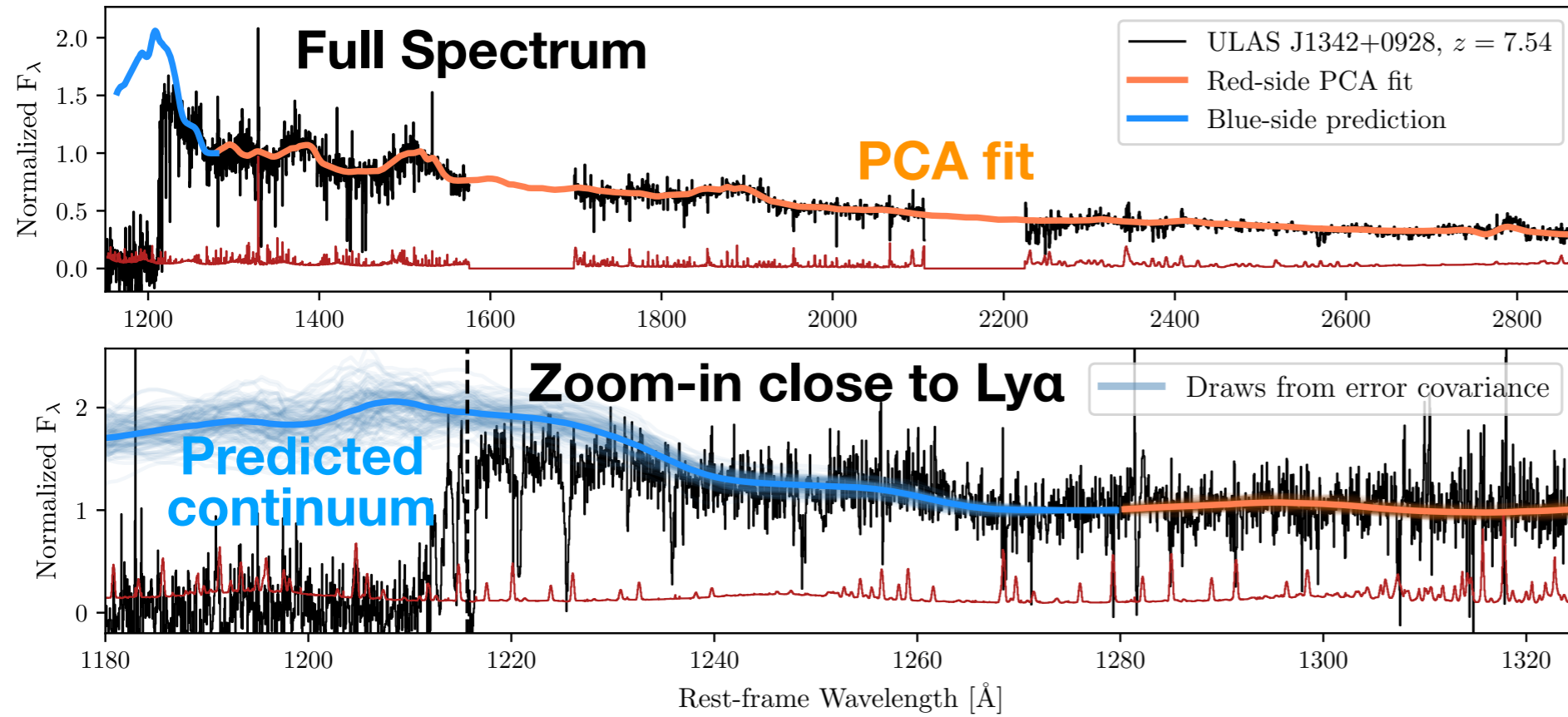


# Quantitative Reionization Constraints from Quasar Spectra

Frederick Davies, UC Santa Barbara

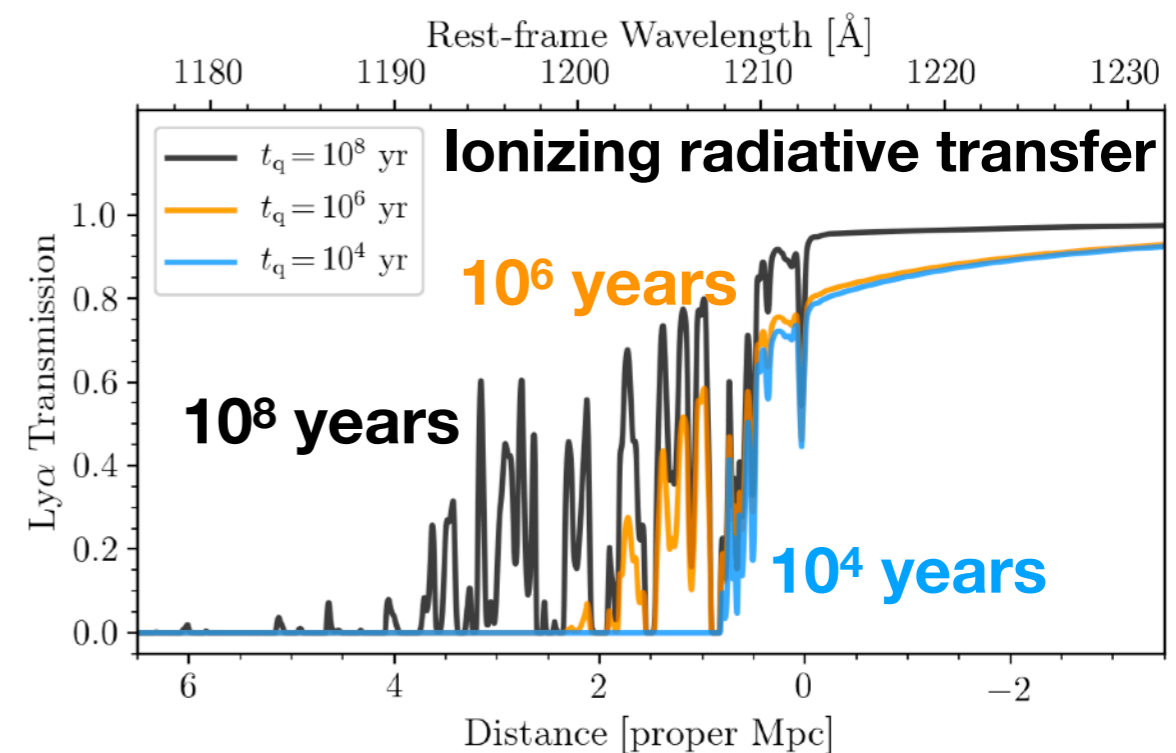
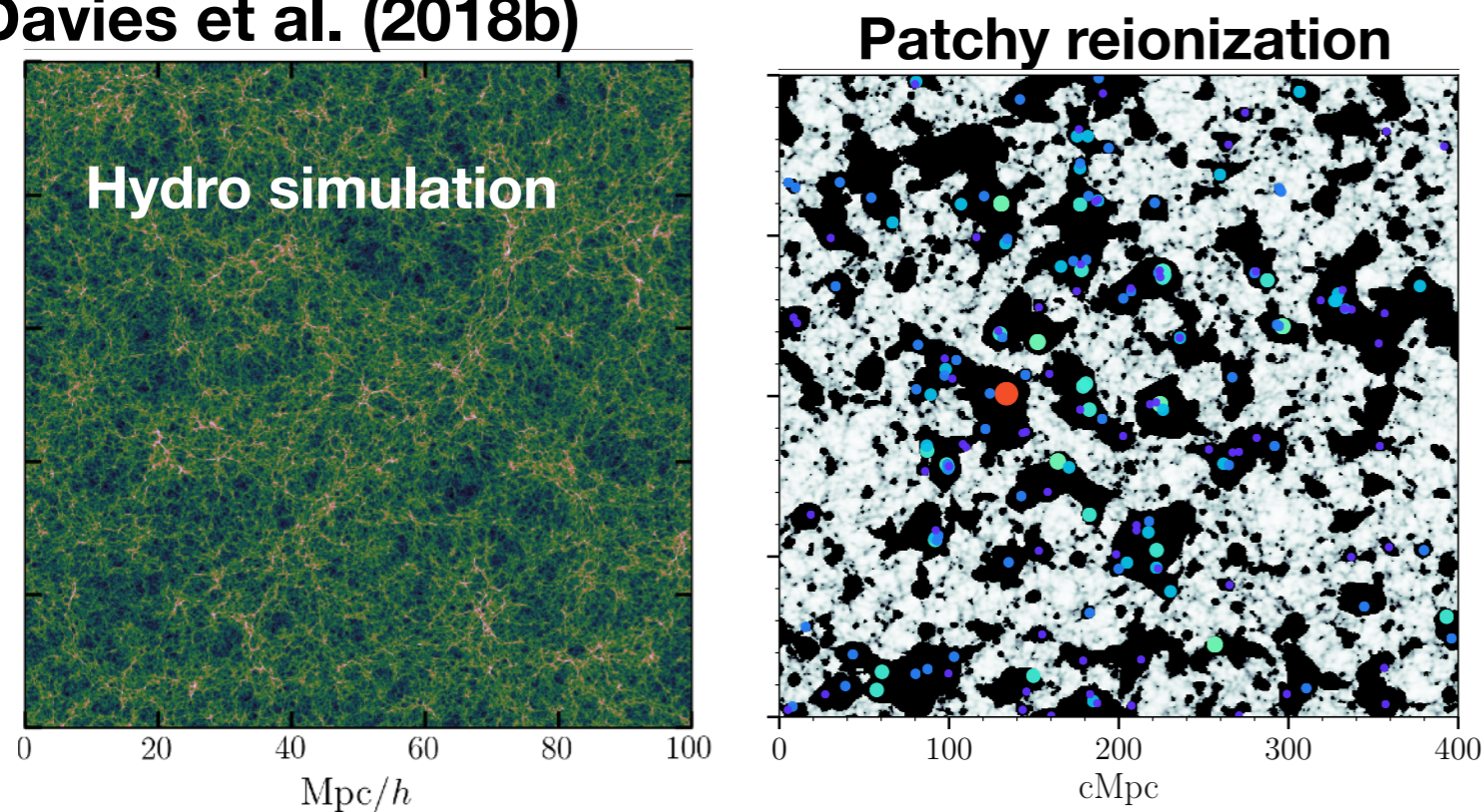


**Continuum prediction  
via PCA**

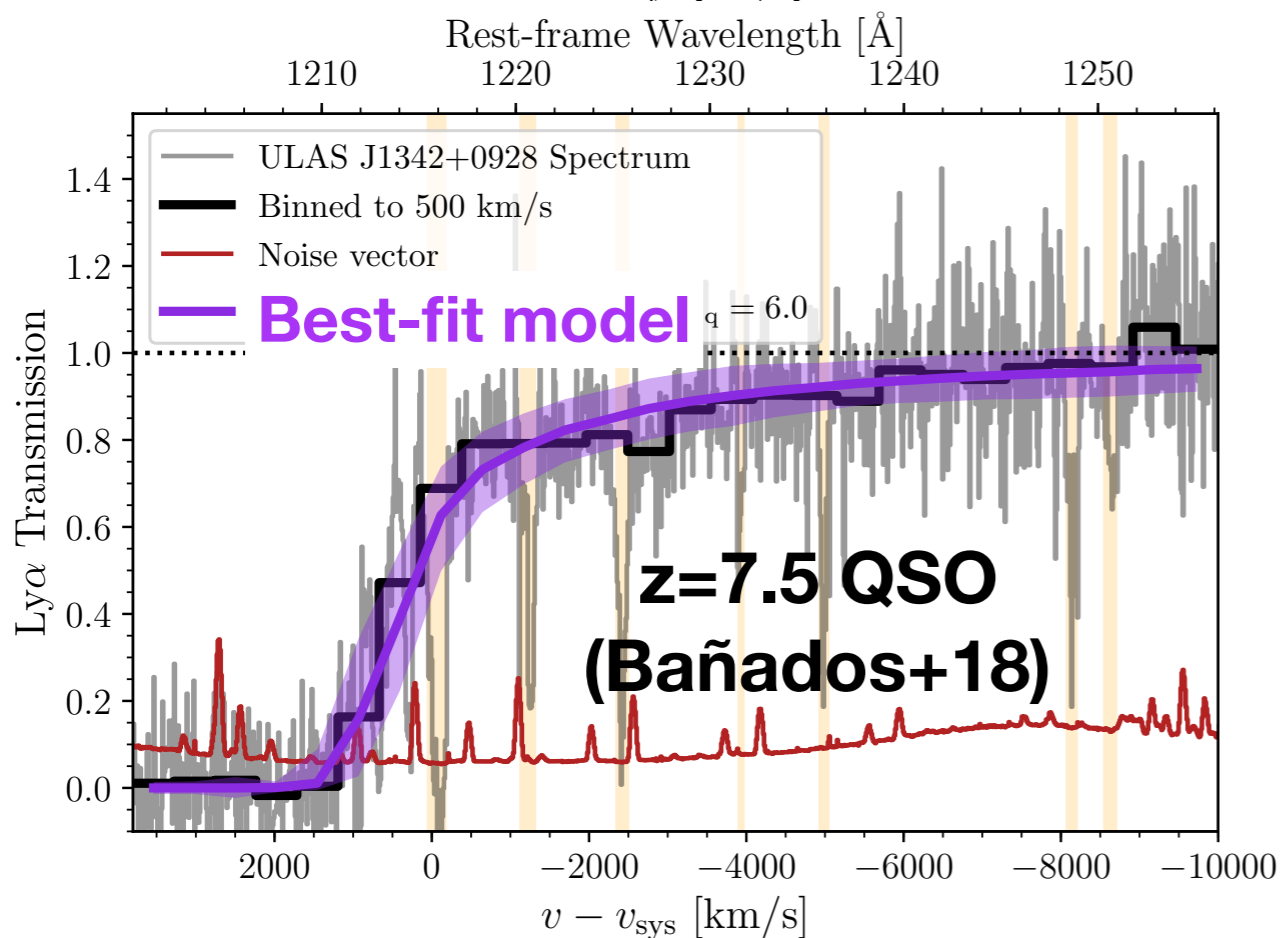
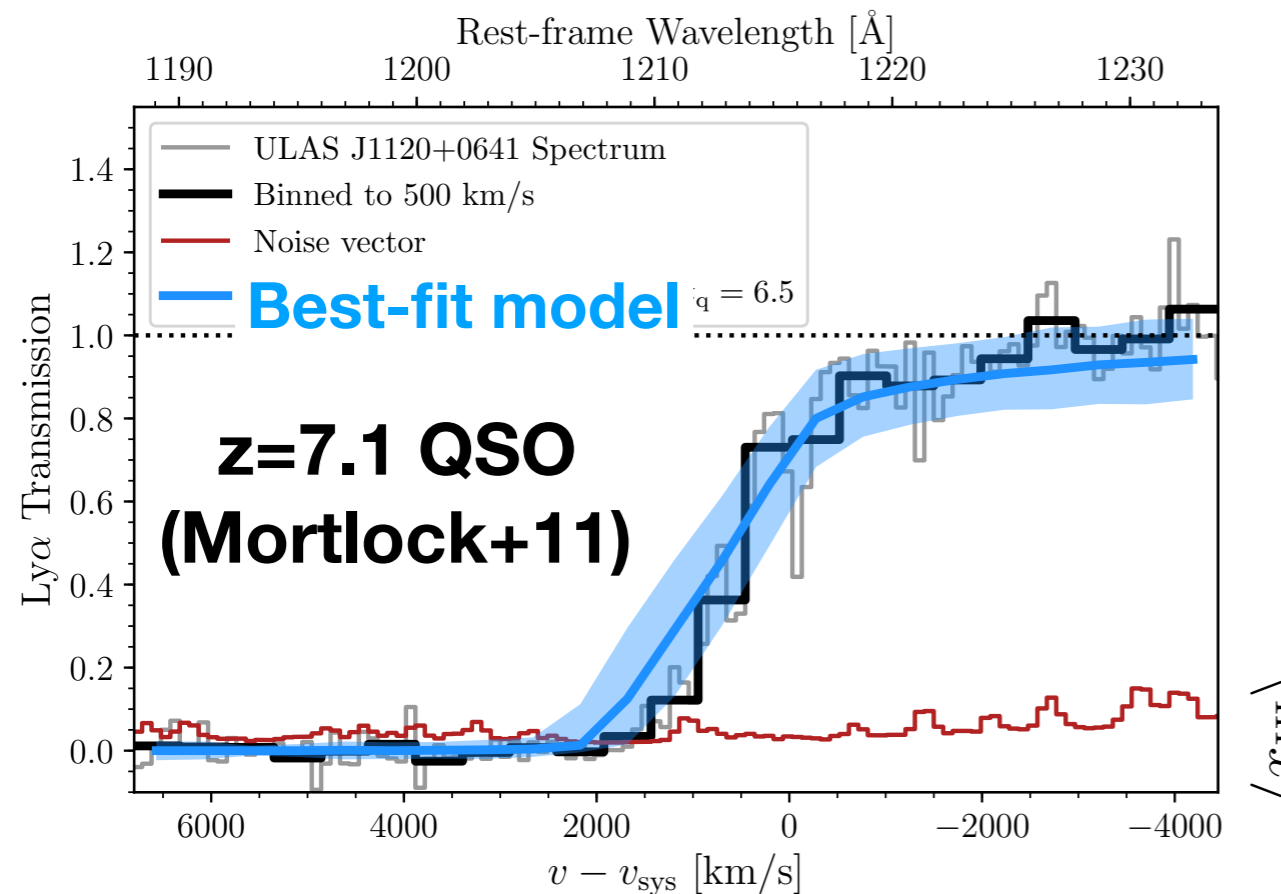
Davies et al. (2018a)

## Hybrid simulations of quasar proximity zones and damping wings

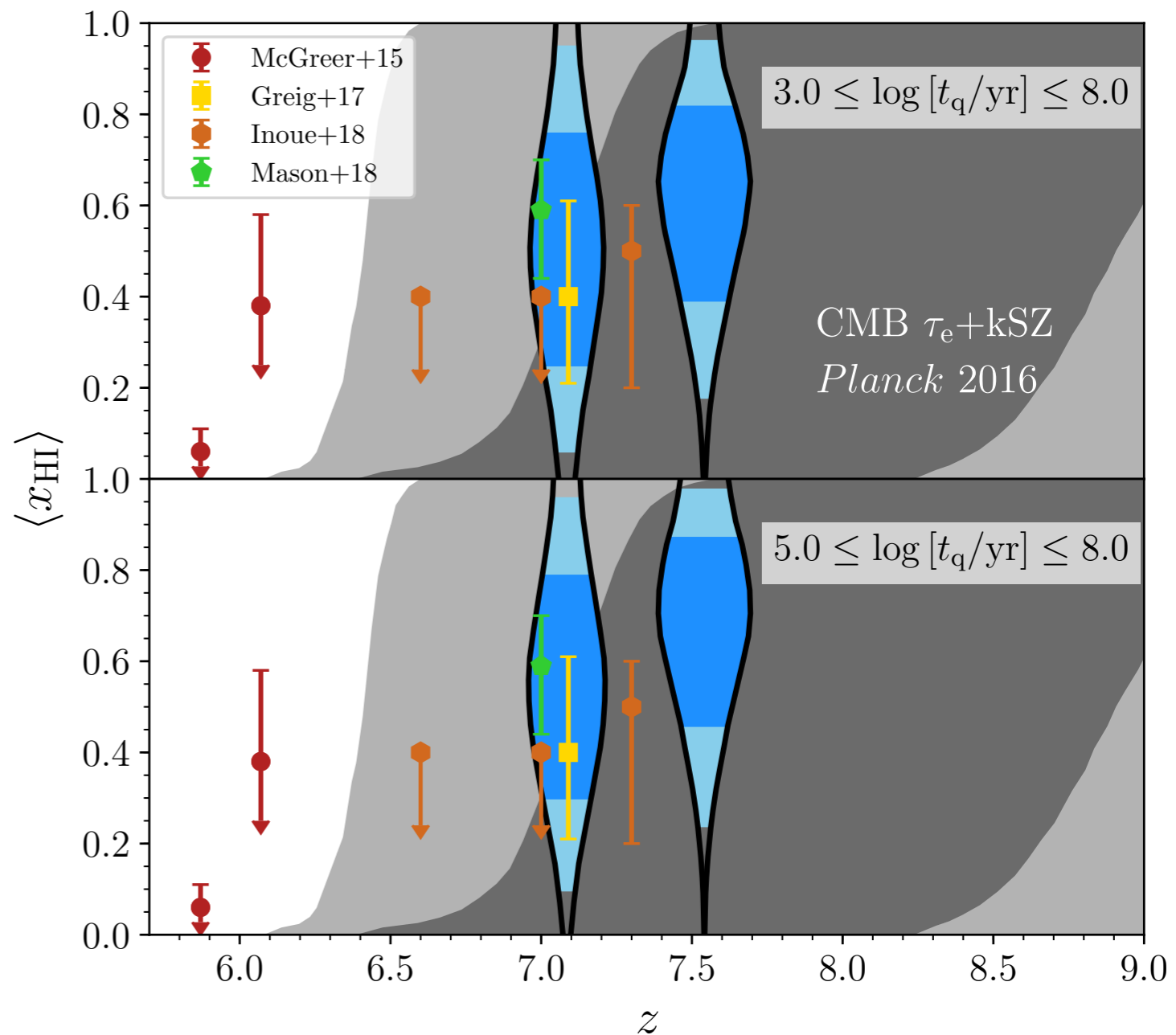
Davies et al. (2018b)



# $z > 7$ quasars are deep into the epoch of reionization



$\langle x_{\text{HI}} \rangle \sim 0.5/0.7$  at  $z=7.1/7.5$



Davies et al. (2018b)

**Constraints *marginalized* over uncertain QSO lifetime**