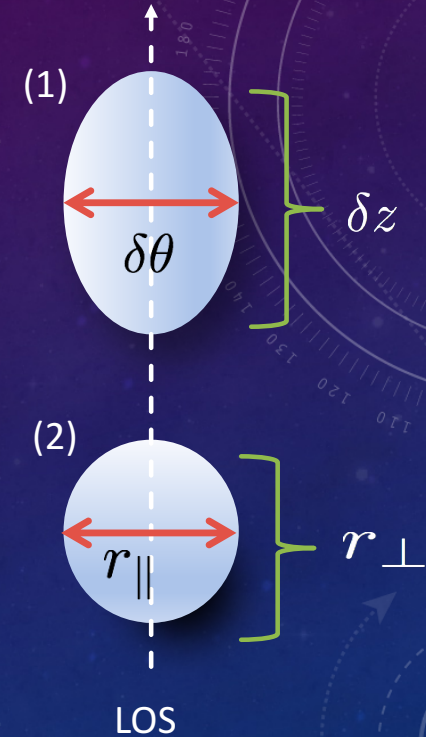
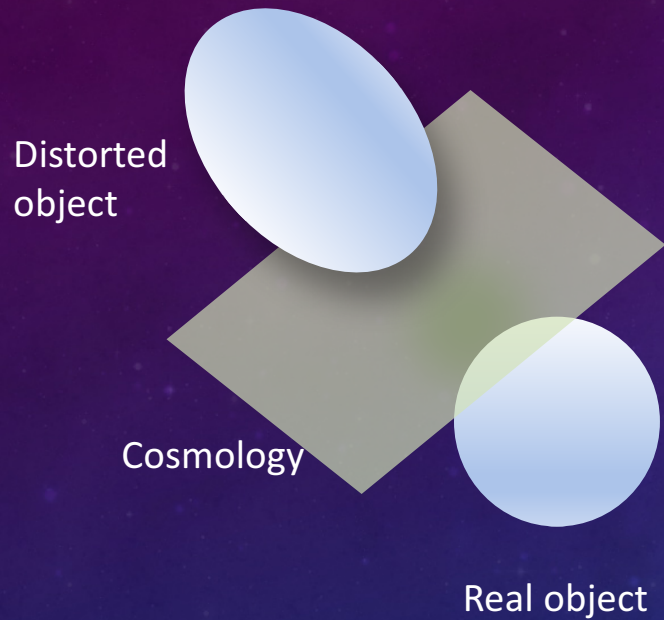


The background features a gradient from dark purple on the left to dark blue on the right. On the left side, there are several circular patterns, some solid and some dashed, with arrows indicating a clockwise direction. A scale with numerical markings (140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260) is visible, curving around the circles. The main title is centered in white, bold, sans-serif font.

ALCOCK- PACZYNSKI TEST WITH COSMIC VOIDS : CURRENT STATUS

A GEOMETRICAL TEST.

ALCOCK – PACZYNSKI TEST :



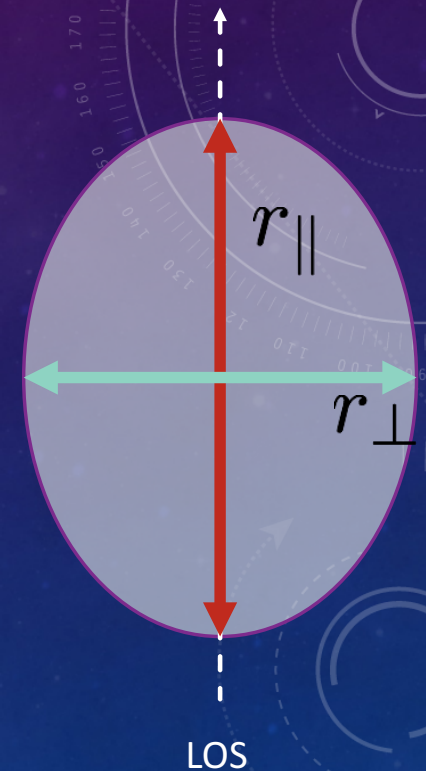
In an ideal world, the only thing causing a difference between both figures is the cosmology.

$$\frac{r_{\parallel}}{r_{\perp}} = \frac{\delta z}{\delta\theta} \frac{c}{D_A(z)H(z)}$$

AP TEST ON VOID – IN PRACTICE

- Voids are considered as most appropriate to apply this test. Indeed, they are expected to be spherical in **average**, as the **Universe is expected to be homogeneous and isotropic**.
- In practice, voids are stacked and aligned along a same line of sight (LOS) in order to extract their **average** information.
- The AP test consists in measuring the extent of the stack sample along the LOS and in the perpendicular direction to the LOS, as:

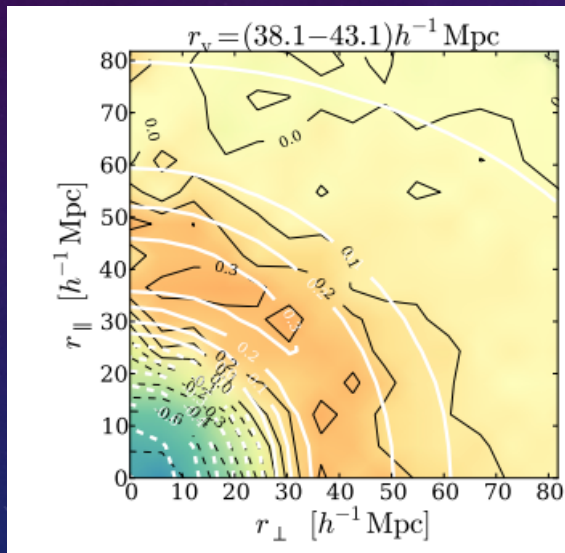
$$\frac{r_{\parallel}}{r_{\perp}} = \frac{D_A(z)^{true} H(z)^{true}}{D_A(z)^{fid} H(z)^{fid}}$$



MEASURING THE EXTENT

There are two ways, as of now, to measure the extent of the stacks :

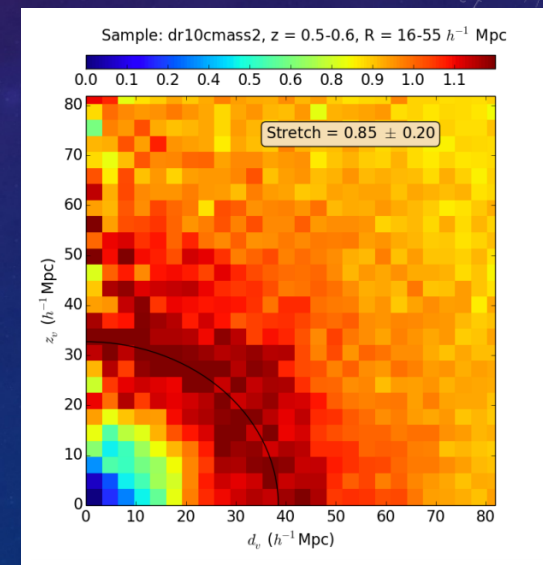
Measure the Galaxy-Void cross-correlation function $\xi(\sigma, \pi)$.



Hamaus et al. 2016

Measure the inertia of the stack of the void, projected in 2D :

$$\epsilon = \sqrt{\frac{2 \sum z_i}{\sum d_i}}$$



Sutter et al. 2014

Which is actually highly correlated to the method used to stack

COMBINATION WITH OTHER PROBES

- Future prospects will concern potentially stringent constraints if combined with CMB/BAO/SNIa, and how to do this within Class/Camel framework?