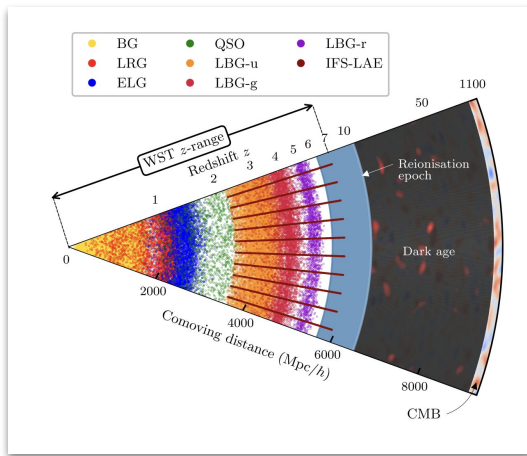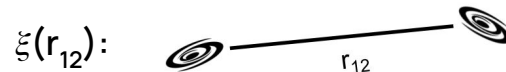# Cosmology with higher-order statistics with WST
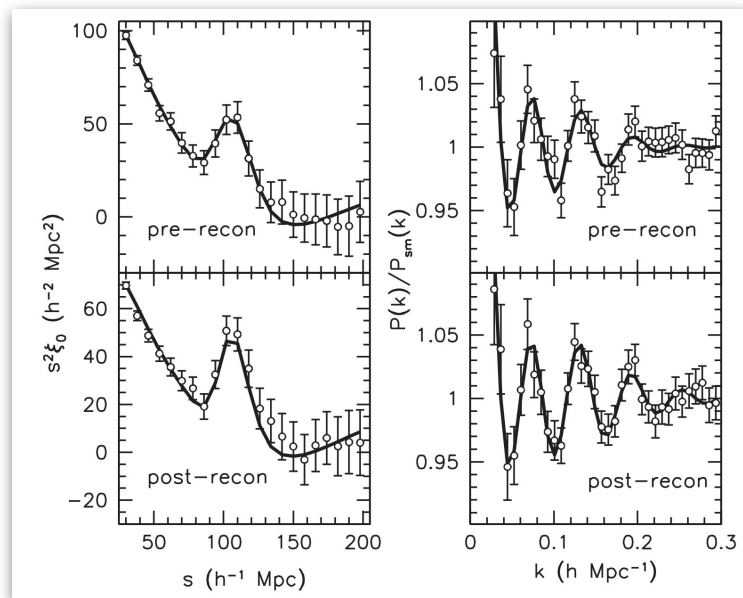
2-point clustering

2-point galaxy/quasar clustering: expansion history through BAO standard ruler, growth of structure from RSD

$\xi(r_{12})$:

r_{12}

WST: *incremental* for density and volume with respect to Stage-IV, potentially *transformative* with respect to the redshift range

From WST white paper: schematic lightcone of the survey

From Anderson et 2014: DR11 CMASS BAO features in the 2-point correlation function (left) and power spectrum (right)

Why going higher order?

- Additional information on probes: **BAO** and **RSD**

- Constraining power on nonlinear evolution and **non-gaussianity**, parity violation

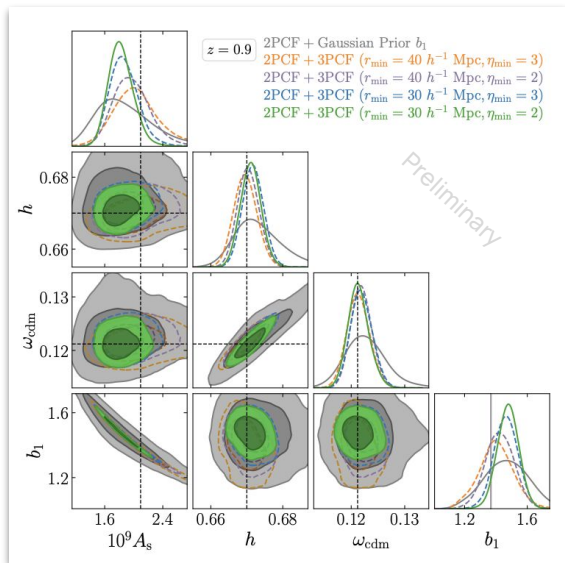- 3-point: cosmological information encoded in **triangle shapes**

$$dP_{123} = n^3 \left[1 + \xi(r_{12}) + \xi(r_{13}) + \xi(r_{23}) + \zeta(r_{12}, r_{13}, r_{23}) \right] dV_1 dV_2 dV_3$$
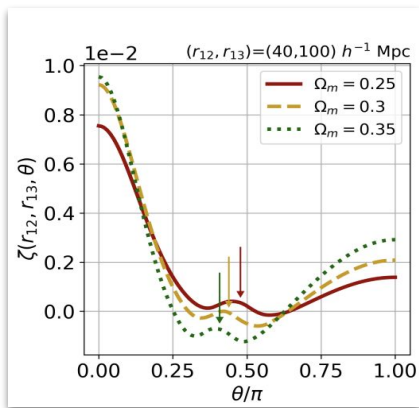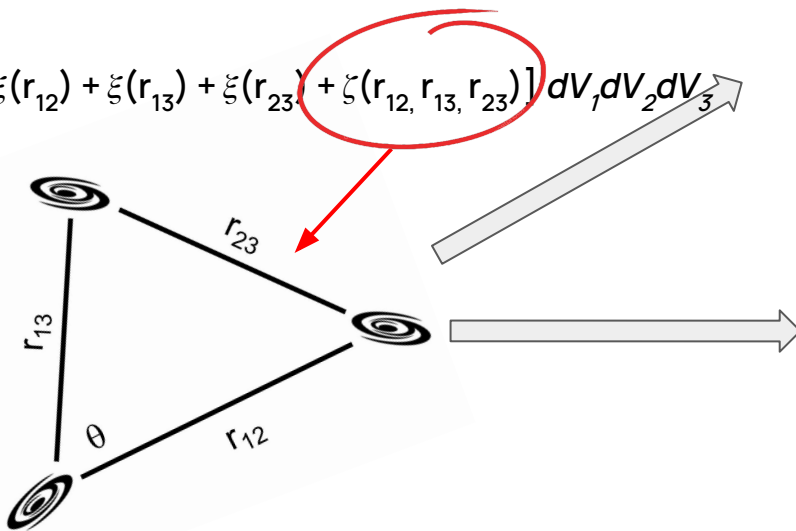
From *Moresco et al 2020*: BAO features in the 3-point correlation function of a single triangle configuration
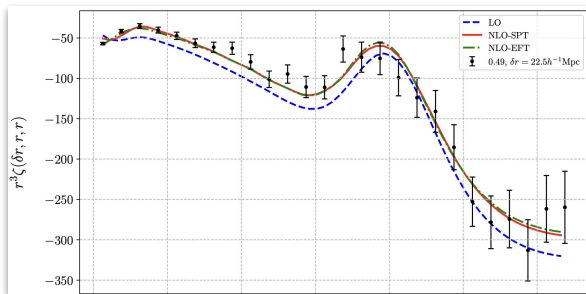

From *Guidi et al 2023*: BAO features in the 3-point correlation function of squeezed BAO triangle configuration

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Toward full-shape beyond 2-point in Stage V era

~ 2025 Stage IV Cosmology ongoing   WST ~ 2040 Cosmology

Euclid Collaboration: Guidi et al: first full-shape analysis combining 2PCF and 3PCF

Higher order from its current status: first full-shape analysis in configuration space...

...toward higher-order 2040 cosmology: from massive neutrinos...
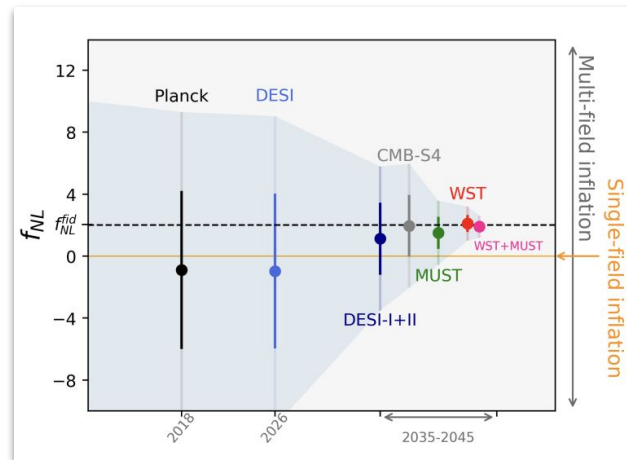
From the WST white paper: full-shape forecast considering non local PNG from P+B

...to multi-field inflation?
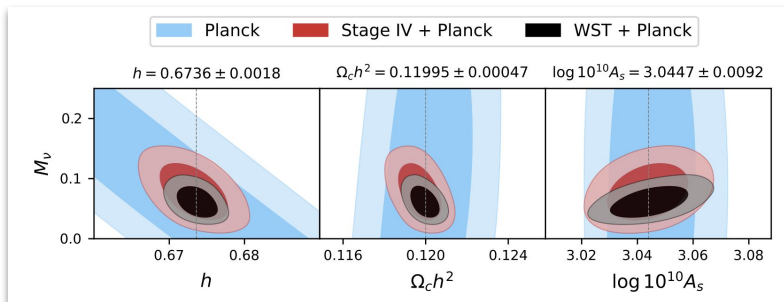
From the WST white paper: full-shape forecast considering massive neutrinos from P+B

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