Late reionization models in light of JWST LAEs and AGNs

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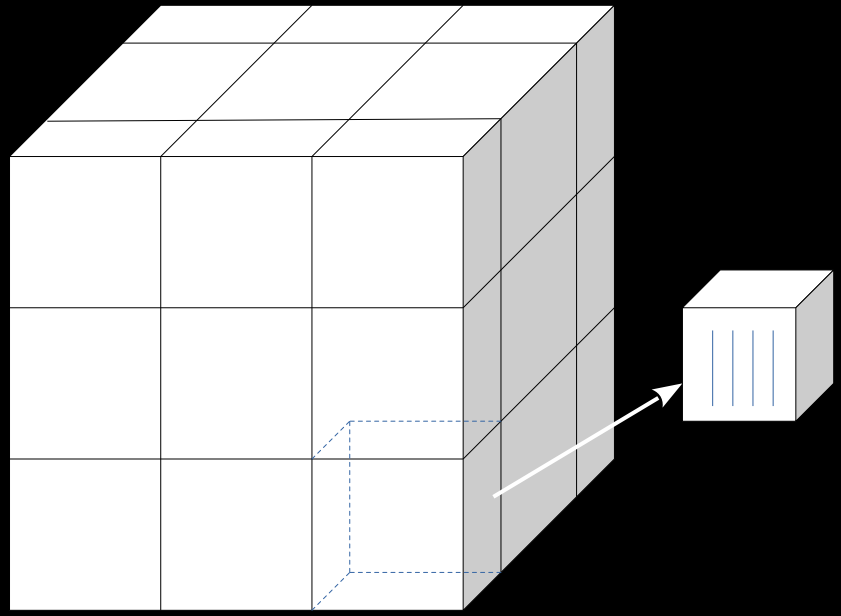
Radiative transfer with ATON-HE

Original version Aubert, Teyssier 2008

Grid based, M1 radiative transfer code used in post processing on GPUs

Modified ATON to include Helium and multi-frequency. Speed up of 30% by using GPU streams, and non-blocking communication. Automated the pipeline.



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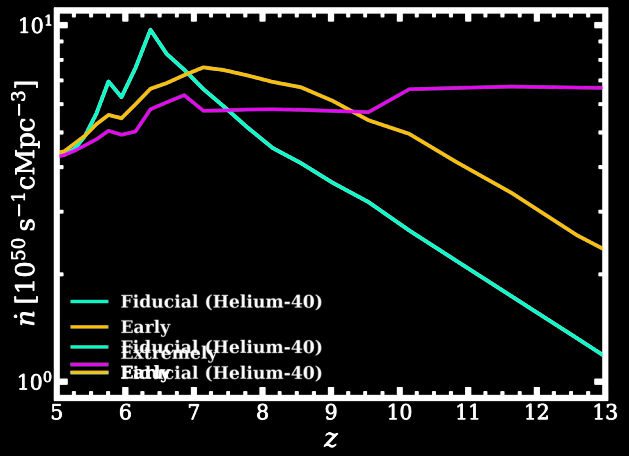
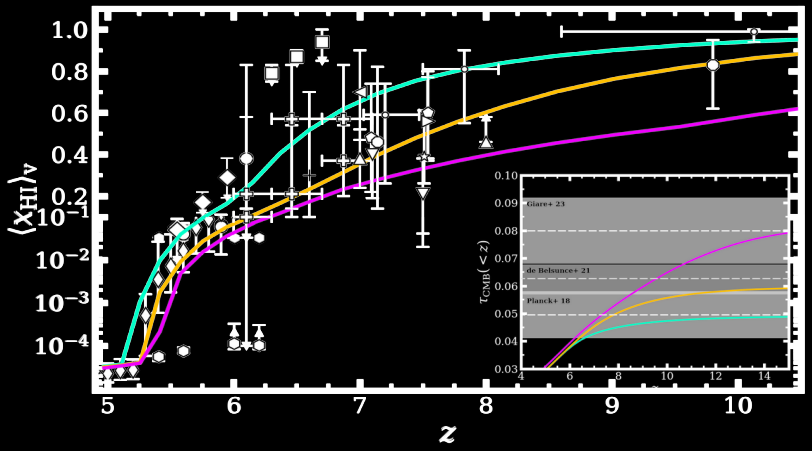
Study variations in late reionization scenarios





Modulate emissivity to change reionization history.

Low volume averaged neutral fraction at high redshift should lead to formation of ionized bubbles.

Early reionization history is slightly in tension with Planck

160 cMpc/h - 2048^3
arXiv:2404.06548v1

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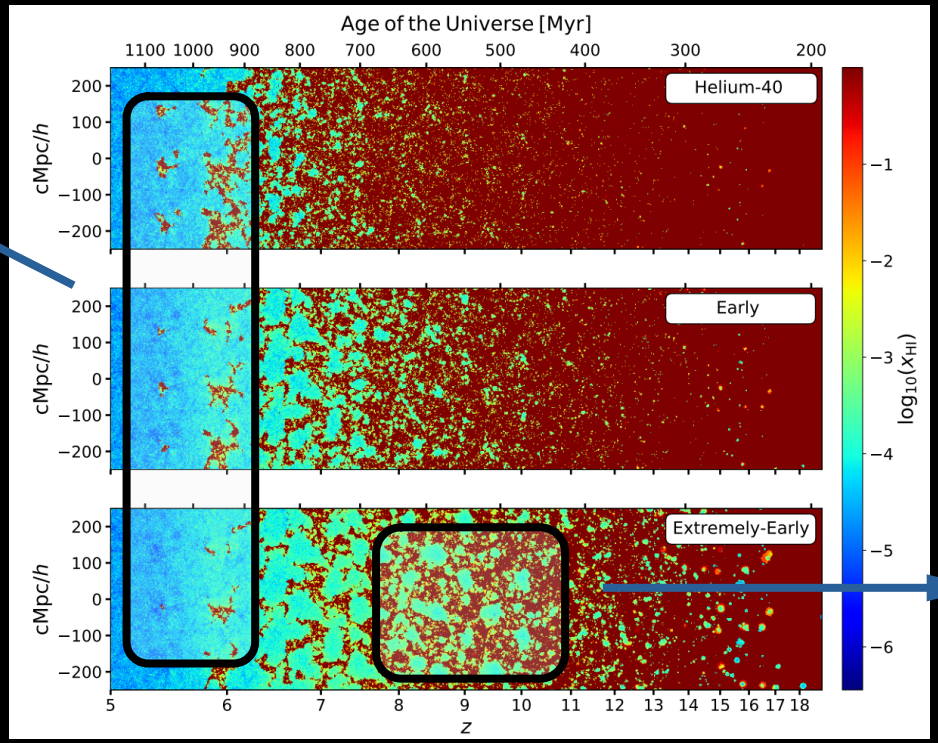
Calibrated to the end of reionization

Ending of reionization is fixed by mean Lyman-α transmission.

Slight variations in neutral island distribution are within the observational errors.



Modifying the start of reionization creates different morphologies

Large ionized regions at high redshifts

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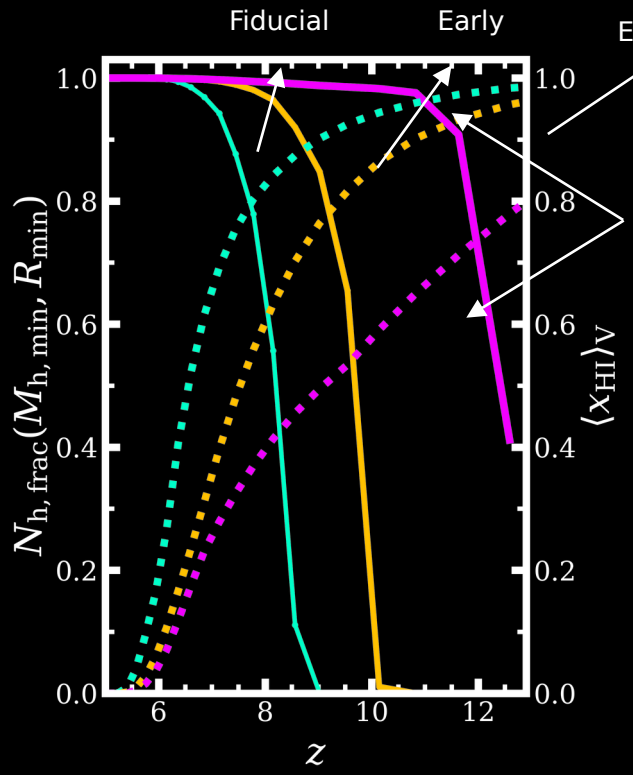
Sources are biased tracers

Fraction of sources ($>10^{10}$ M$\odot$) in bubbles radius > 1 pMpc

Sources in earlier reionization models are found in ionized regions at higher redshifts.



It’s expected that we find LAEs at high redshift.

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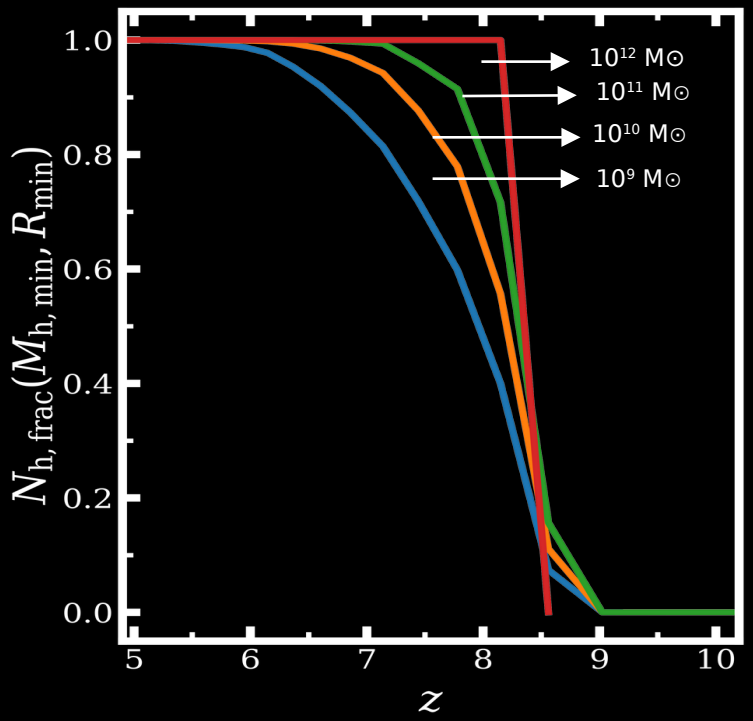
Sources are biased tracers



The evolution of UVLF for bright objects with redshift is fairly constant. Brighter objects are already found in ionized regions at a very high redshift.

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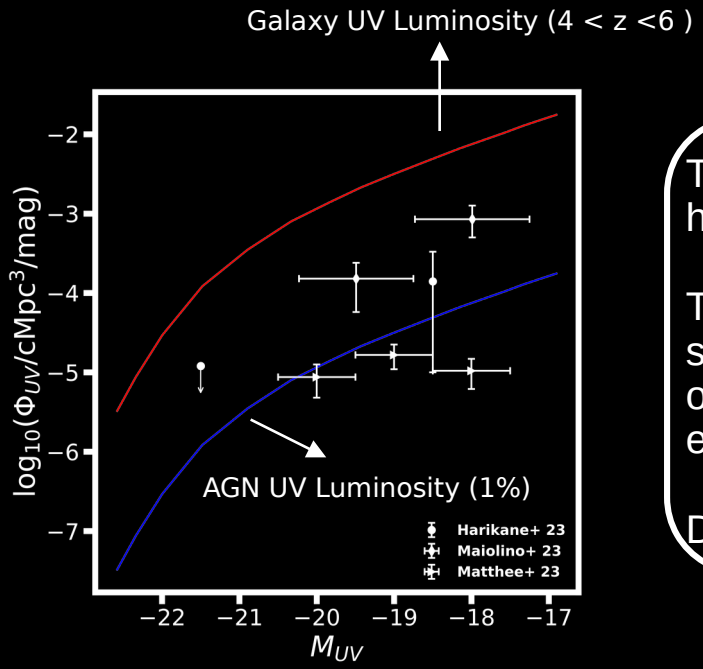
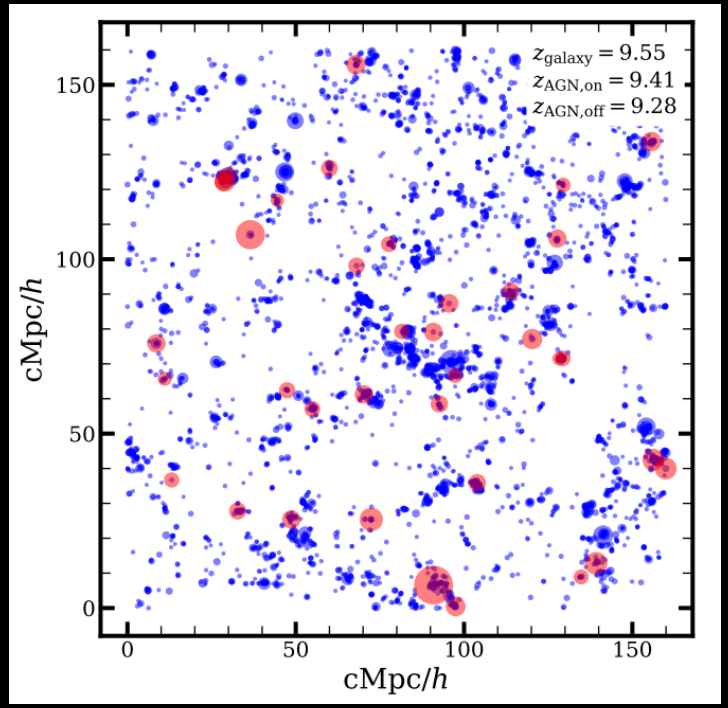
Implementing low luminosity AGNs



Take a fraction of halos to host AGNs.

The emissivity of these sources are a fraction of the total galaxy emissivity.

Duty cycle of 10 Myr.



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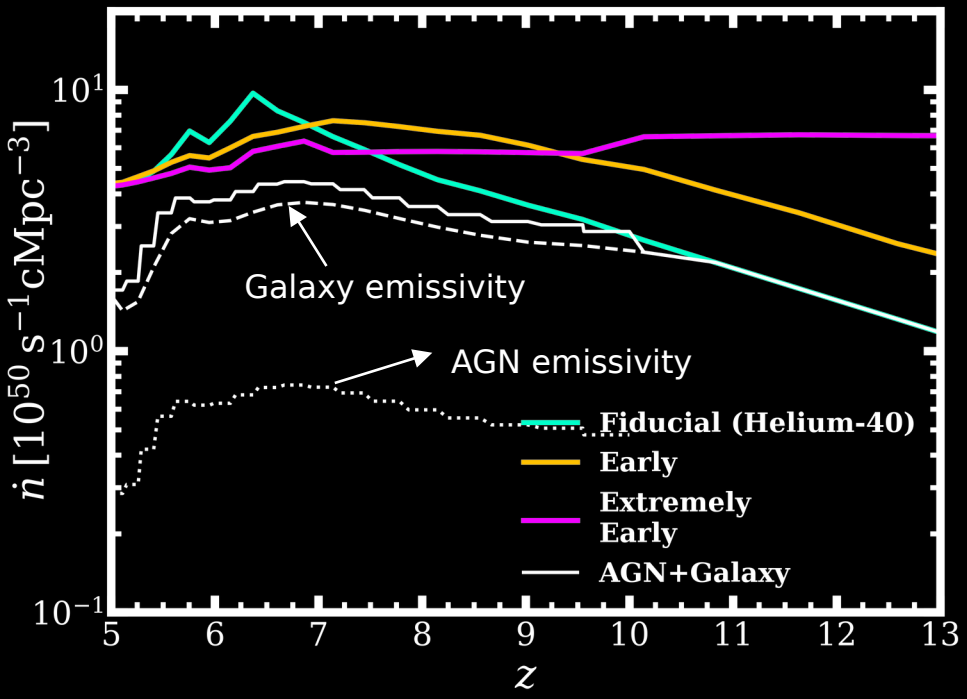
Emissivity drops by a factor of 2

The models end like the others i.e it is calibrated to the mean Lyman-α transmission.

Total emissivity drops by a factor of 2, even though the AGNs emissivity is 20%.



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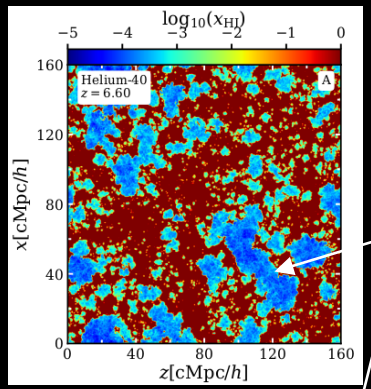
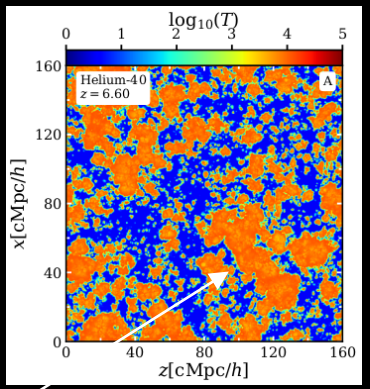
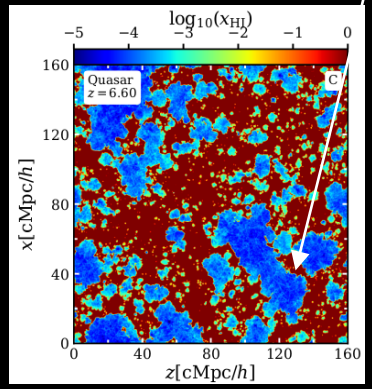
Ionized regions are *more* ionized

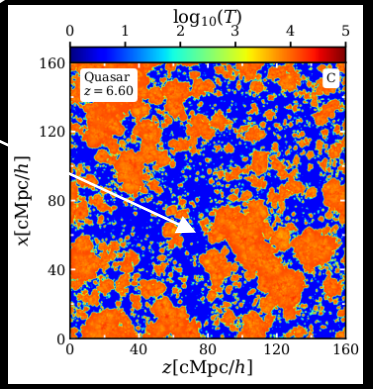


Ionized regions are highly ionized





Which leads to hotter ionized regions



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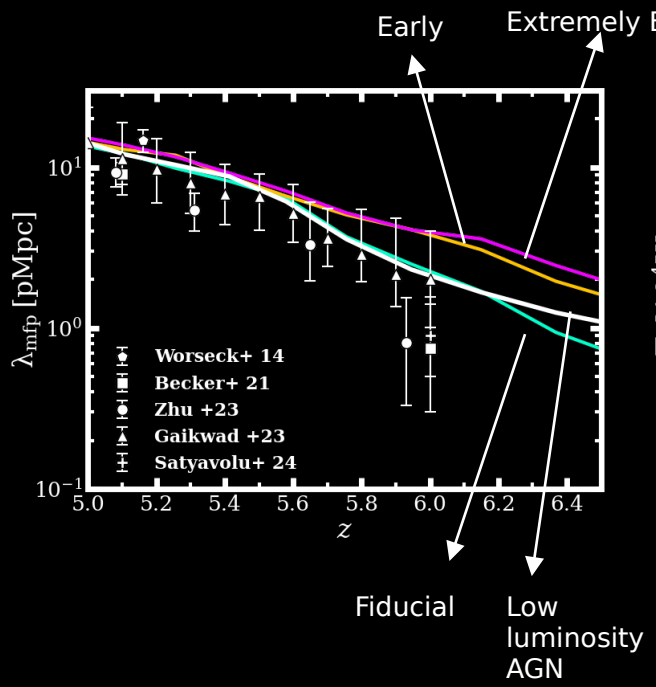
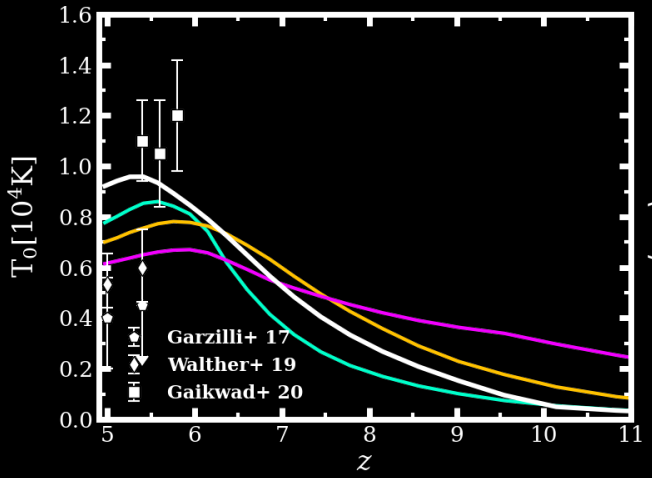
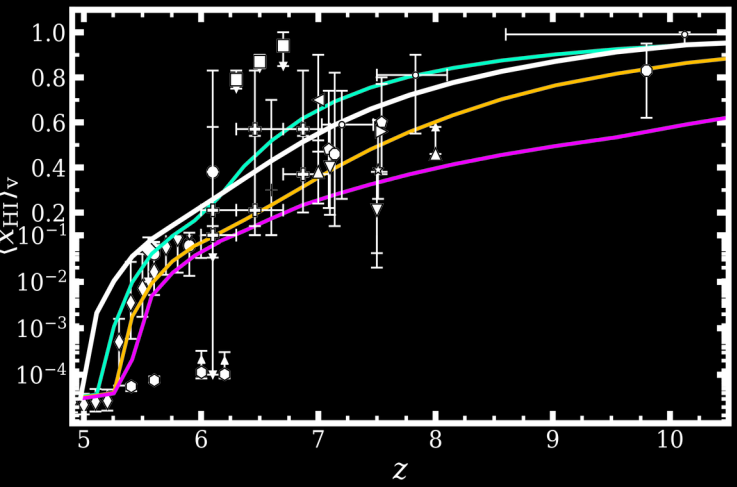
Is one model preferred over the others?







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Conclusions

Detection of LAEs down to z=11 by JWST is not inconsistent with late reionization scenarios required by the Lyman-alpha forest.

Brighter LAEs do not evolve with redshift as strongly as fainter sources.

A moderate contribution of faint AGN to reionization is not in tension with the data.

These models have lower emissivity and slightly better fit to the Lyman-α forest.

Will be applying for Post-doc position this academic cycle!

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