Implication of the Shape of the EDGES Signal for the 21 cm Power Spectrum

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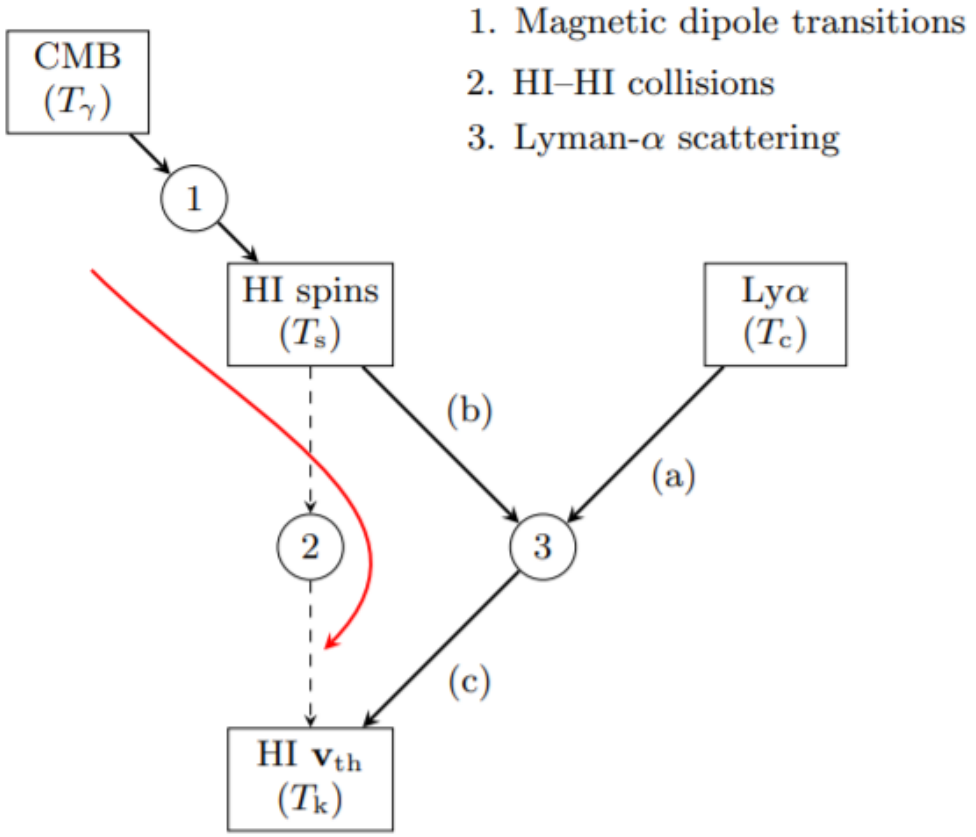
Heating corrections

Tejaswi Venumadhav, Liang Dai, **AK**, Matias Zaldarriaga (arXiv:1804.02406)

FIG. 1: Schematic illustration of heat transfer during cosmic dawn: squares show energy reservoirs (along with their temperatures) that are coupled by microphysical processes (indexed by numbers). Arrows show the direction of heat transfer. The dashed line indicates that atomic collisions are inefficient. The red line is our new heating mechanism. Symbols (a), (b), and (c) label the net diffusive heat loss of the Lyman-α photons, and the contributions of spin-flips and atomic recoils, respectively.



Ultra cold baryons are heated by CMB!

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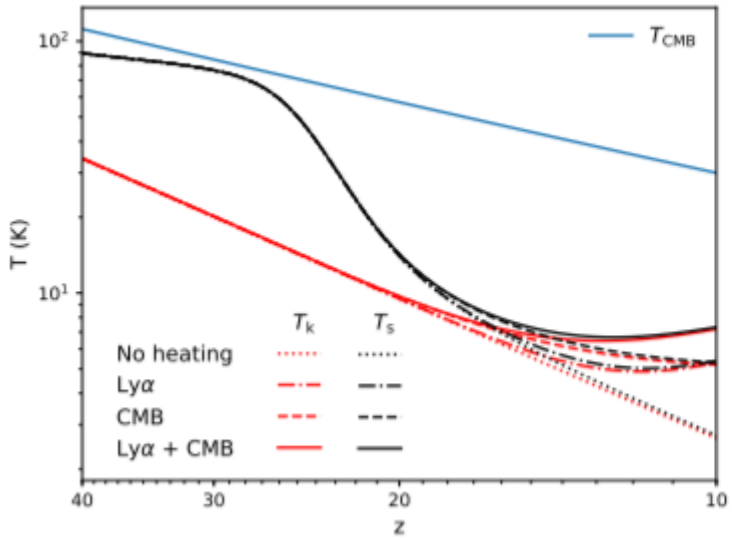

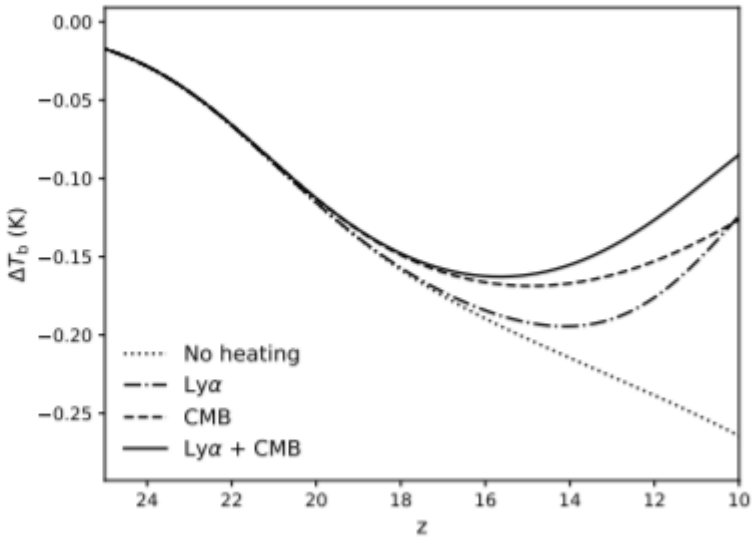

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EDGES signal shape

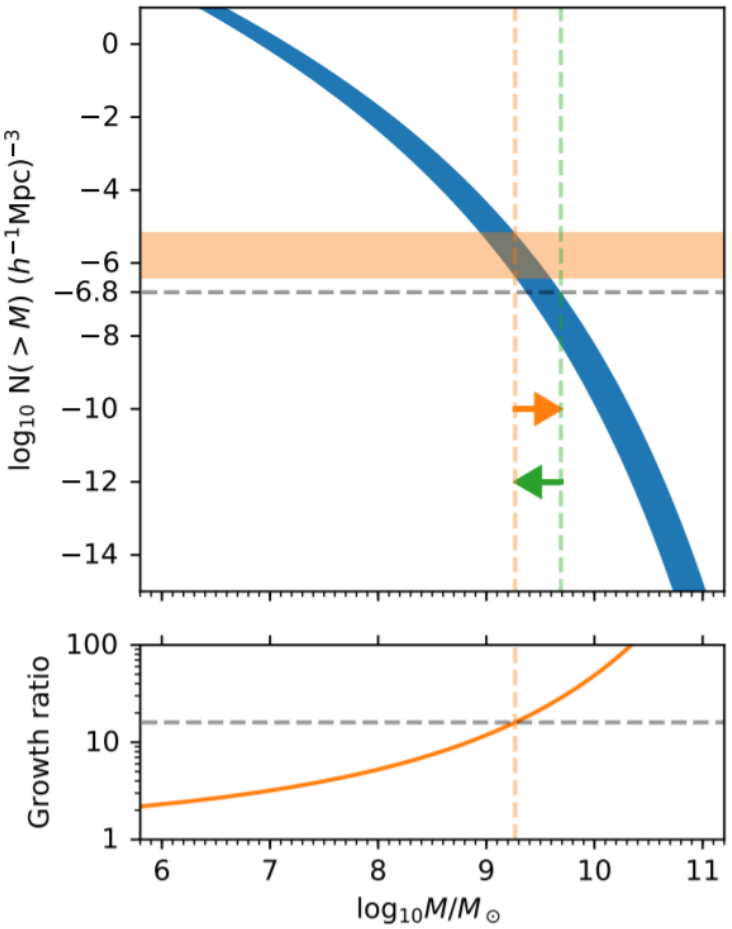
AK, Tejaswi Venumadhav, Liang Dai, Matias Zaldarriaga (arXiv:1805.03254)

- How can we reproduce the sharpness?

Coupling should happen very quick; thus, sources of L Lyman-α radiation should:

(A) be abundant enough for photons from them to reach ‘voids’;

(B) grow in number dramatically in short redshift interval.



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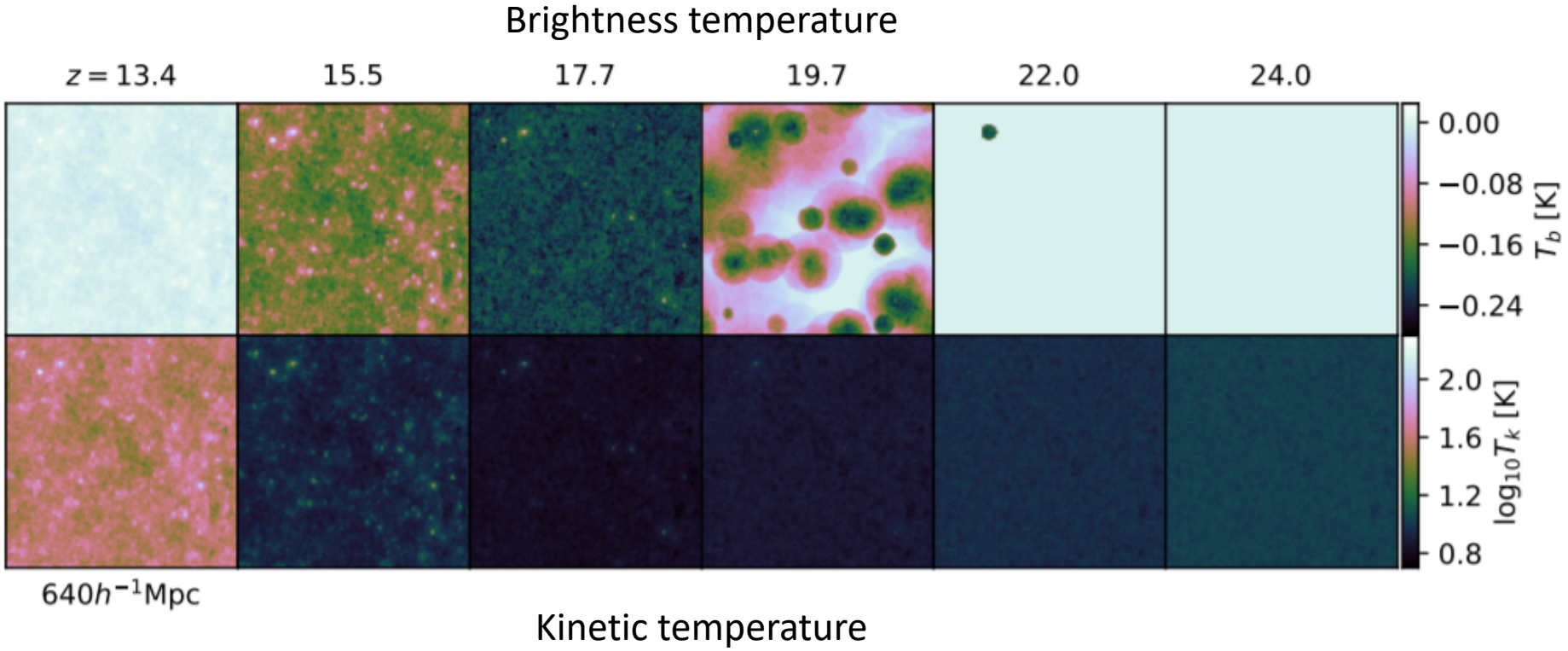

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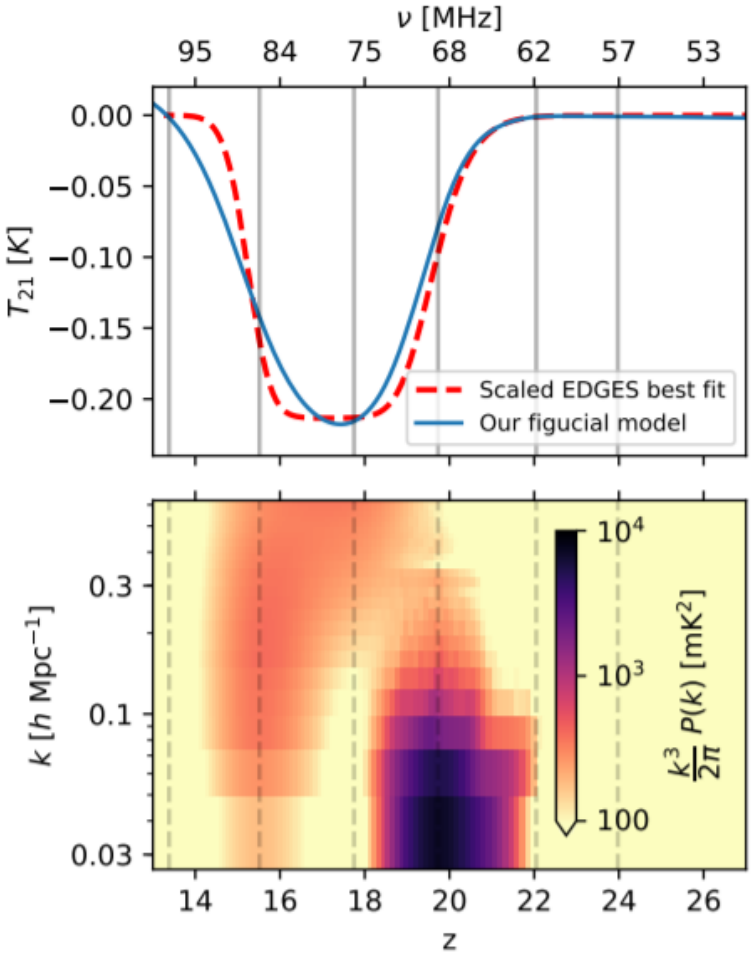

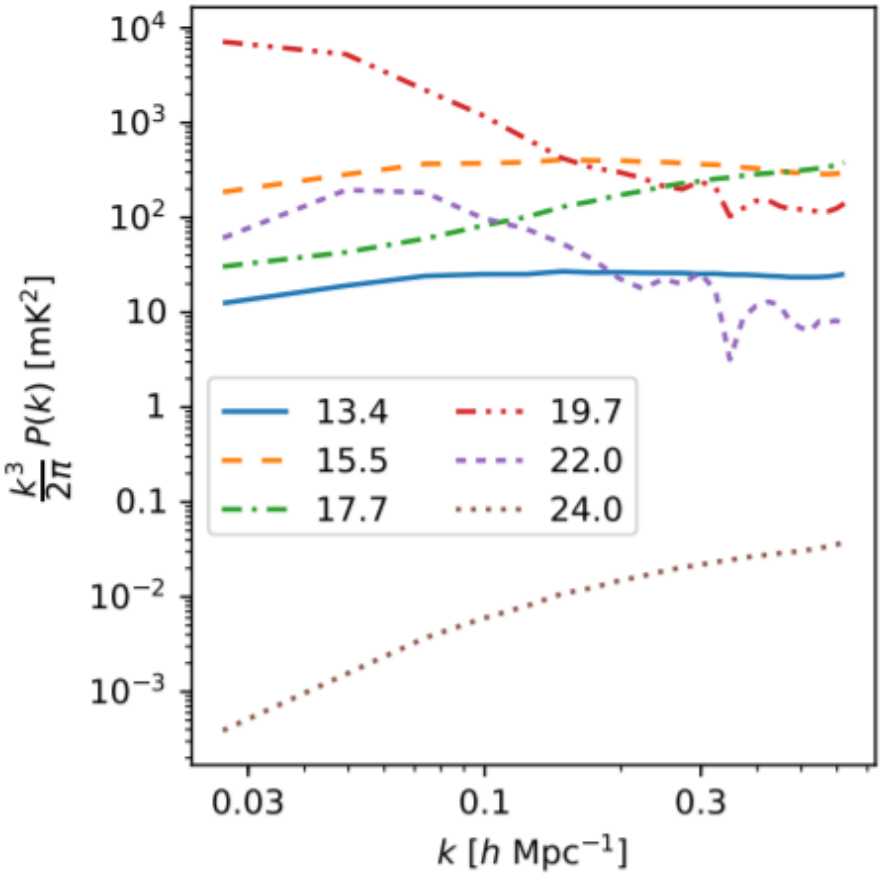

EDGES signal shape

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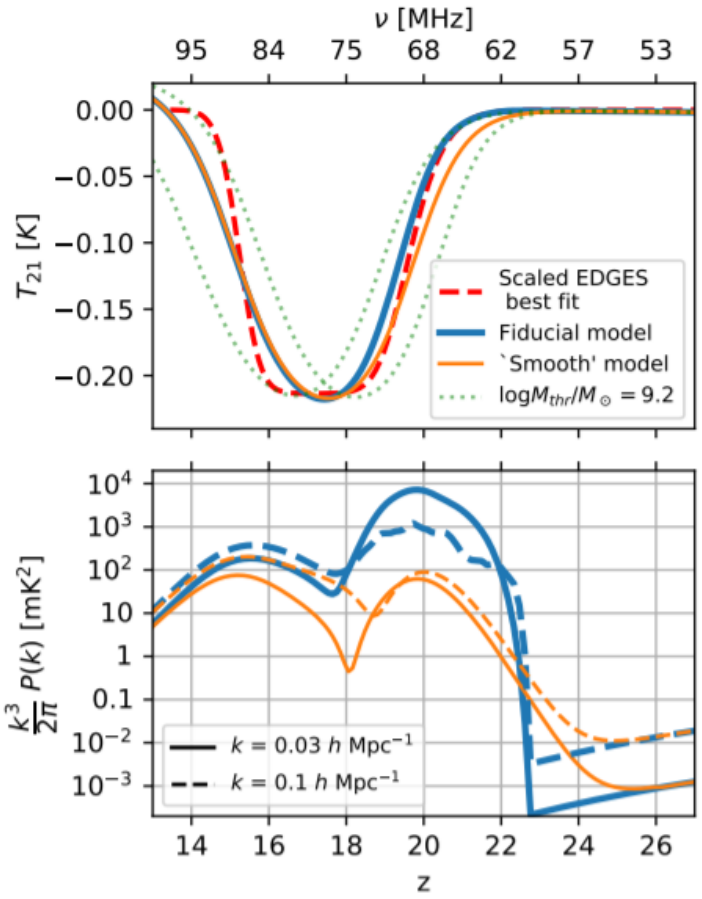
Inhomogeneous coupling produces extra power spectrum!

Can we probe it?

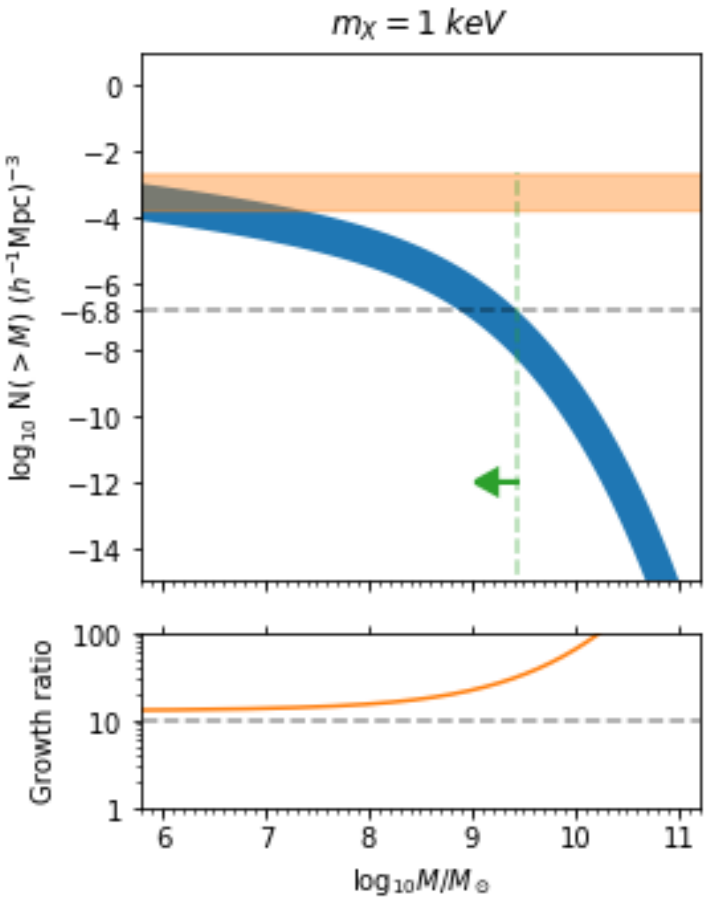
Super bright galaxies visible by the JWST, but very rare.

Still there are problems with heating.



WDM relief…

with Mohammadtaher Safarzadeh (not published)



WDM

(or other model that modifies HMF)

can make it easier to couple quickly.

Other things…

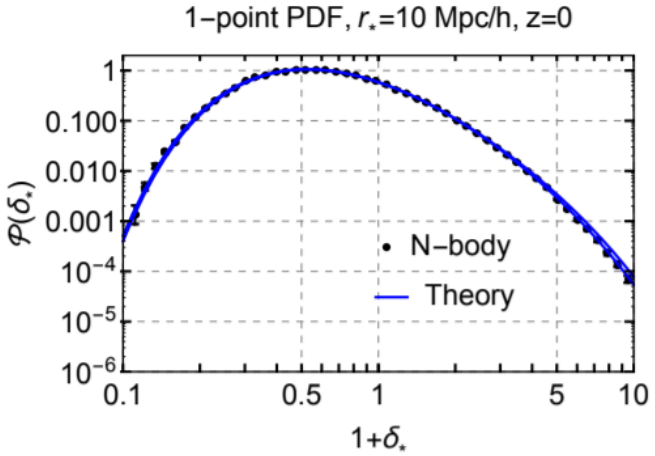
I am happy to talk about many things, including:

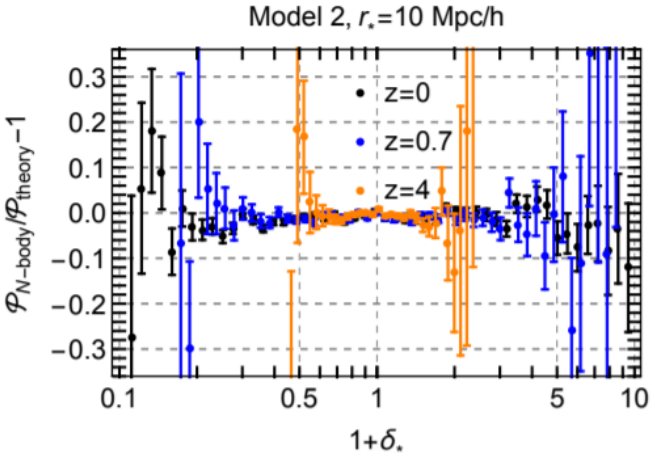
Non-perturbative probability distribution function for cosmological counts in cells

Misha Ivanov (NYU), **AK**, Sergey Sibiryakov (CERN -> Perimeter)

How powerful 1-point statistics?

Can we machine-learn large scale structure and 21cm signal?





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More detailed Lyman-α treatment:

- If Lyman-α is indeed so abundant during the Cosmic Dawn, what dynamical baryonic effects we should expect?
- What is the fate of a Lyman-α photon?

We study it with MC RT codes.