Assuming Ionization Equilibrium and the Impact on the Lyman-α Forest Power Spectrum during the End of Reionization at 8 ≥ z ≥ 5

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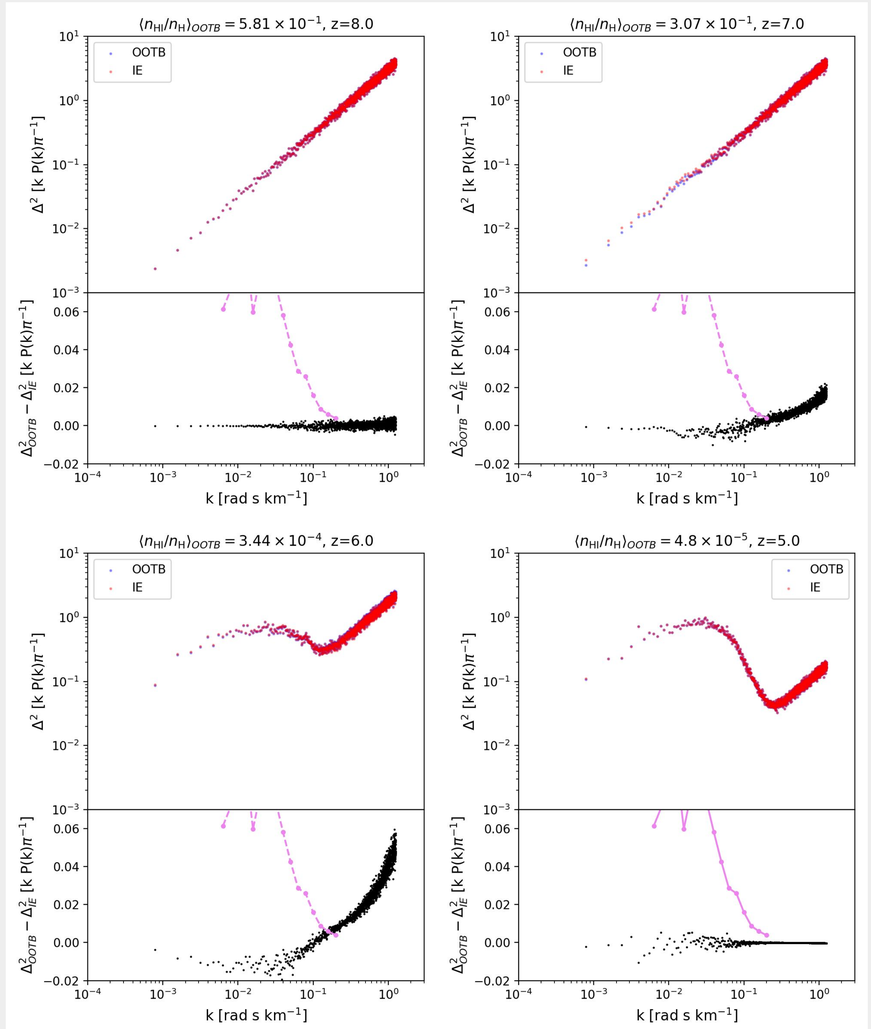
Introduction

- EOR driven by early galaxies, but difficult to measure IGM for tests
- One can assume photoionization equilibrium, but potential observational consequences arise
- *What is the impact on observing and studying the IGM's properties assuming photoionization equilibrium?*

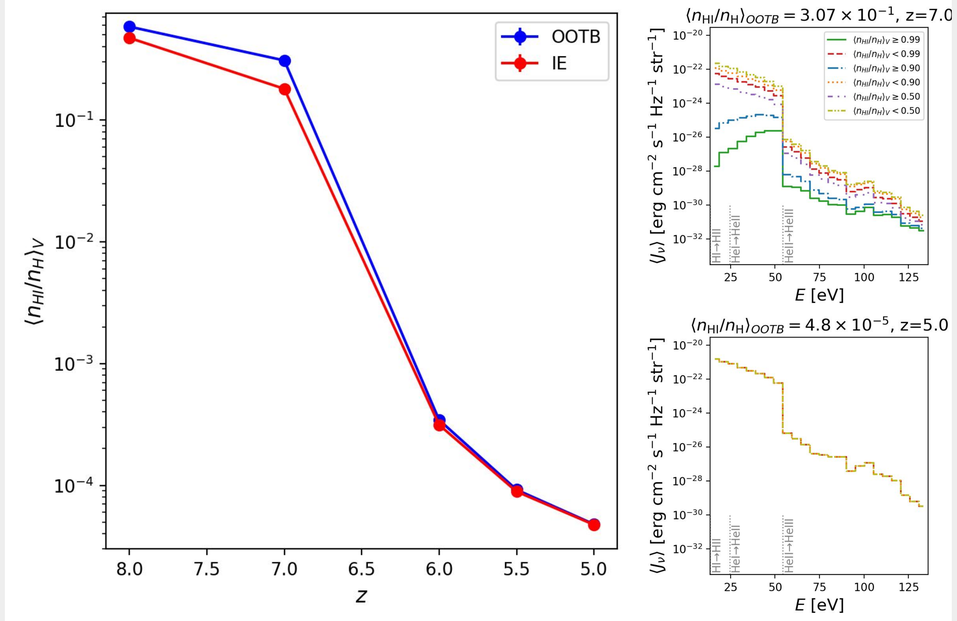
Simulation/Analysis

- *TECHNICOLOR DAWN*
  - 15 h^{-1} Mpc
  - 2×640^3 particles
  - RT done in 80^3 cells, inhomogeneous UVB
  - $(\Omega_M, \Omega_\Lambda, \Omega_b, H_0, X_H)$ = (0.3089, 0.6911, 0.0486, 67.74, 0.751)
- Quasar sightline traverses and periodically wraps simulation
  - Spectrum extracted twice: once assuming non-equilibrium solver in simulation, once assuming ionization equilibrium

Results



- Impact on power spectrum: IE reduces power in smaller scales
- Such impact not observable in some of latest LAF power spectrum errors (z=5; Boera+ 19), potentially in future



- Comparing non-equilibrium (OOTB) and ionization equilibrium (IE)
- IE increases ionization fraction of IGM
- Decrease in UVB overall with more neutral hydrogen, considerable dip around HI ionization

Discussion

- IE accelerates ionization
- Reduction in power in smaller scale, potentially observable with newer technology
- *This research has been submitted for publication*

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