Dwarf galaxy mergers

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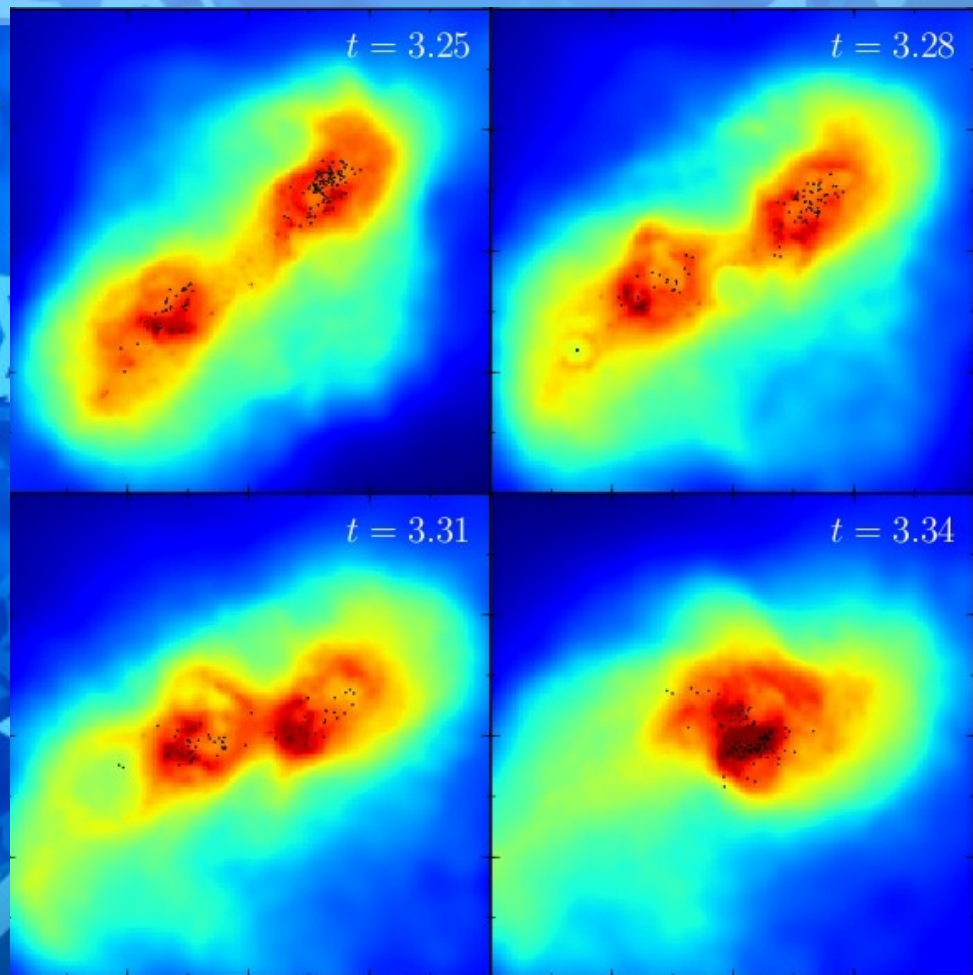
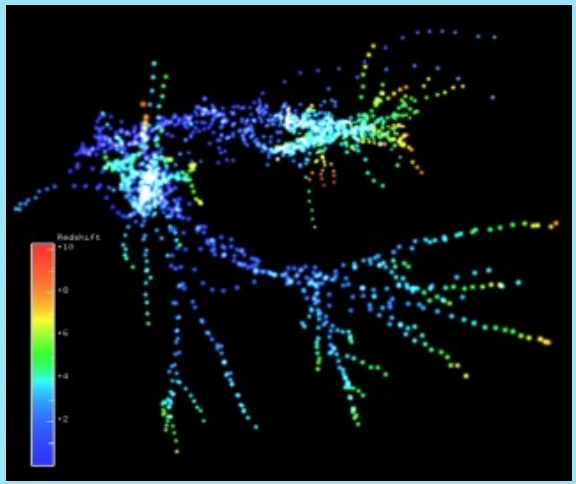


Why merging dwarf galaxies?

- ΛCDM cosmology: Hierarchical structure formation
- Simulations of isolated galaxies:(Valcke et al. 2008, Schroyen et al. 2010)

  $\rightarrow$ making simulations more cosmologically motivated by adding a merger history
- Merger trees:



Millenium run (Springel et al., 2005)

Simulations

Code: modified version of **Gadget2** (Springel et al. 2005)

- + star formation
- + feedback
- + cooling (metallicity dependent radiative cooling (Sutherland and Dopita, 193) and cooling below 10^4K (Maio, 2007))

Initial conditions:

- → Joining 2 isolated simulations
- → Orbital parameters of galaxies → Benson et al., 2005

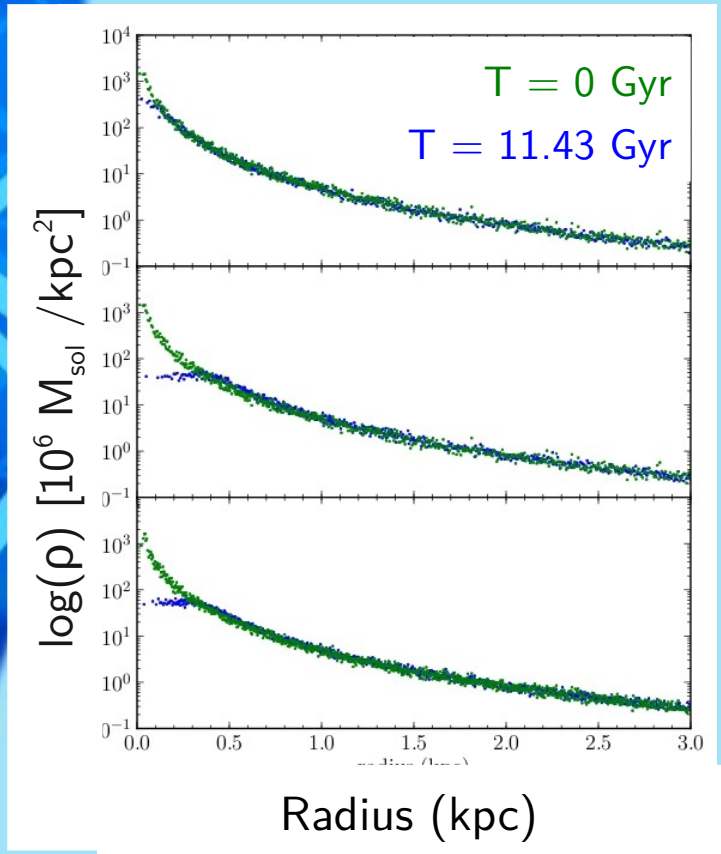
Isolated simulations

Initial setup:

- spherical symmetric **dark matter (DM) halo** with **NFW density profile**

(Navarro, Frank & White, 1994)

- homogeneous **gas cloud**



- ✓ **stable** in DM only simulations
- ✓ conversion from **cusp to core** in DM + gas simulations and in DM + gas + star formation simulations.

Star formation criteria:

$$\vec{\nabla}.\vec{v} \leqslant 0,$$

$$\rho_{\rm g} \geqslant \rho_{\rm SF}$$

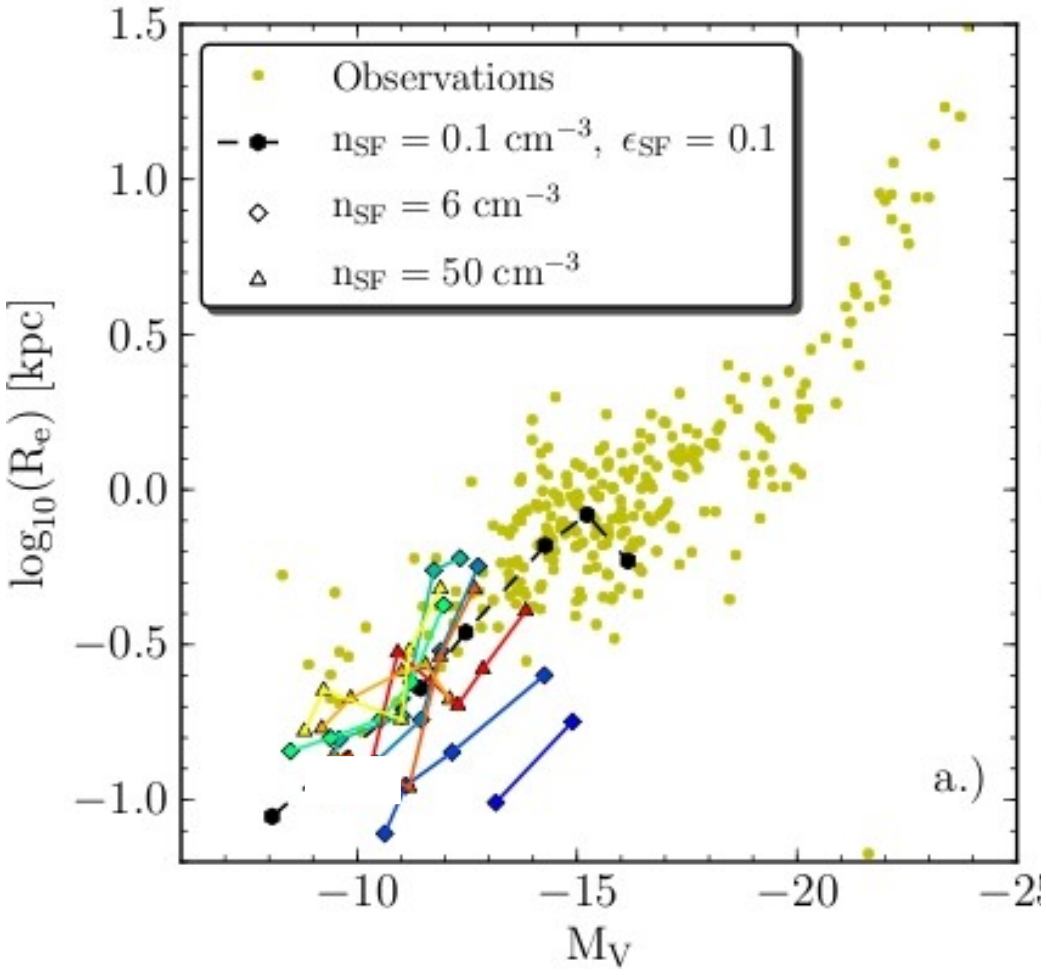
Isolated simulations

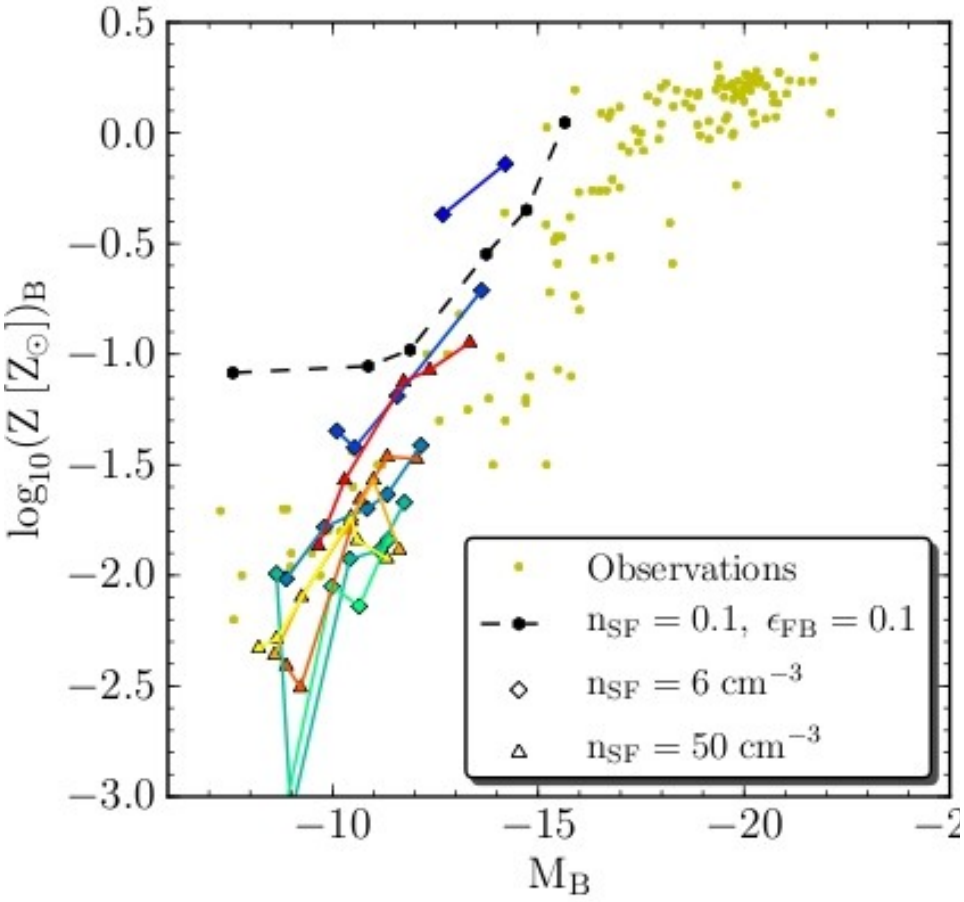
Feedback efficiency ε_{FB} = fraction of supernova energy that is absorbed by the ISM (SNIa, SNII and stellar winds)

Other poster: parameter survey to investigate the degeneracy between **ε_{FB} and ρ_{SF}.**

$$\rho_{SF} = 6\ \mathrm{cm}^{-3} \rightarrow \varepsilon_{FB} = 0.5$$
$$\rho_{SF} = 50\ \mathrm{cm}^{-3} \rightarrow \varepsilon_{FB} = 0.7$$

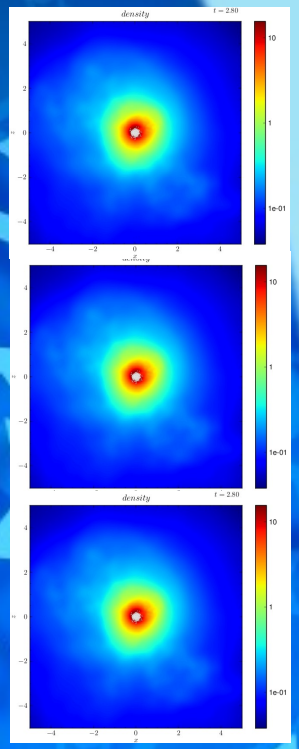
Simulations are in agreement with the observed **kinematical and photometric scaling relations**

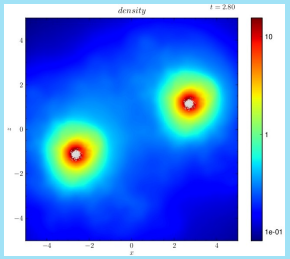


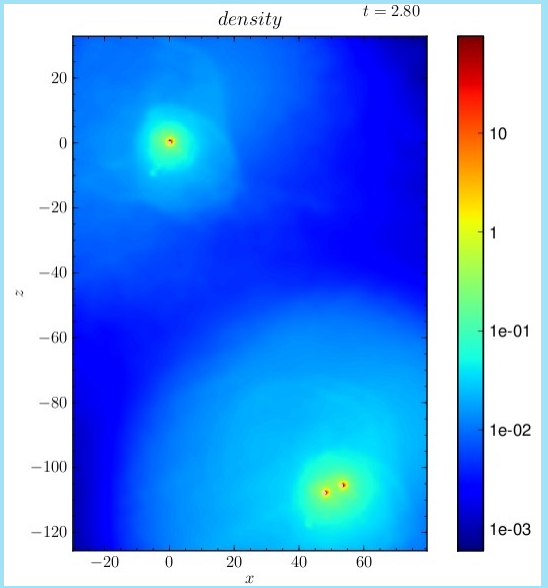


Top: half-light radius versus V-band magnitude

Right: metallicity versus V-band magnitude







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Merging time is set by hand

Later: implement cosmological motivated merger tree

100 000 gasparticles

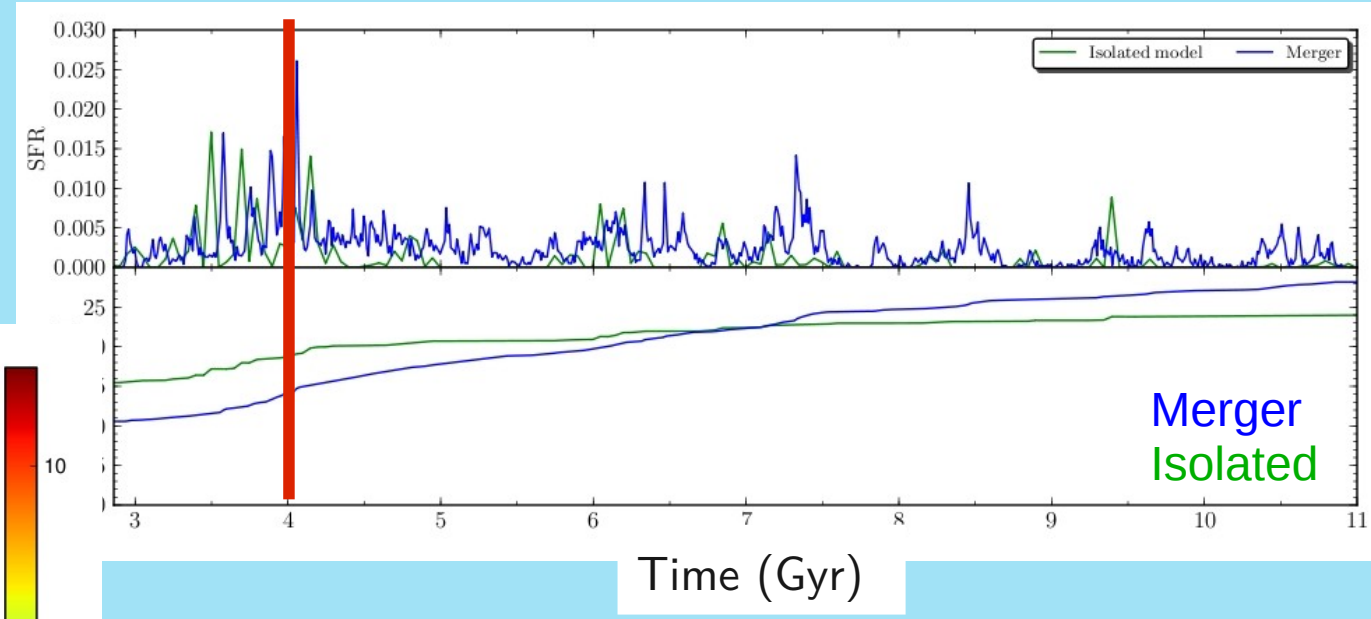
100 000 DM particles

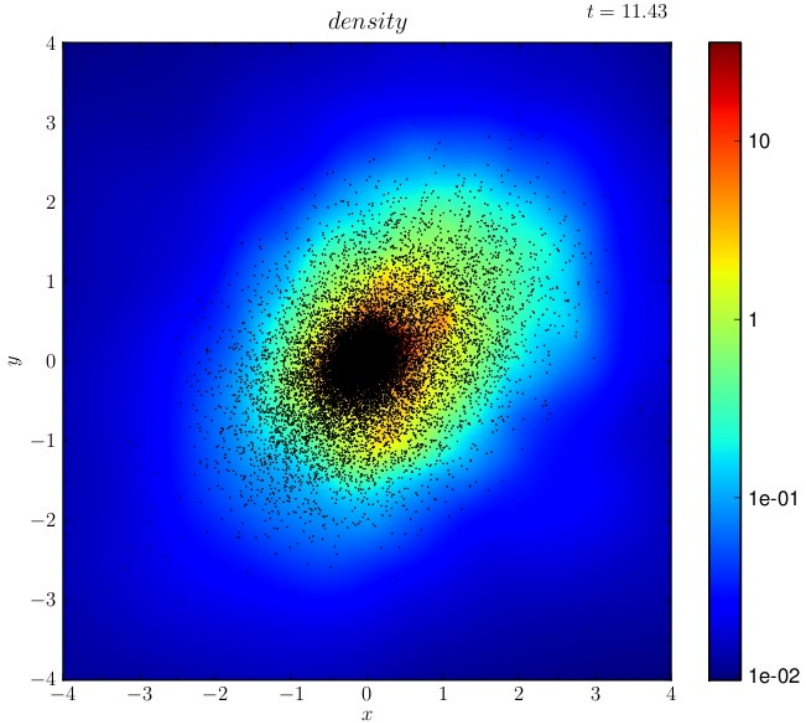
$\rightarrow$ total mass: 1.5 10^9 M_{sol}

Preliminary results

Star formation history:

Increase of the star formation rate at the moment of the interaction.



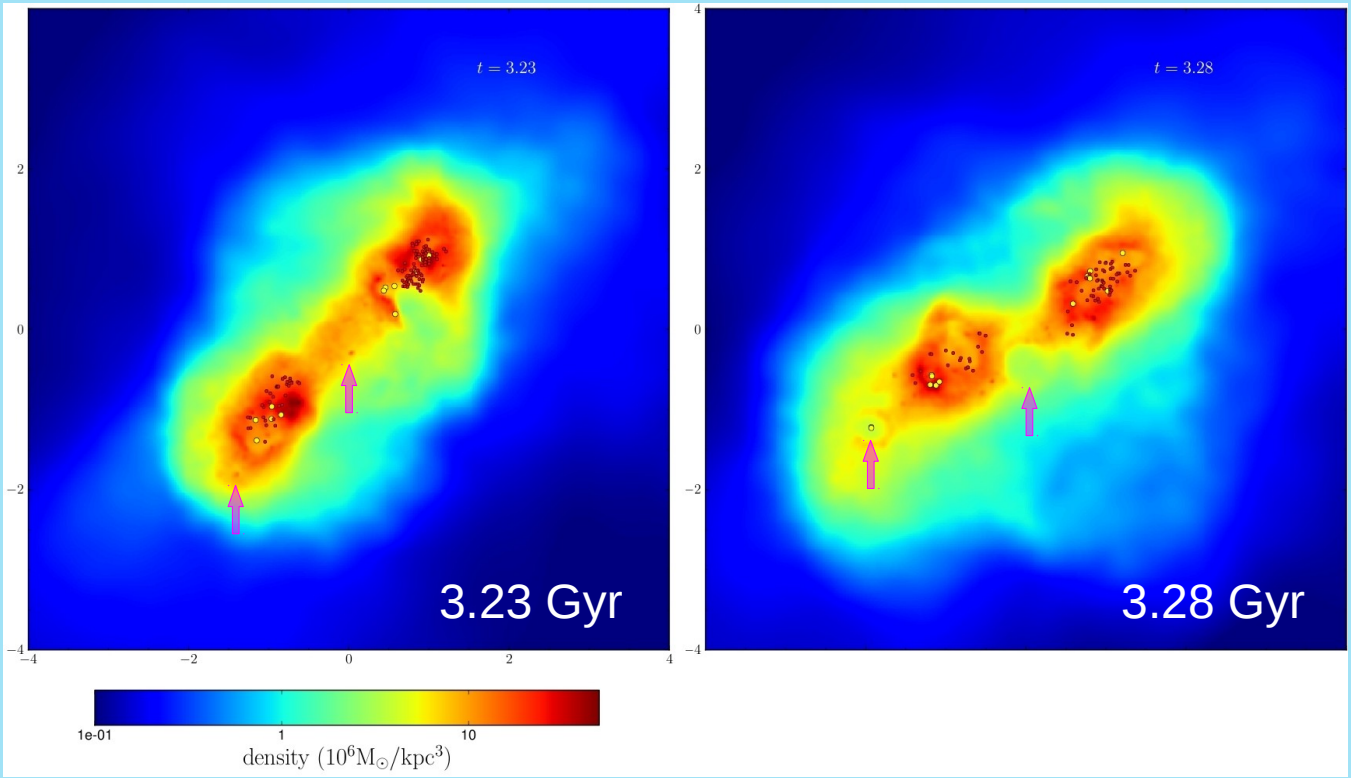


Final galaxy is **triaxial** and is **rotating**

Preliminary results

Small gas clumps:

We observe very small gas clumps which collapse and in which stars form. Supernova explosions redistribute the gas and create a bubble structure in the ISM.



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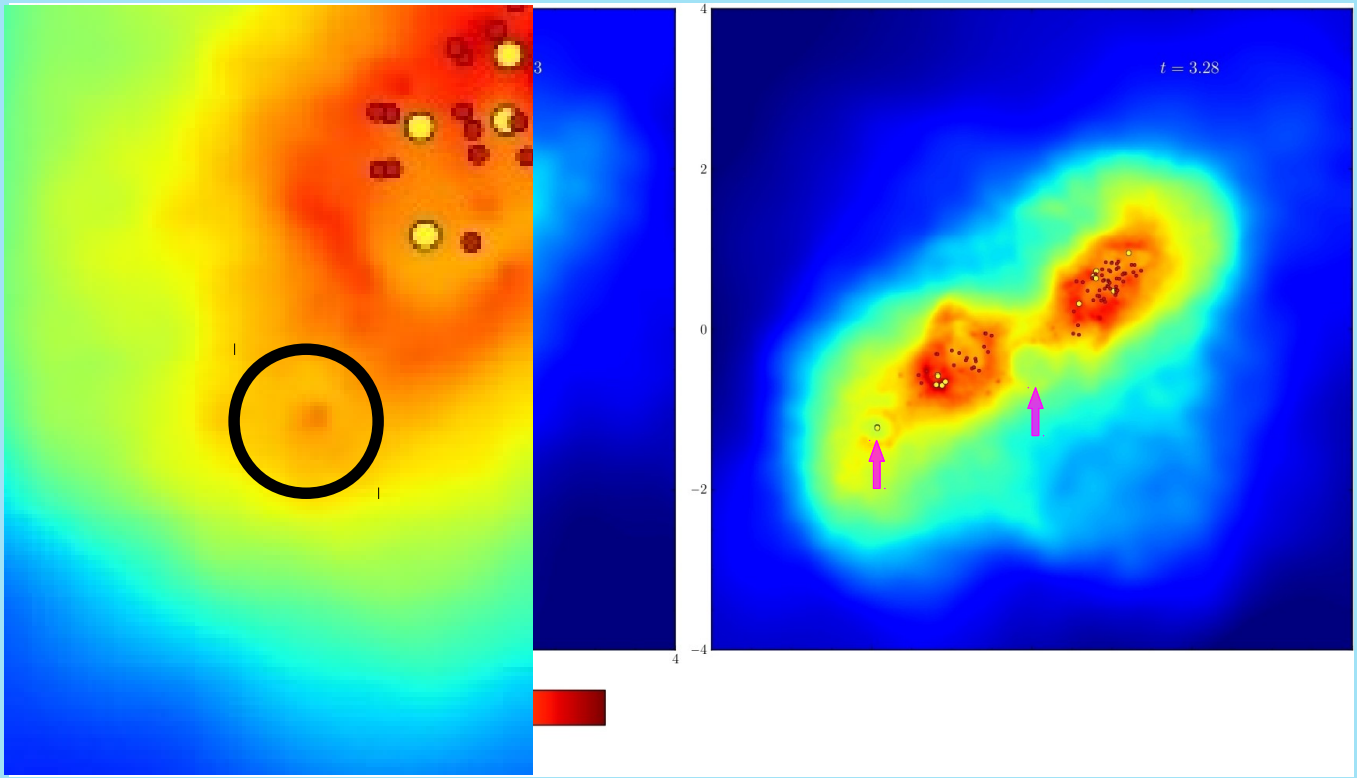

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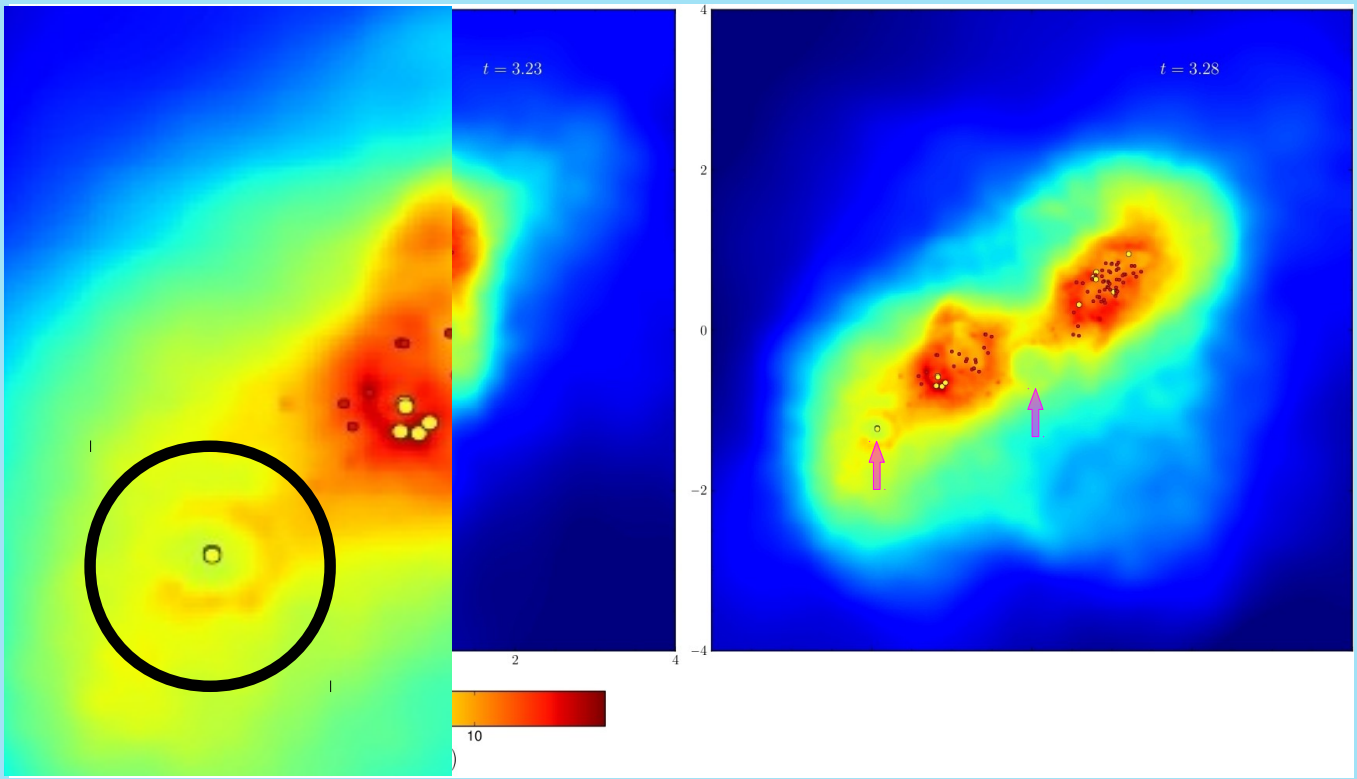
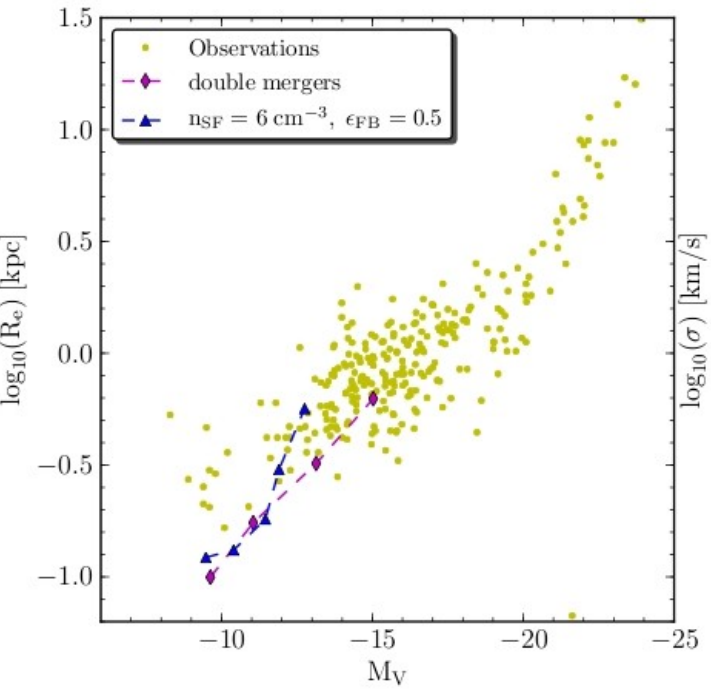


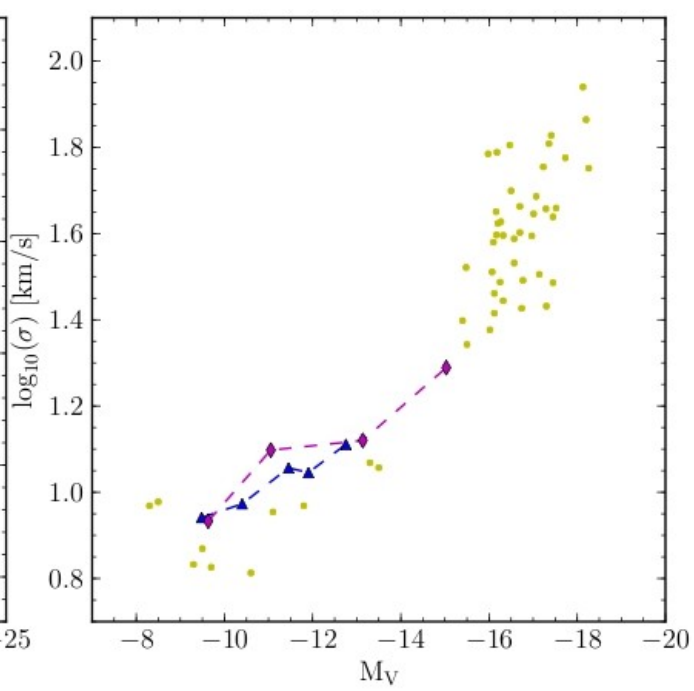
Preliminary results

→ kinematic and photometric **scaling relations**

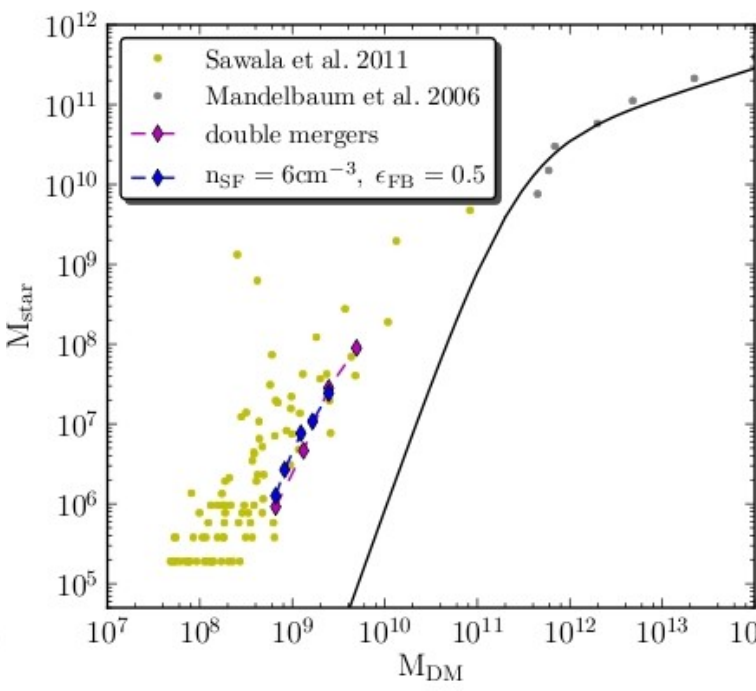
→ slope of the M_{star}-M_{halo} **relation**



Log(R_e)-M_v relation



Log(σ)-M_v relation



Relation between the stellar and halo mass

Movie

Thank you for your attention.

Questions?