

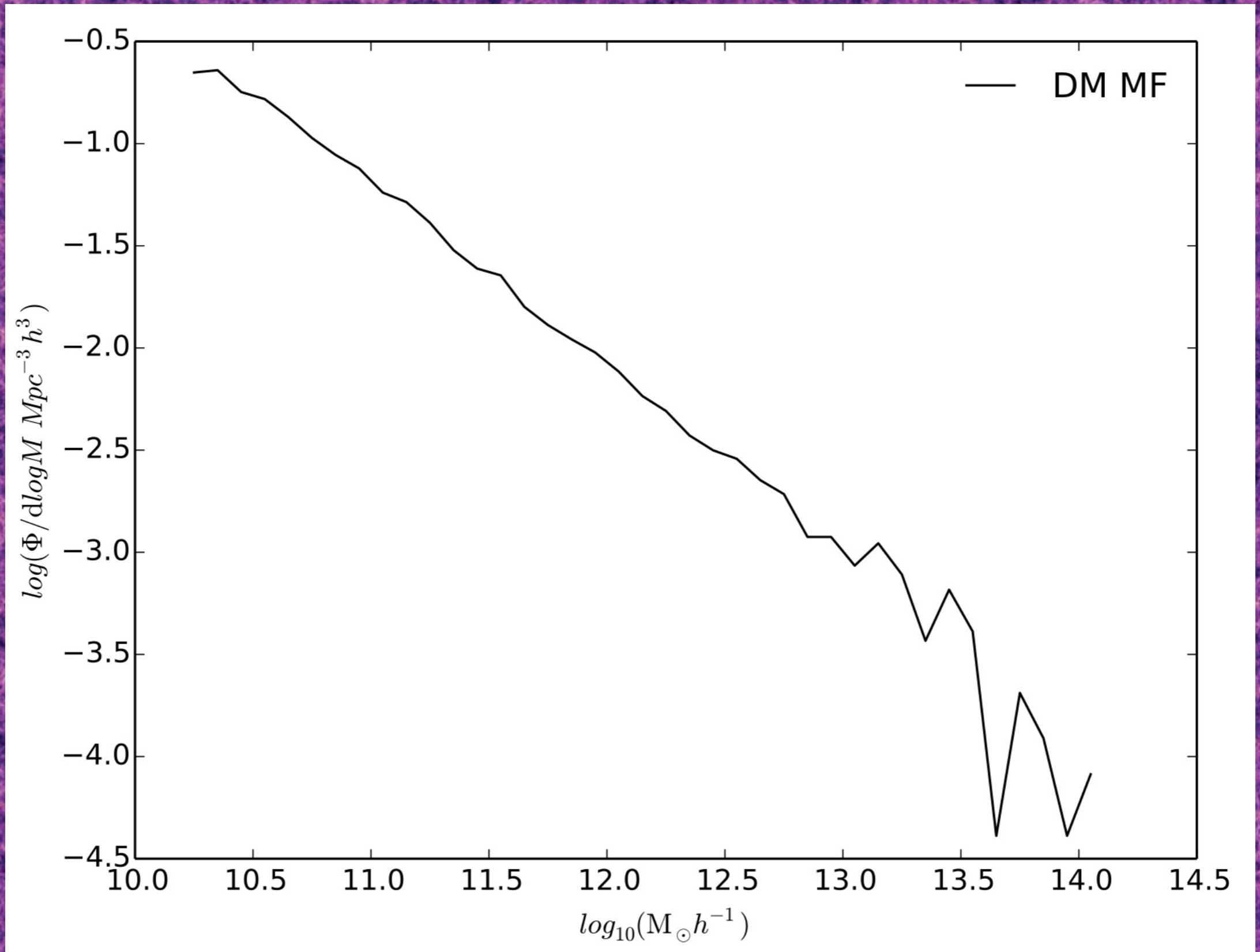


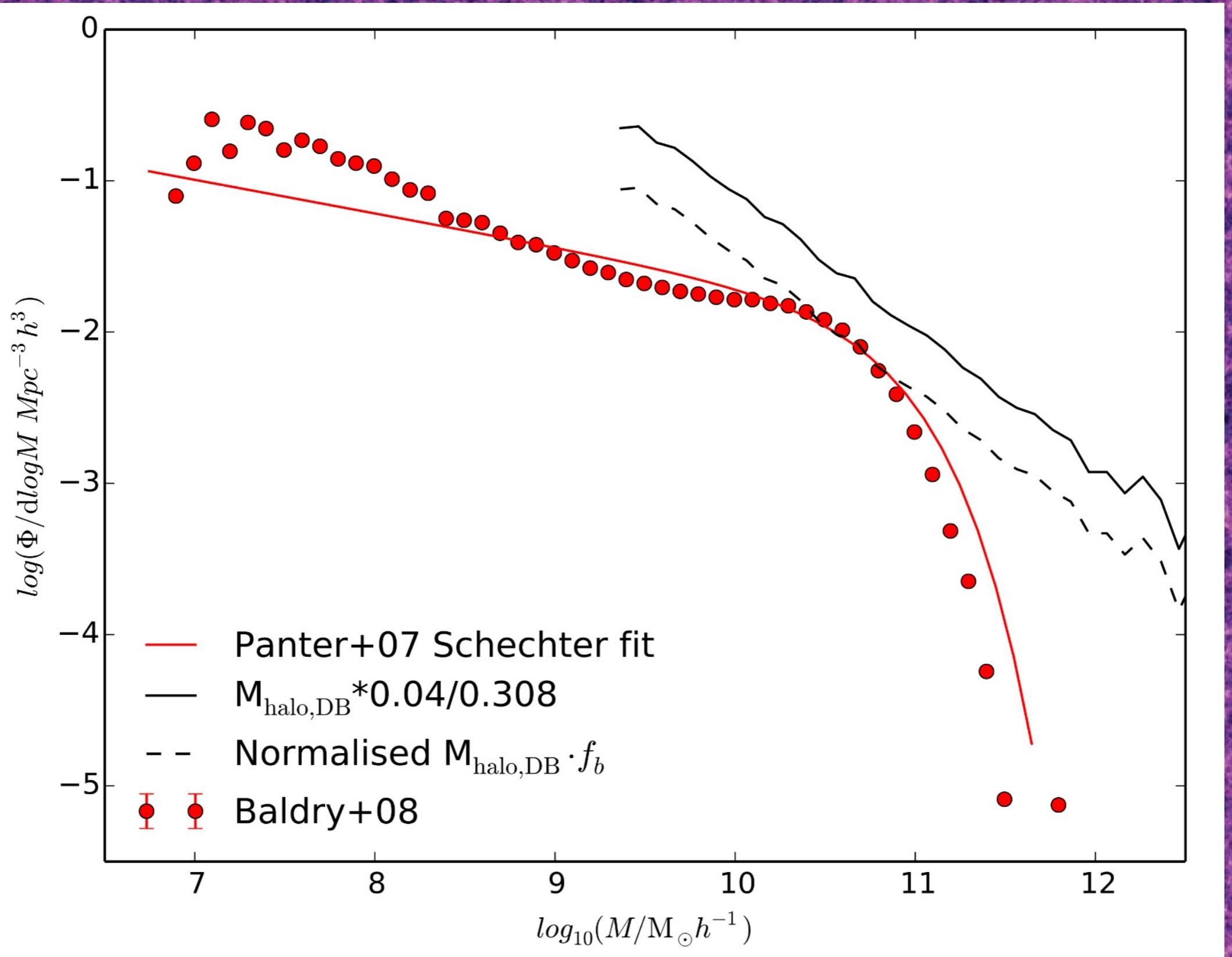
Why do we model galaxies?

Violeta Gonzalez-Perez @violegp

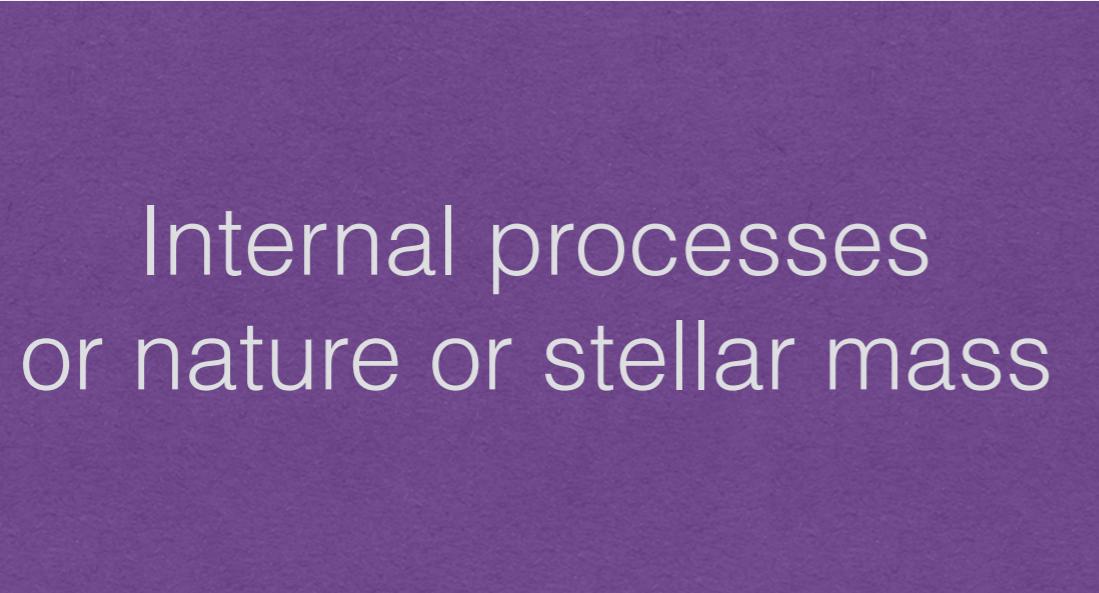


From the CosmicUniverse App

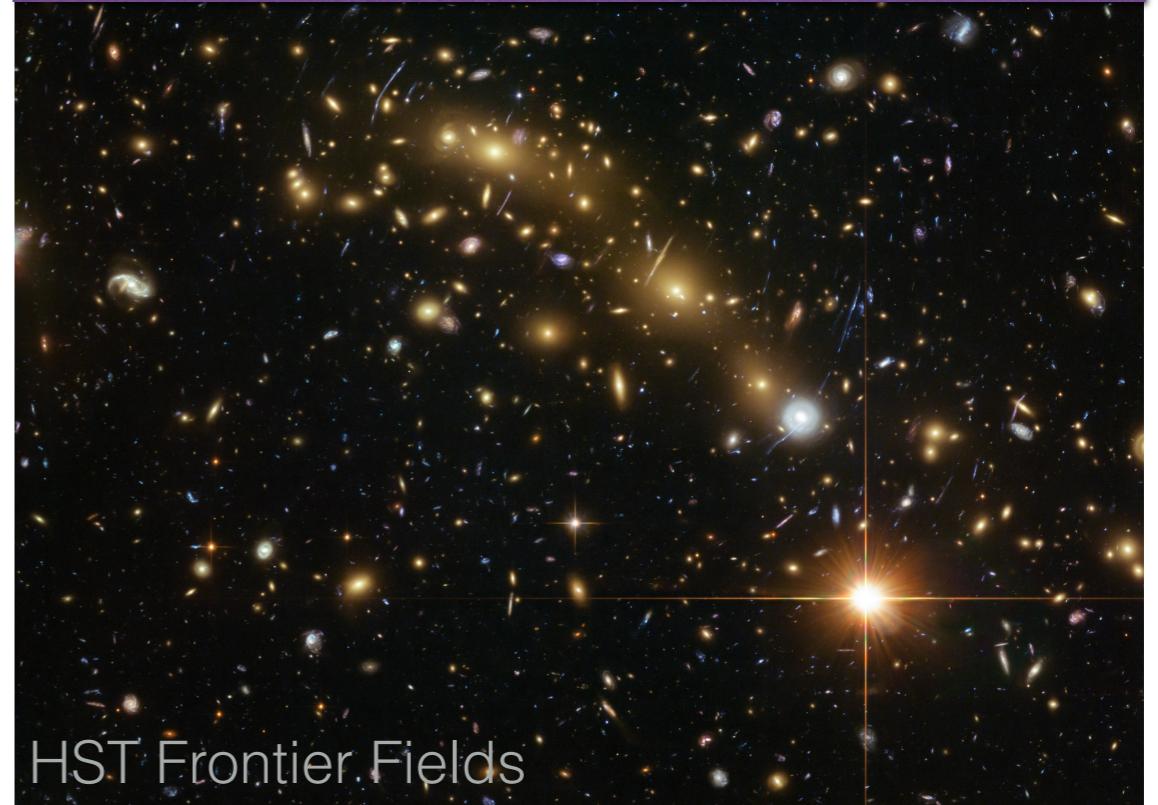
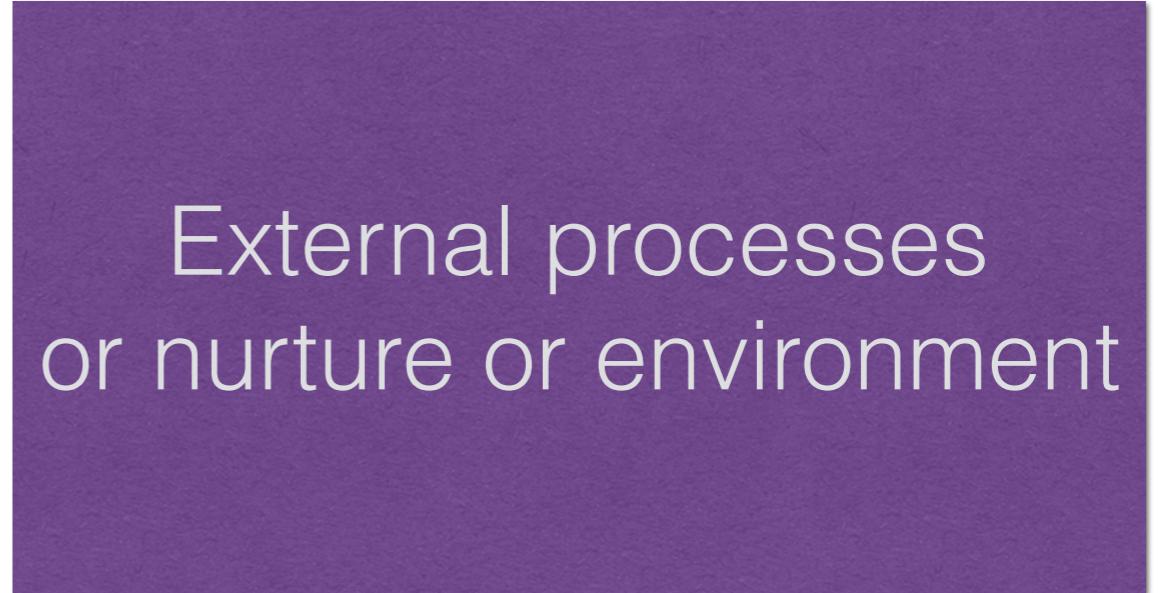




The star formation in galaxies can be regulated by



NGC 4414



HST Frontier Fields

which ones dominate depend on being
central/satellites, z, etc.

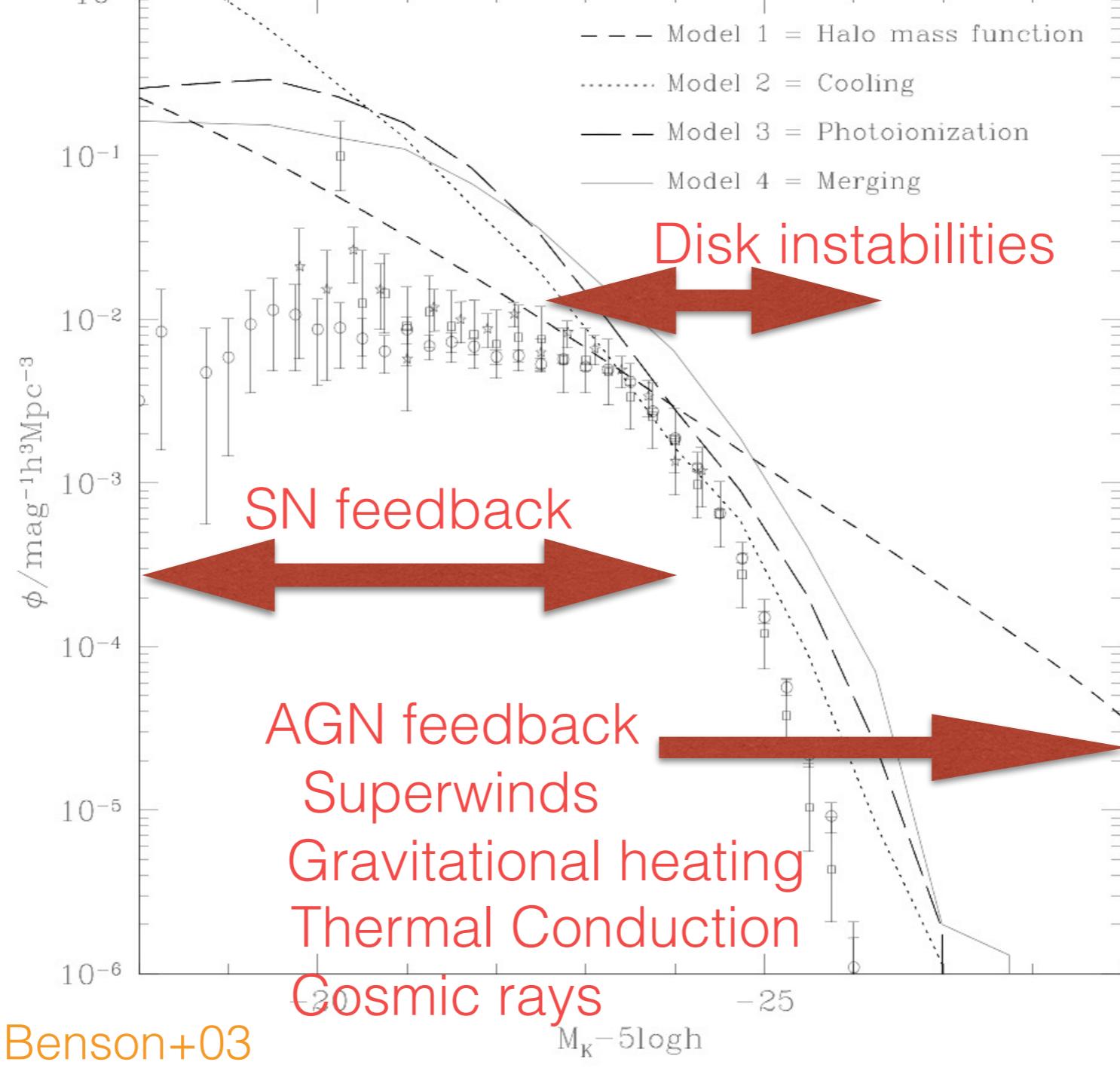
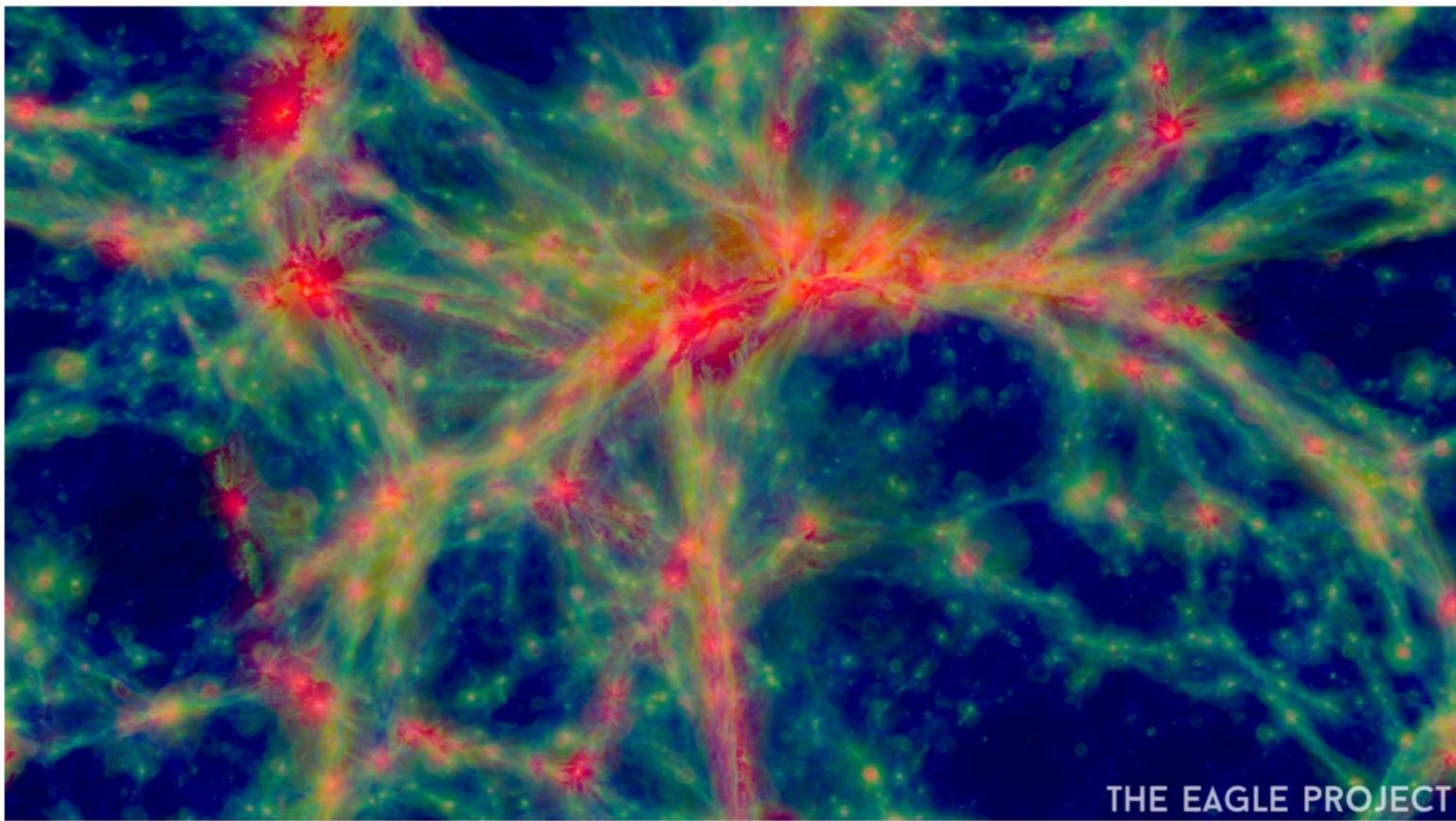


FIG. 1.—*K*-band luminosity function of galaxies. The points show the observational determinations of Cole et al. (2001; *circles*), Kochanek et al. (2001; *squares*), and Huang et al. (2003; $z < 0.1$, *stars*). Lines show model results. Model 1 (*dashed line*) shows the result of converting the dark matter halo mass function into a galaxy luminosity function by assuming a fixed mass-to-light ratio chosen to match the knee of the luminosity function. Model 2 (*dotted line*) shows the result from GALFORM when no feedback, photoionization suppression, galaxy merging, or conduction is included. Models 3 and 4 (*long-dashed and solid lines, respectively*) show the effects of adding photoionization and then galaxy merging.

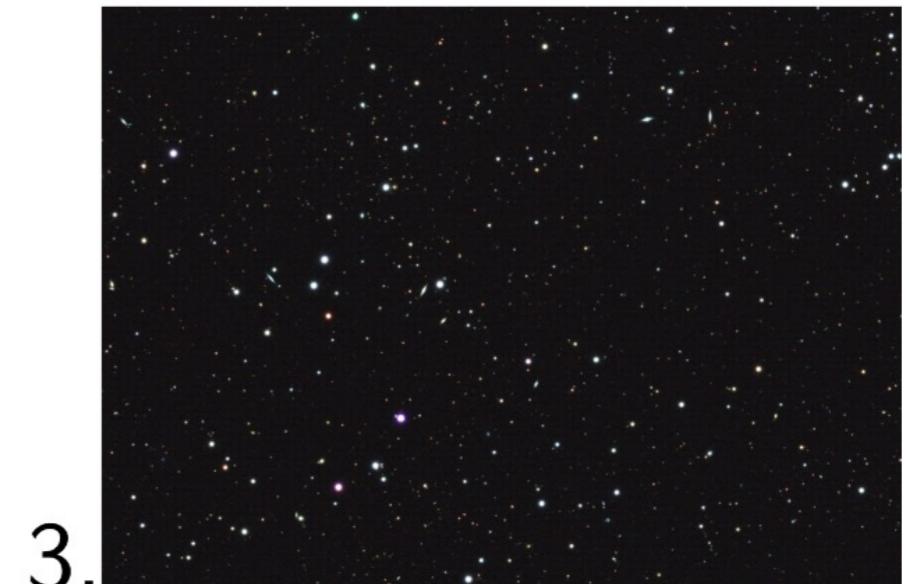
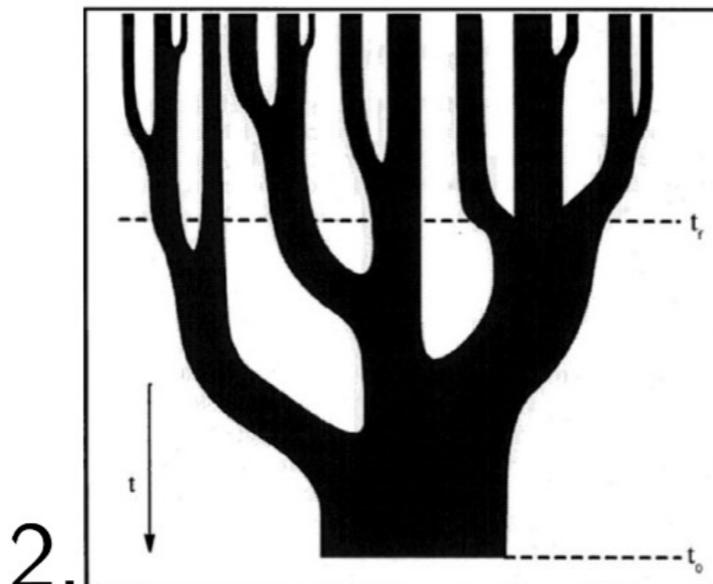
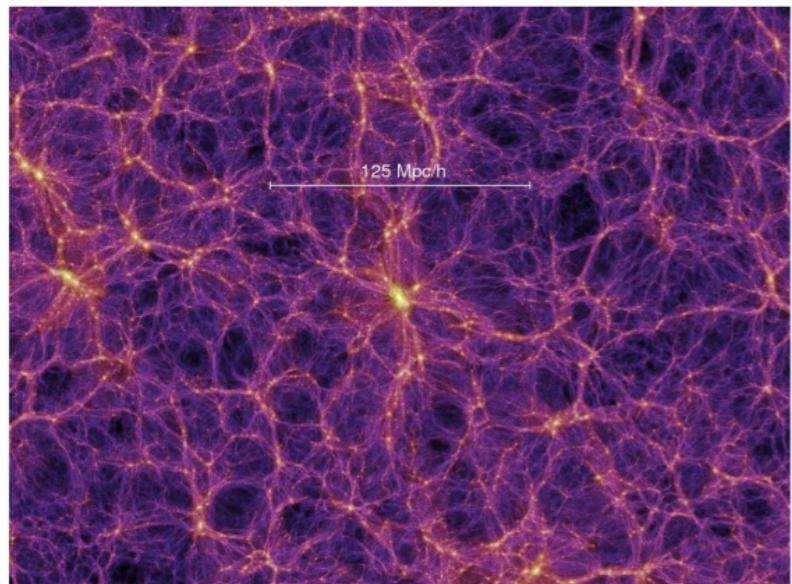


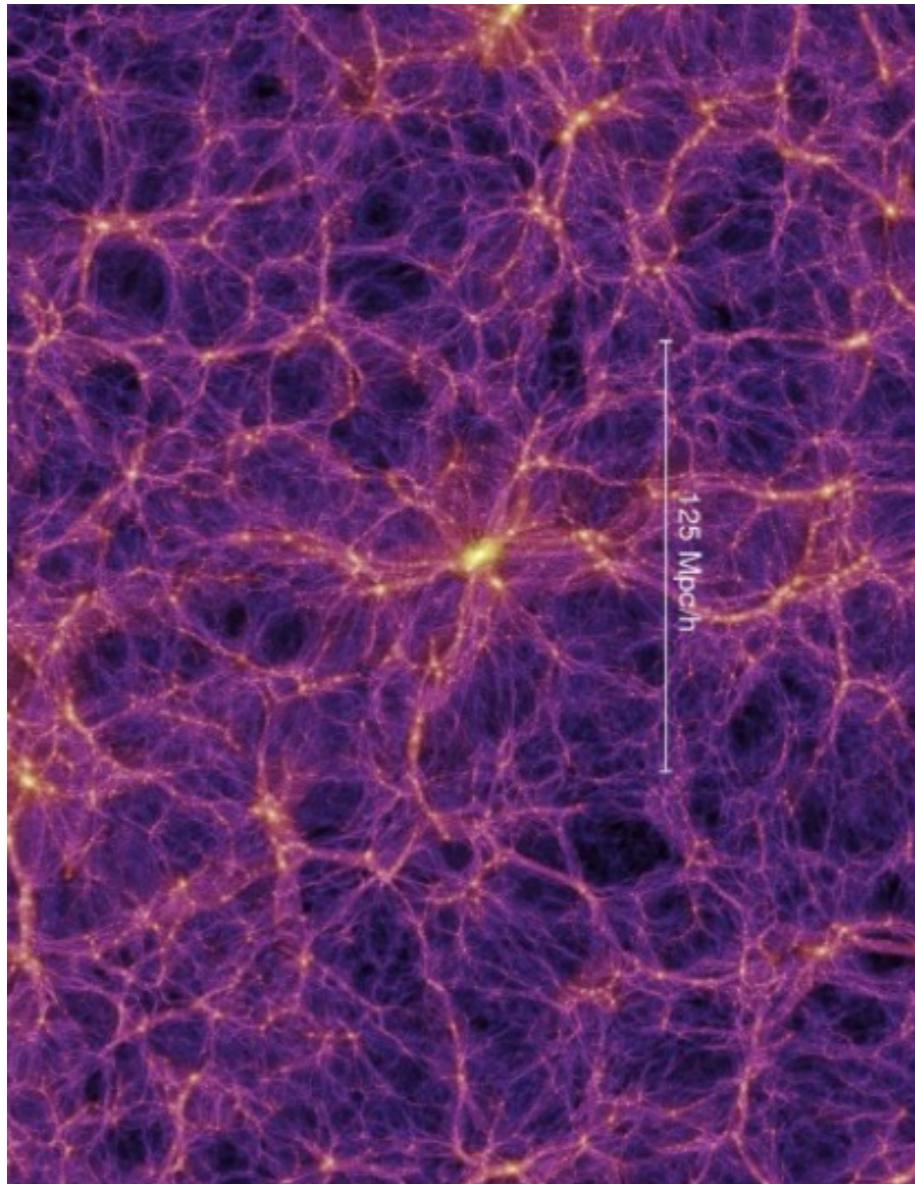
Violeta Gonzalez-Perez

a) In parallel: hydrodynamical simulations



b) In series: SAMs, EMs, SHAMs, HOD modelling



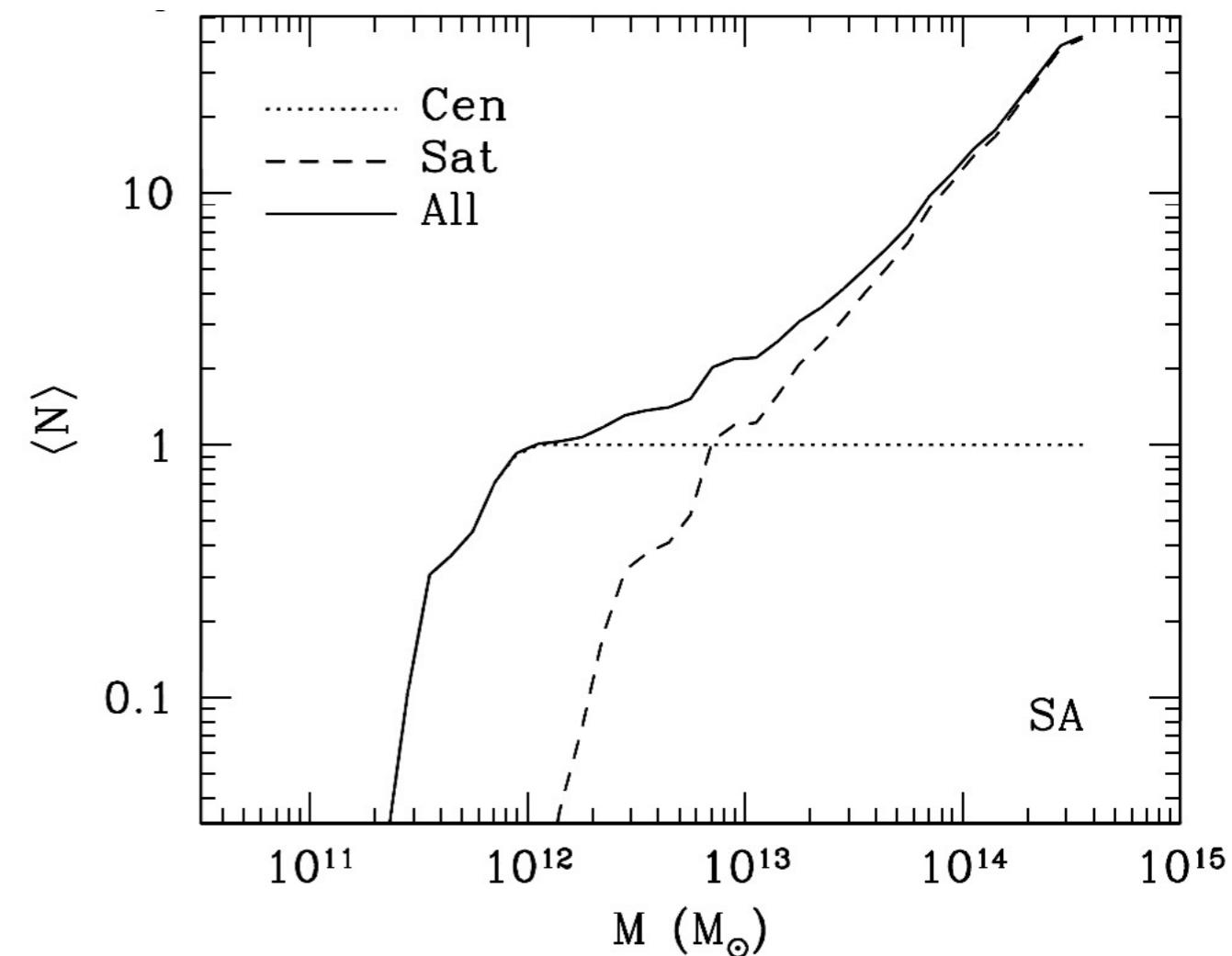
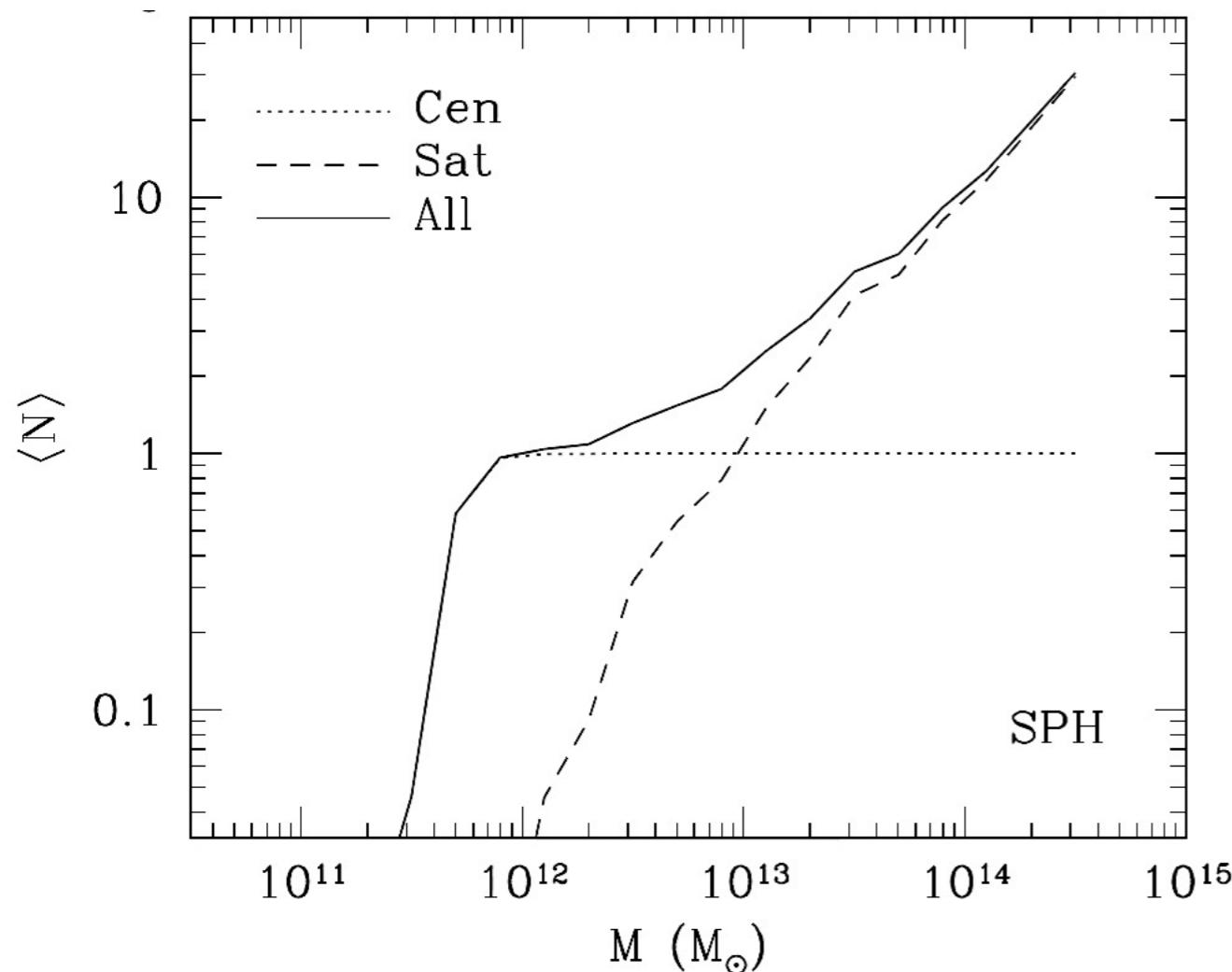


Empirical models,
(sub) halo
abundance
matching,
halo occupation
distribution
models



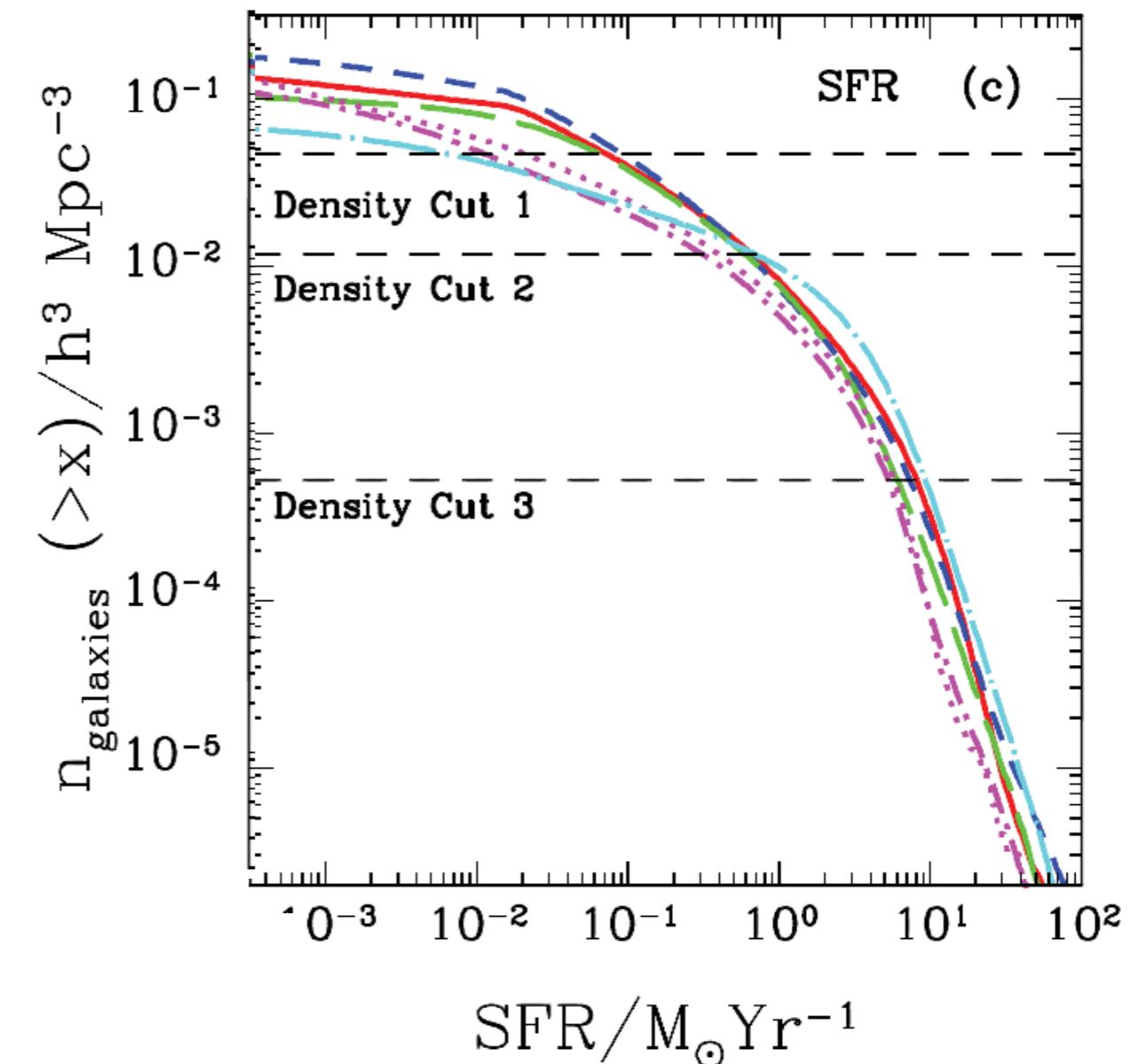
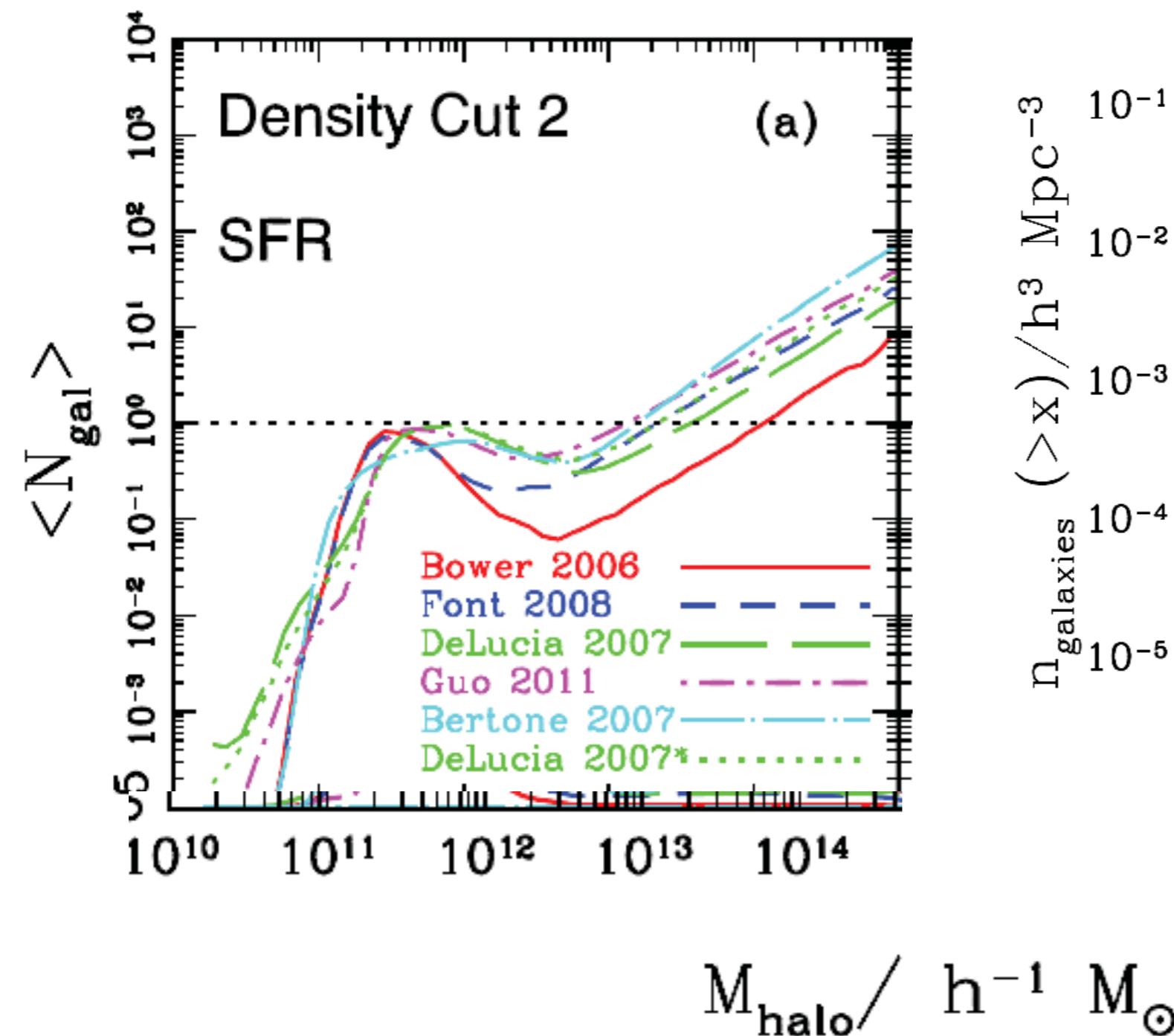
Great for very large scales but contain limited information about the physics shaping the properties of galaxies

The HOD for a mass-selected sample of galaxies

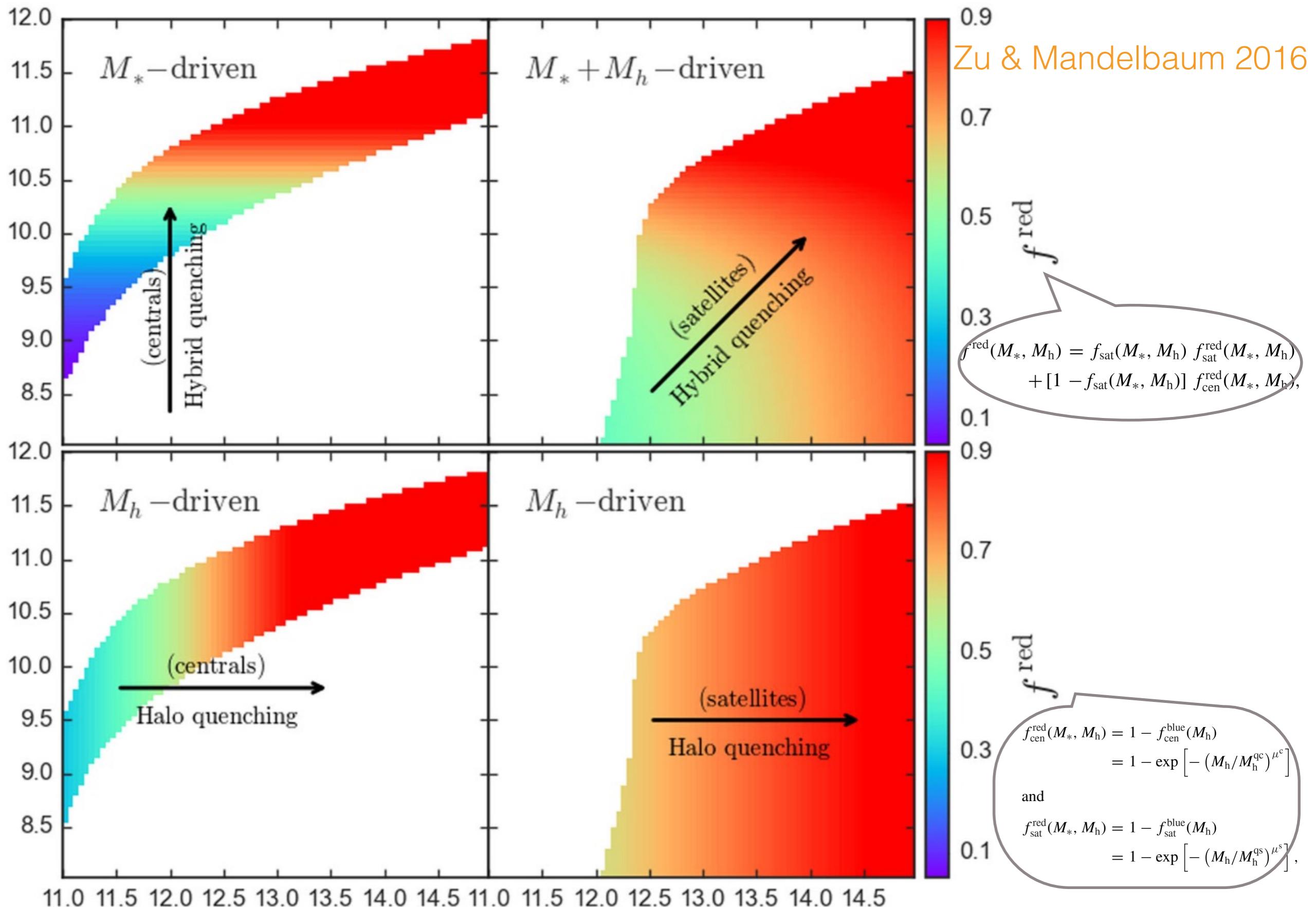


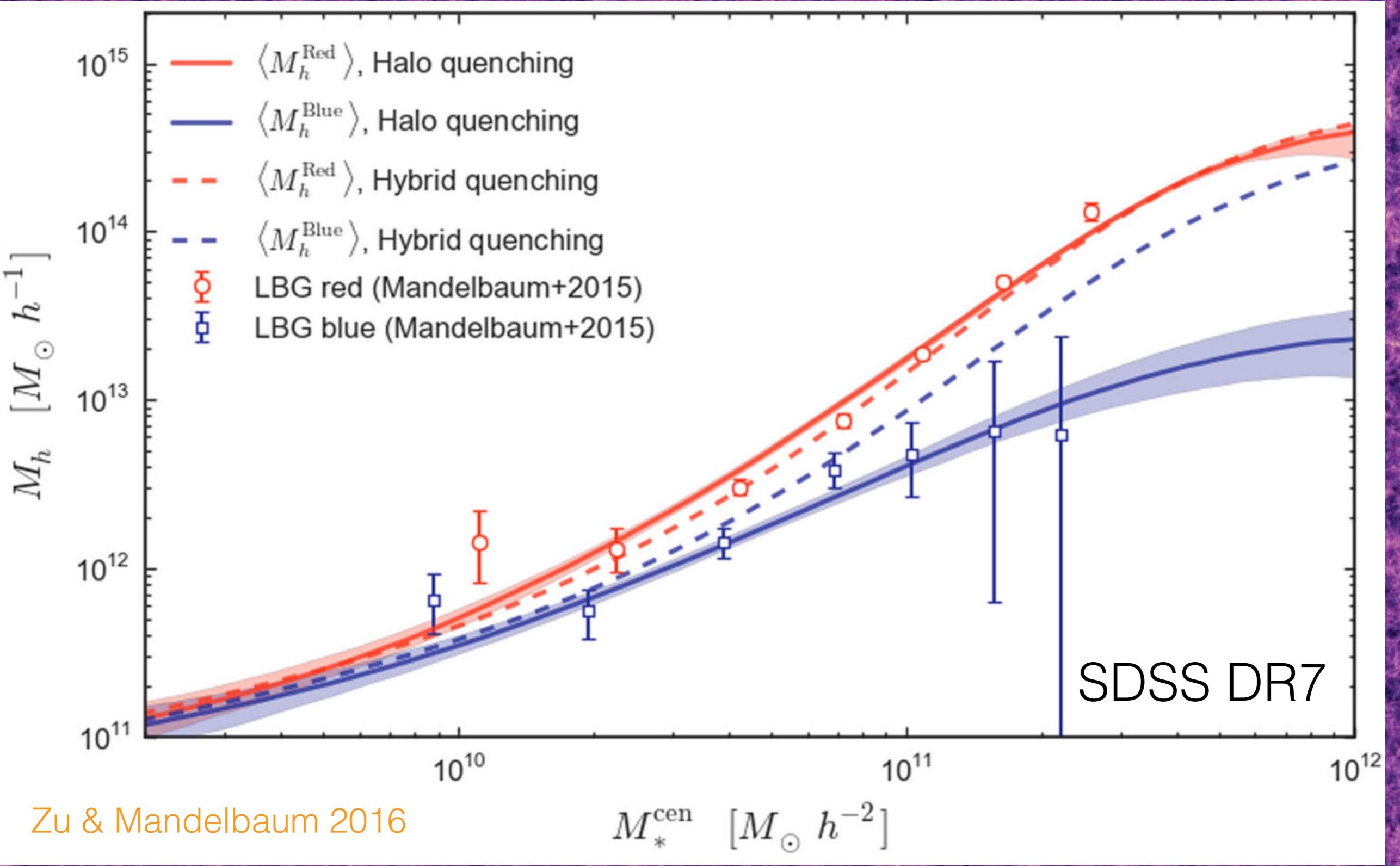
Zheng 2005

The HOD for a SFR-selected sample of galaxies

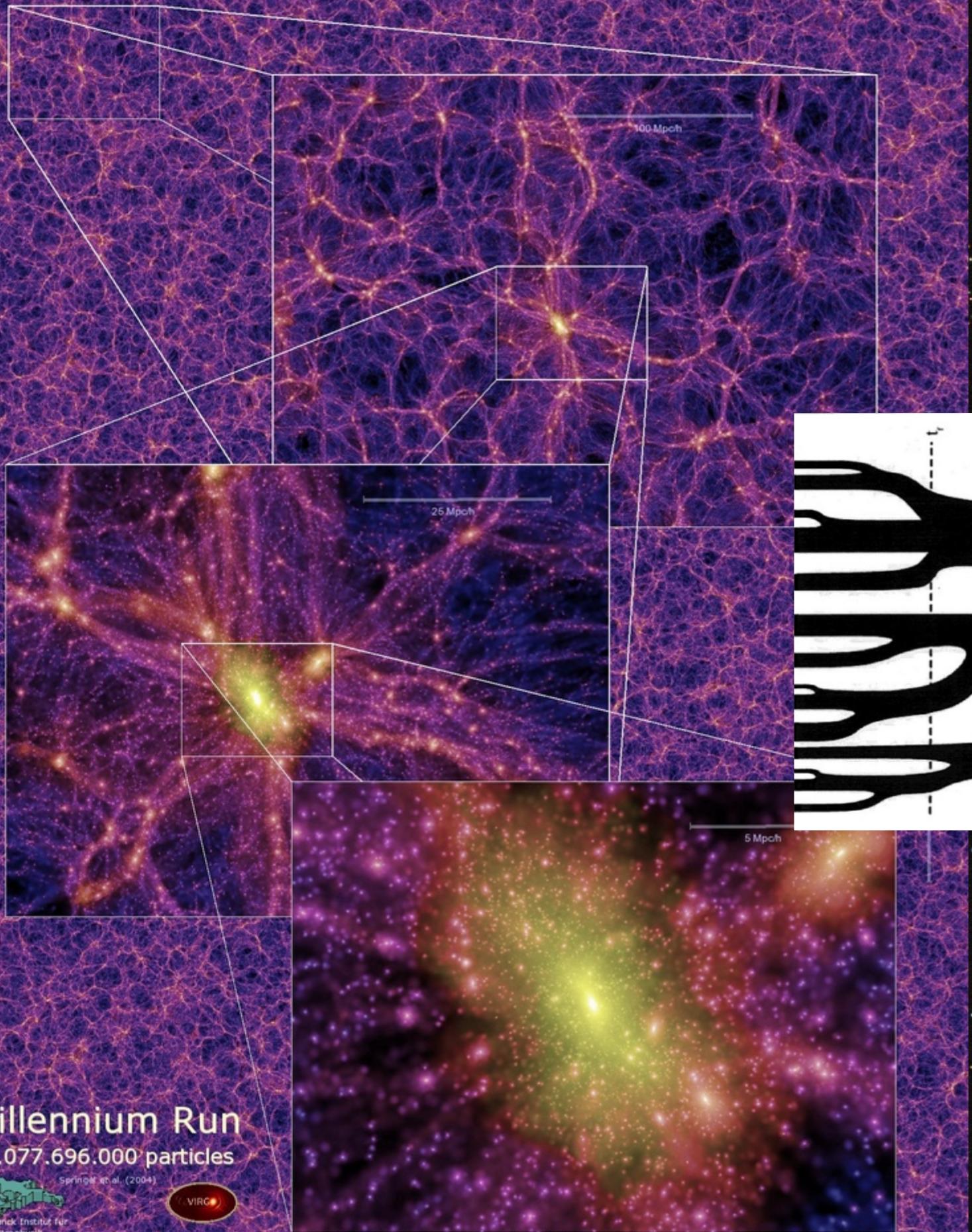


Contreras 2013

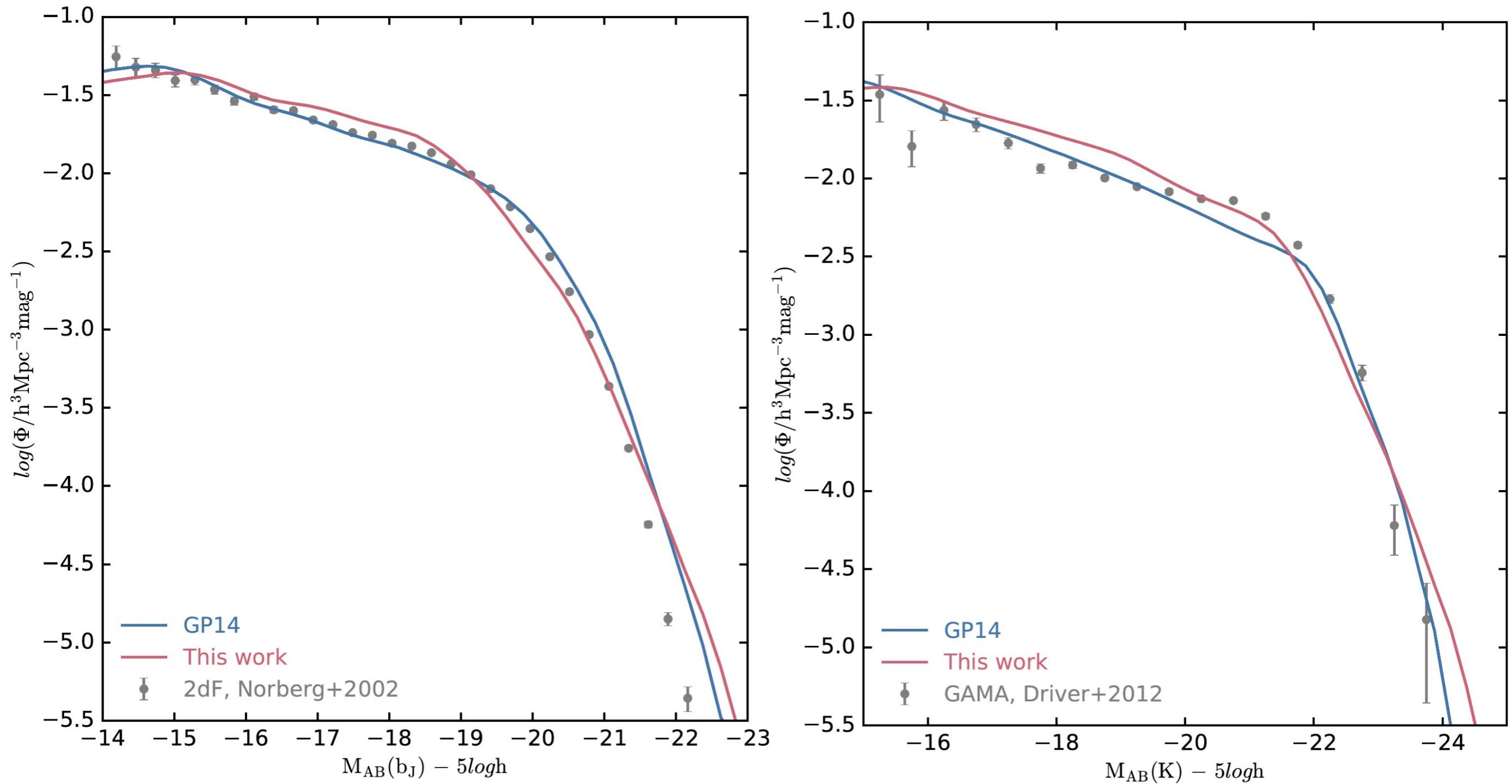


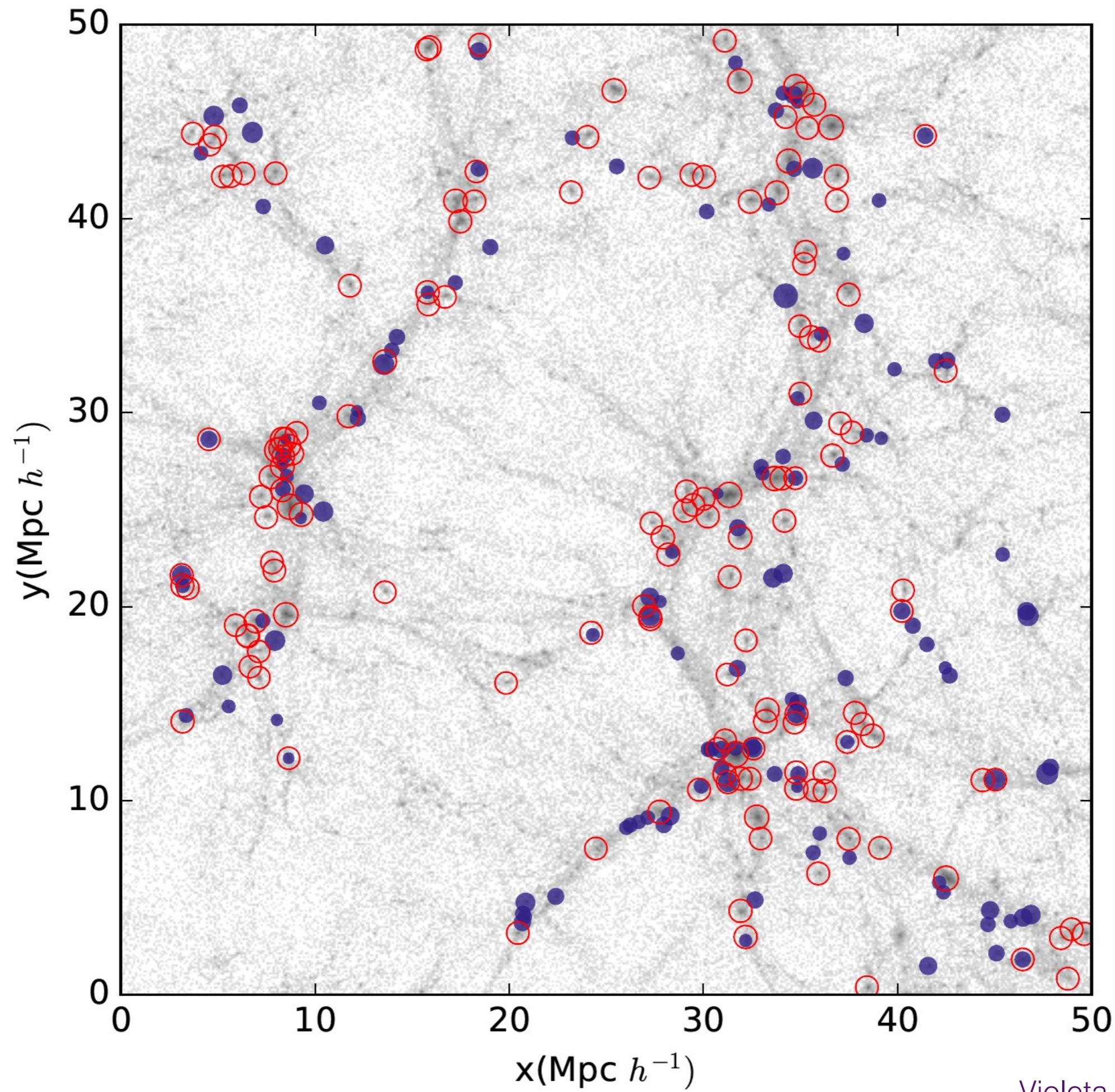


Galform



The GALFORM flavour used for this work: calibration





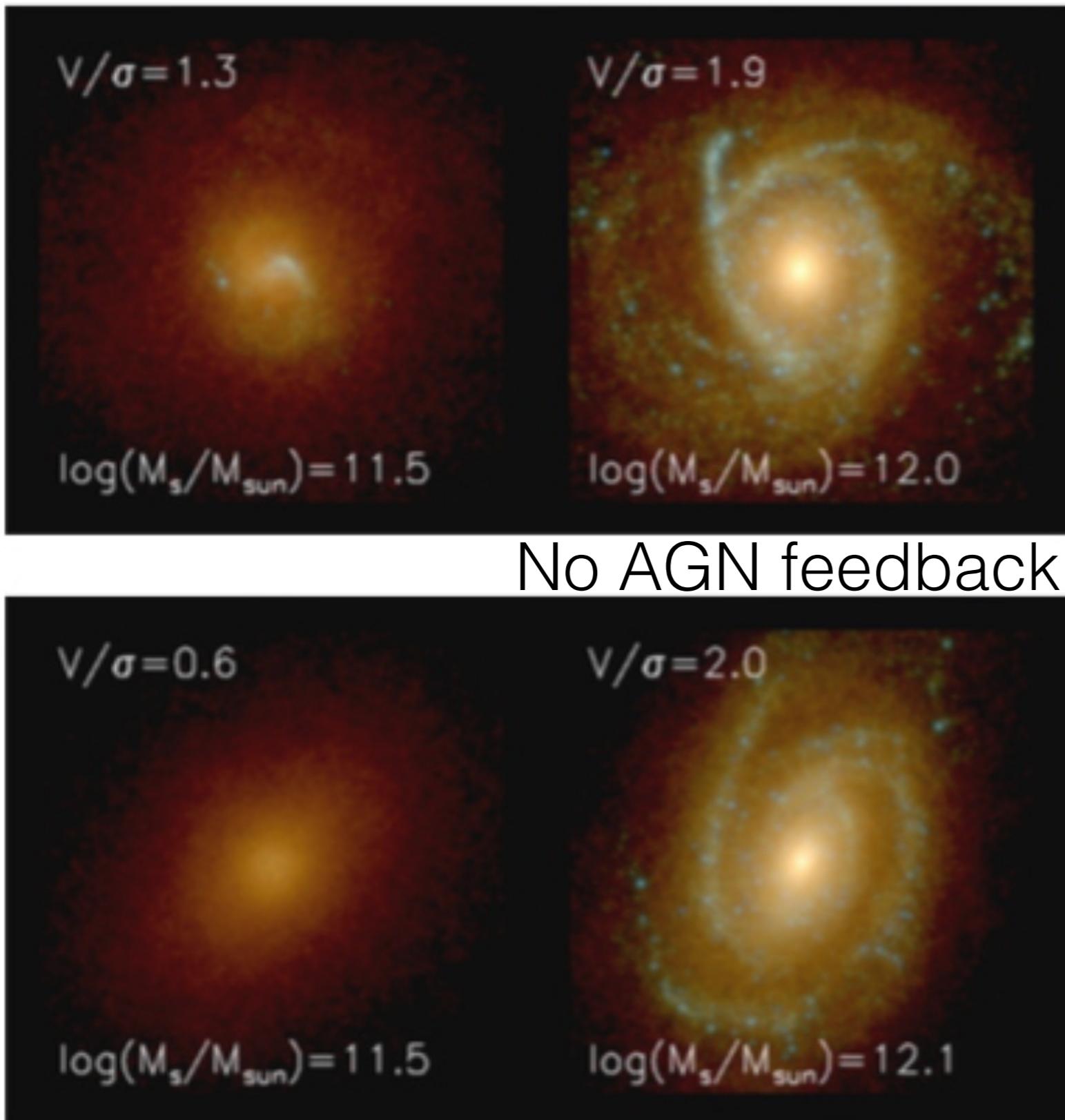
Gas

Dark
Matter

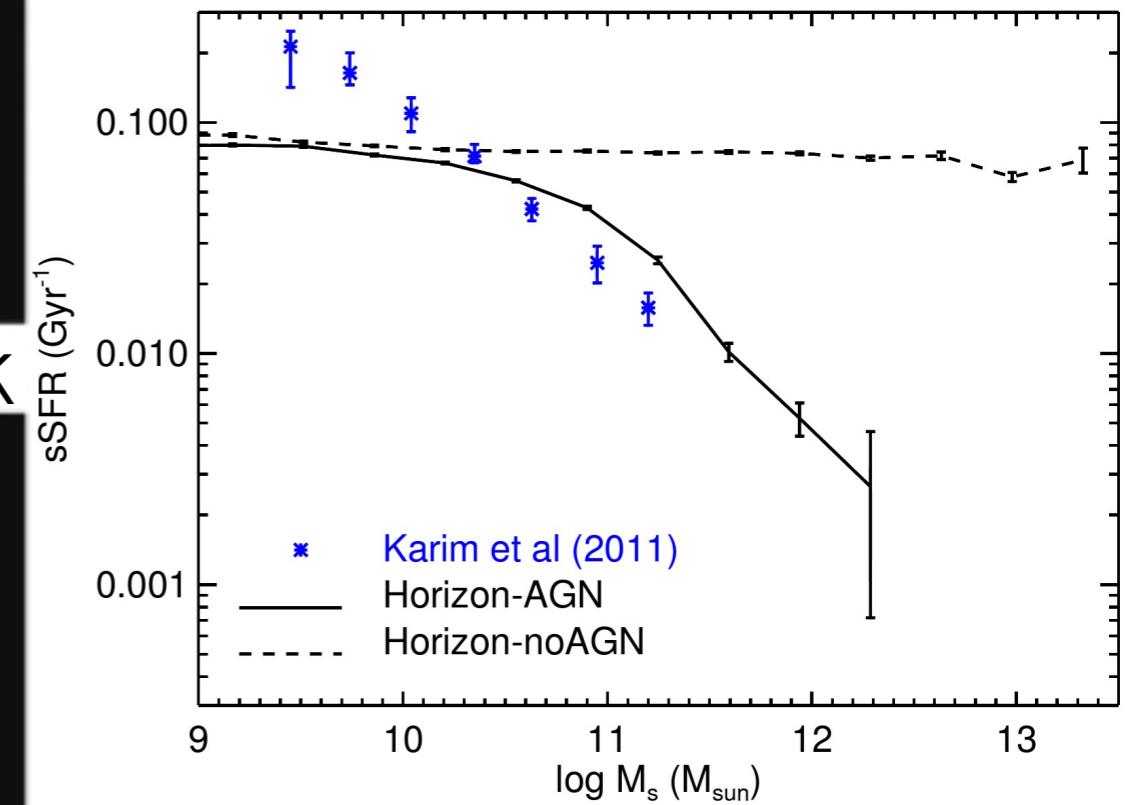
Hydrodynamical simulations: The Eagle project

Stars

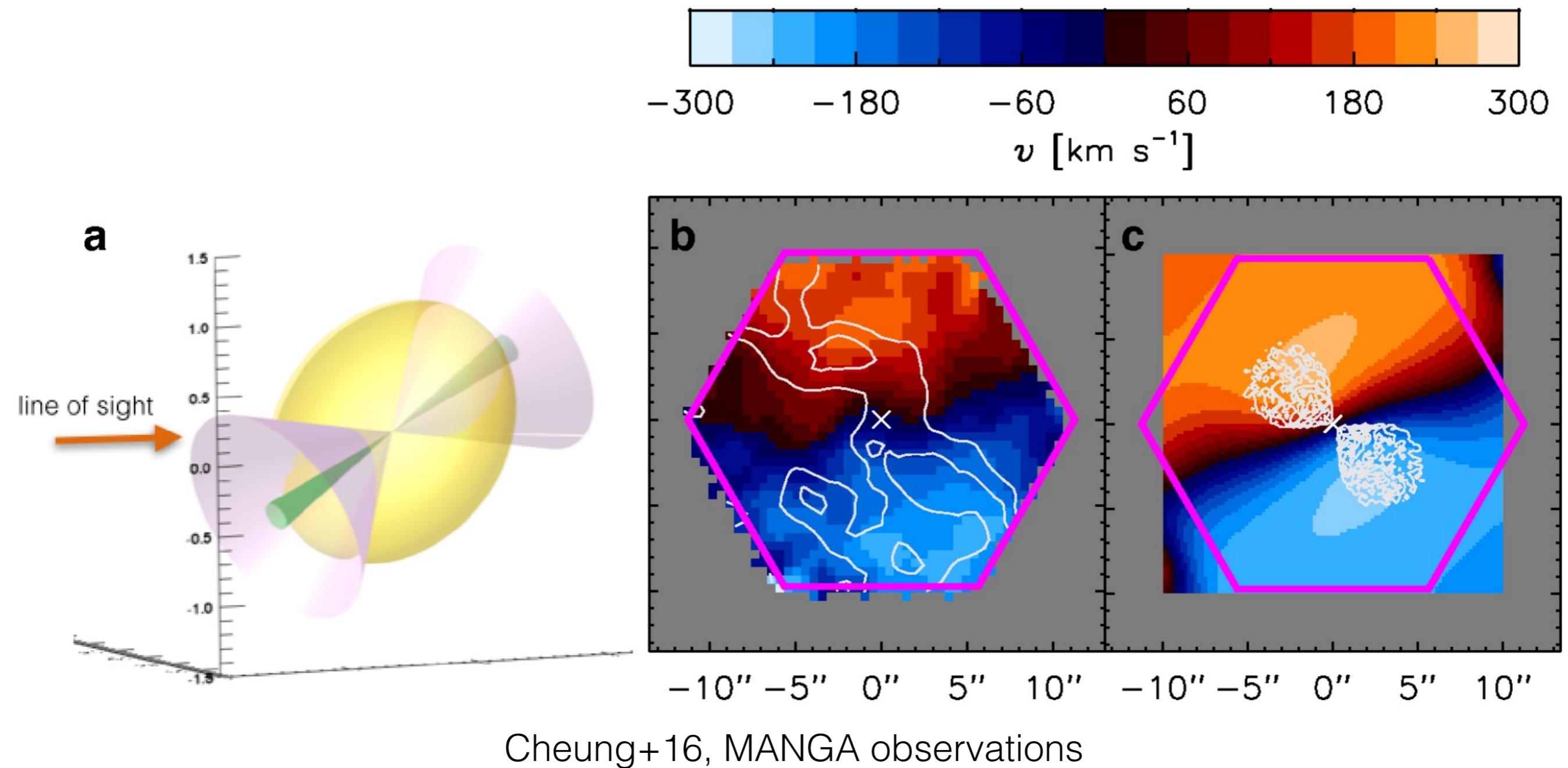
Cold
gas

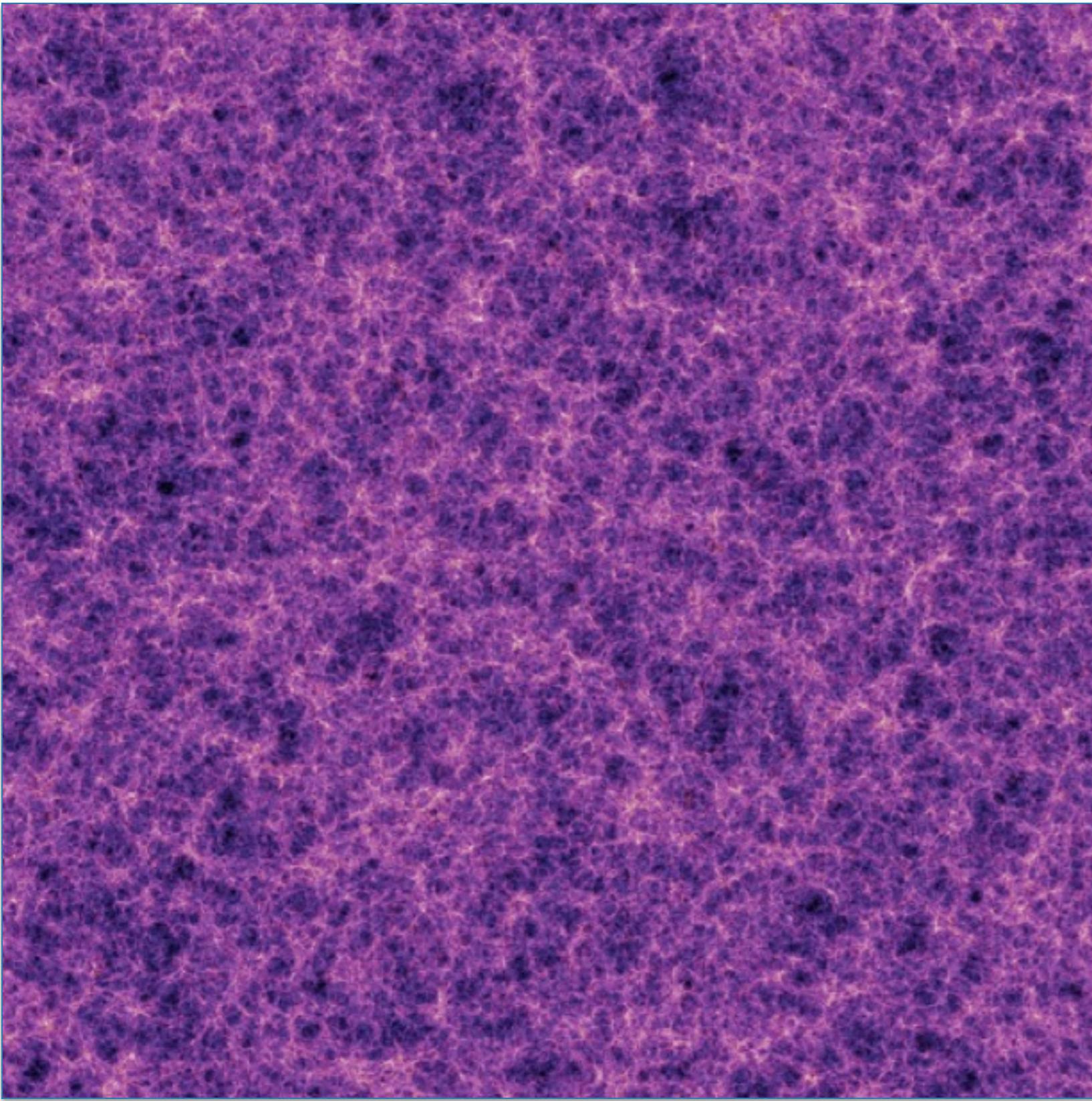


Dubois+16, Horizon-AGN simulations

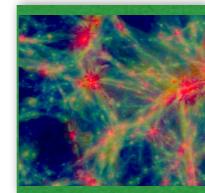


Which type of AGN feedback?

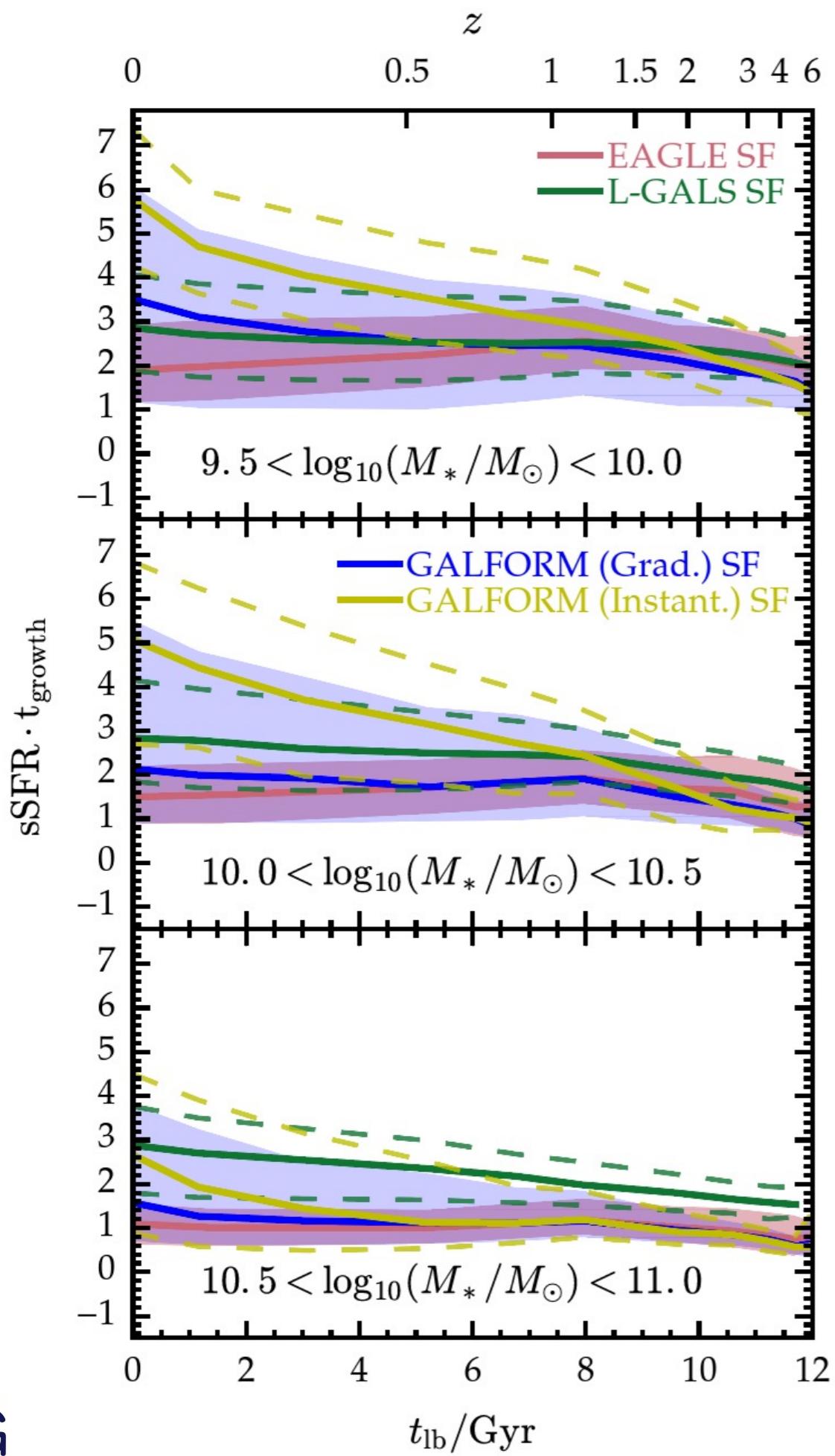




Millennium type
simulation



The Eagle
simulation



$$t_{\text{growth}}^{-1} (\text{Gyr}^{-1}) = \frac{\text{d}M/\text{dt}}{M(z)}$$

$$M(z) = M_0(1+z)^\alpha e^{\beta z}$$

Guo, VGP+16

Violeta Gonzalez-Perez

Model galaxies are publicly available



- **http:**
`//www.virgo.dur.ac.uk/`
- **https:**
`//tao.asvo.org.au/tao/`
- `https://github.com/darrencroton/sage`
- `http://galacticusblog.blogspot.com.au/`
- **http:**
`//galformod.mpa-garching.mpg.de/public/LGalaxies/`
- Coming soon: Multidark galaxies