



The role of the stellar mass-halo mass relation on galaxy merger rates, star formation histories and satellite abundances

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Galaxies evolution with the ESA Euclid mission and ESO telescopes

25-28 October 2022 Madrid

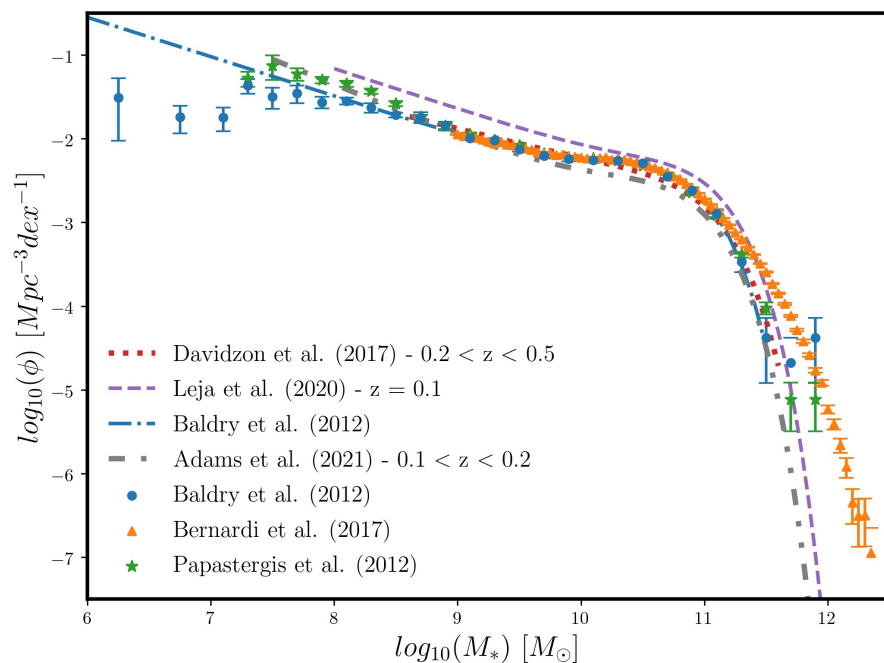


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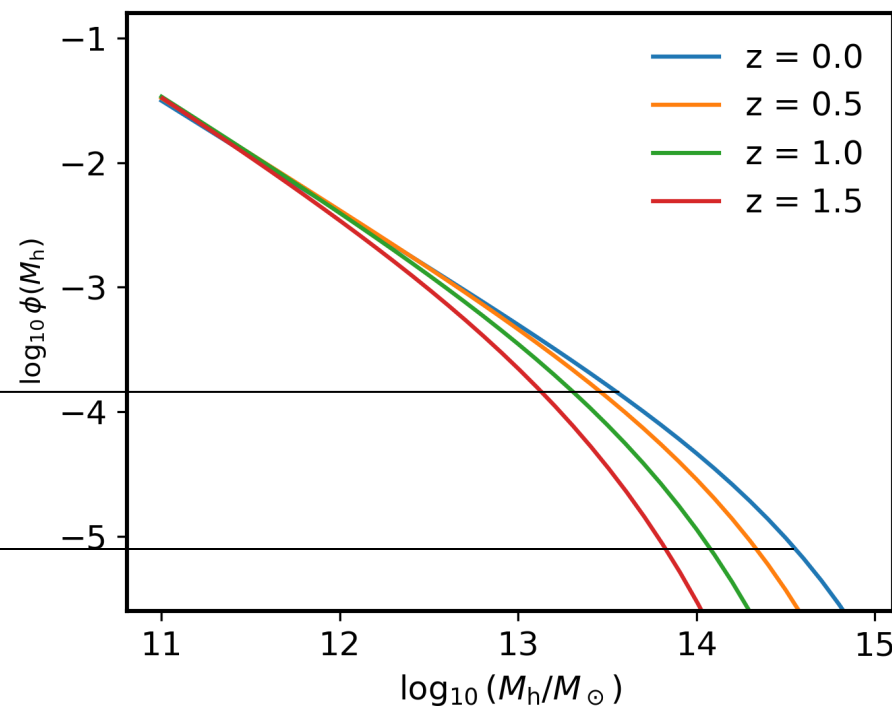
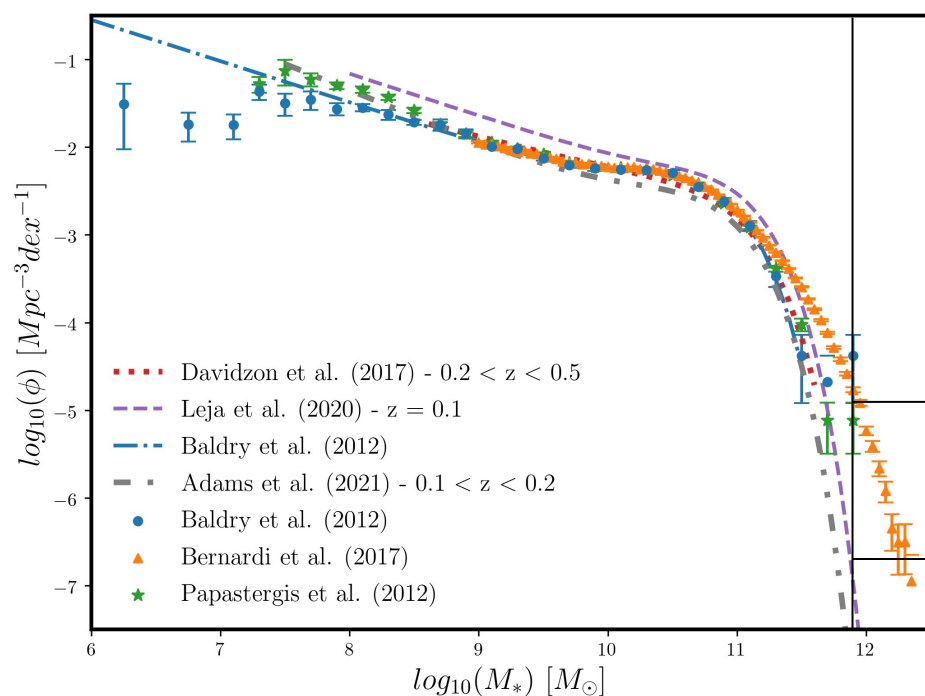
The galaxy stellar mass function and abundance matching

Still many systematics in the SMF \rightarrow profound consequences on the Stellar Mass-Halo Mass (SMHM) relation



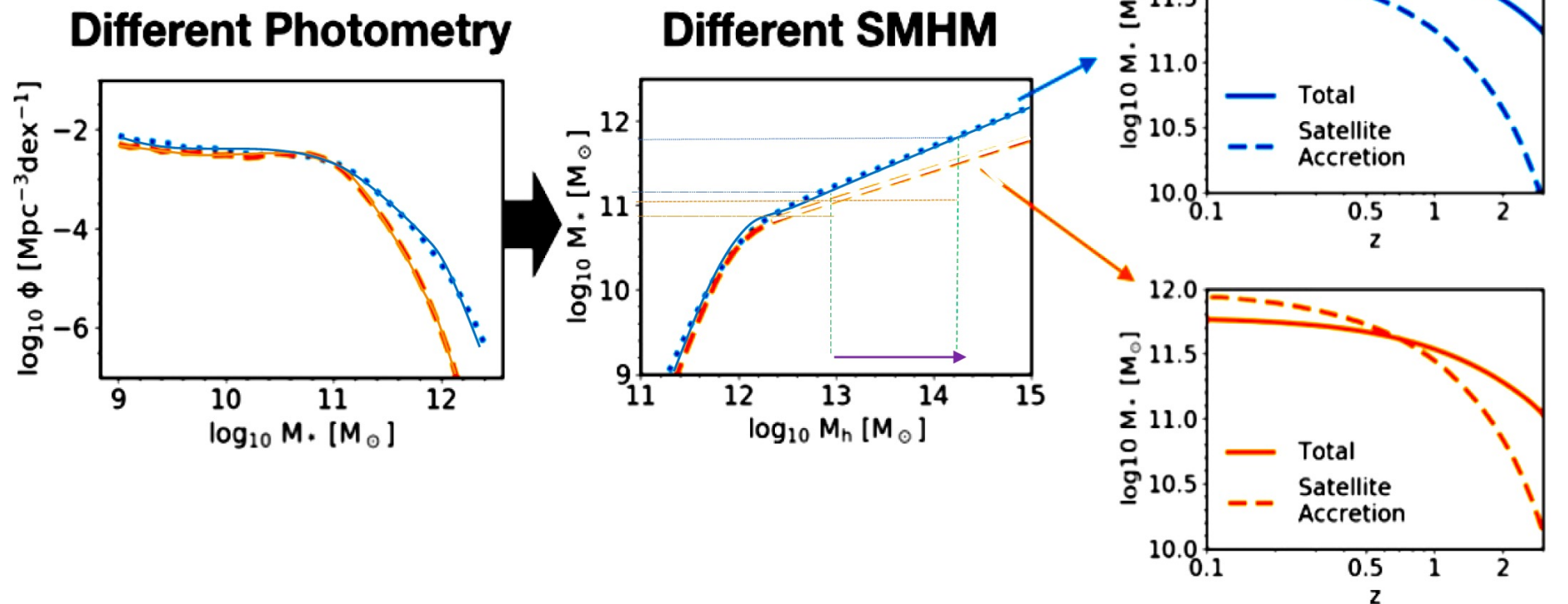
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The role of the $M_{\star} - M_h$ relation

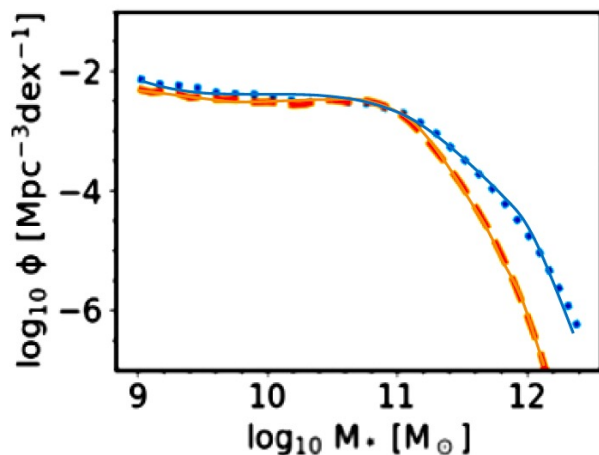
Varying the SMHM relation has significant implications to the galaxy assembly histories...



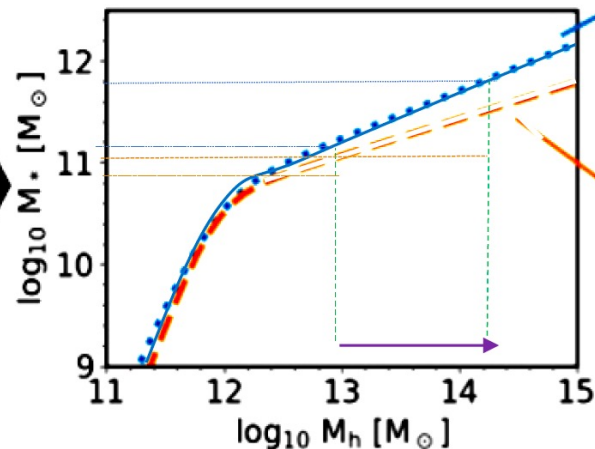
The role of the $M_{\star} - M_h$ relation

Varying the SMHM relation has significant implications to the galaxy assembly histories... and to merger rates

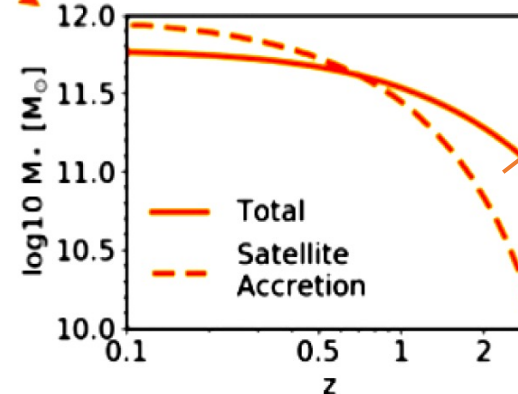
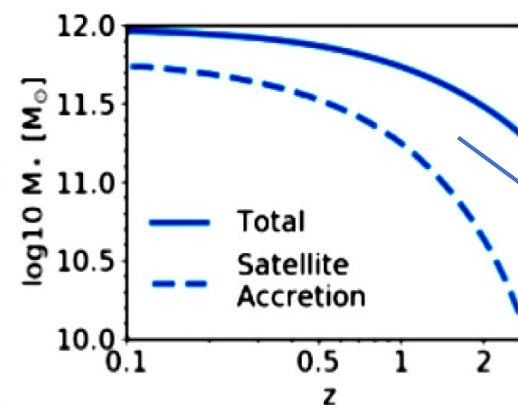
Different Photometry



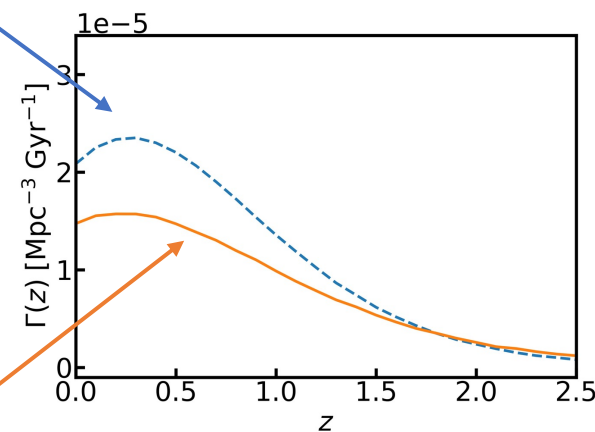
Different SMHM



Different Accretion

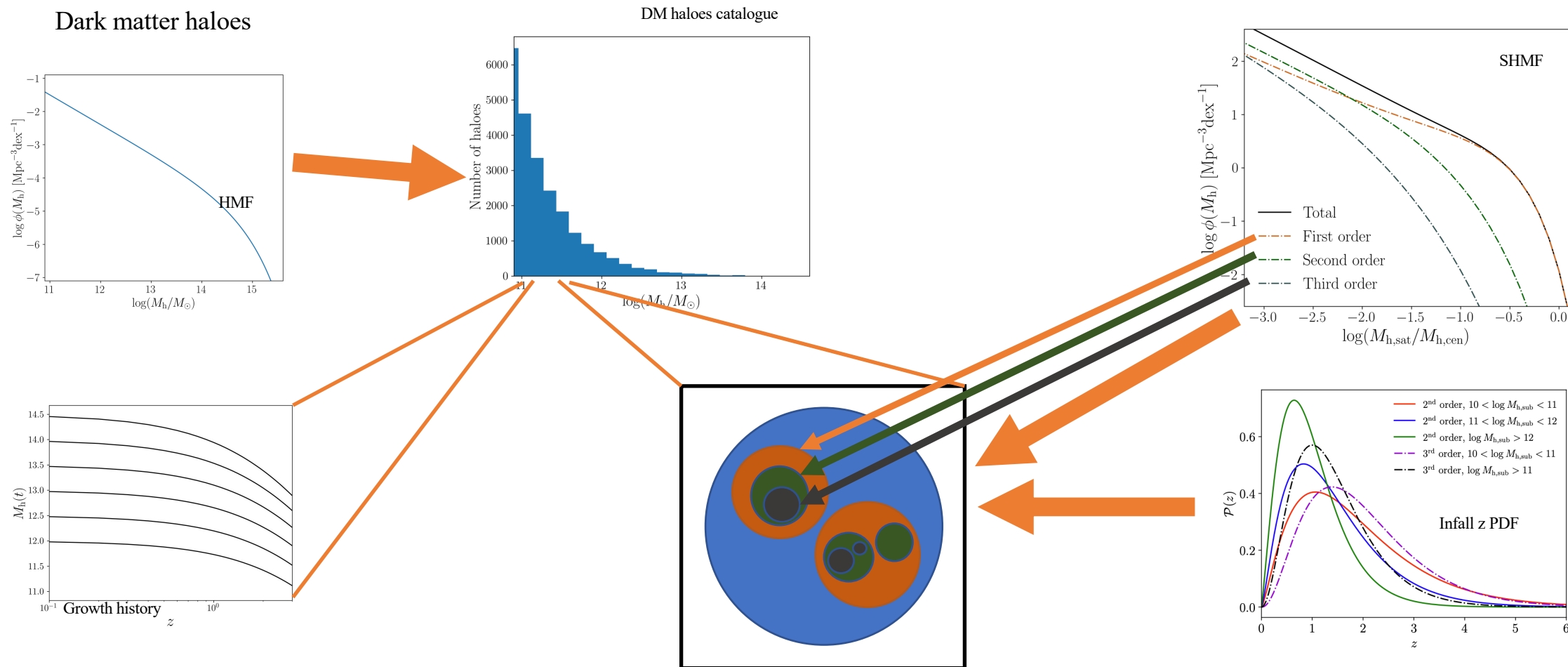


Different merger rates

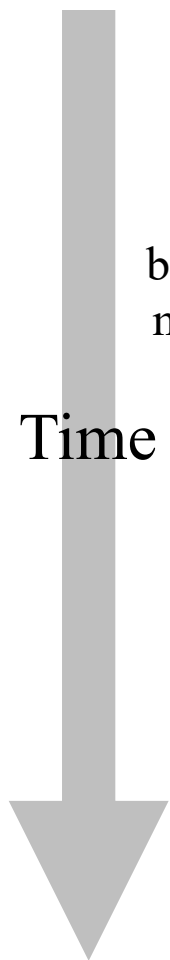


The role of the $M_{\star} - M_h$ relation

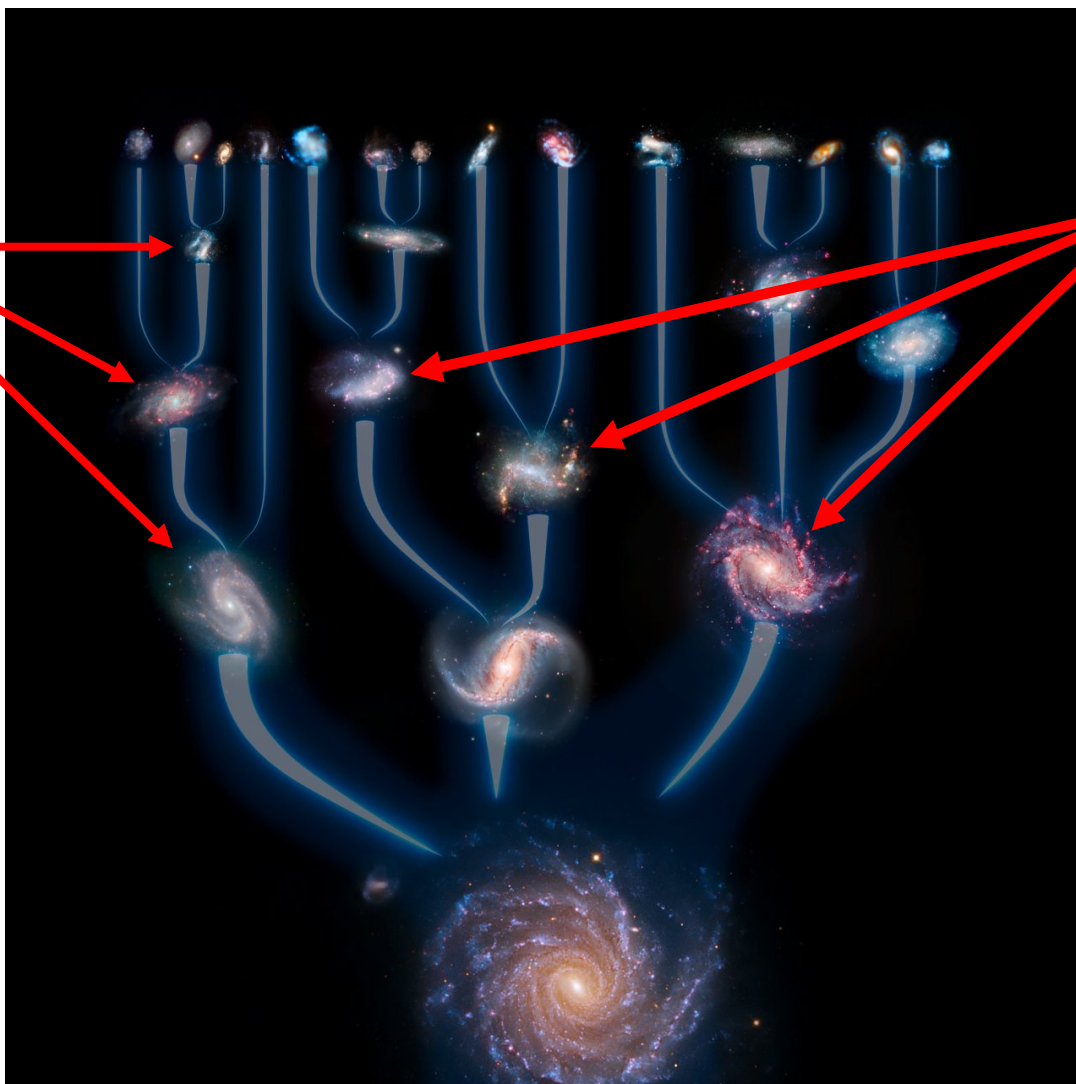
To address this problem we use our semi-empirical model **DECODE** (Fu H., Shankar F., et al. 2022)



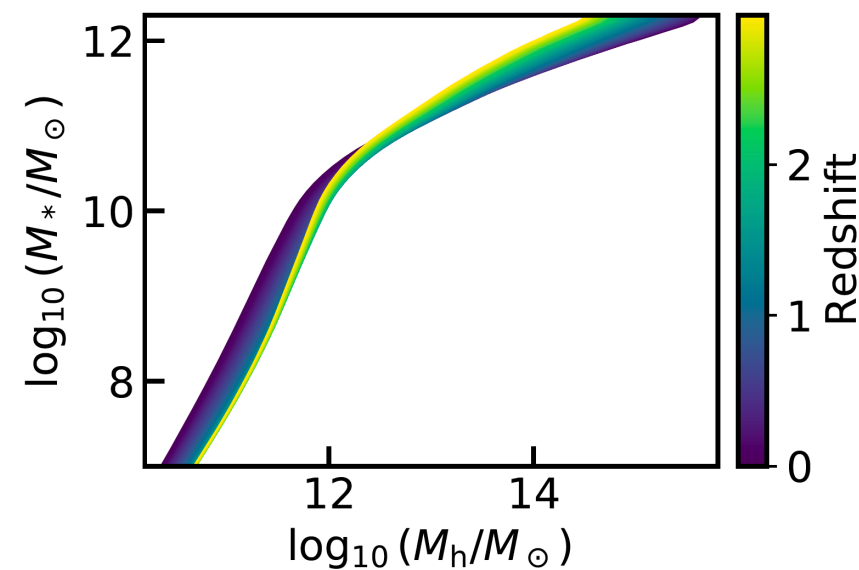
Methodology



Discs
grow
between
mergers

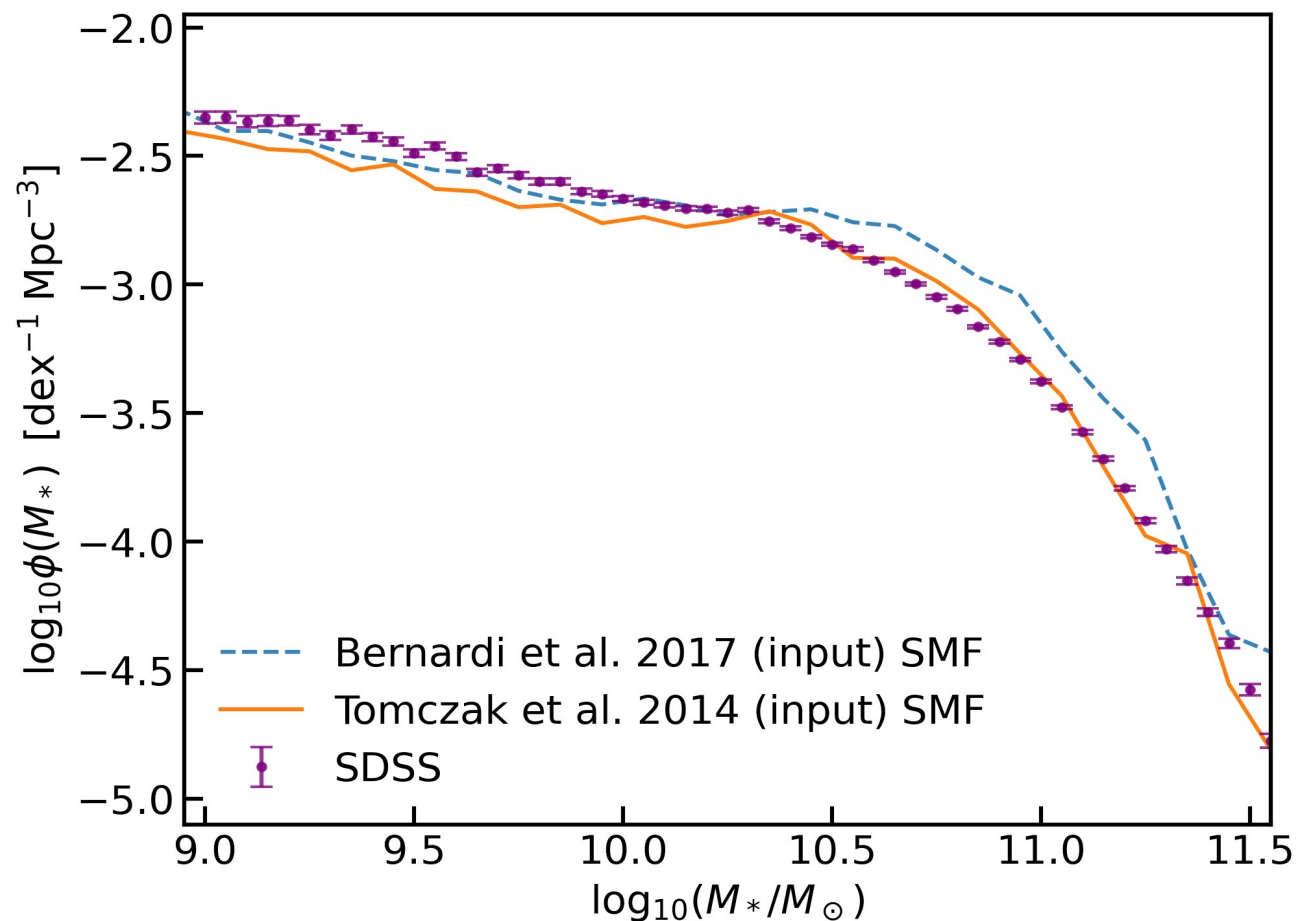


Stellar Mass-Halo Mass (SMHM) relation to
assign galaxy stellar masses to host dark matter
haloes at each cosmic time

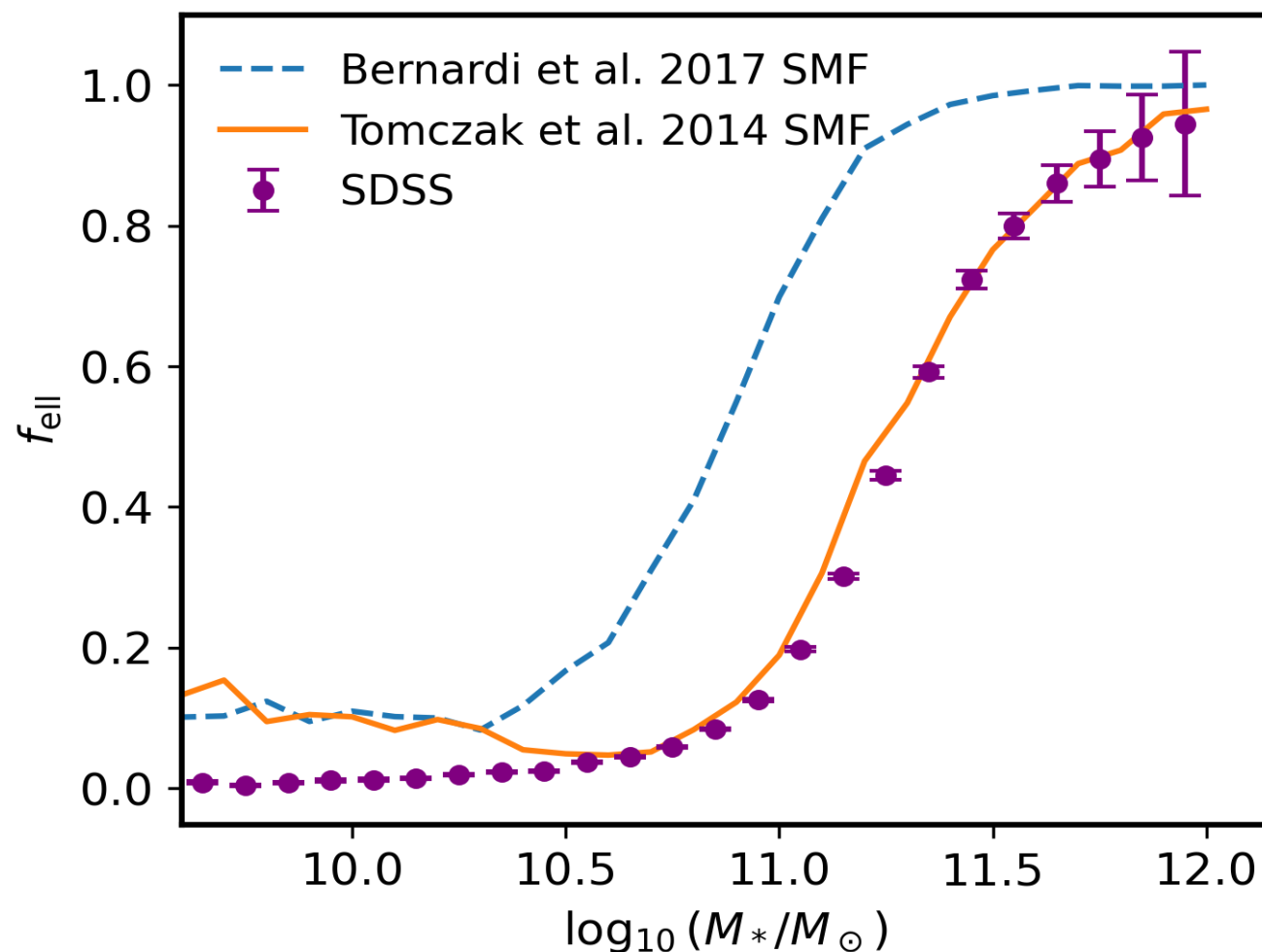


Satellite galaxies are the other side of the coin

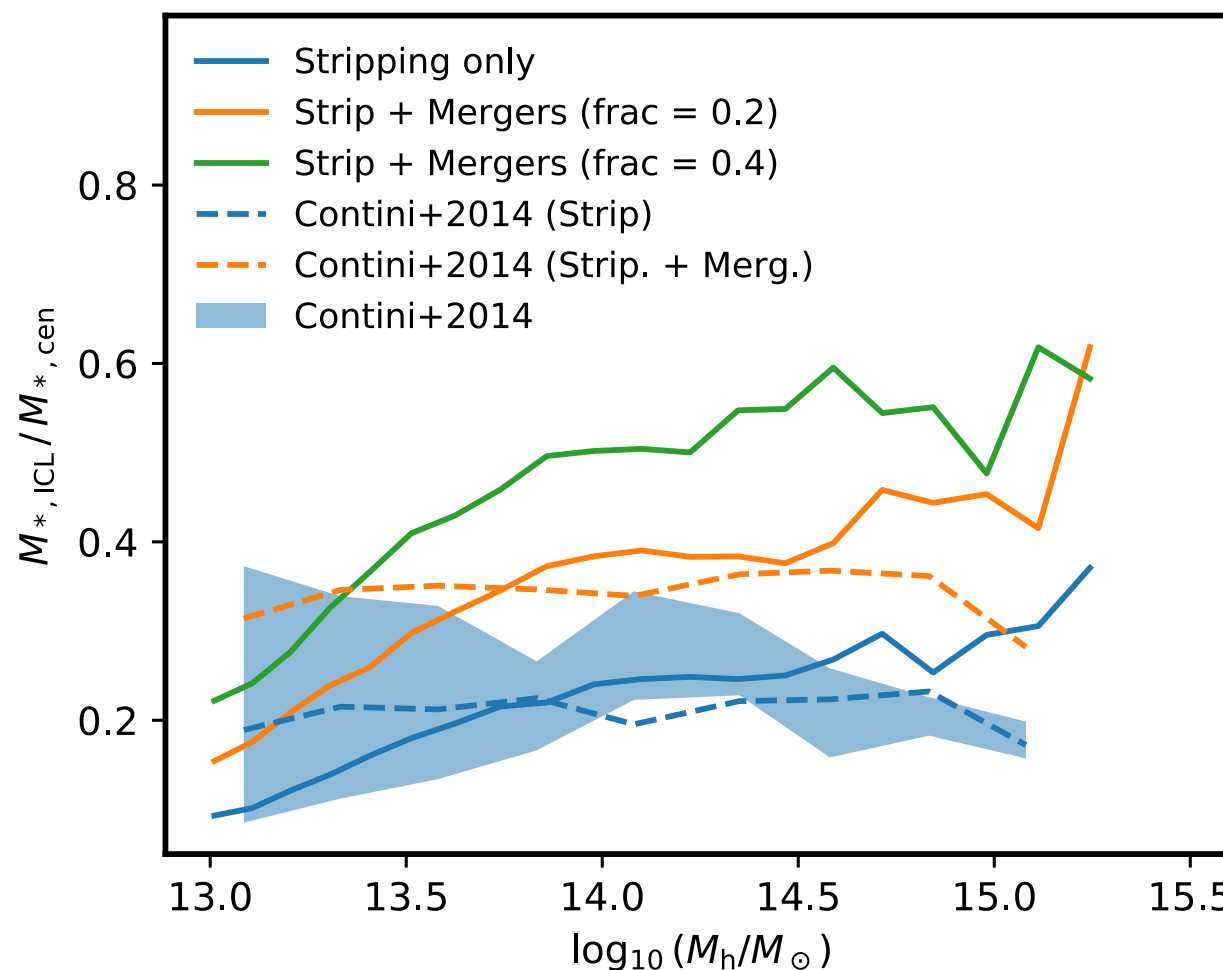
Satellites are un-merged galaxies and are extremely important to test the SMHM relation



How many ellipticals can be formed from major mergers?



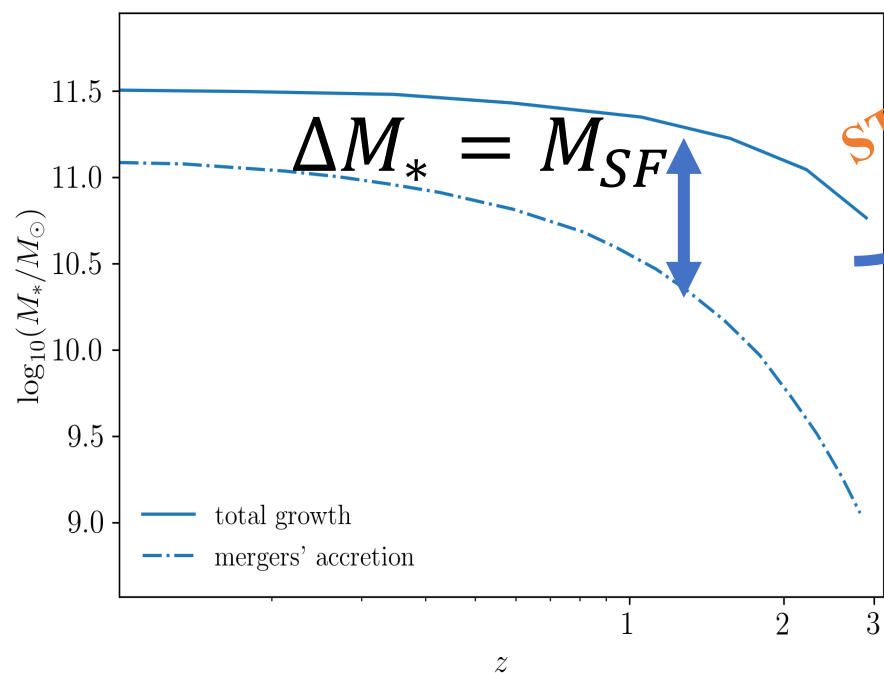
Is intra-cluster formed from stripping or mergers?



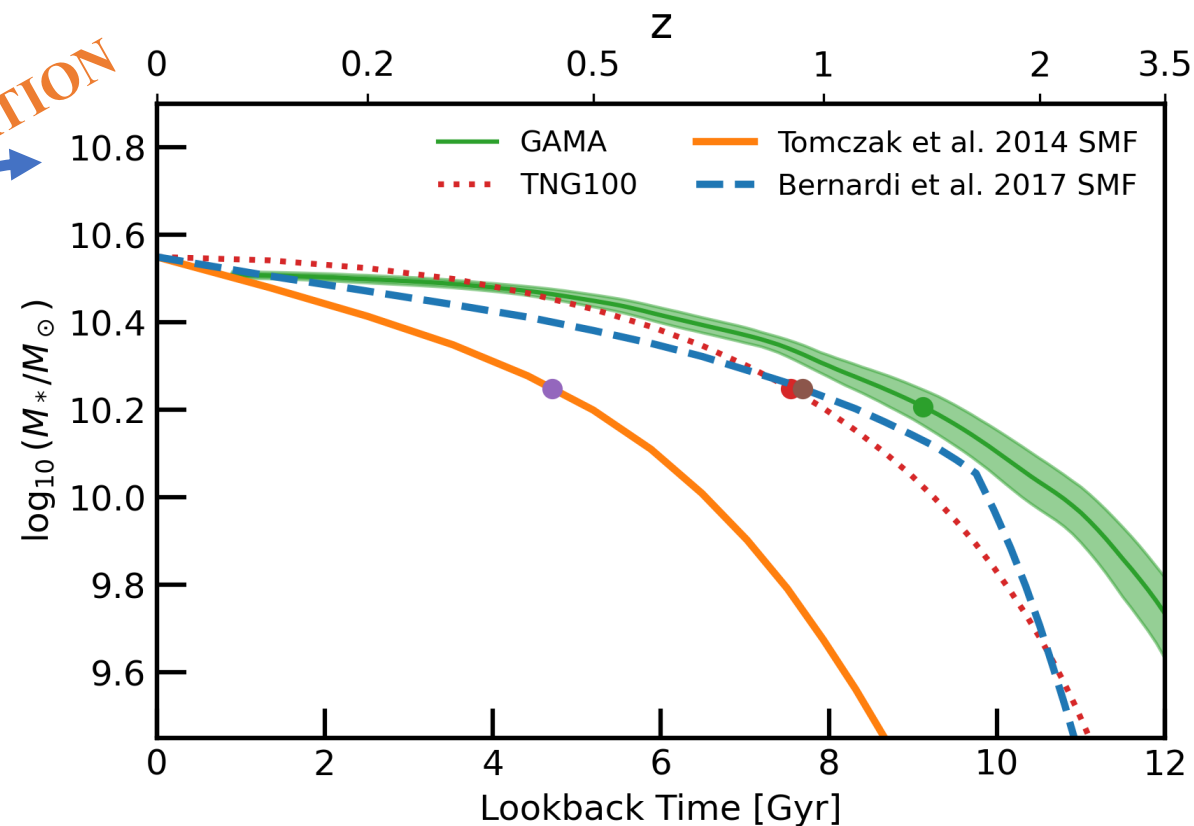
Star formation histories

Changing the SMHM relation strongly impacts the star formation history of galaxies

$$M_{tot} \sim M_{SF} + M_{mergers}$$



STAR FORMATION



Testing data self-consistency

EUCLID OBSERVATIONS

DECODE

Galaxy stellar
mass function

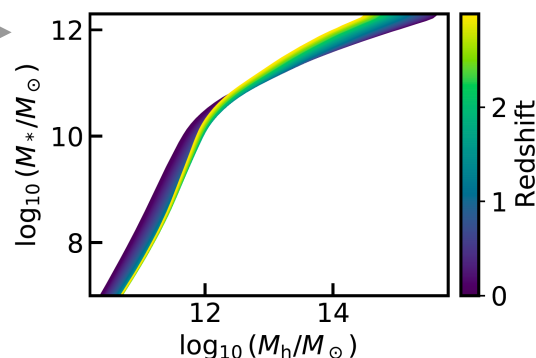
Star formation rates

Galaxy merger rates

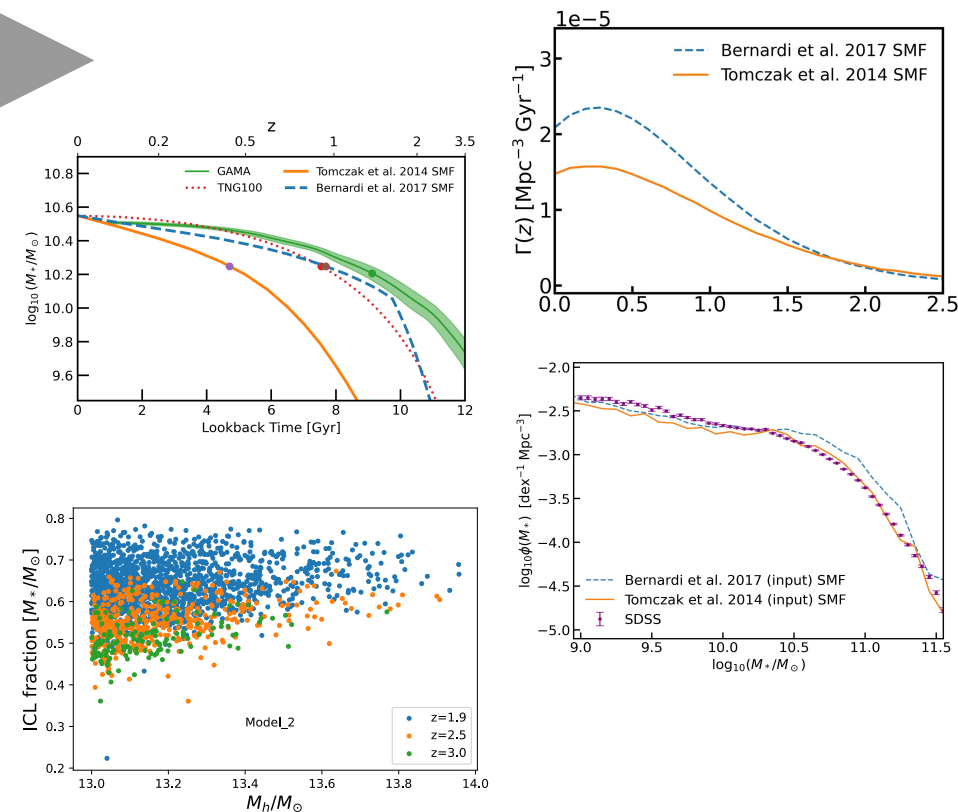
Morphology

Intra-cluster light

Abundance matching



Predicting mergers rates, SFRs, ICLs, etc...



To summarize, the SMHM relation has strong implications on:

- Galaxy merger rates (therefore elliptical, spiral and lenticular fractions);
- satellite abundances;
- star formation rates.

These quantities should be taken into account when producing a robust galaxy mock in a self-consistent way.