

PyCosmo: Tests and Development

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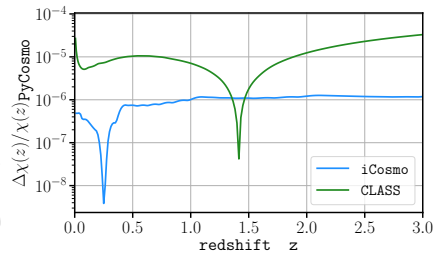


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Overview

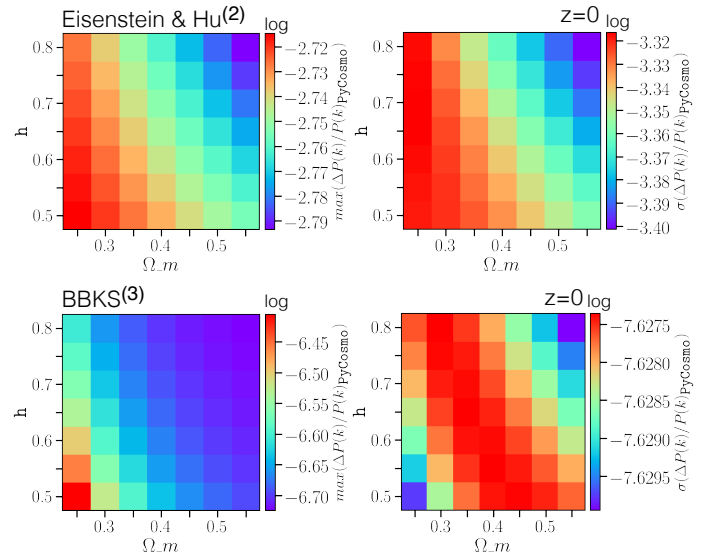
- > Python-based framework providing cosmological model predictions
- > Symbolic calculation of the Einstein-Boltzmann equations
 - implemented with the *sympy* package
 - the symbolic representation provides the user a convenient interface to manipulate the equations and implement new cosmological models
- > Currently under test and development
- > **Future work:** CMB angular power spectrum, massive neutrinos, more general models beyond flat Λ CDM...
- > More info at <http://www.cosmology.ethz.ch/research/software-lab.html>

Background

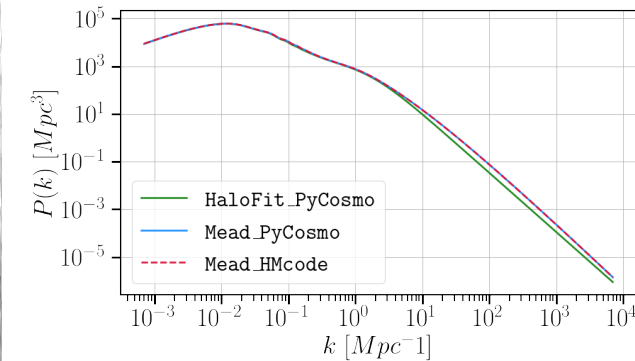


> Varying cosmology, we obtain a max relative difference up to e-4, with a dispersion up to e-6, in comparison iCosmo, and up to e-3 with CLASS

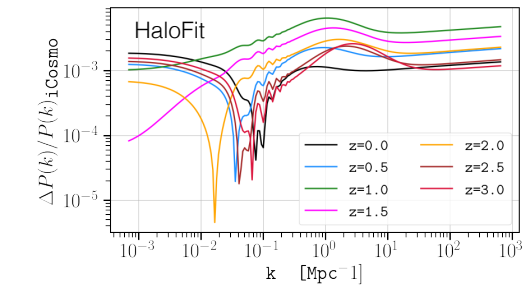
Linear perturbations — PyCosmo-iCosmo comparison



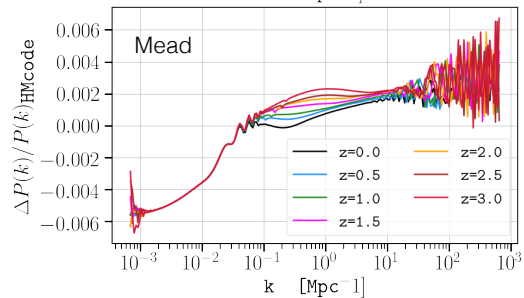
Non-linear perturbations



- > PyCosmo can compute the non-linear power spectrum using two different fitting functions: HaloFit and the Mead model⁽⁴⁾⁽⁵⁾
- > HaloFit is tested against iCosmo. The user can choose to include the additional corrections from Takahashi et al., 2012⁽⁶⁾
- > The Mead model in PyCosmo is developed in python and cython. It is tested against the original code in Fortran (HMcode).
- > HaloFit and Mead run at comparable speed.



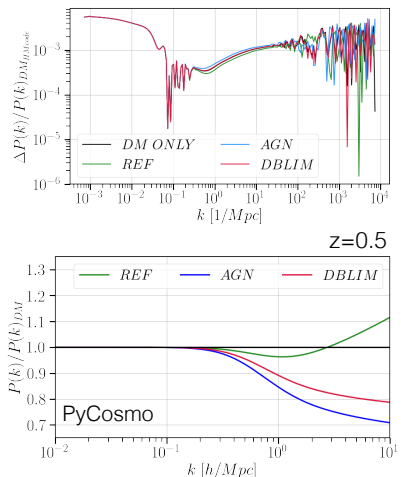
Exec. time:
t=2.75 s



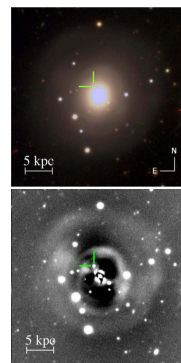
Exec. time:
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Mead + Baryons

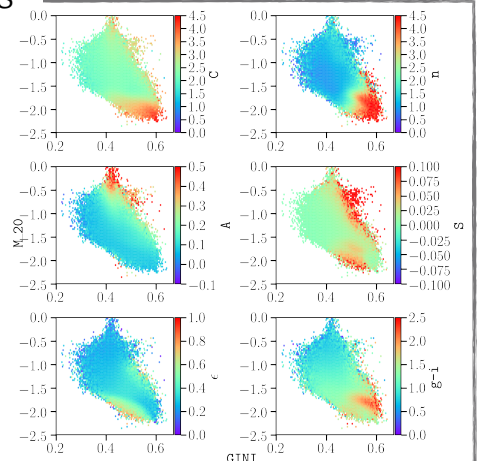
- > In the Mead model the baryonic feedback (BF) is implemented by tuning two parameters of the model: A (*min. halo conc.*) and η_0 (*halo bloating parameter*)
- > A and eta vary in four different cases accounting for BF: DM ONLY, REF, AGN and DBLIM
- > We test our python implementation against the HMcode in the four cases
- > We can reproduce the comparison, shown in [5], between the model+BF and the DM ONLY case.



Other projects



Properties of GW170817 BNS in NGC 4993⁽⁷⁾



Galaxy Morphology catalogue DES Y1⁽⁸⁾