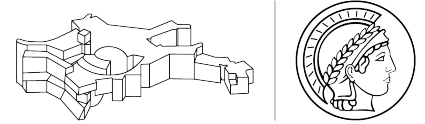


# Investigating supernova feedback in EoR galaxies using Lyman alpha

Elie Cueto  
First RECAP collaboration workshop  
February 23-25 2026



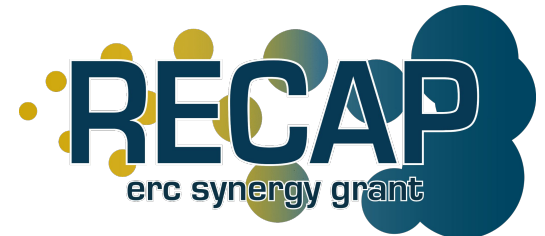
**MAX PLANCK INSTITUTE**  
FOR ASTROPHYSICS



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# Disposition

- Background: The SPICE simulations
- The Ly- $\alpha$  RT simulations
  - Ly- $\alpha$  spectra
  - Comparing the models

# SPICE simulations

RHD Cosmological simulations for the EoR

Multiple simulations with different SN feedback modelling

## **Bursty Model**

- All SN feedback occurs 10 Myr after star formation
- Ly $\alpha$  RT for  $\sim 300$  halos so far

## **Smooth Model**

- SN feedback occurs  $\sim 3-40$  Myr after star formation according to stellar lifetimes
- Ly $\alpha$  RT for  $\sim 650$  halos so far

# SPICE simulations

RHD Cosmological simulations for the EoR

Multiple simulations with different SN feedback modelling

## Hypernovae Model

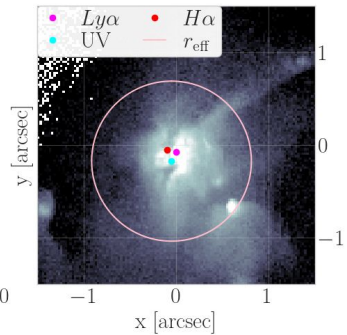
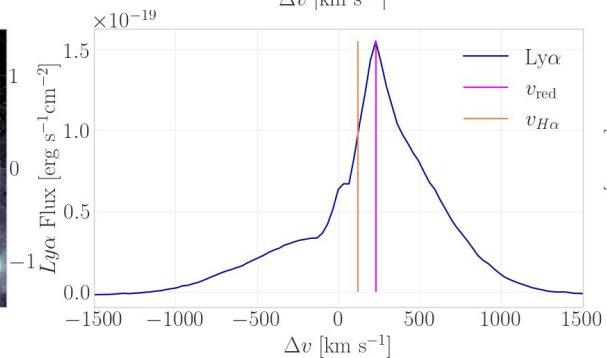
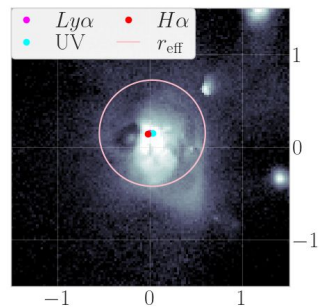
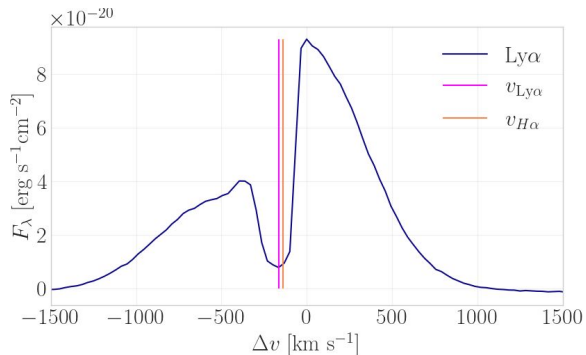
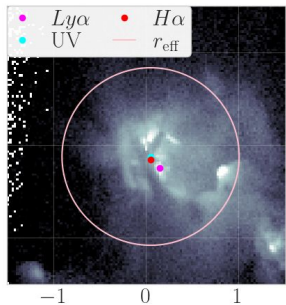
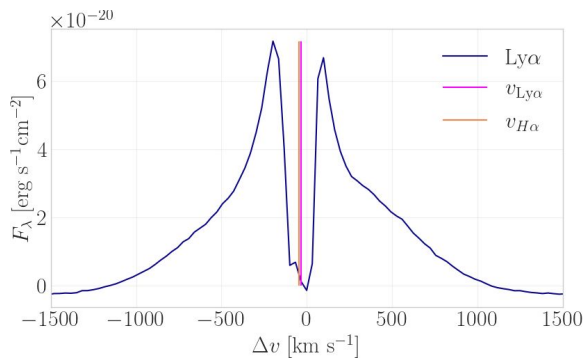
- All SN feedback timing like in smooth model, but some stars explode as Hypernovae with more energy
- Ly $\alpha$  RT for  $\sim 9$  halos so far

## Smooth Model

- SN feedback occurs  $\sim 3-40$  Myr after star formation according to stellar lifetimes
- Ly $\alpha$  RT for  $\sim 650$  halos so far

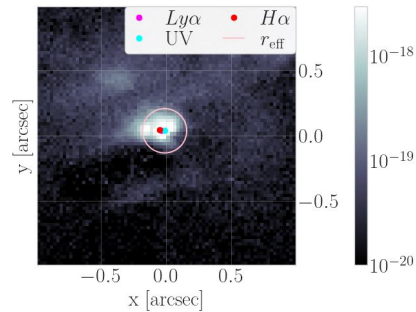
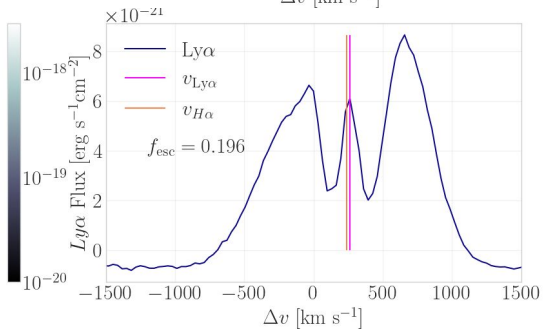
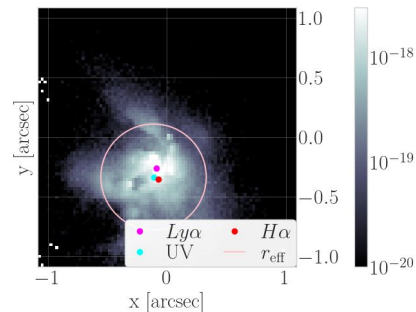
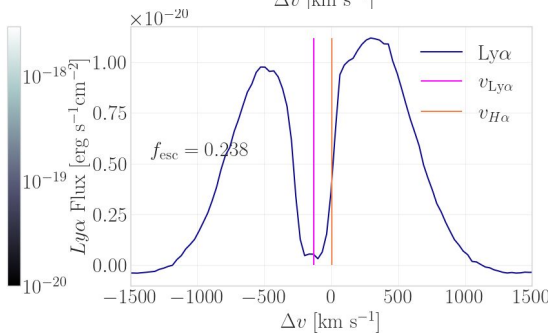
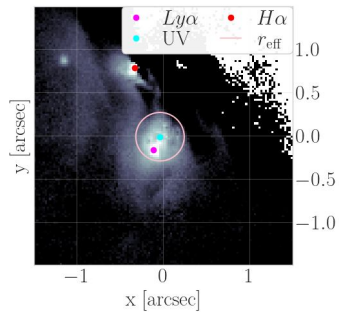
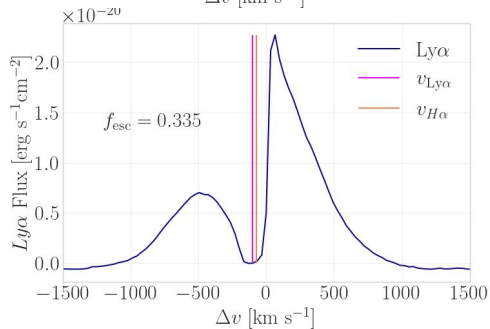
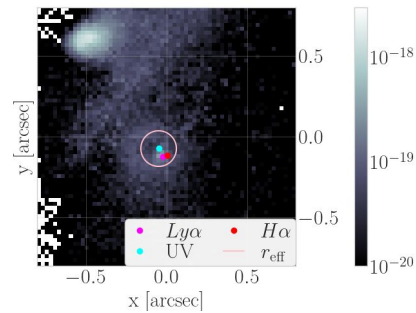
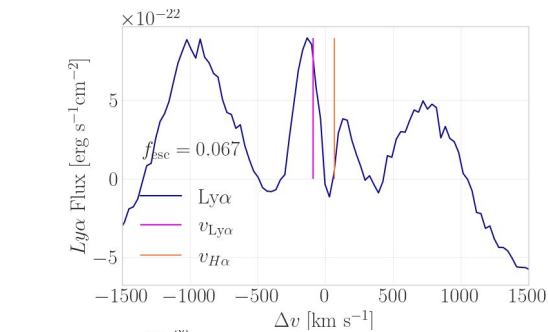
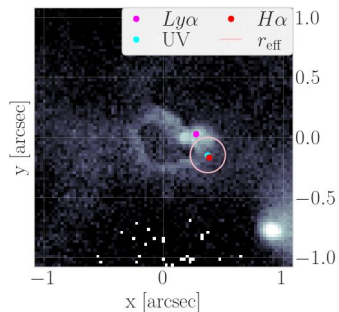
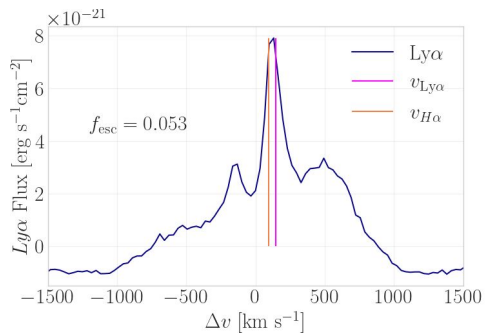
# Ly- $\alpha$ RT simulations

Variability of spectral shapes with direction



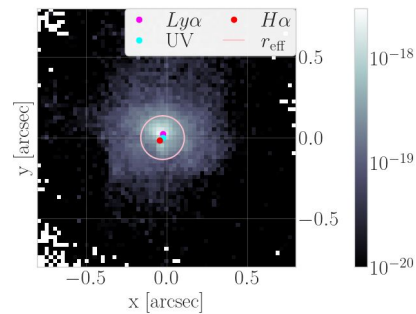
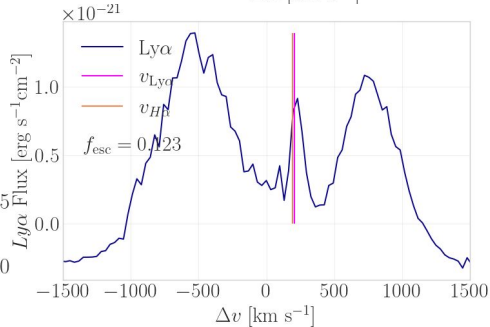
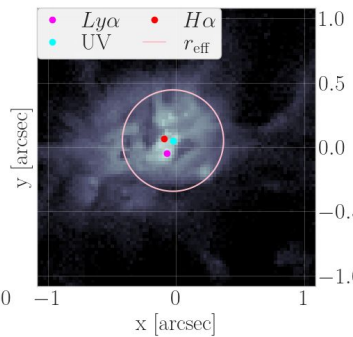
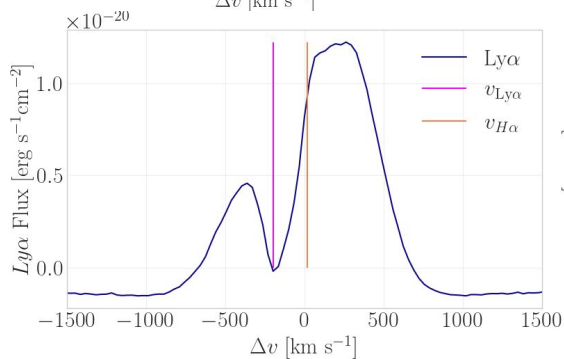
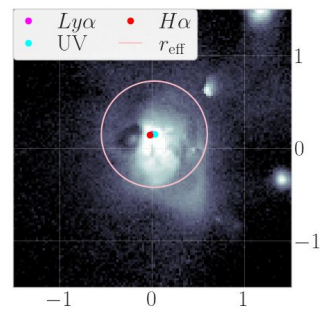
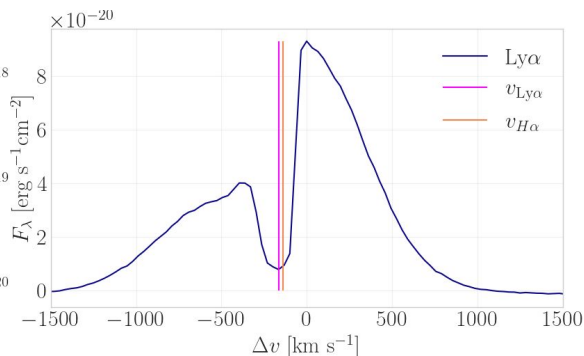
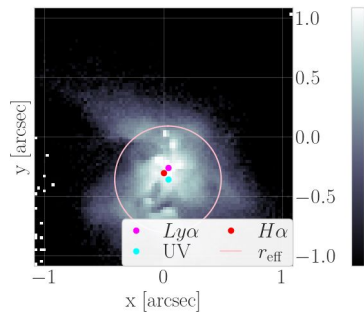
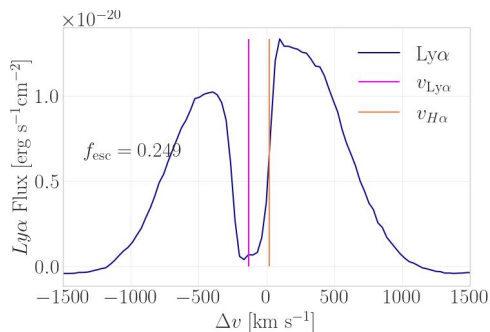
# Ly- $\alpha$ RT simulations

## Various spectral shapes



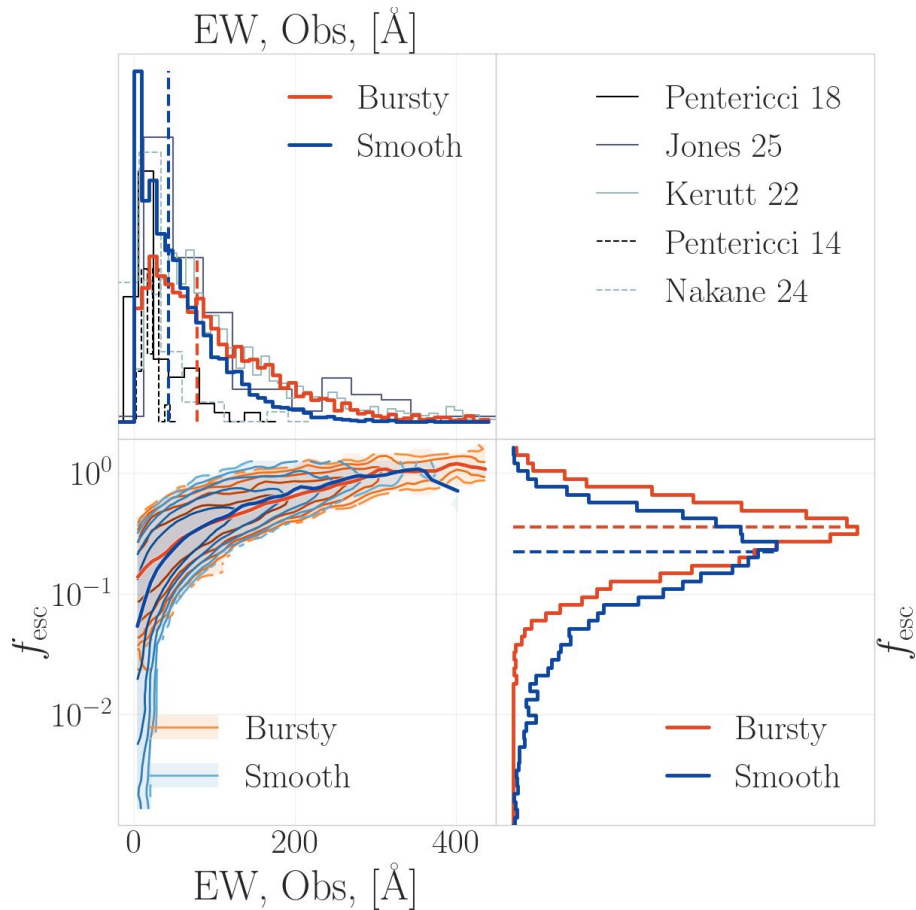
# Ly- $\alpha$ RT simulations

## Velocity offset between H- $\alpha$ and Ly- $\alpha$



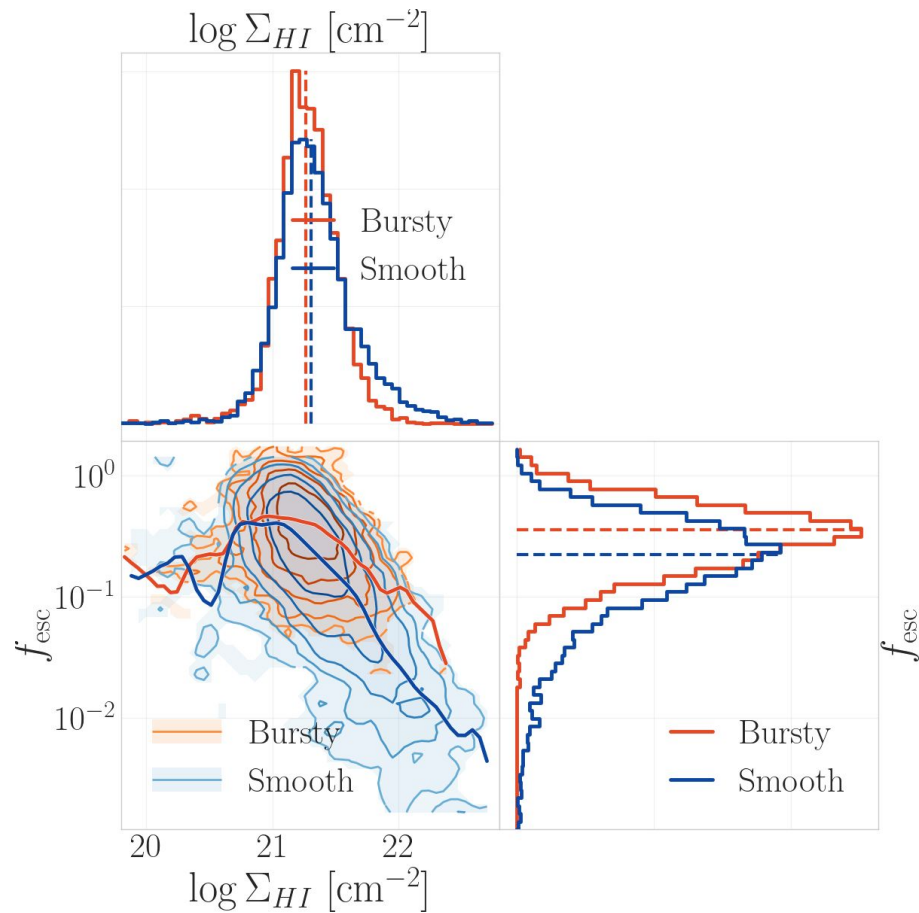
# Comparing Models

Escape fractions / Equivalent widths



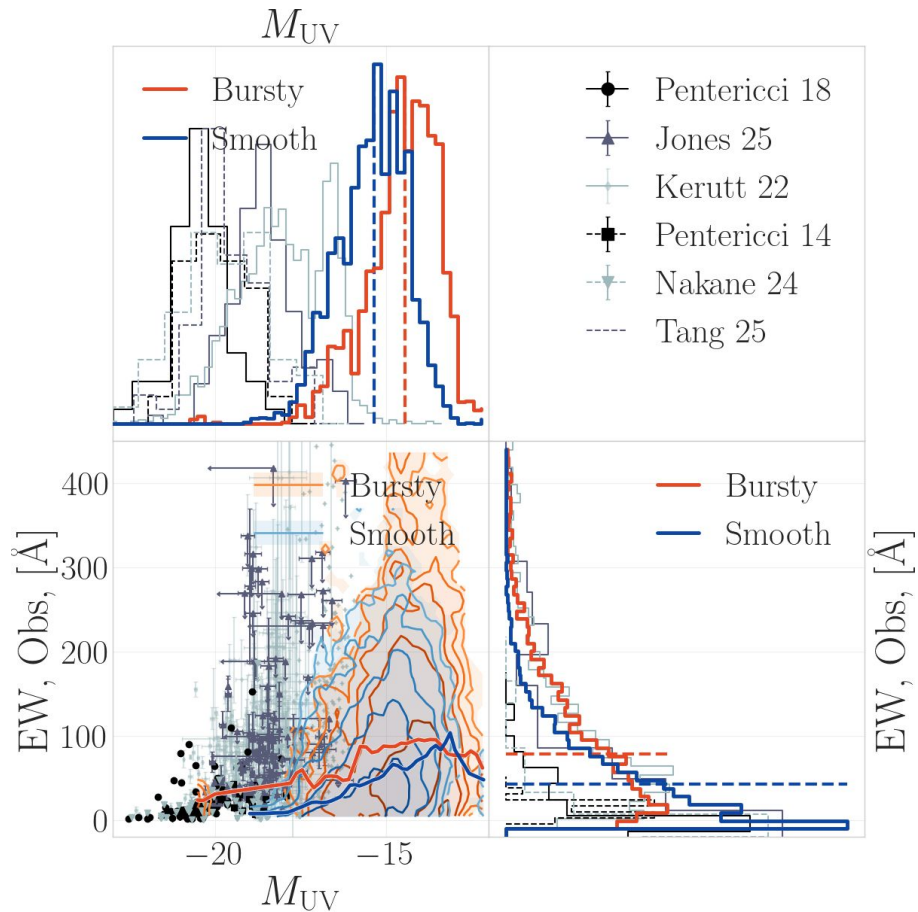
# Comparing Models

Escape fractions / Column densities



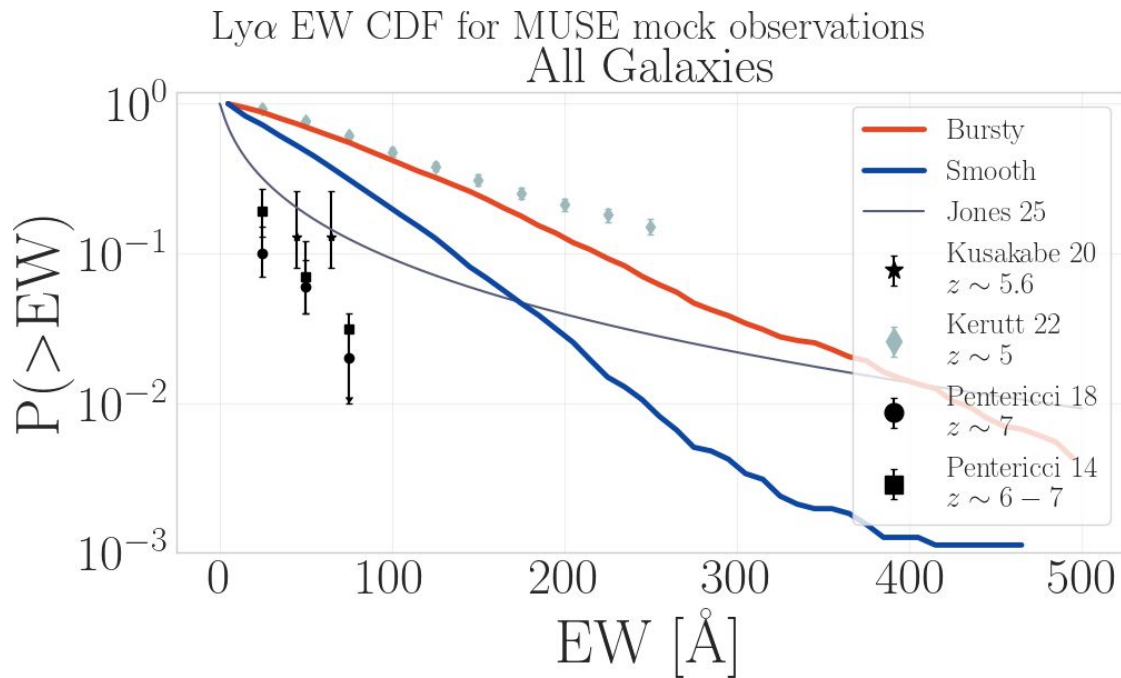
# Comparing To observations

Very different populations of galaxies



# Comparing To observations

Ly $\alpha$  EW CDFs, similar to MUSE observations



# Comparing Models

Blue-to-red peak ratios and peak separation

