COSMOLOGY & GALAXY CLUSTERS

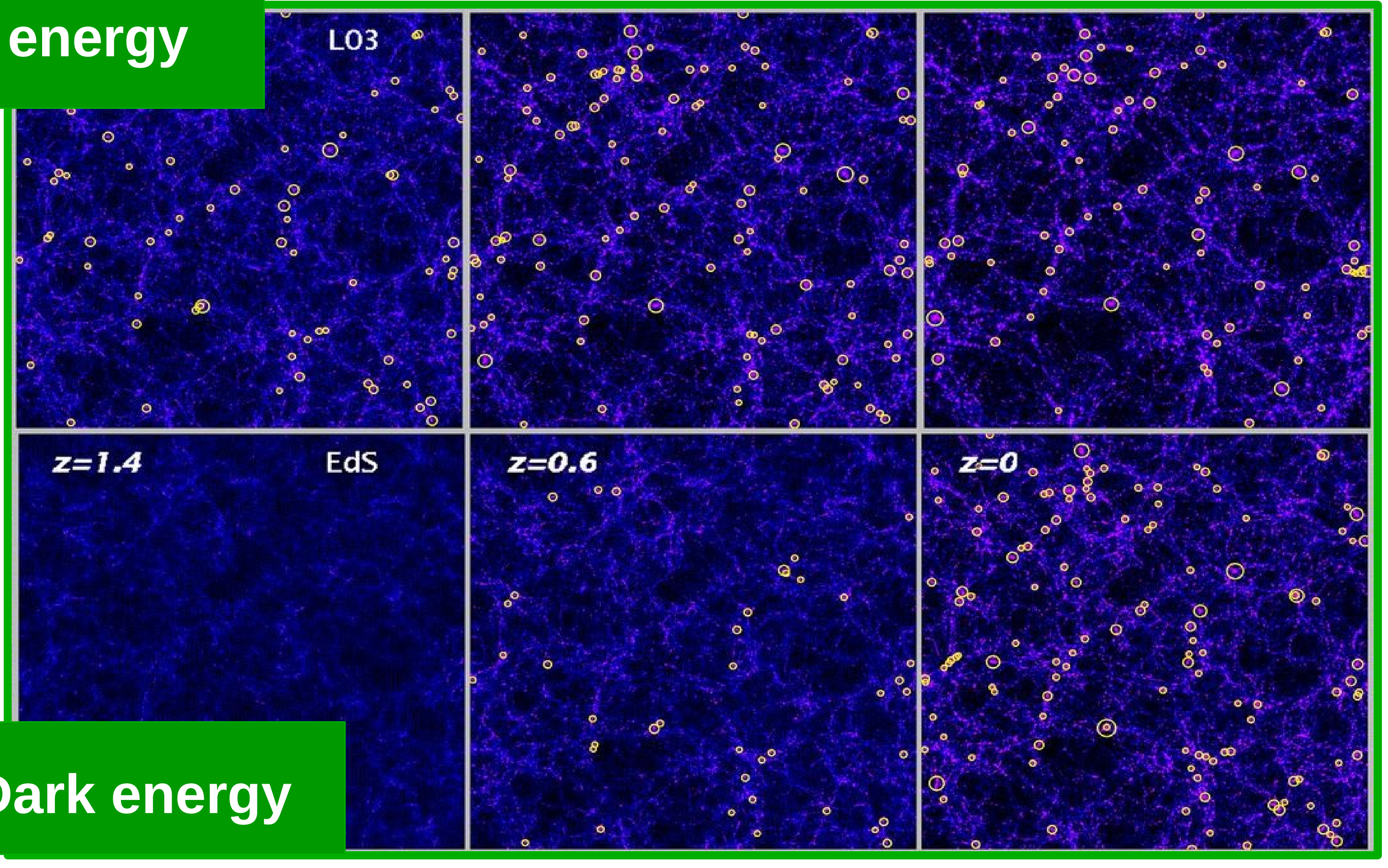
Era of precision cosmology:
- Understand nature of Dark Matter, Dark Energy and behaviour of gravity on cosmological scales.

Key role of clusters of galaxies:
- the largest and most recent objects that have formed
- end result of the collapse of density fluctuations having comoving size of ~10 Mpc

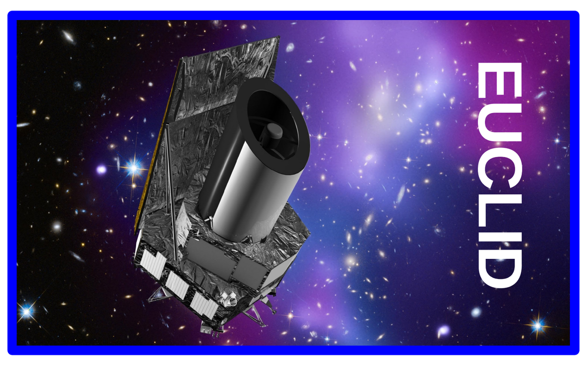
→ Highly sensitive to the details of the fundamental constituents of the Universe and to possible modifications of gravity.

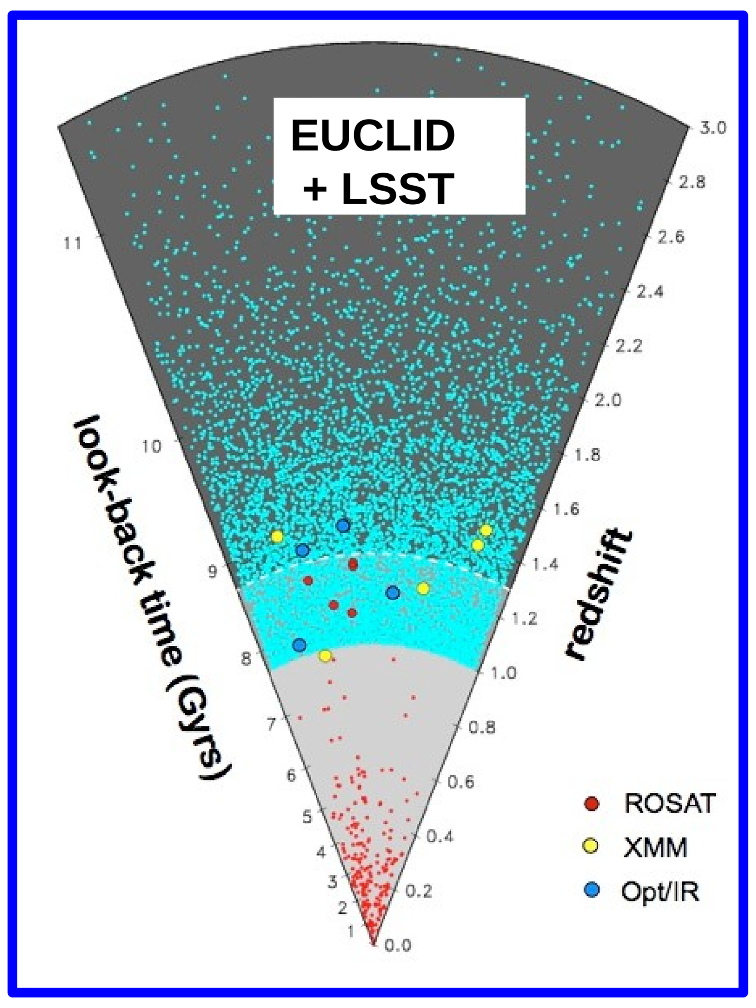
With Dark energy

Without Dark energy

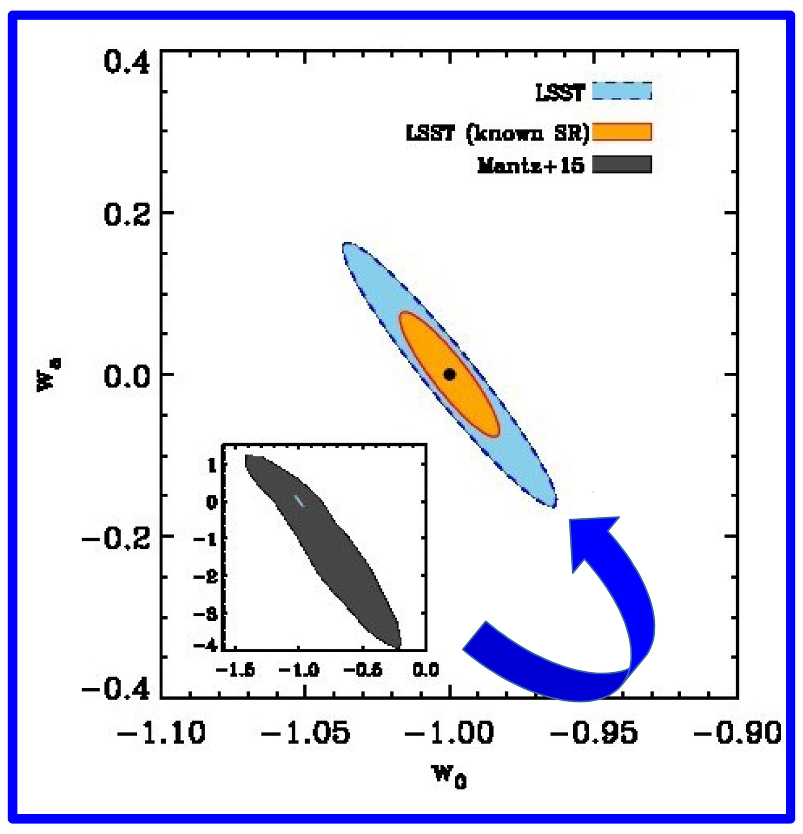


The evolution of the cluster population from N–body simulations in two different cosmologies. Top panels describe a flat, low–density model. Bottom panels are for an Einstein–de-Sitter model (EdS).





Explore new redshift range



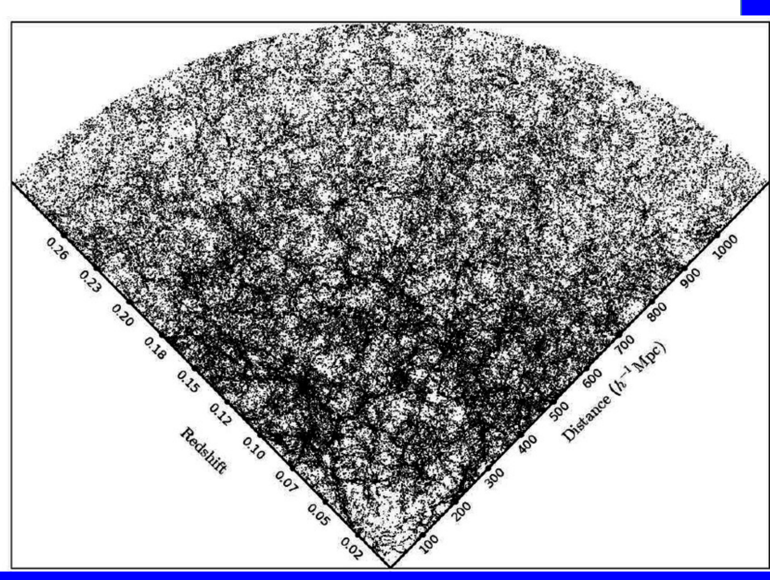
Improve cosmological constraints

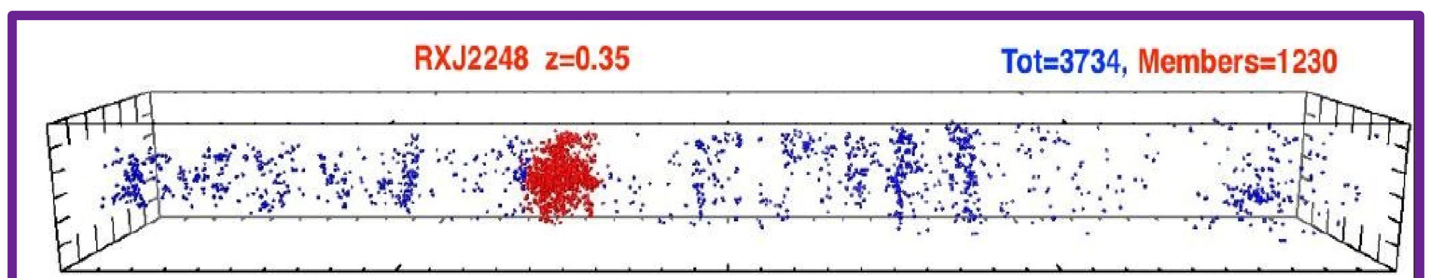
1) Project: constrain cosmological model with cluster surveys

Next generation of telescopes:

The next generation of optical and near infrared telescopes EUCLID and LSST will:
- enhance the number of detected clusters by orders of magnitude
- trace the cluster population out to unprecedented distances.

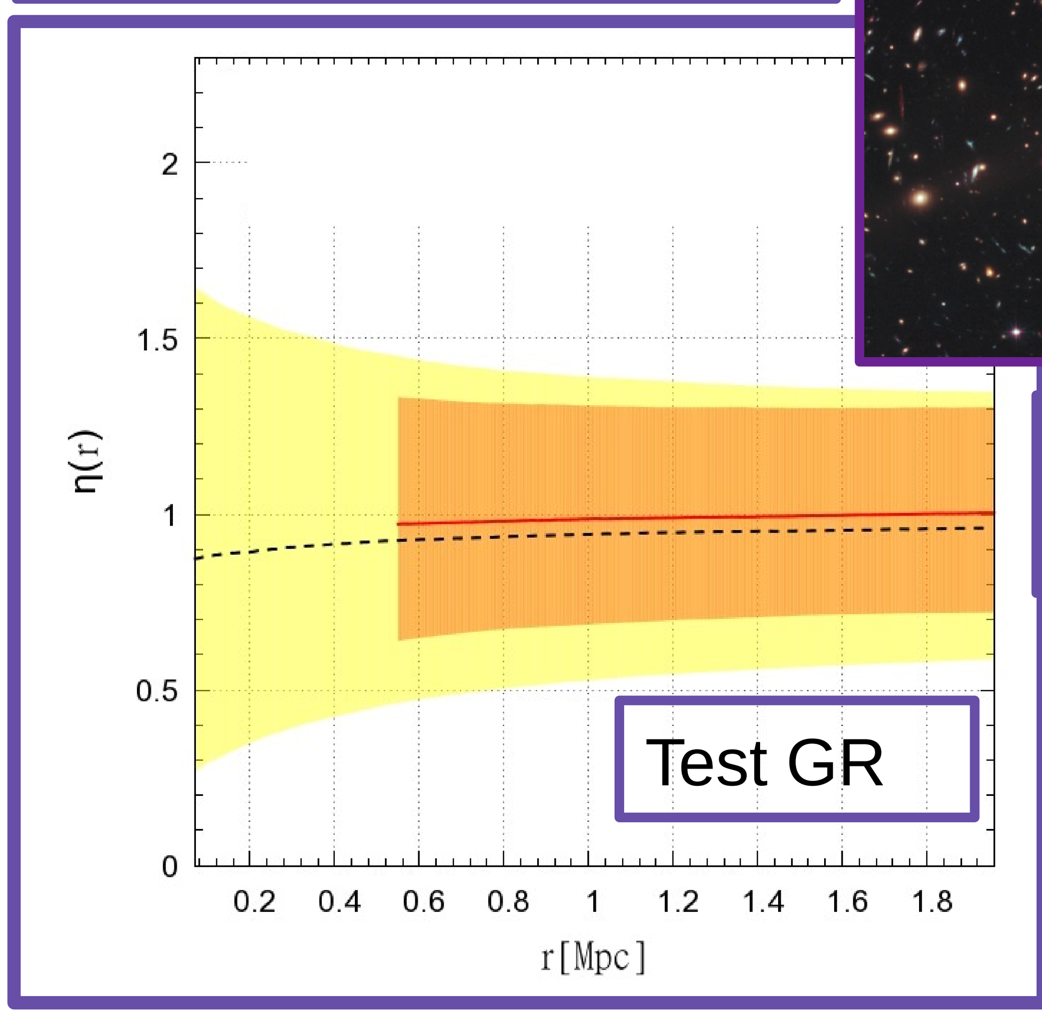
The algorithms developed for the exploitation of future data will be immediately applied to the existing, ground-based, largest sample of cluster Sloan Digital Sky Survey-III.





Mass profile from dynamic

Mass profile from lensing



Test GR

2) Project: Clusters as cosmological test for non-standard gravity

Is General Relativity the real theory of gravity?

To which precision can we recover a signal of modified gravity?

Modifications of GR enter in different combinations in determining gravitational lensing (i.e. motion of light) effects and internal gravitational dynamics (i.e. motion of non-relativistic matter).

A comparison between mass profiles of galaxy clusters through observations of lensing, of galaxy motions and of hydrostatic equilibrium of the intra-cluster hot baryons will allow us to set stringent constraints on possible deviations from GR.

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