Euclid @ UniMI

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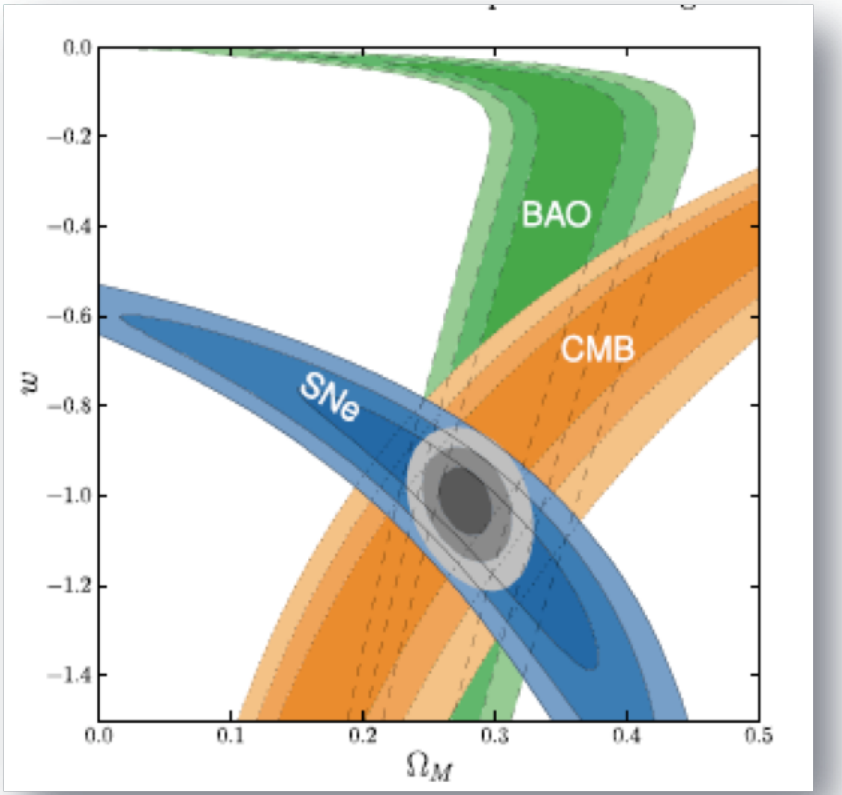
UniMI (Italy)

Euclid Cosmological Motivation

- Concordance Model: An accelerating Λ dominated Universe



- ...but with some open interesting questions

The 2000s question...

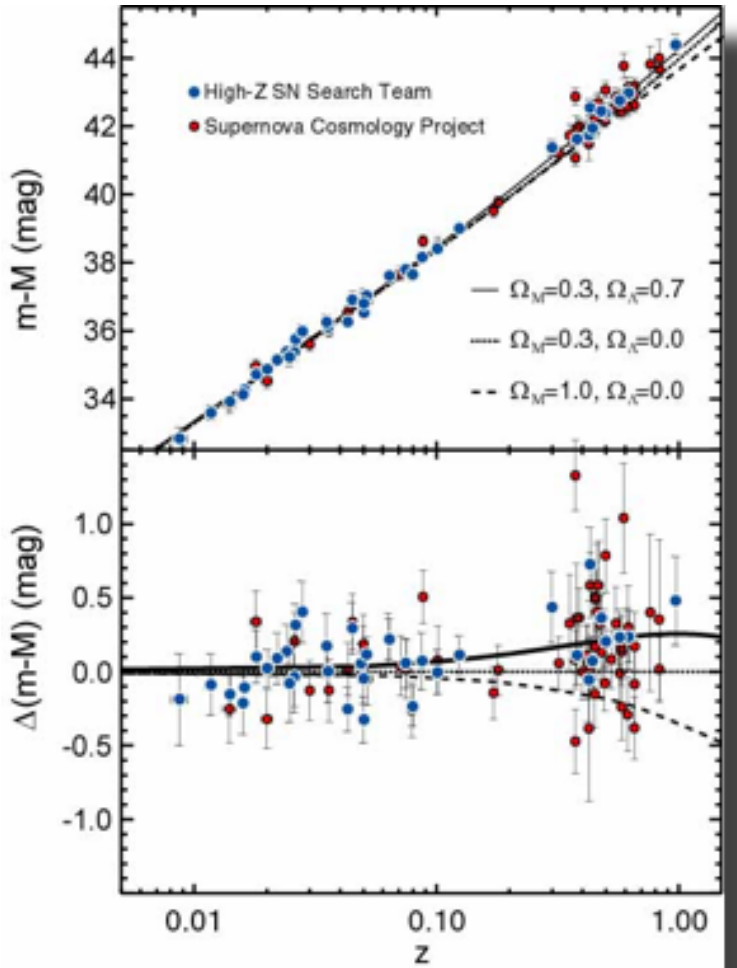
- Is acceleration driven by a cosmological constant or by an evolving quantity (e.g. scalar field)?
- Does General Relativity still work on cosmological scales?

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R = \frac{8\pi G}{c^2} T_{\mu\nu} + \Lambda g_{\mu\nu}$$

- $R \rightarrow f(R)$ i.e. modified theory of gravity and nature of Λ
- Different effect on the background expansion $H(z)$ and growth rate of structures $f(z)$

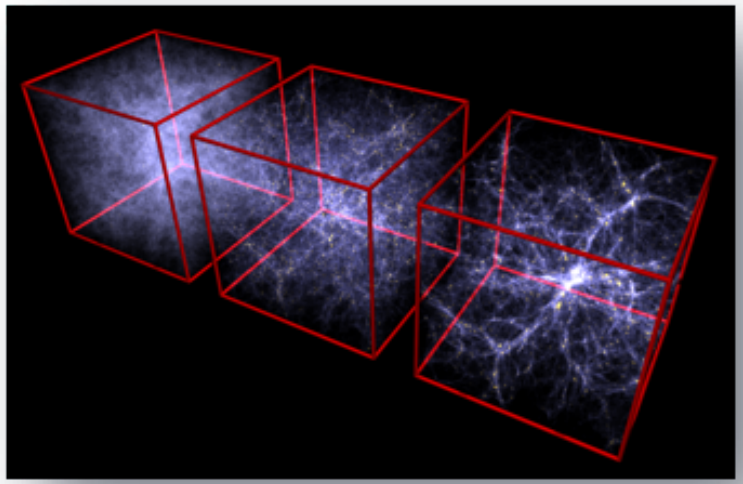
Euclid Goal: Answer both questions

- Measure the expansion history $H(z)$ to high accuracy to detector $\sim$% variation in DE e.o.s. $w(z)$
  - BAO (Barionic Acoustic Oscillations) in the clustering pattern of galaxies as a standard rod
  - Weak Lensing effect as a shape distortion on galaxies



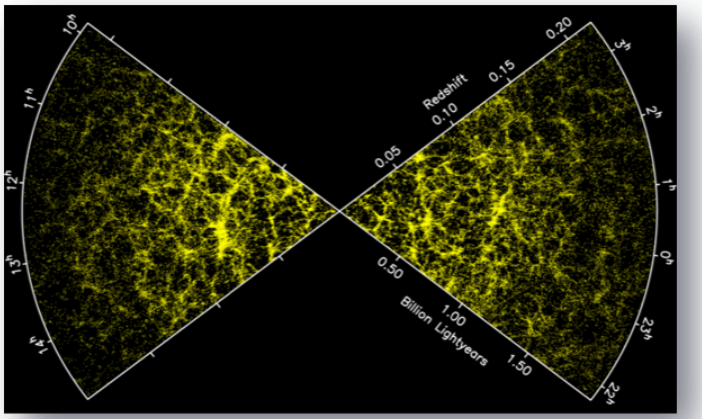
Euclid Goal: Answer both questions

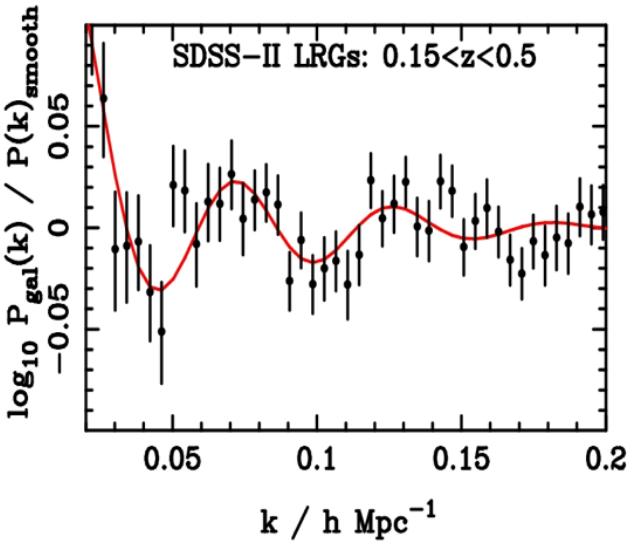
- Measure from both probes at the same time the growth rate of structures to detect modification of gravity
  - RSD (Redshift Space Distortions) in galaxy clusters
  - WL Tomography
- These probes are sensitive differently on the Φ and Ψ potentials of the perturbed metric



BAO: A cosmological ruler

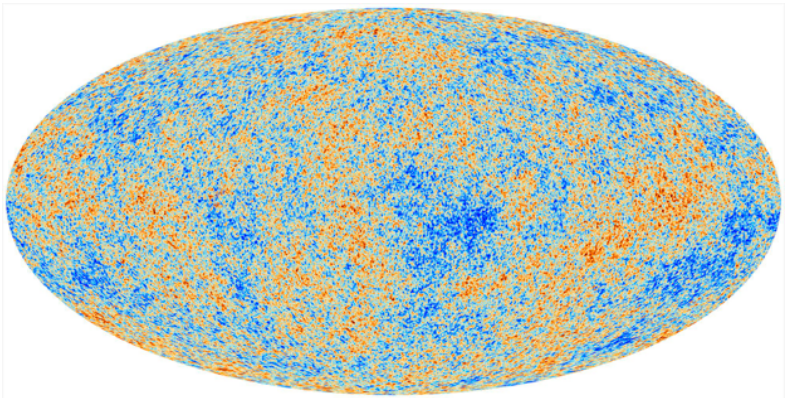
Galaxies

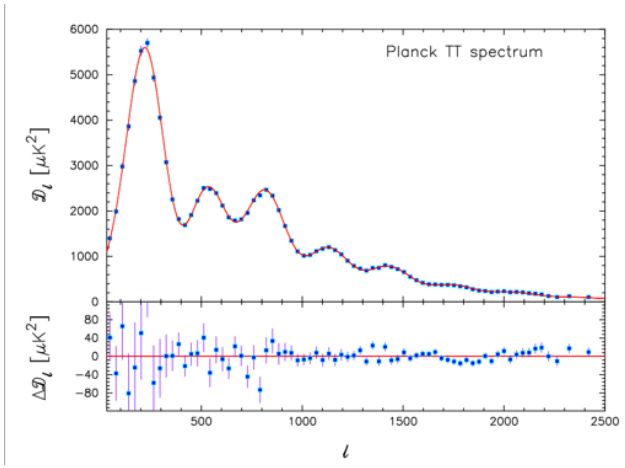




Percival et al 2007,09,11

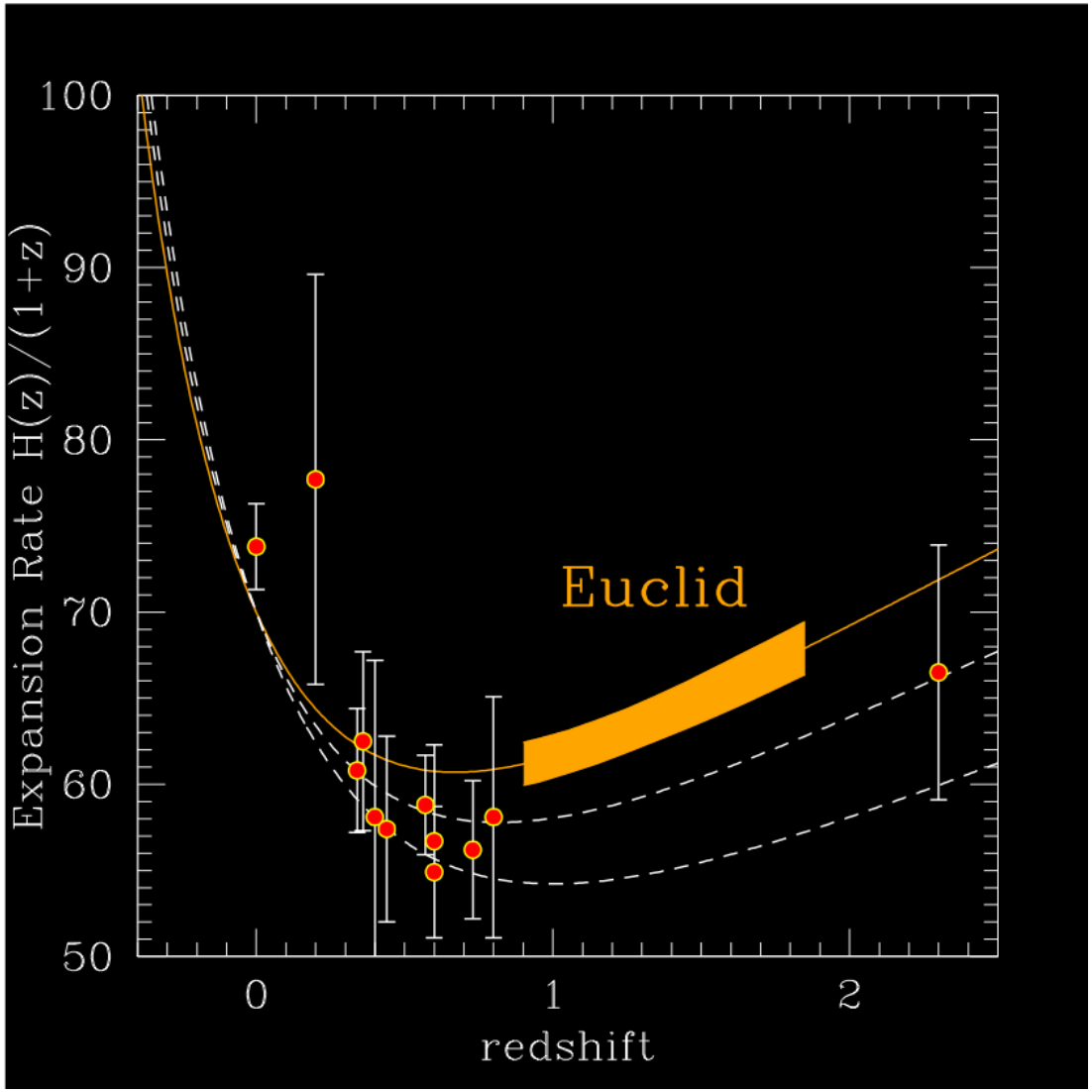
CMB





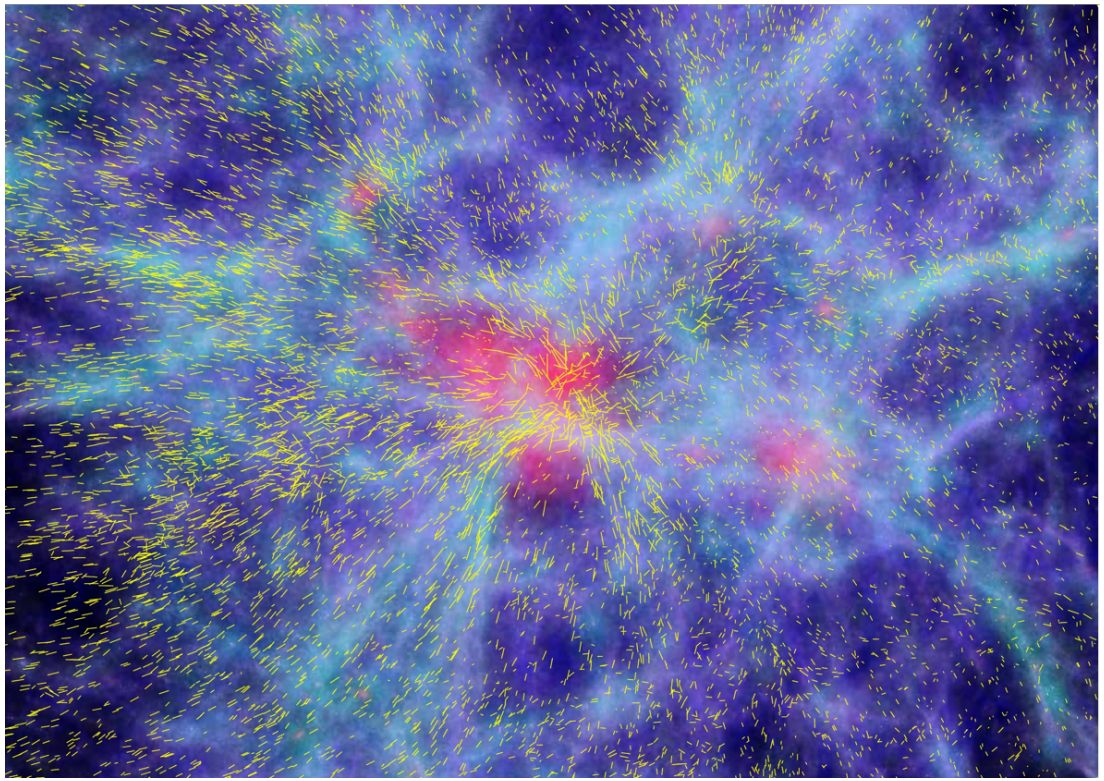
Planck Collaboration 2013

BAO: A cosmological ruler

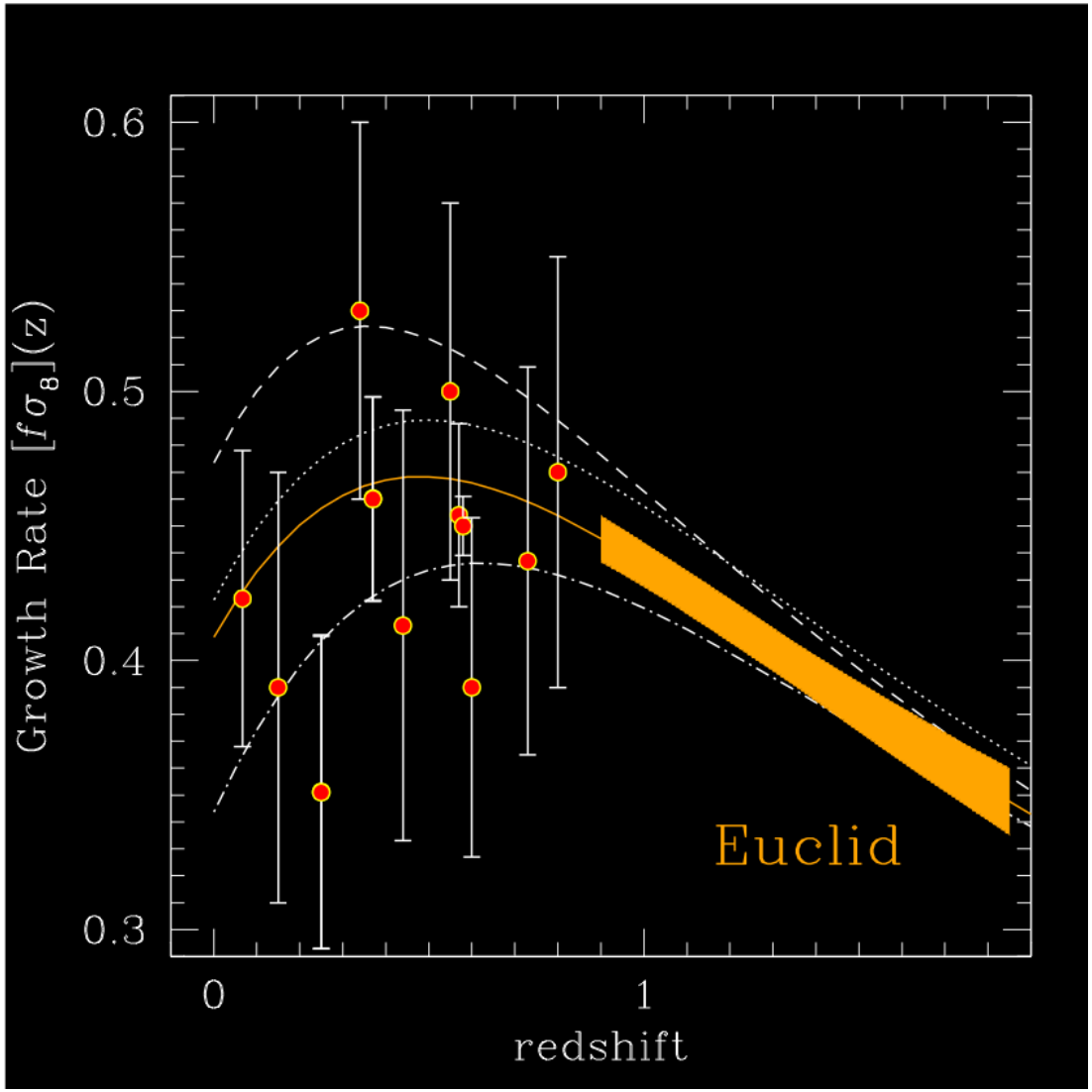


Growth of structure: peculiar motions

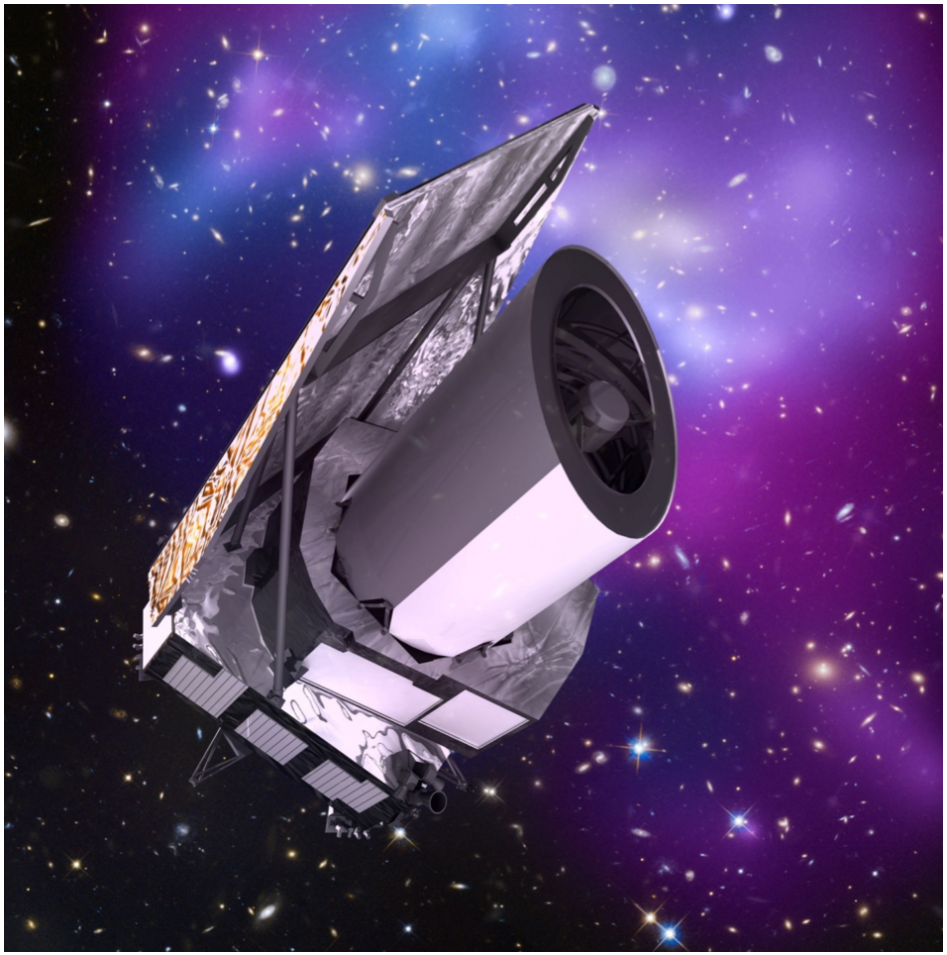
Growth produces motions: galaxy peculiar velocities



Growth of structure: peculiar motions



ESA Euclid Mission

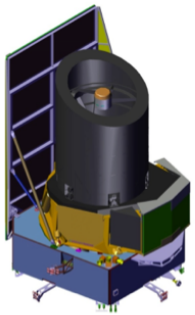


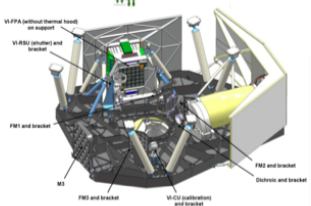
- Mirror: 1.2 meter Korsch
- Mass: 2200 kg
- Dimensions: 4.5 x 3 meters
- Launch: December 2020 by Soyuz from Kourou
- Orbit/Lifetime: L2 & 6 years

The ESA Euclid space mission

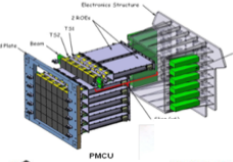
Soyuz@Kourou
2020

PLM+SVM: 2010-2020





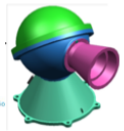
VI-FPA

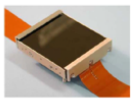


VIS imaging:
2010-2020
(VIS team)

VI-RSU

VI-Cal. Unit

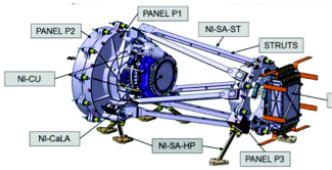


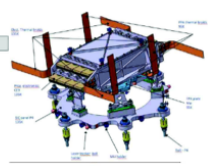


VIS

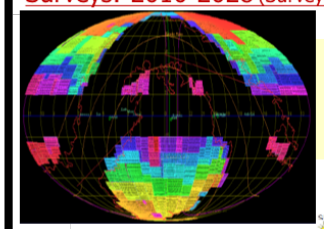
NIR spectro-imaging
2010-2020 (NISP team)

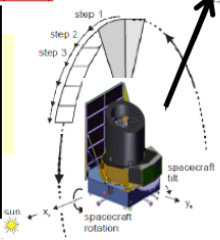
NISP NI-OMA





Surveys: 2010-2028 (Survey WG)



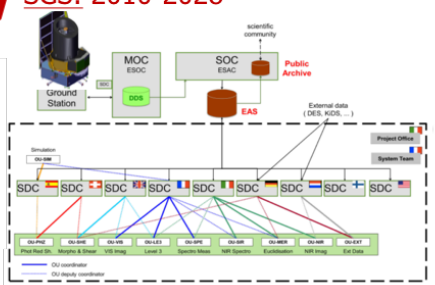


6 yrs - 15,000 deg^2

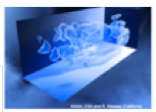
- Commisionning – SV
- Euclid opération:
5.5 yrs:Euclid Wide+Deep
- +: SNIa, mu-lens, MW?

Ground data

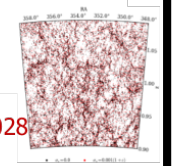
SGS: 2010-2028

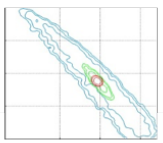


~100 PB data processing (EC-SGS team)



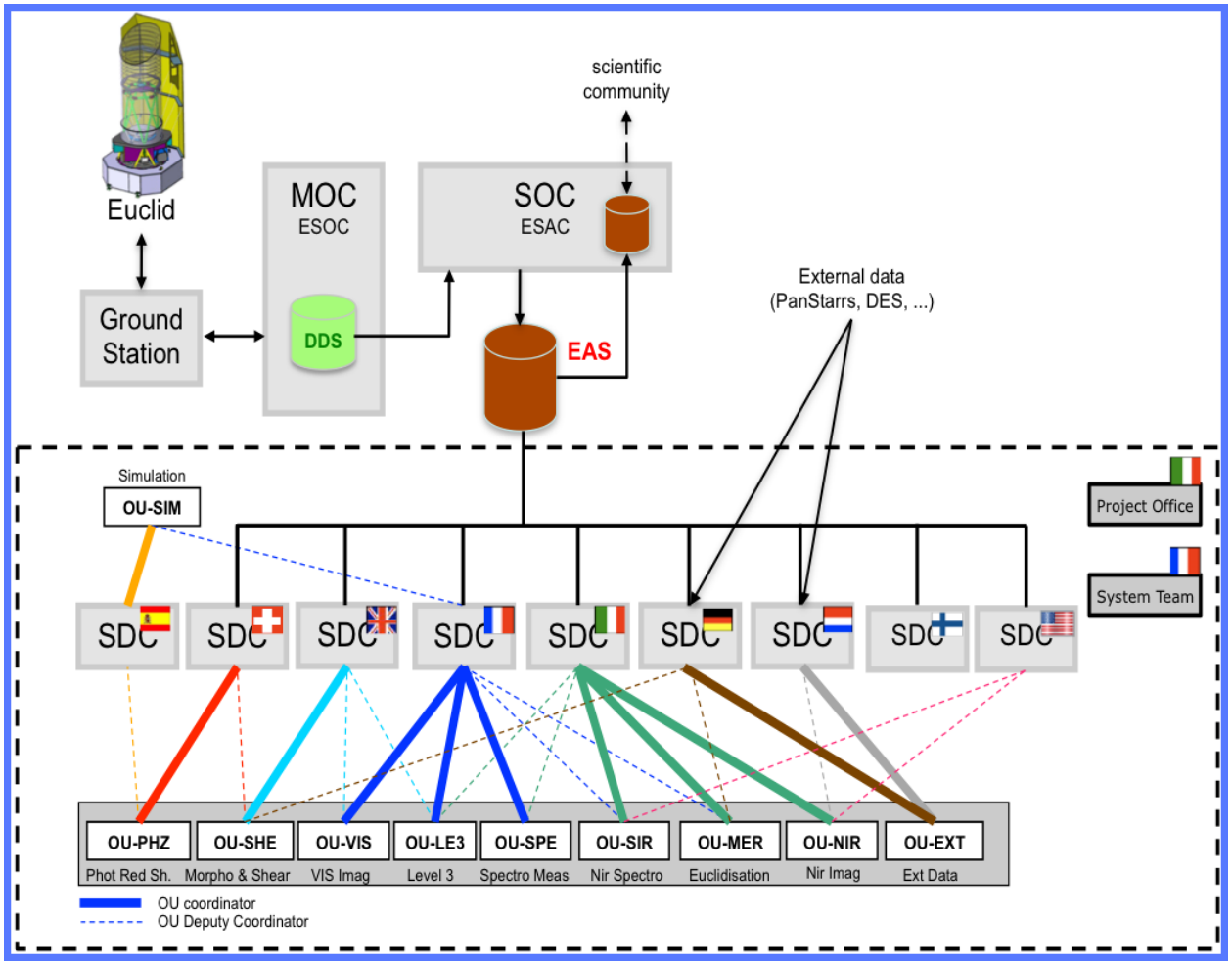
SWG:
2019-2028





Science analyses

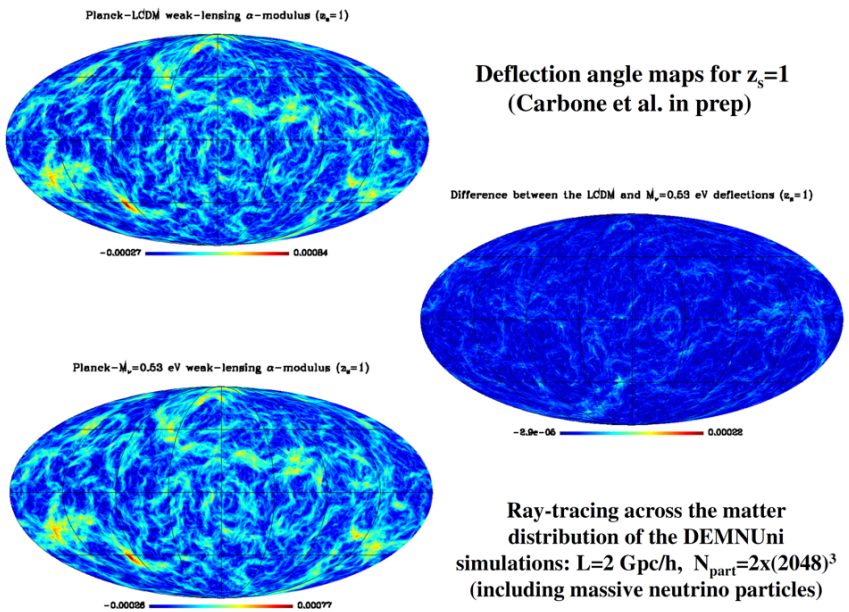
Euclid SGS

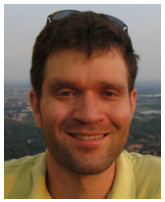

Euclid
Ground Station
MOC
ESOC
DDS
SOC
ESAC
scientific community
EAS
External data
(PanStarrs, DES, ...)
Simulation
OU-SIM
Project Office
System Team
SDC
SDC
SDC
SDC
SDC
SDC
SDC
SDC
SDC
OU-PHZ
Phot Red Sh.
OU-SHE
Morpho & Shear
OU-VIS
VIS Imag
OU-LE3
Level 3
OU-SPE
Spectro Meas
OU-SIR
Nir Spectro
OU-MER
Euclidisation
OU-NIR
Nir Imag
OU-EXT
Ext Data
OU coordinator
OU Deputy Coordinator

Euclid@UniMI

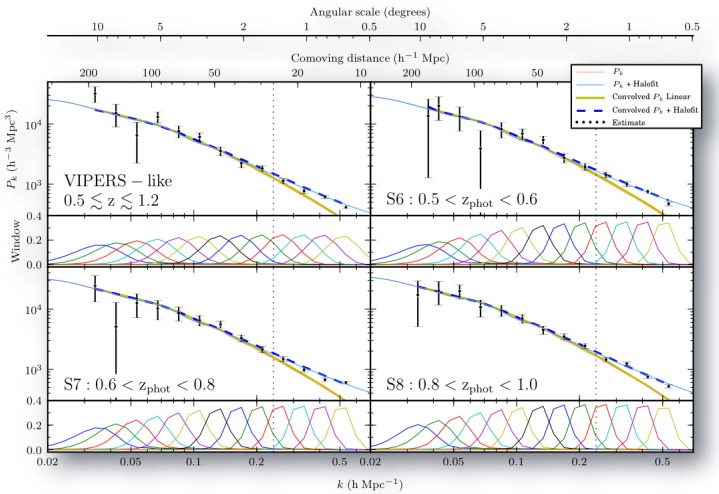
- DM is involved into SGS activities: deputy lead and scientific coordinator of SDC-IT
  - S/W development (`Euclid Image Utils`) for OU-NIR & OU-SIR
  - Support for S/W integration into the SGS infrastructures to complete Scientific Challenges
  - S/W development and integration for OU-SPE (Emission & Absorption Lines measurements) and OU-LE3 (Dust extintion)
- Around "autumn" UniMI will gain 3 other Euclidian: Luigi Guzzo (as Full Professor), Carmelita Carbone and Ben Granett

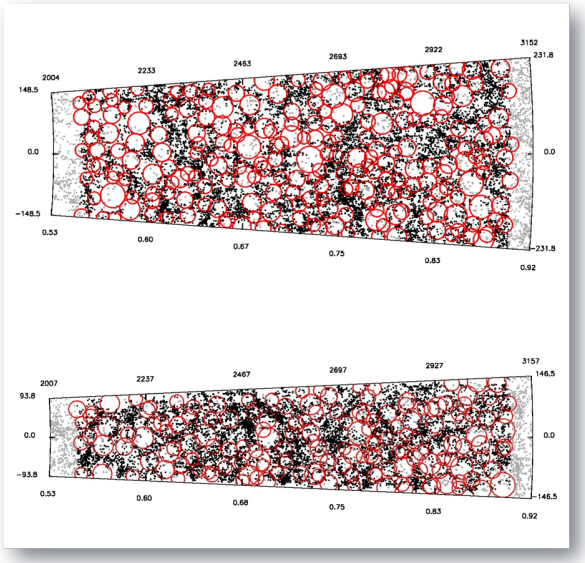
- Large scale simulations include DE and with neutrinos with three different masses
- Impact on Weak Lensing deflection angle on CMB anisotropies





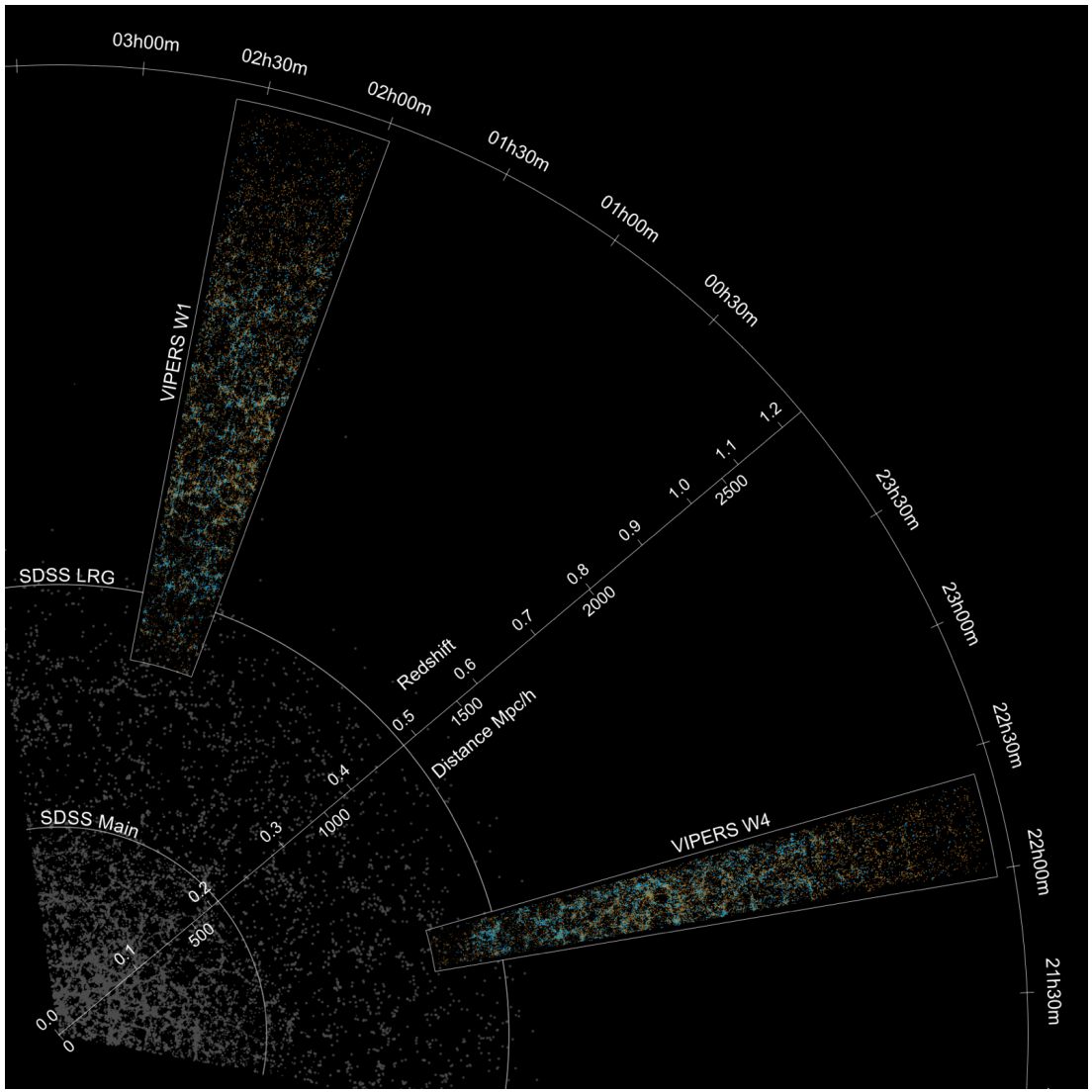
- Improved statistical estimator of $P(k)$
- Find new cosmological probes: cosmic voids





Euclid@UniMI - Luigi Guzzo

- Co-Lead of Galaxy Cluster WG
- PI of VIPERS, a galaxy redshift survey with VIMOS@VLT:
  - 90k redshifts to trace cosmic web at $z > 0.5$
  - Density and Volume comparable to state-of-the-art of local surveys (SDSS)
  - Cosmology with GC and RSD



VIPERS Collaboration