

# Fast Large-Scale simulations for the Epoch of Reionization

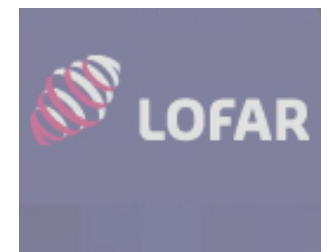
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LOFAR-EoR WG1





For details:

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[www.astro.rug.nl/~thomas/eormap.pdf](http://www.astro.rug.nl/~thomas/eormap.pdf)

arXiv0809.1326 $\tau$



## Objective:

*Extremely fast & accurate(!!) EoR simulations for future Large-scale 21(1+z)-cm surveys*

## Rationale:

- Uncertain Astrophysics of the “dark ages” and at the EoR.
- Scales spanned by proper 3D-RT codes.
- Completing the EoR simulation pipeline.
- Input to calibration & signal extraction schemes.



# Algorithmically speaking

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- Using proper 1D-RT simulations (Thomas & Zaroubi, 2008), we create a suite of simulations for different:
  - (i) source spectra,
  - (ii) mass range,
  - (iii) Escape fractions,at various redshifts.

# Coupling with N-body semi-analytically

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Perform N-body simulations  
& identify haloes  
(Dark Matter only!!)

Populated these haloes with  
Sources of given spectra &  
Luminosity.

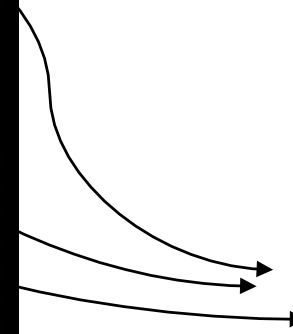
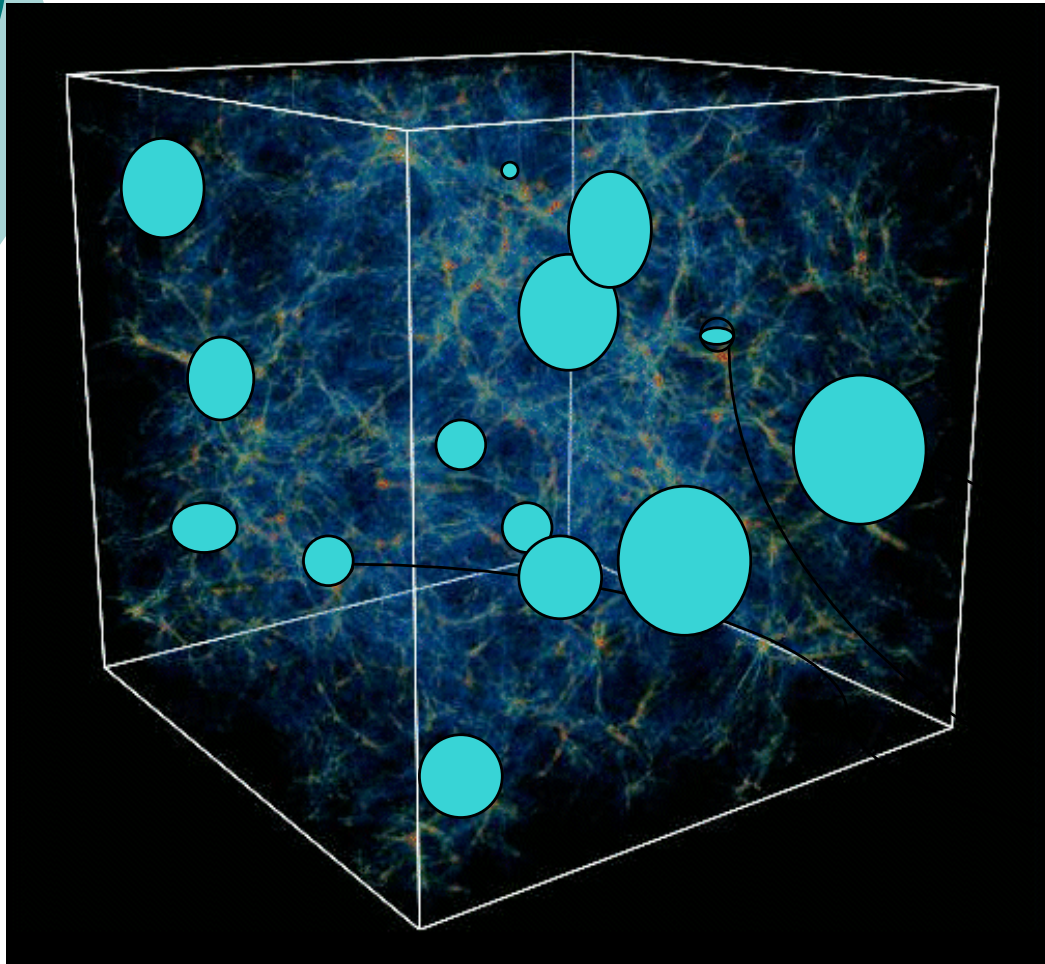
Use the appropriate 1-D  
Simulations to construct a  
Bubble at the source location

Make corrections for overlap



# Cartoon Illustration

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Identify the haloes



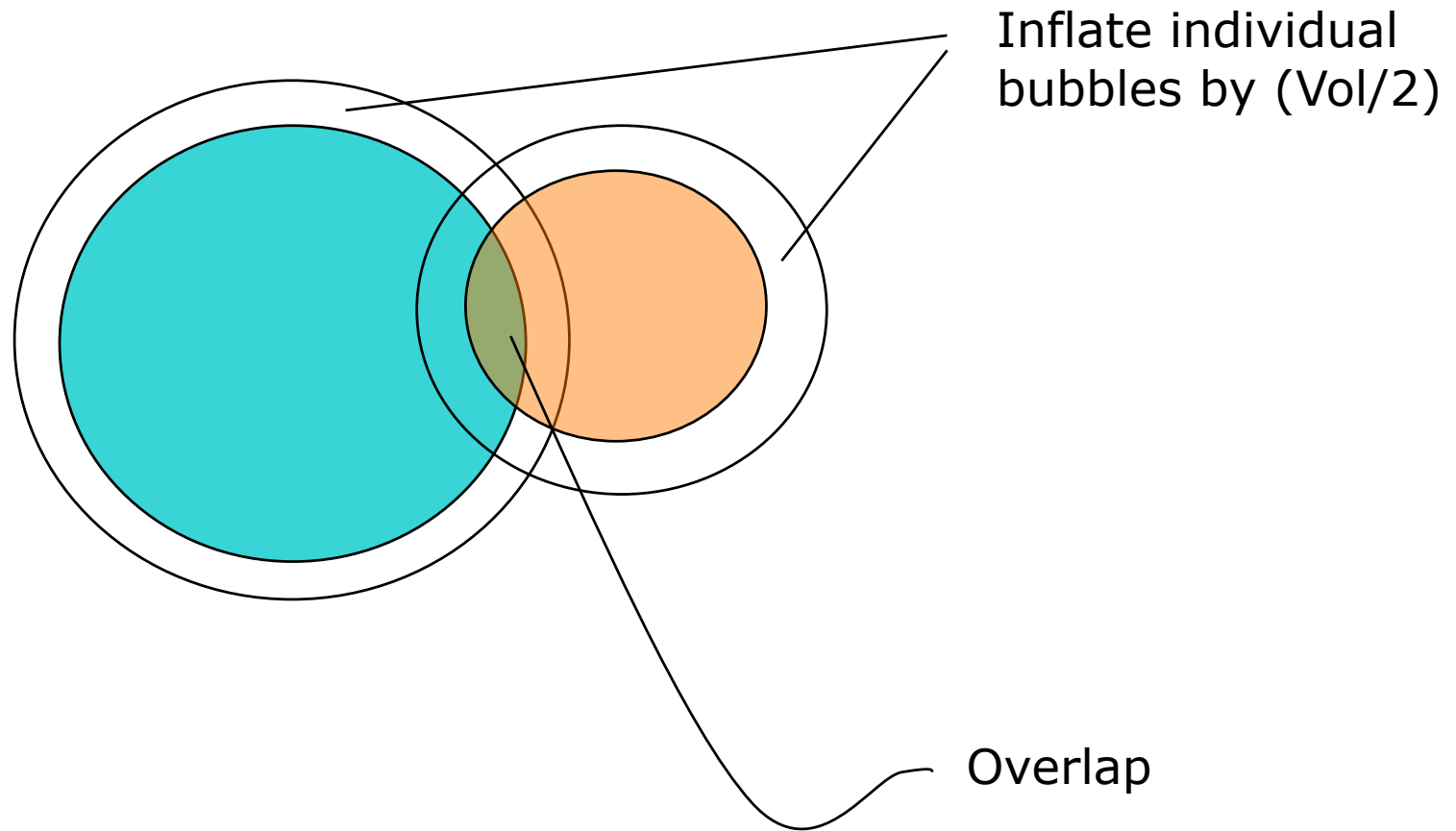
## Why should this approach work?

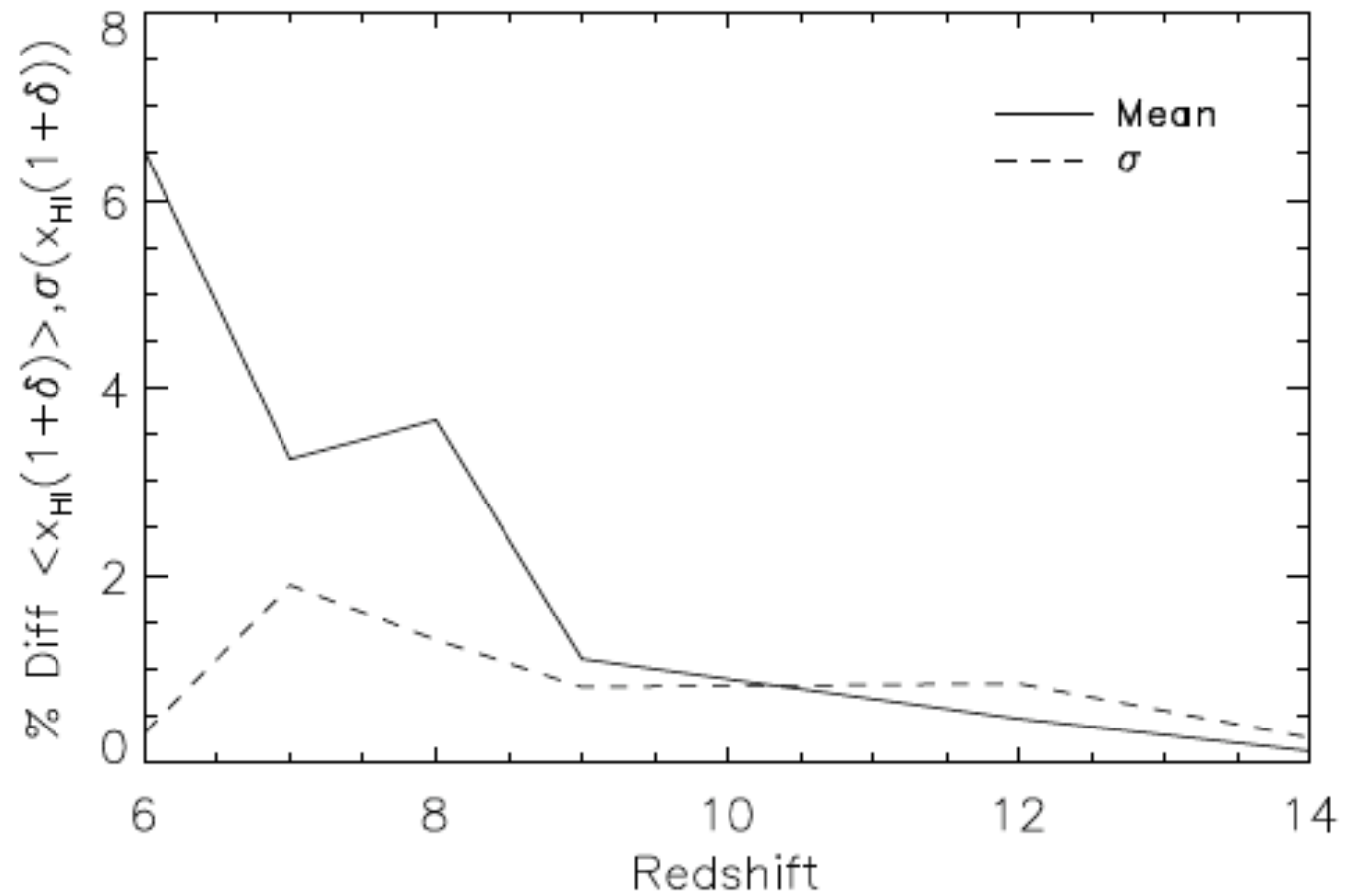
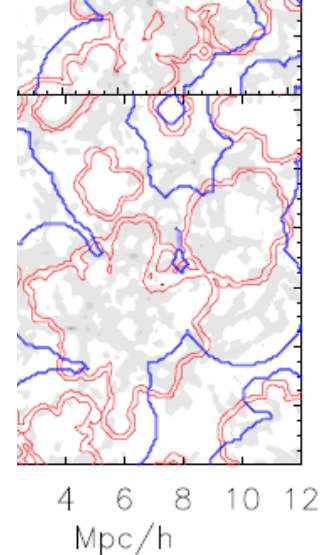
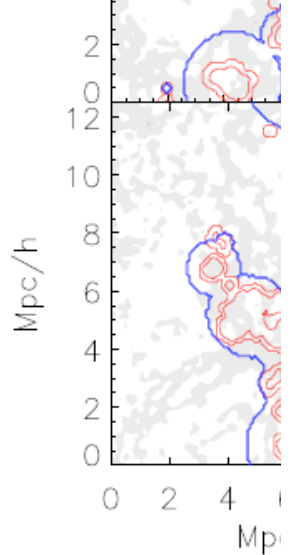
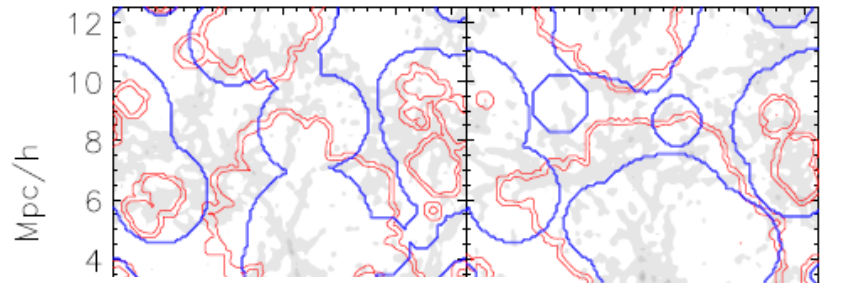
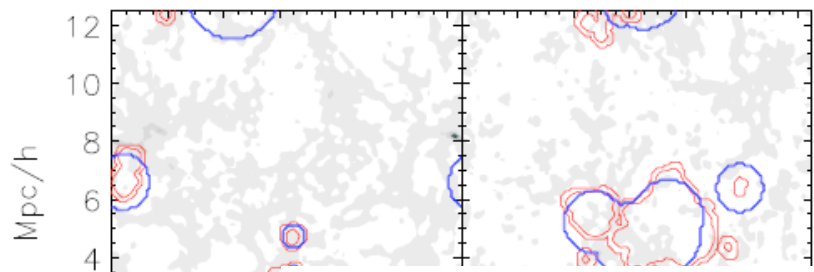
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- $6 < z < 12$  : The Universe is still considerably homogeneous/isotropic.
- Overdensity around the source is corrected for.

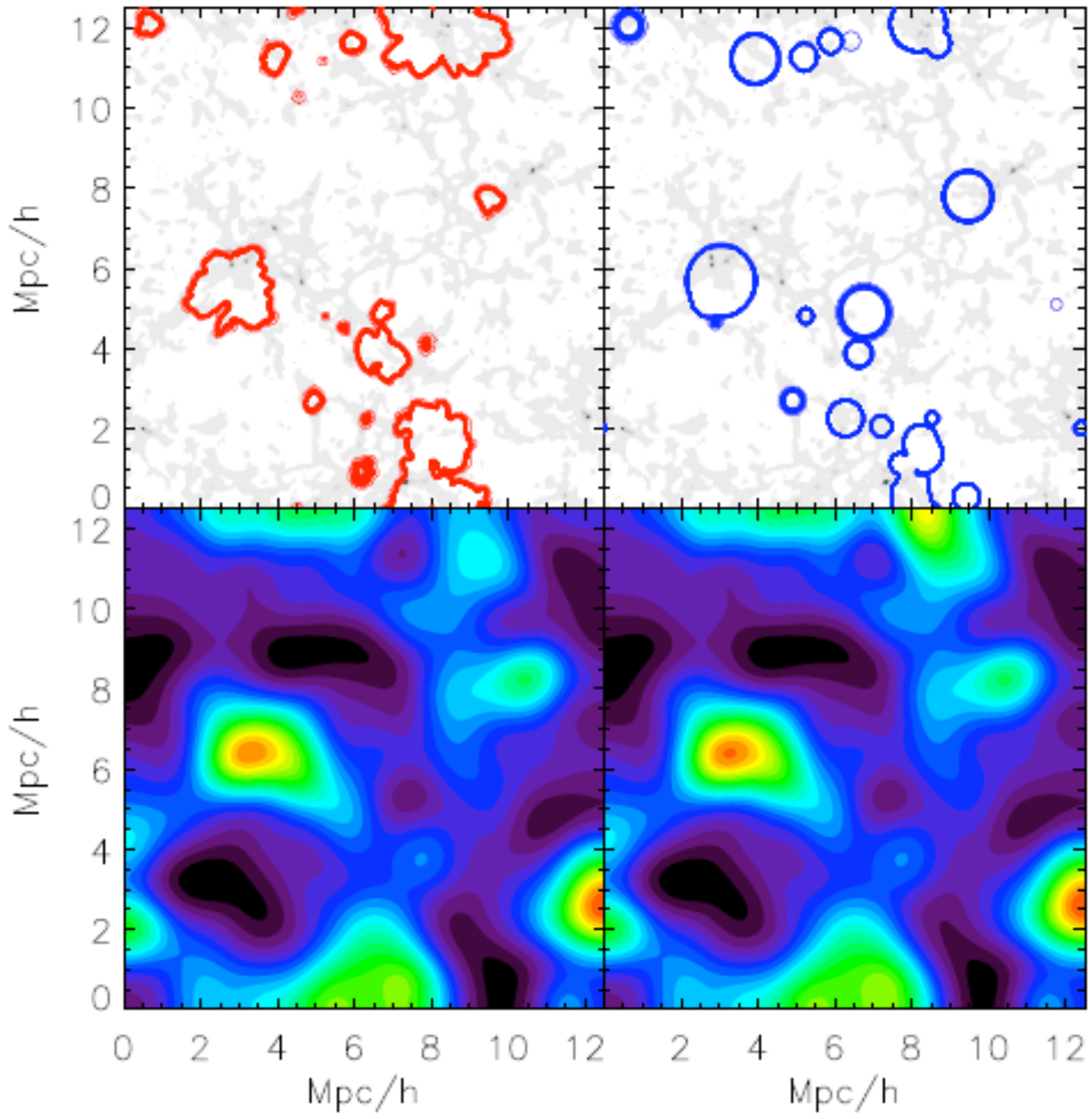
# Correction for overlap: Photon conservation

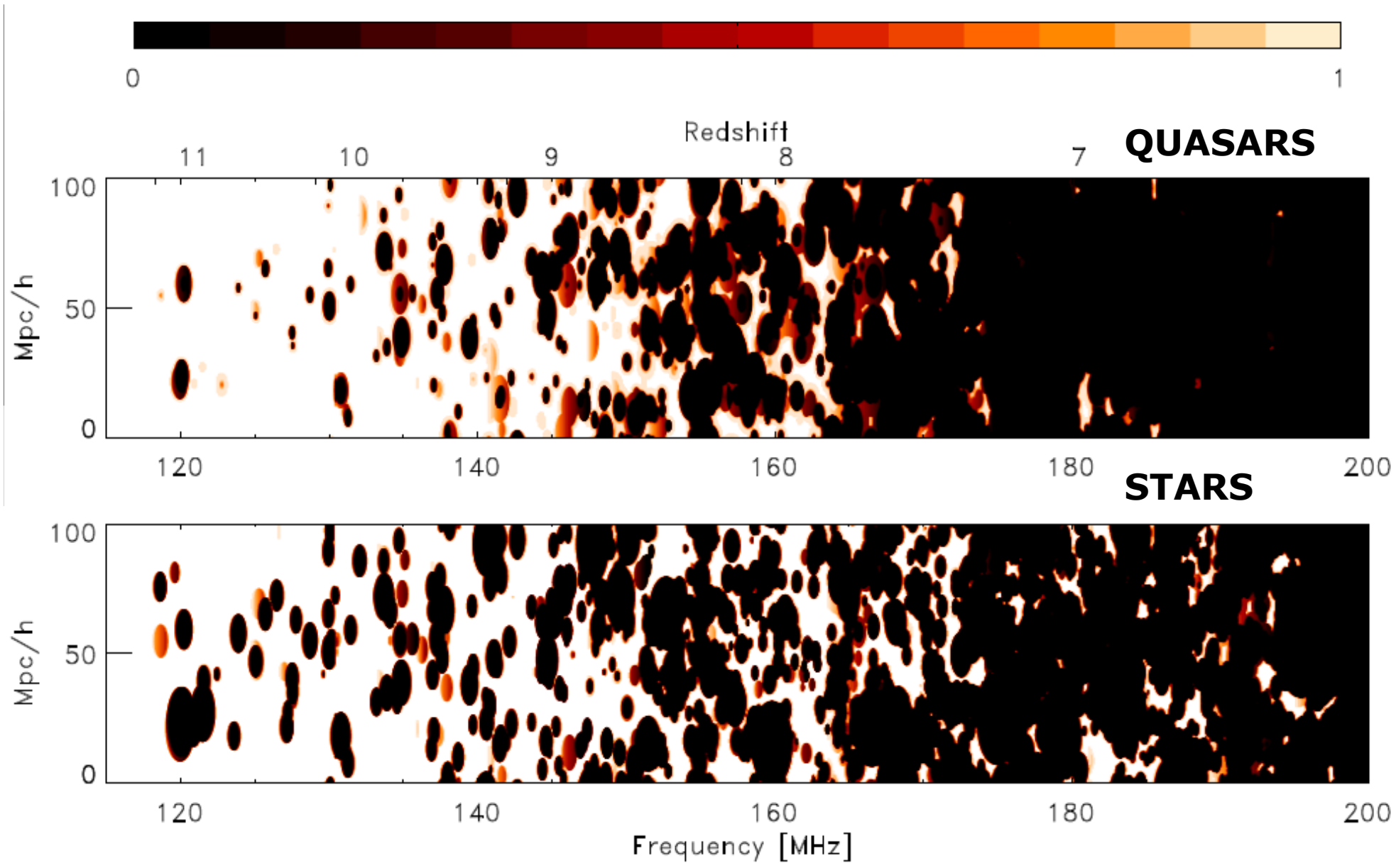
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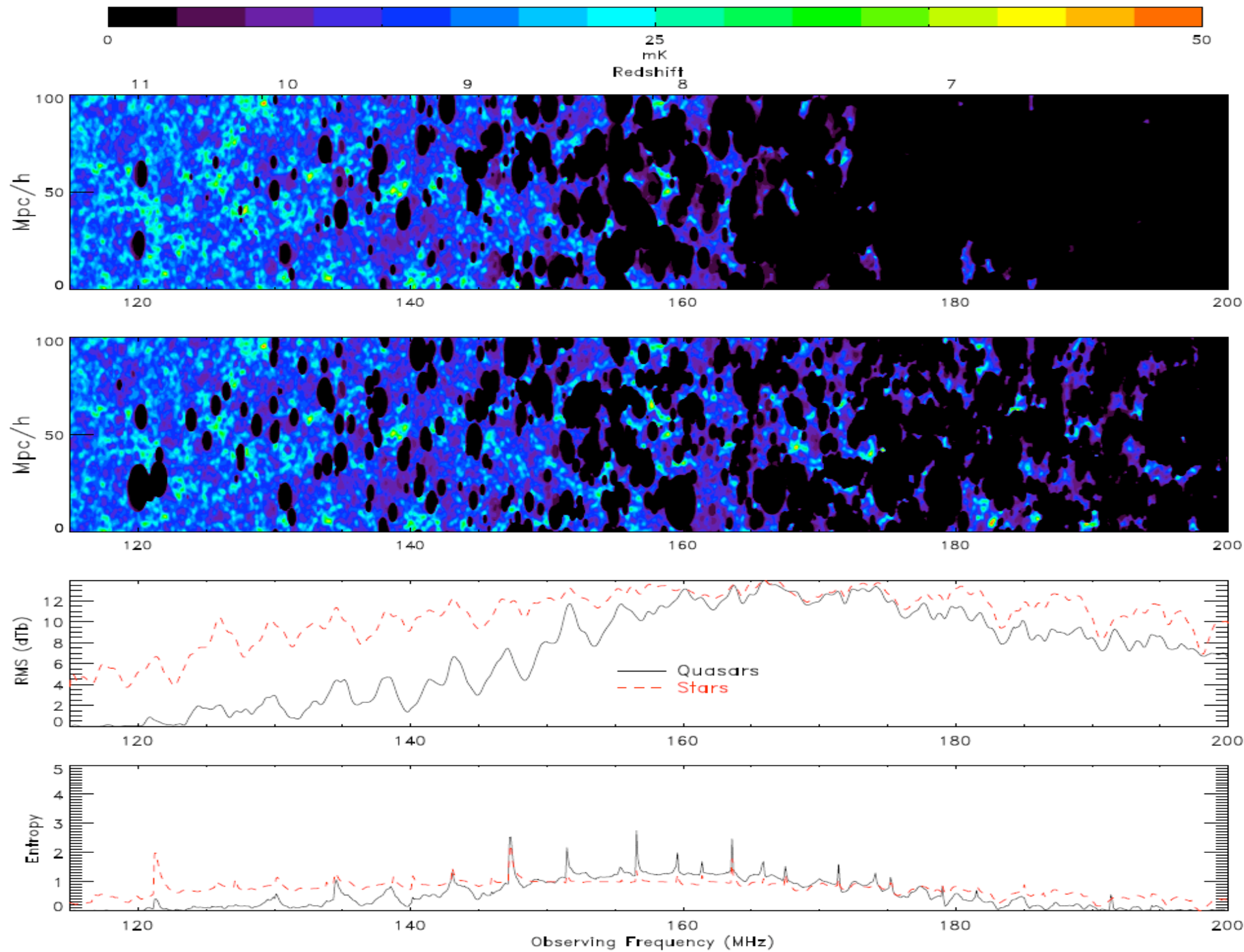


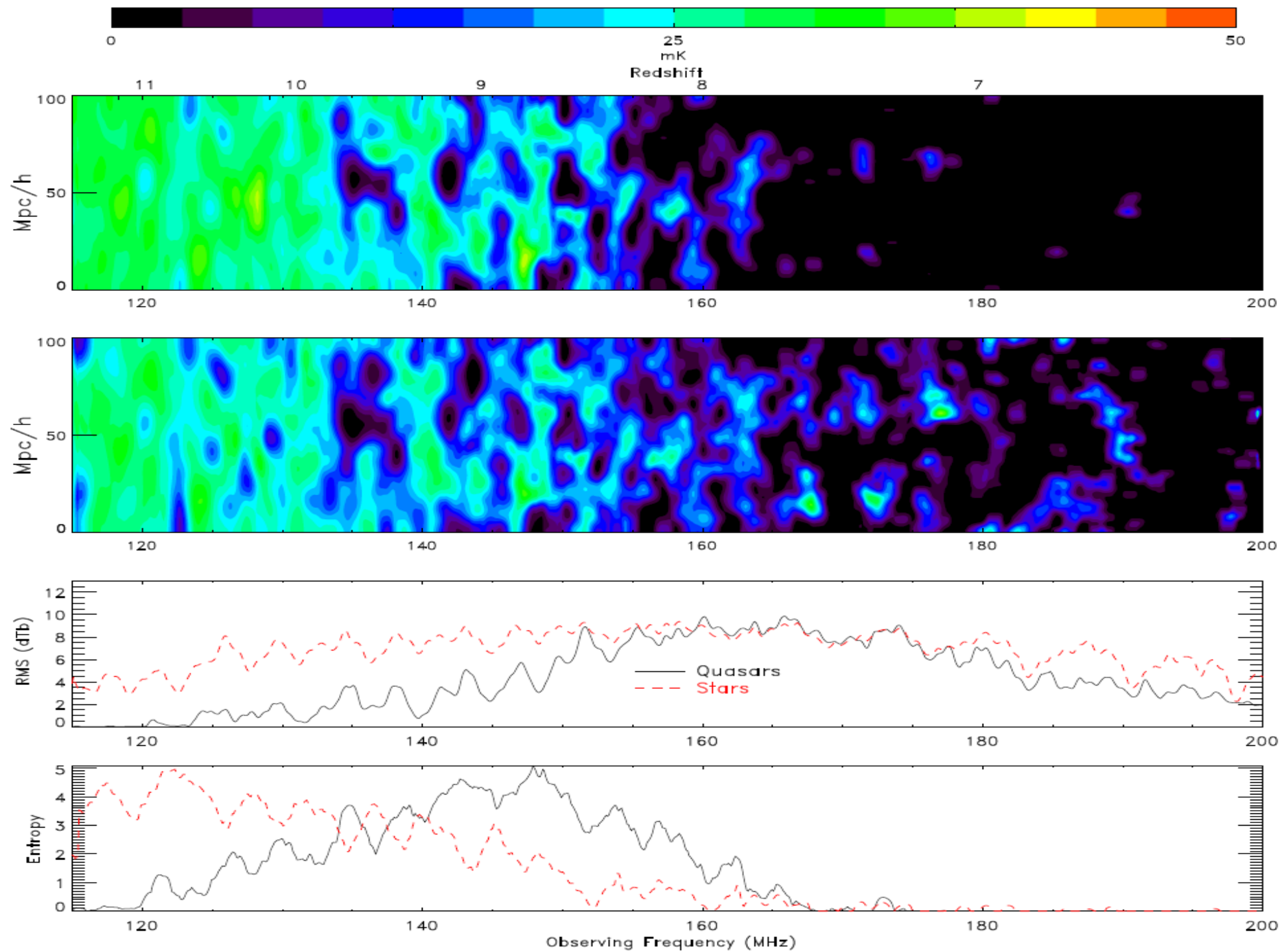


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## Summary

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- Semi-empirical approach to 3D radiative transfer works well given the resolution of the antenna.
- Multiple simulations with different sources have been produced as inputs to the “simulation pipeline”.



## In the immediate future

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- Source mixtures
- Heating by Qsos