STUDY OF THE DARK COMPONENTS OF THE UNIVERSE WITH THE EUCLID MISSION

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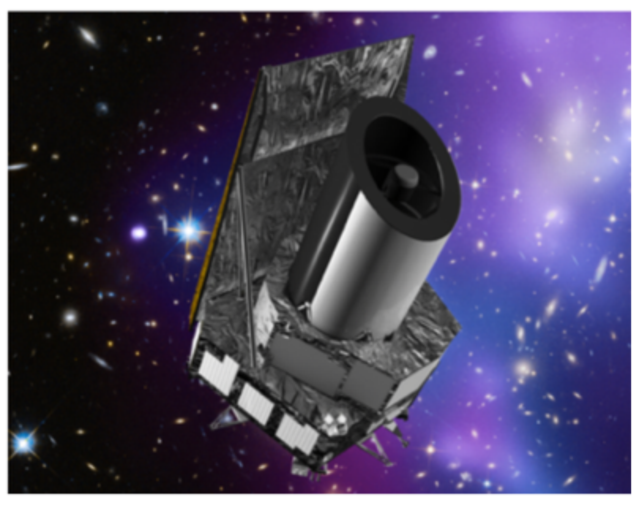
INTRODUCTION

The ΛCDM cosmological model is the current standard model in cosmology thanks to its good phenomenological fit to cosmological data like SNIa, BAO or CMB. However, neither a dark matter, nor a dark energy candidate have been experimentally detected, so there is still room to study models differing from this ideal case.



OBJECTIVE

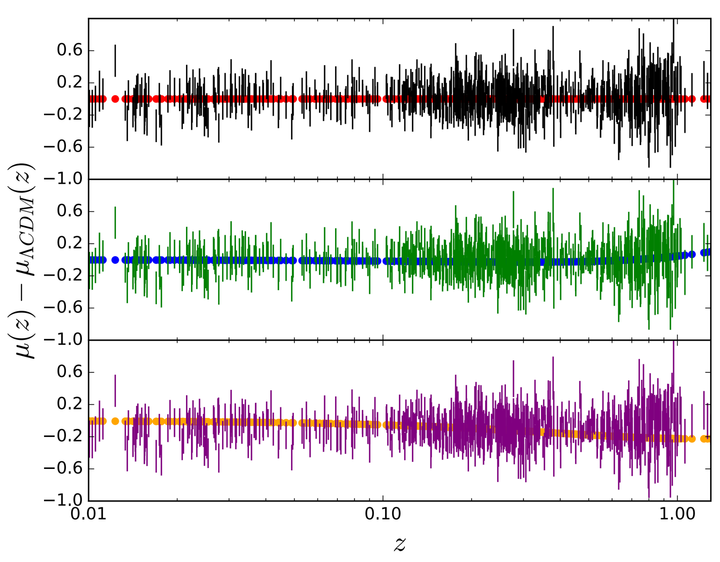
To study different cosmological models explaining the dark sector of the Universe using both real data and predicting the ability of the future Euclid mission to constraint these models.

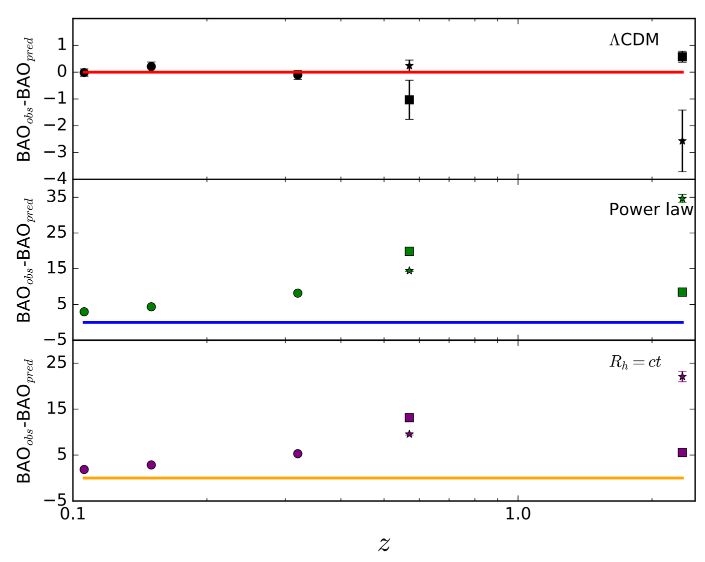
MODELS

1. **Generalized dark matter model:**
   - A non pressure-less dark matter component is allowed, together with a dark energy fluid different from a cosmological constant.
2. **Power law cosmology:**
   - A power law expansion of the Universe scale radius is assumed.
3. **Type Ia supernovae luminosity:**
   - SNIa luminosity independence of the redshift is not assumed.
4. **Probe combination:**
   - The correlations between different probes (galaxy clustering and weak lensing) are taken into account.

Power law cosmology [2]

- These models may be able to reproduce low-redshift data, but they cannot account for both low-redshift and CMB data.
- They are ruled out when considering all the expansion history of the Universe.



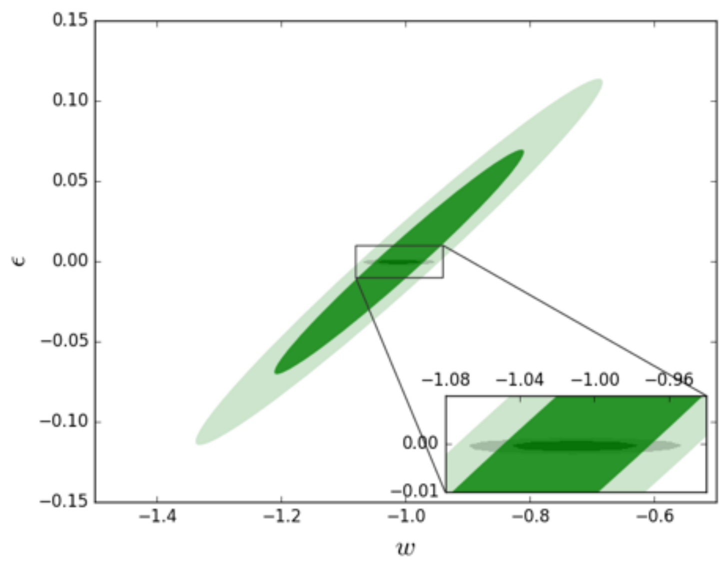


Probe combination

- Taking into account the correlations between galaxy clustering and weak lensing for the Euclid mission seems to have an effect on the cosmological parameter constraints (work in progress).

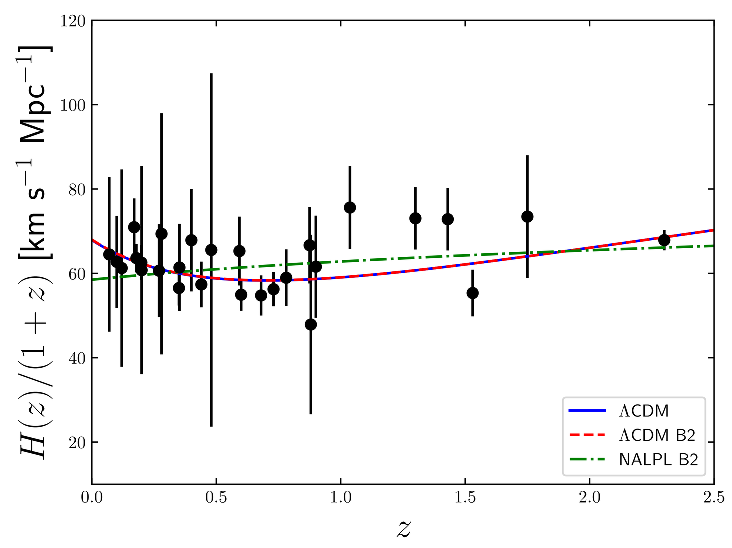
Generalized dark matter [1]

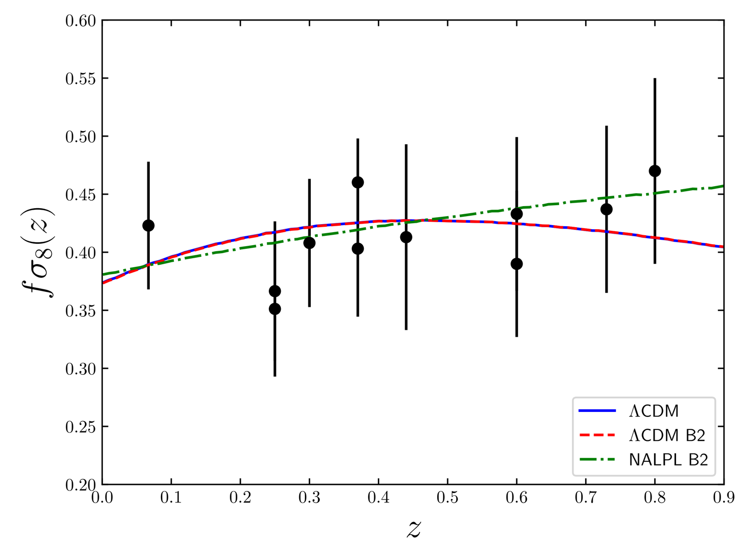
- The forecasted constraints on dark energy (w) with Euclid are strongly weakened when generalized dark matter (ϵ) is added (still much better than present-day constraints).
- The combination of Euclid and the CMB restores the exquisite expected dark energy constraints.



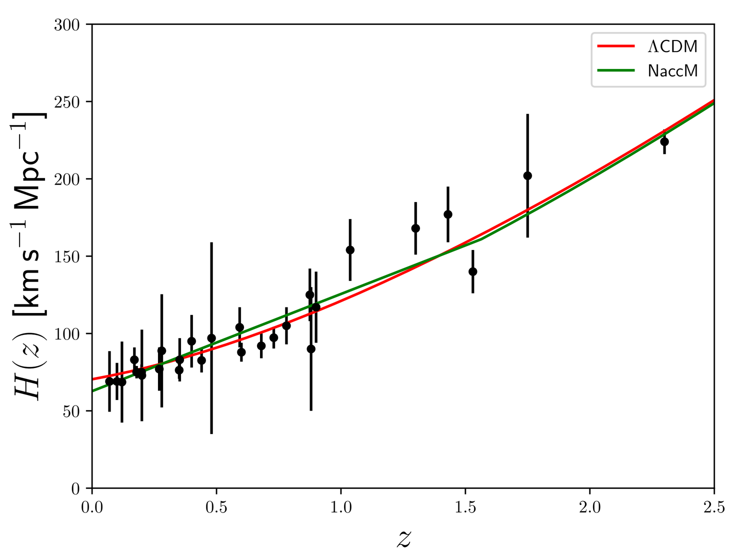
SNIa luminosity [3,4]

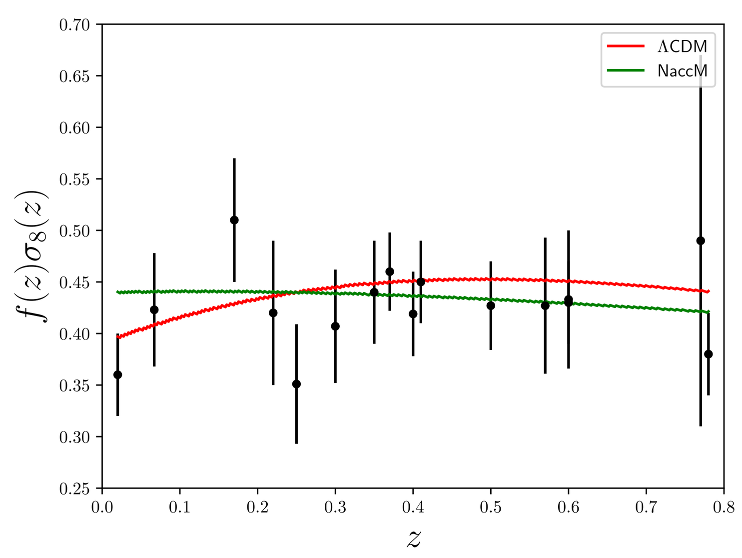
- Without the assumption of SNIa intrinsic luminosity being redshift independent, low-redshift probes are consistent with a non-accelerated universe.





- We can even find a non-accelerated phenomenological model fitting also high-redshift data.





CONCLUSIONS

- Obtained constraints on dark energy are sensitive to the assumptions performed on the dark matter sector (work in progress).
- Exotic power law cosmologies are excluded when considering all the expansion history of the Universe, but they can explain the local Universe.
- The accelerated expansion of the Universe is strongly based on the assumption that SNIa intrinsic luminosity is independent of the redshift.
- To perform precision cosmology we need to combine cosmological probes and their correlations may not have a negligible impact on cosmological parameter constraints (work in progress).

REFERENCES

1. I. Tutusaus *et al.*, Phys. Rev. D **94**, 123515 (2016).
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4. I. Tutusaus *et al.* (in prep.)

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