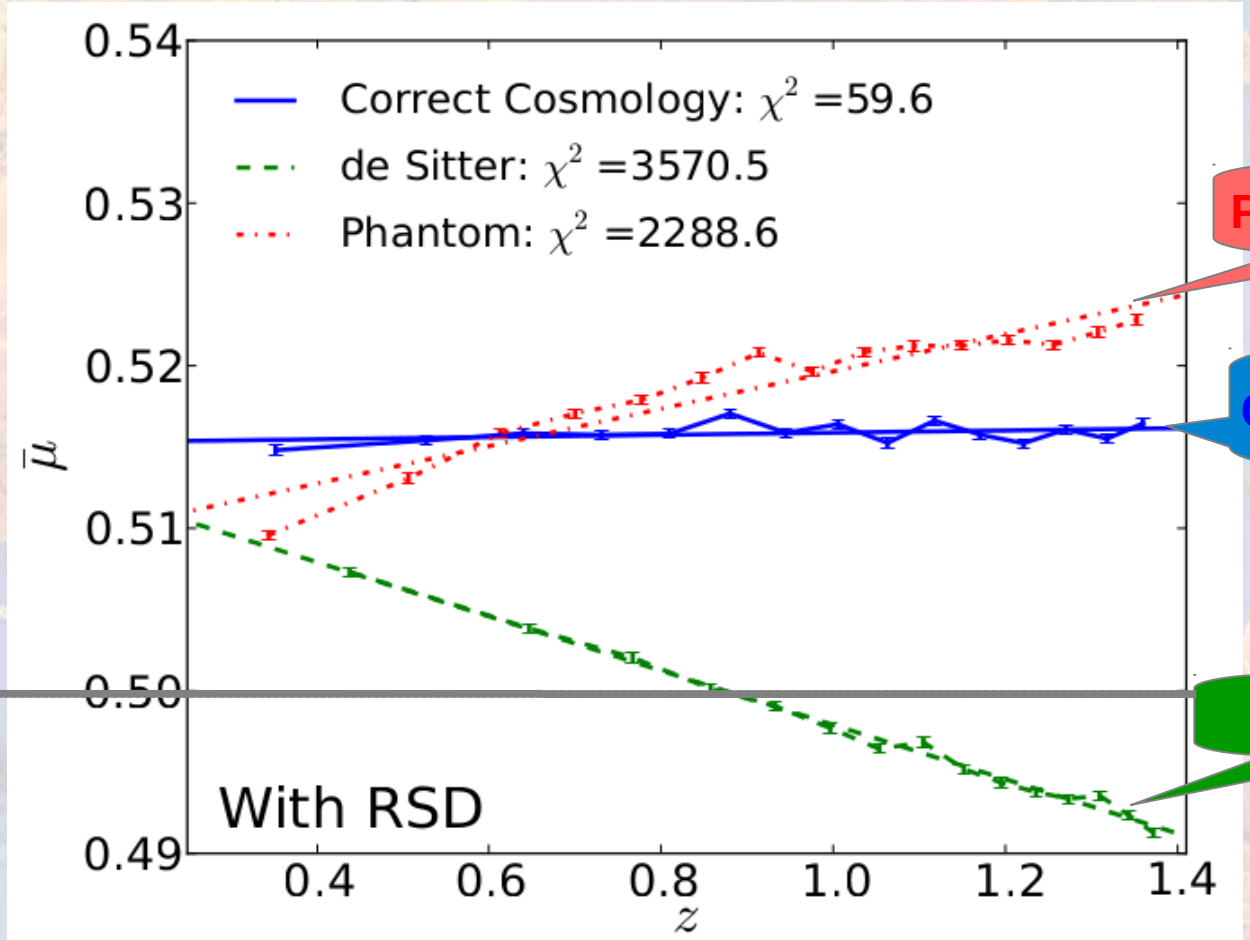


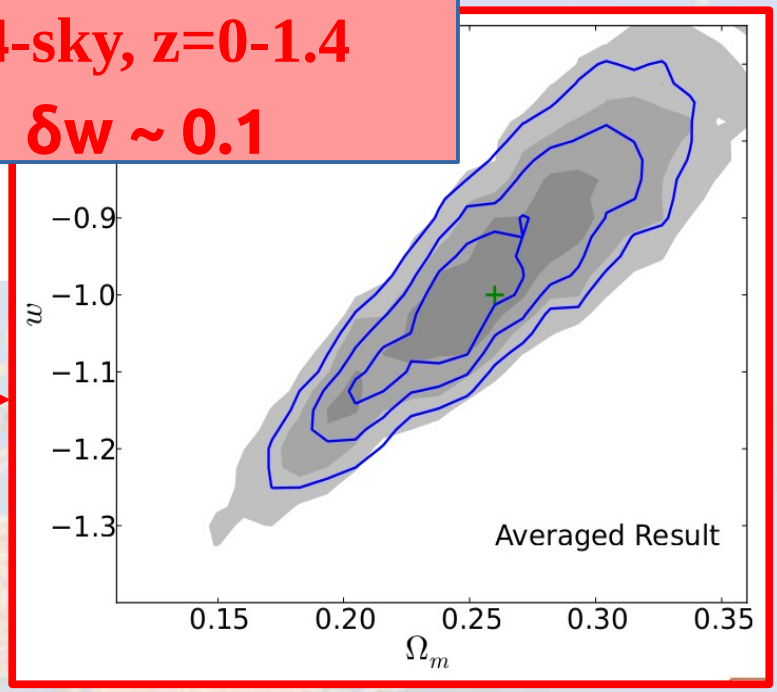
Cosmological Constraints

1/4-sky, z=0-1.4

δw ~ 0.1

Prediction from HR3 N-body

*** C. Park, X.-D. Li, J.E. Forero-Romero, J. Kim, accepted by ApJ**



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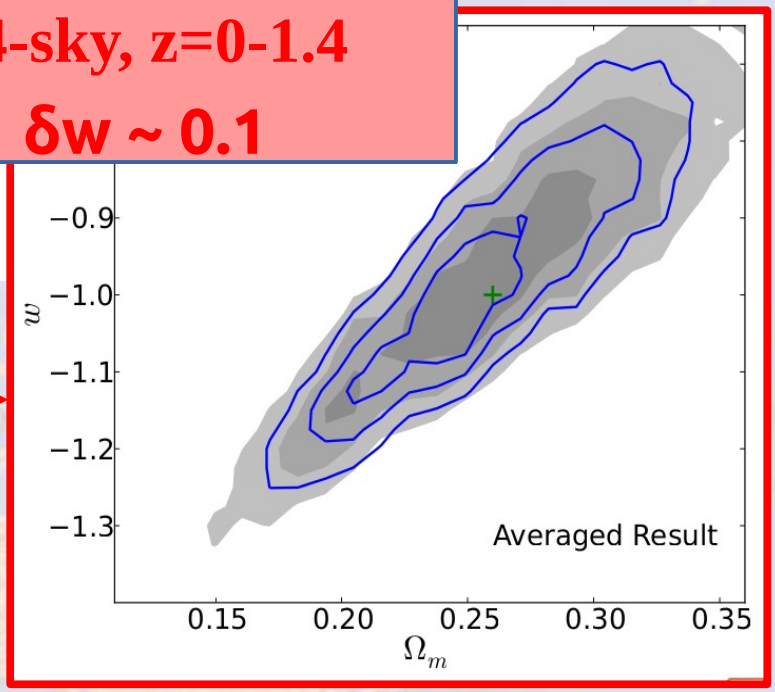

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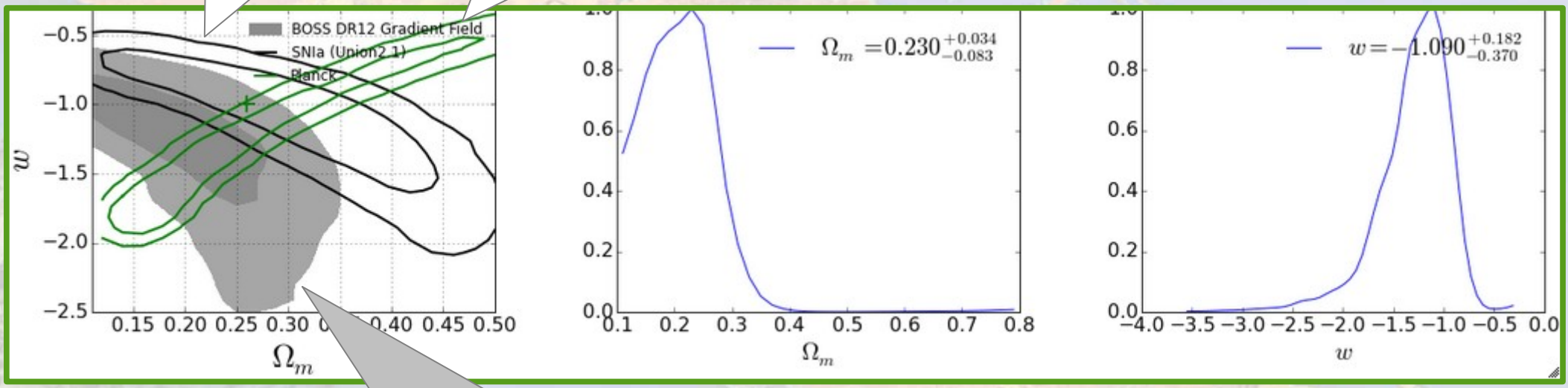
Preliminary result from BOSS DR12

Union2.1 SNIa

Planck



Our method @ BOSS DR12

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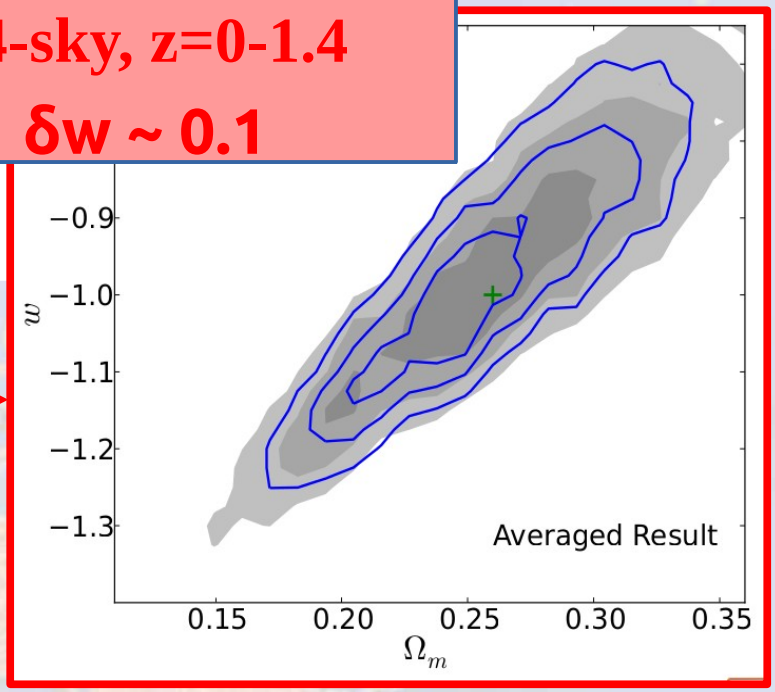

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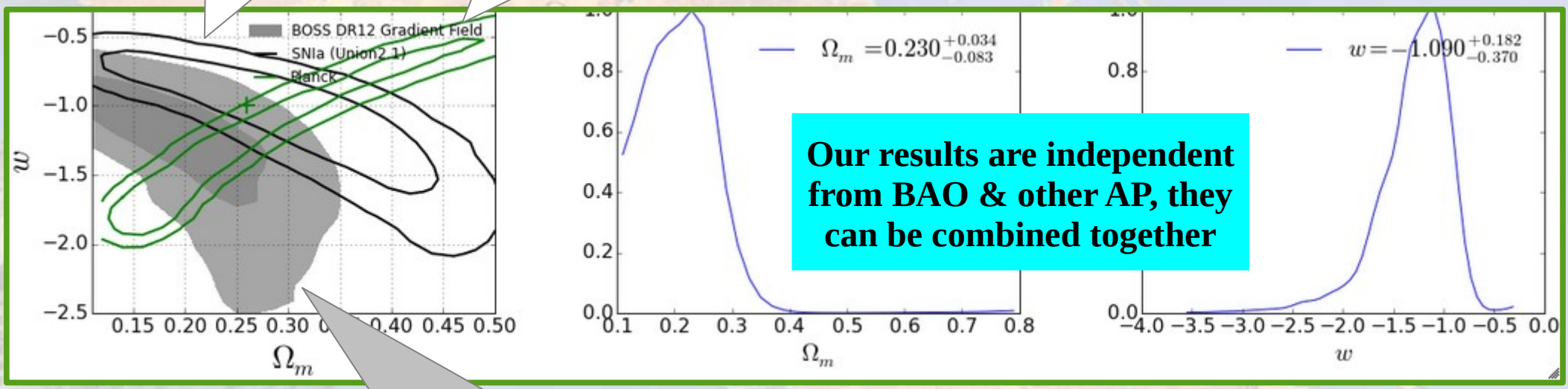


Our results are independent from BAO & other AP, they can be combined together

Our method @ BOSS DR12

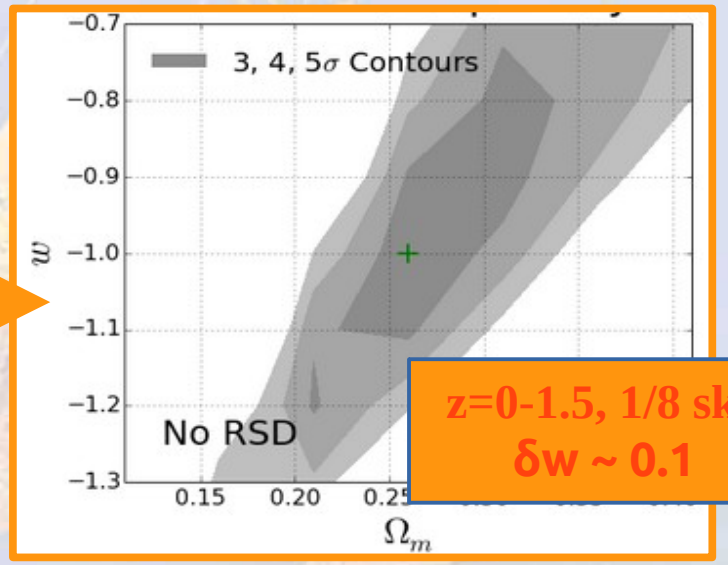
Concluding Remarks

- **Redshift evolution of anisotropy: <u>sensitive to AP & insensitive to RSD</u>**
- Digging up more information encoded in LSS [$d\,(D_A{*}H)\,/\,dz$]
  - Complimentary to others (Other AP: $D_A{*}H$; BAO: D_A, H, D_V)
- **Novel statistics [Galaxy Density Gradient Field]**
  - » **Complimentary to 2pCF**
  - » **Information from ~ 10Mpc/h**

- **<u>Follow-up studies</u>**

<u>Cosmological Constraints from</u>

<u>Redshift Dependence of 2pCF</u>




Thank you