

Escape of ionizing radiation from high redshift dwarf galaxies: role of massive black holes

Maxime Trebitsch — Escape of Lyman radiation from galactic labyrinths

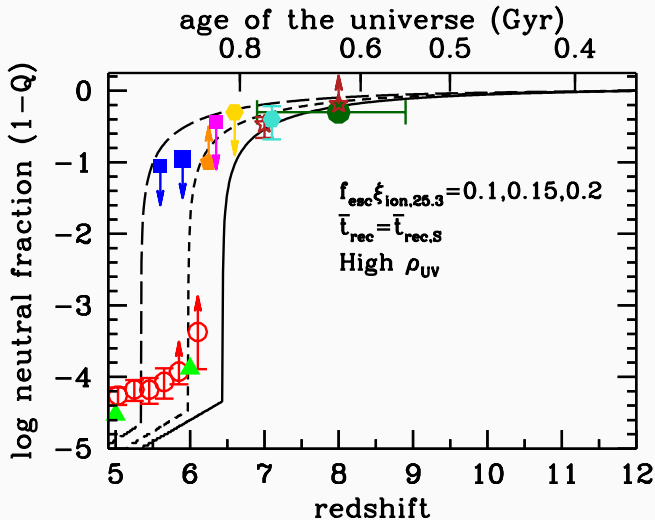
with Marta Volonteri, Yohan Dubois, Piero Madau

September 13, 2018



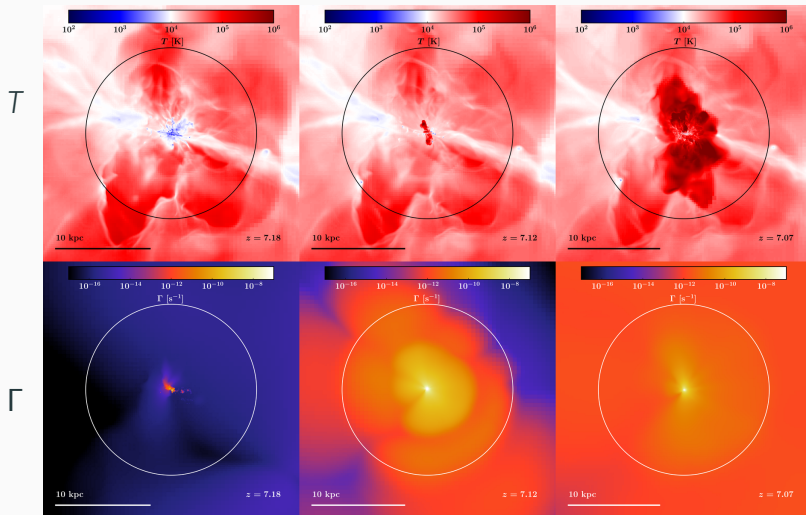
The Epoch of Reionisation

The reionisation history is sensitive to f_{esc}



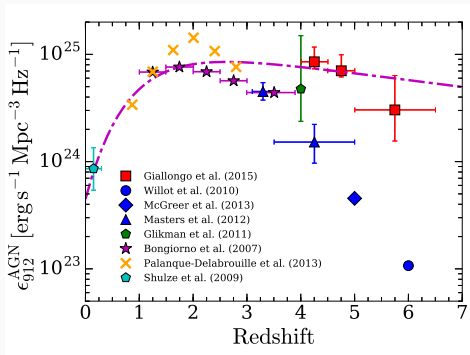
Feedback regulated escape of photons

Photons can escape during SN feedback events



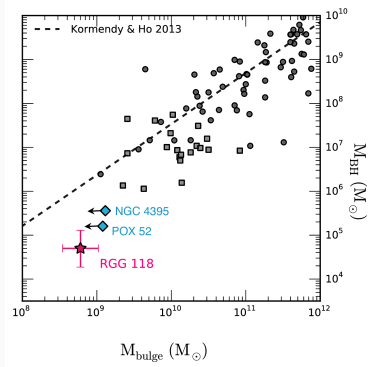
What about AGNs?

Higher AGN contribution to the UVB?



D'Aloisio+2016

SMBHs in dwarf galaxies



Baldassare+2015

At the very least, we need to understand AGNs in dwarfs at high z .

- Zoom-in on a $5 \times 10^9 M_{\odot}$ halo
- Physically motivated subgrid model:
 - Mechanical feedback
 - Virial-based star formation
 - Full RHD with 3 groups
- $\lesssim 10$ pc resolution
- AGN + BH implementation similar to Dubois+2012
 - Bondi-Hoyle accretion
 - Dual mode (radio + quasar) feedback
- Switch on/off both SN and AGN feedback

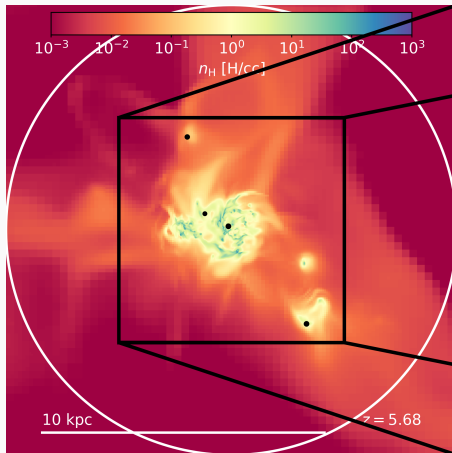
Summary of the simulations

Simulation	SN	AGN	Accretion
	✓	✓	Bondi
	✓	–	–
	–	✓	Bondi
	✓	–	Bondi
	✓	✓	Forced

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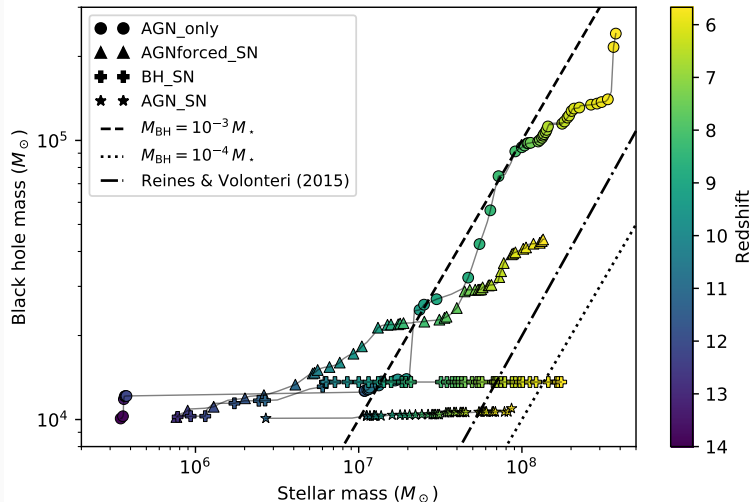
Gas distribution



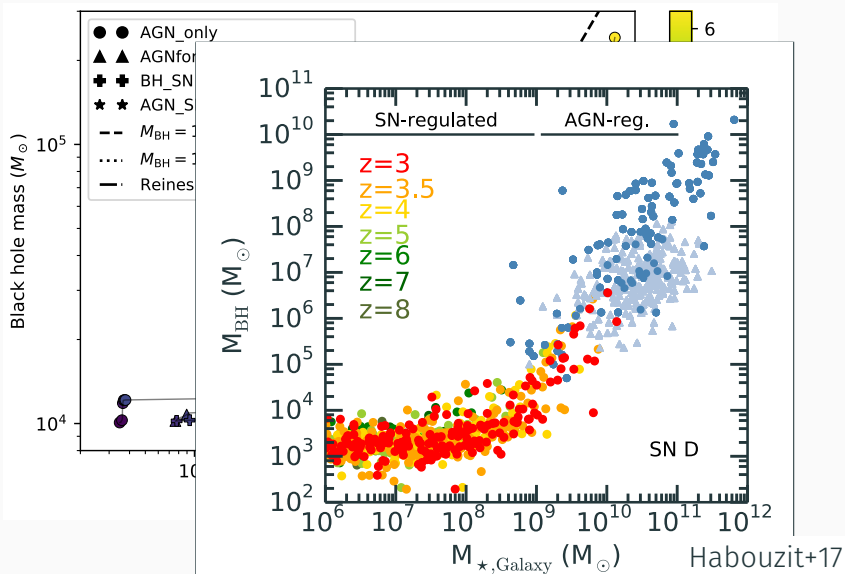
Stellar distribution



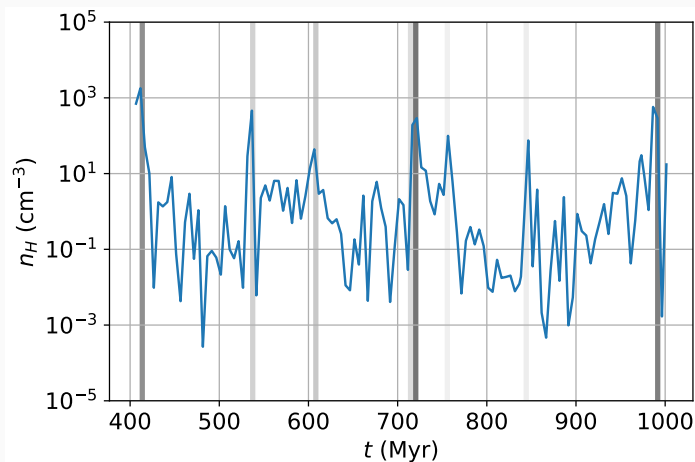
SN feedback prevents BH growth



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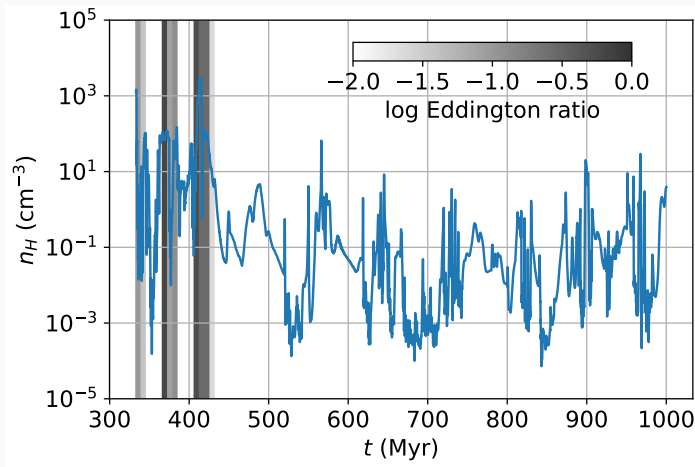


With all feedback mechanisms

Grey background $\propto$ BH accretion rate

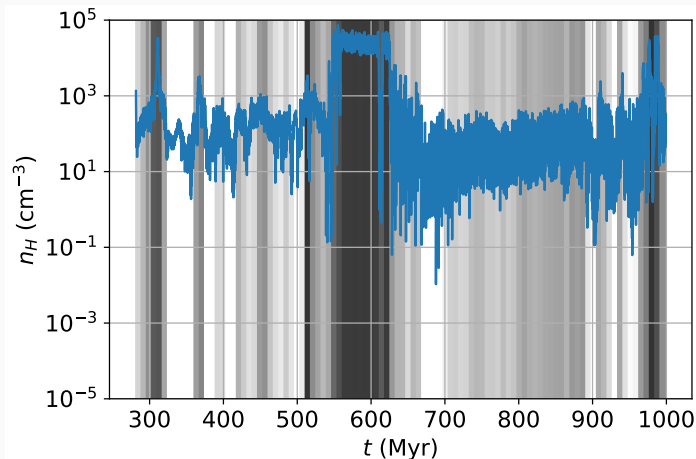
- Low density (1 cm^{-3}) on average
- Very few high accretion episodes

Turning off AGN feedback

Grey background $\propto$ BH accretion rate

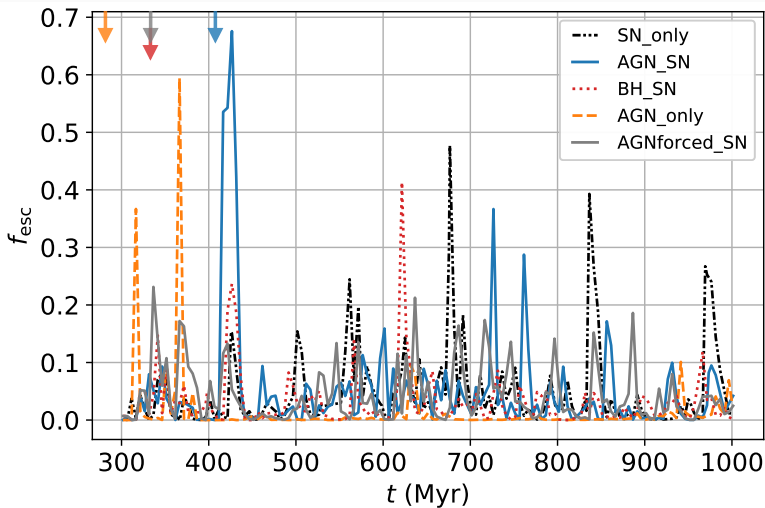
- Low density (1 cm^{-3}) on average
- Few high accretion episodes, for $\sim 5 - 10 \text{ Myr}$

Turning off SN feedback

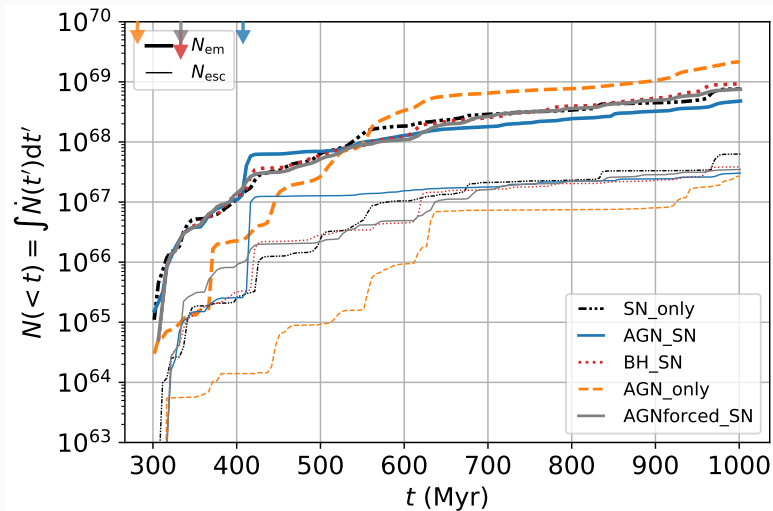
Grey background $\propto$ BH accretion rate

- Higher density (100 cm^{-3}) on average
- Much higher accretion rate

Not really: bursty behaviour dominated by SN feedback

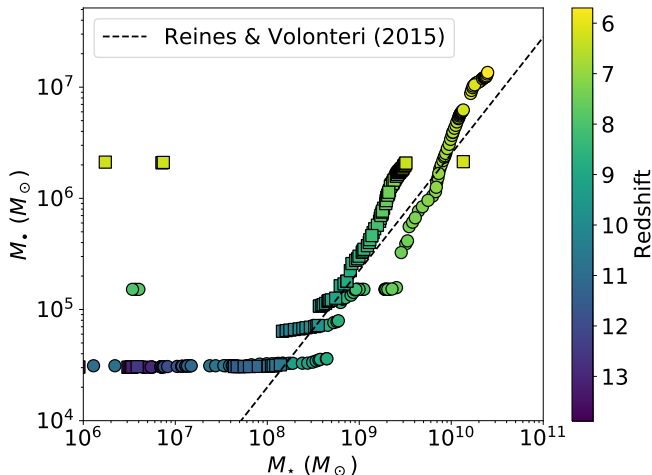


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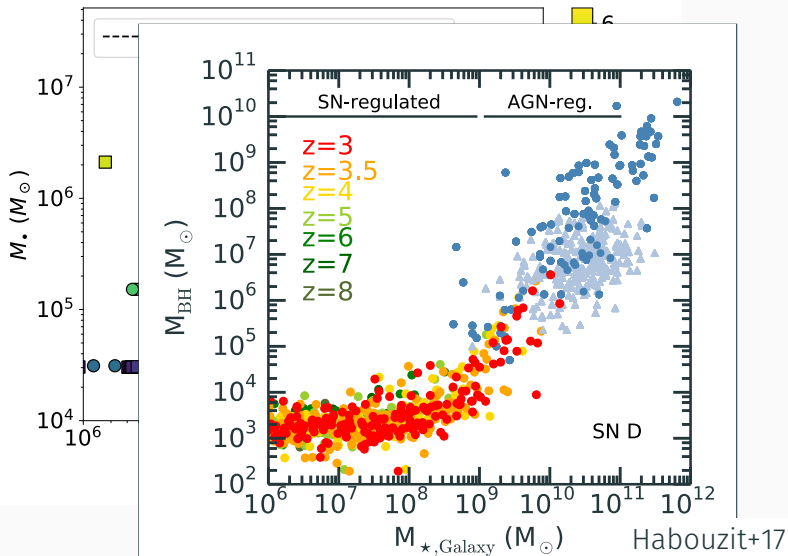
In progress: galaxy-AGN connection in the LAE/LBG regime

BH only grow when the host galaxy is massive enough



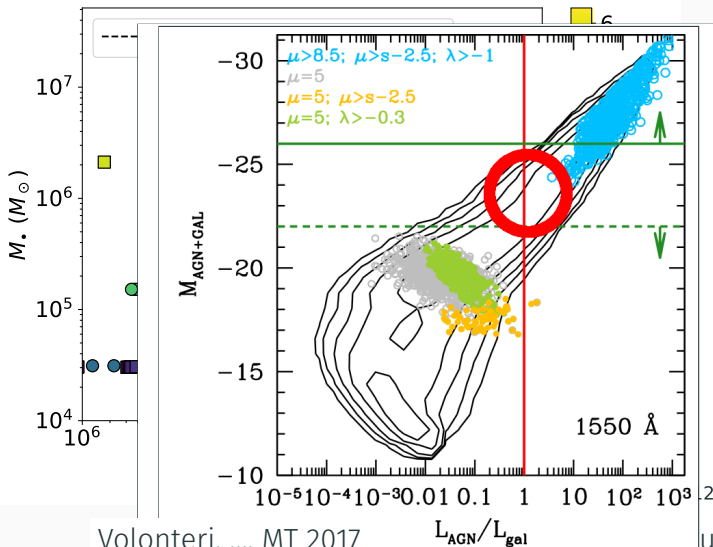
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In progress: galaxy-AGN connection in the LAE/LBG regime

BH only grow when the host galaxy is massive enough



BH in small galaxies

- They don't grow: SN feedback prevents gas feeding
- AGN feedback has a low effect on f_{esc}
- The AGN itself does not contribute much to the reionisation
- ...but stay tuned for exciting new results on (more) massive galaxies