

Impact of baryons on the internal structure of haloes

Results from the EAGLE simulation suite

Matthieu Schaller & EAGLE team

ICC, Durham University

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The EAGLE simulation suite

Project Description

The Eagle simulations

Gas distribution in a cosmological volume (colour encodes temperature)

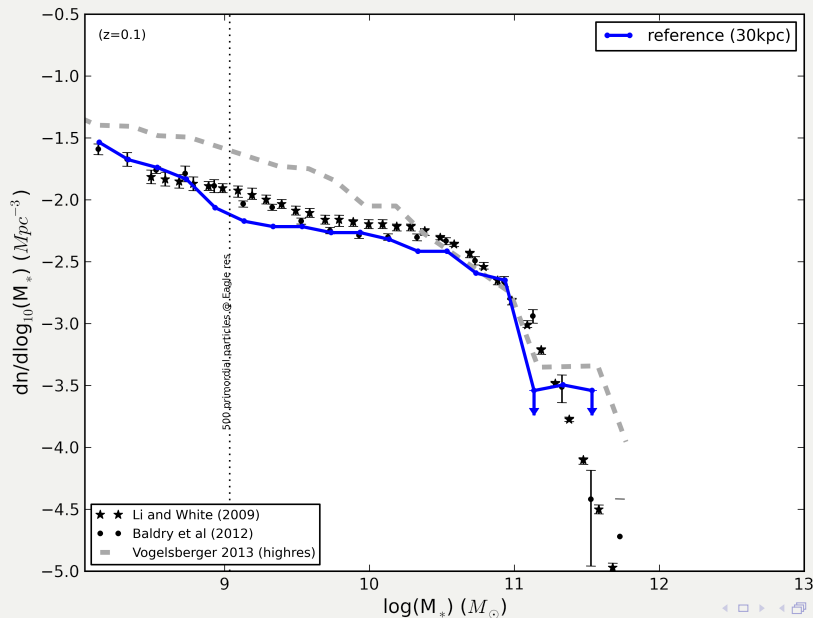
$z = 13.5$
 $t = 0.3 \text{ Gyr}$
 $L = 25.0 \text{ cMpc}$

Movie credits: R. Crain, J. Geach

- SPH simulation using an improved version of GADGET-3.
- Up to 100 Mpc box at $10^6 M_{\odot}$ gas mass resolution.
- Planck cosmology.
- State-of-the-art subgrid modelling:
 - ▶ Metal line cooling,
 - ▶ SF recipe obeying Kennicutt-Schmidt law,
 - ▶ Stellar evolution,
 - ▶ Gas enrichment from SNe & AGB stars,
 - ▶ Stellar feedback from SNe,
 - ▶ BH accretion,
 - ▶ AGN feedback.
- $> 10^3$ MW-like galaxies.

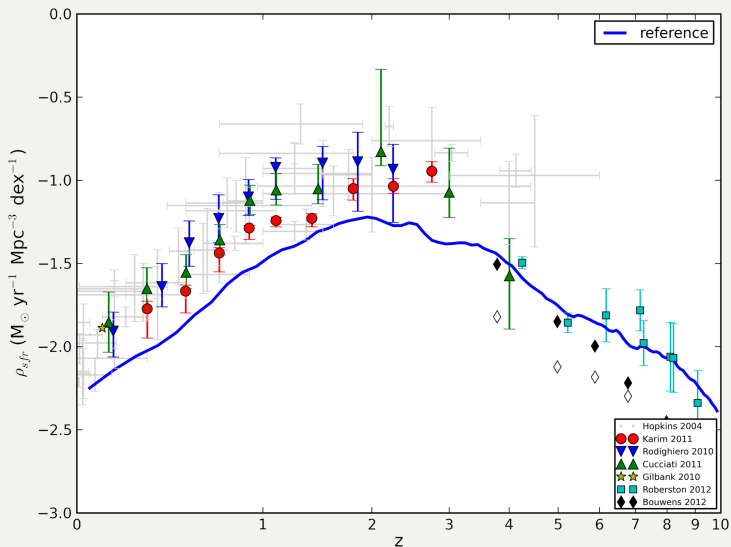
The EAGLE simulation suite

Goal: Reproduce the SMF at $z = 0$



The EAGLE simulation suite

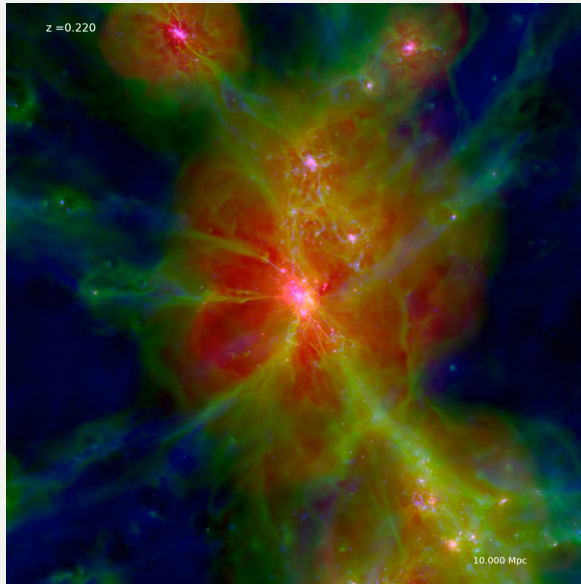
Reasonable star formation density evolution



Plot credits: M. Furlong

The EAGLE simulation suite

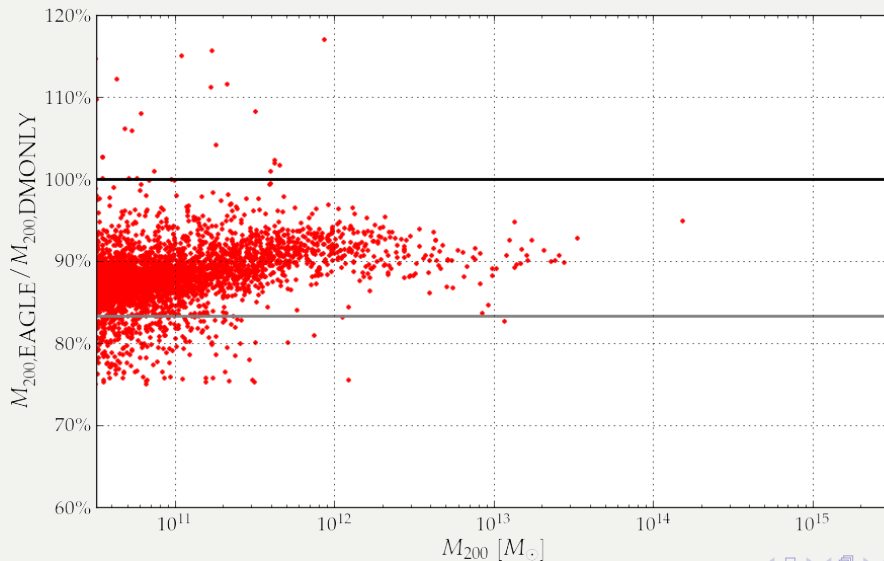
Zoom on one (big) halo



Movie credits: R. Bower

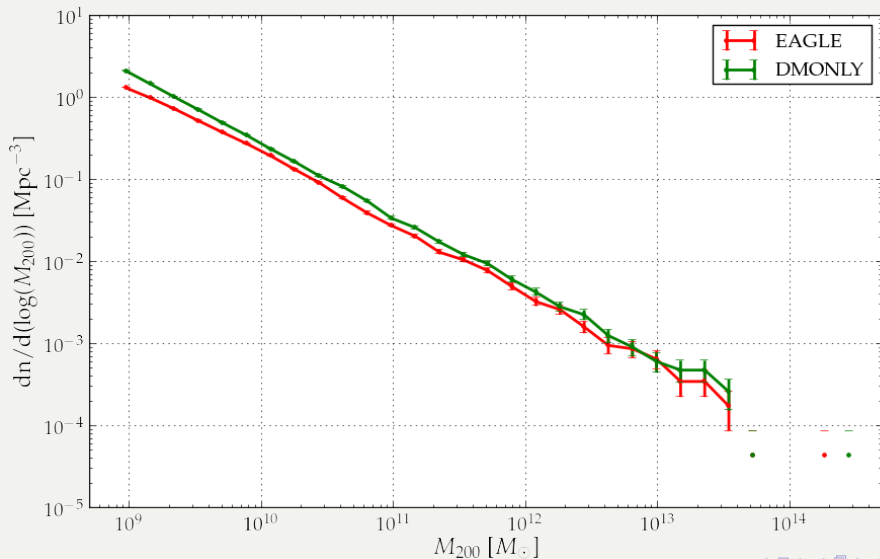
Halo Mass

Comparison between DM-only run and full EAGLE



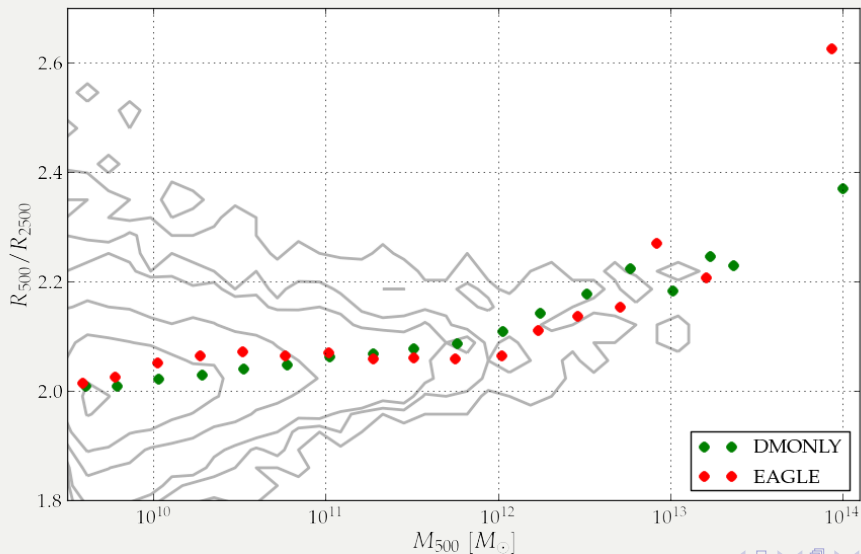
Halo Mass

Effects on the Halo Mass Function



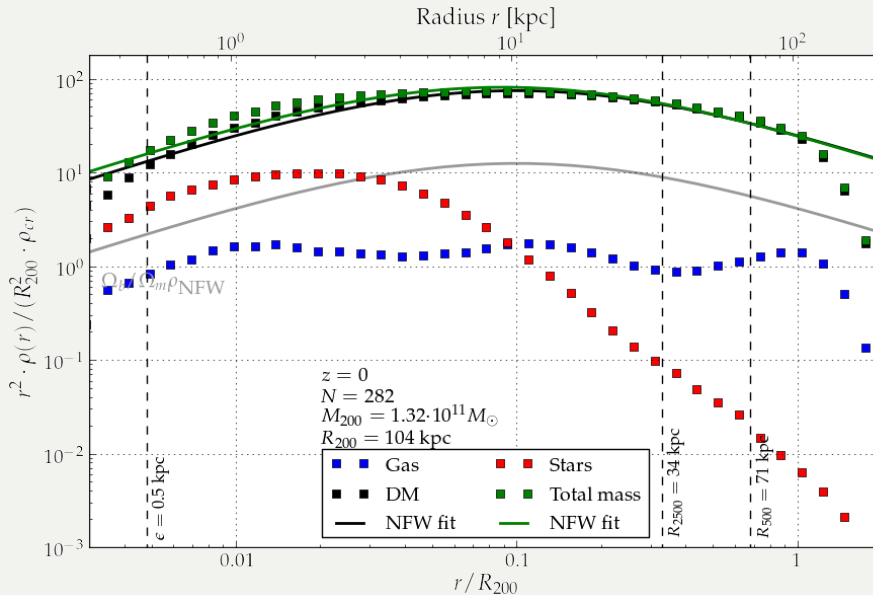
Halo Density Profiles

Non - parametric profile



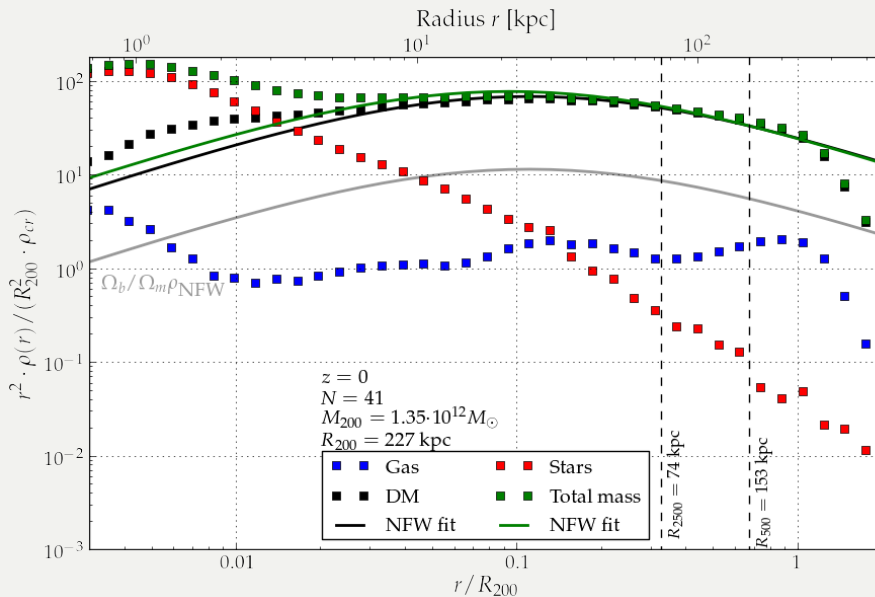
Halo Density Profiles

Stacked $10^{11} M_{\odot}$ halo



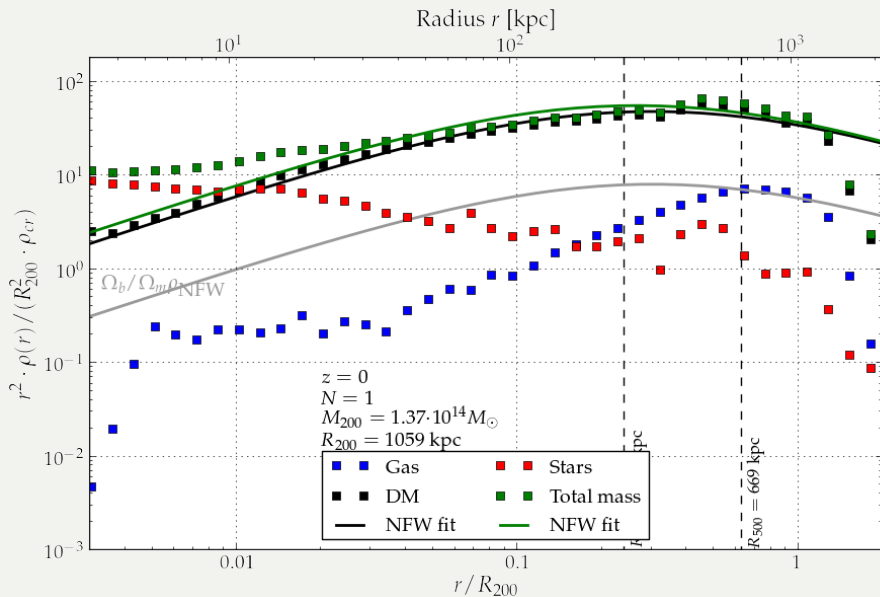
Halo Density Profiles

Stacked $10^{12} M_{\odot}$ halo



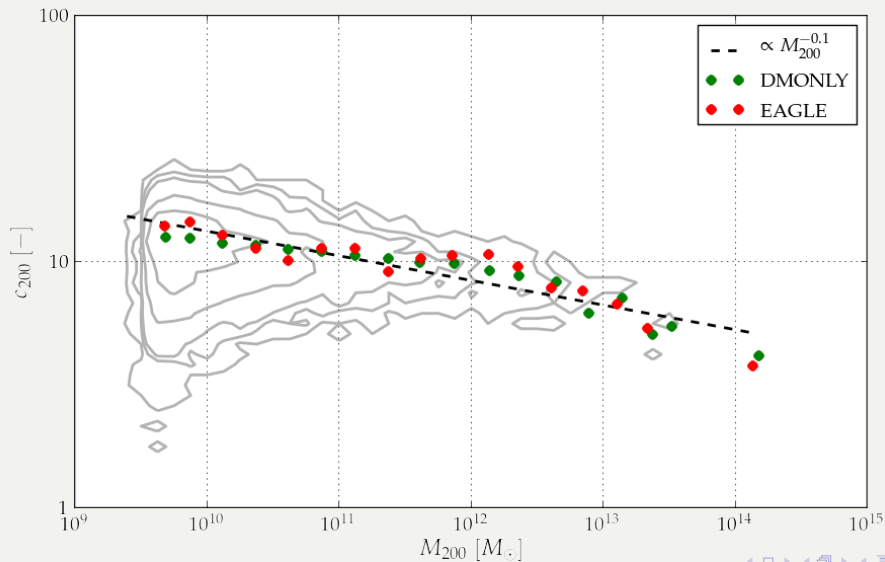
Halo Density Profiles

Stacked $10^{14} M_{\odot}$ halo



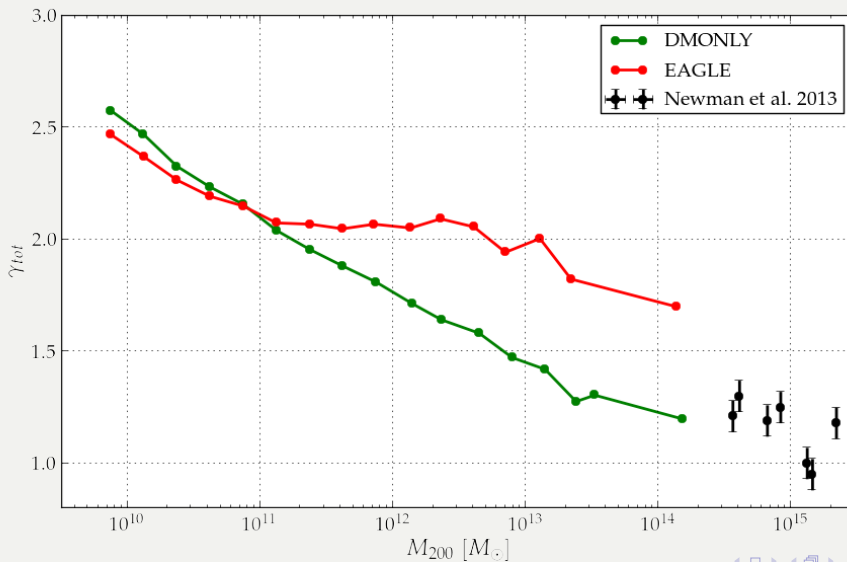
Halo Density Profiles

Mass - Concentration relation



Halo Density Profiles

Inner slope in range $0.003R_{200} - 0.03R_{200}$



- The EAGLE simulations suites are important tools to help constrain future measurements and local cosmological probes.
- The inclusion of baryons in simulations shifts the HMF by $\sim 10\%$.
- Haloes seem to have lost part of their baryons before $z = 0$.
- Haloes density profiles are well described by NFW profiles in their outerparts.
- The inner slope of the profile significantly departs from NFW.
Hint for deviation from CDM when combined with observations ?