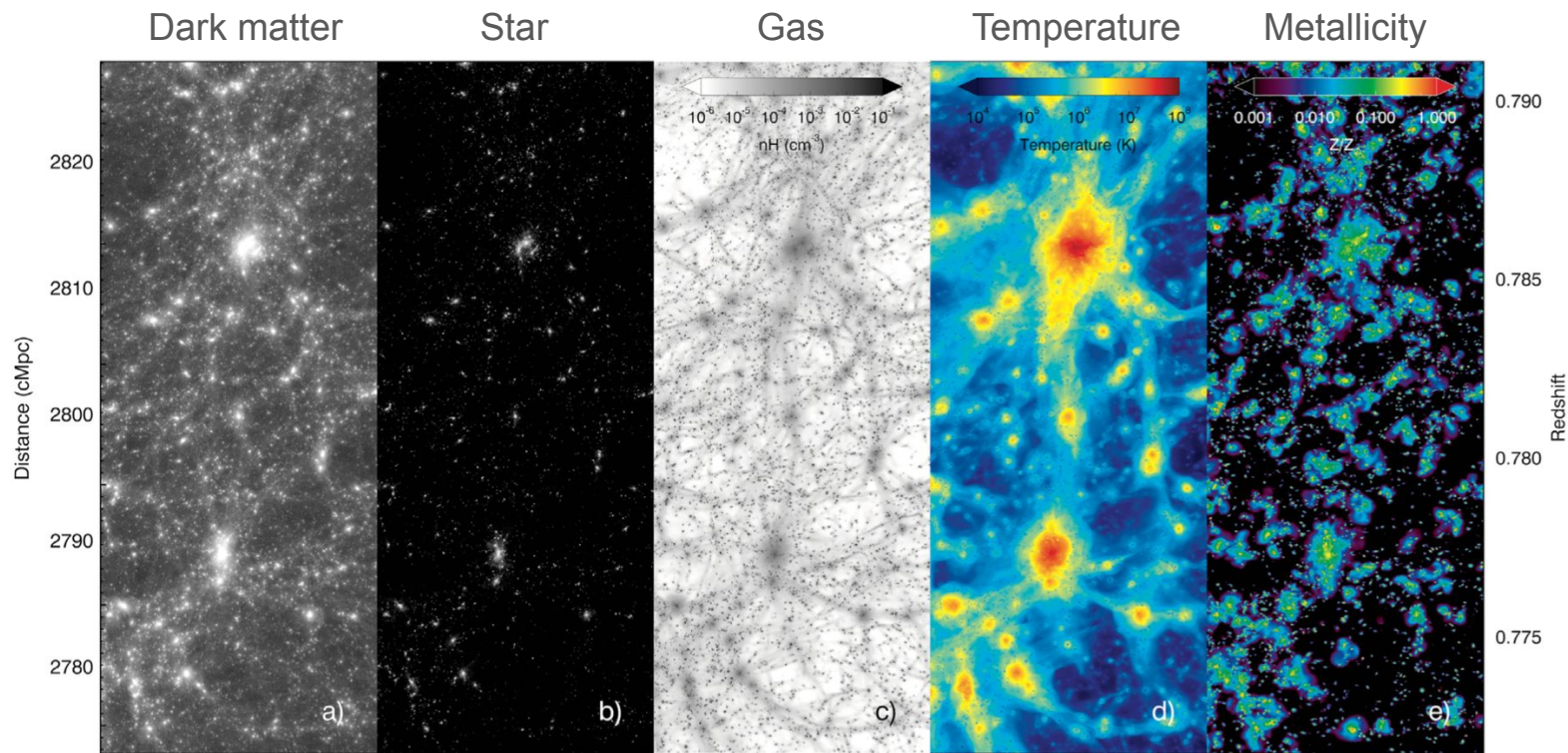


# SED calculation for Horizon Run 5 lightcone data

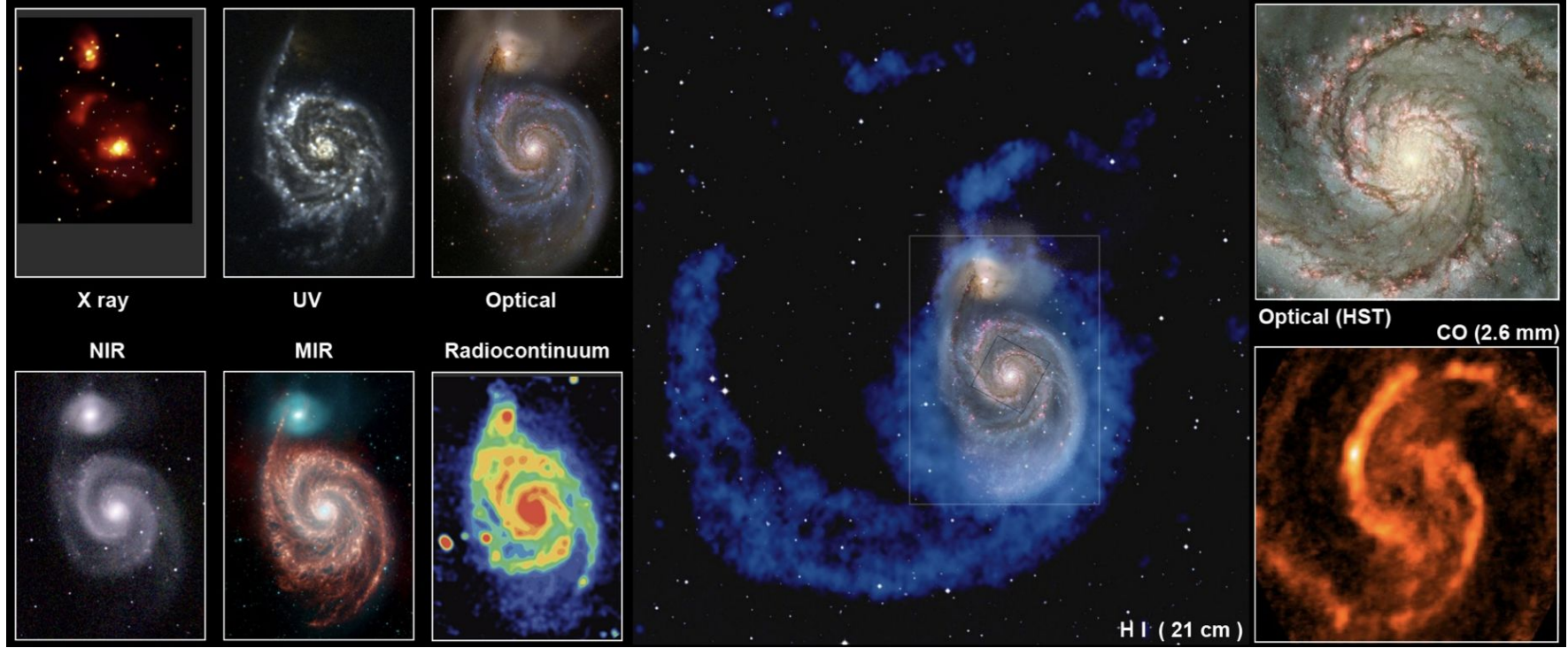
Hyunmi Song (CNU), Clotilde Laigle (IAP), HR5 collaboration  
SSG Workshop 2023  
16-18 January 2023

# What we get from simulations



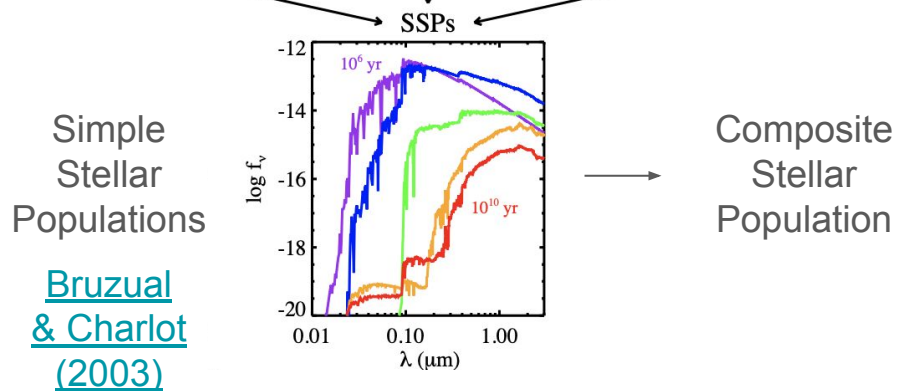
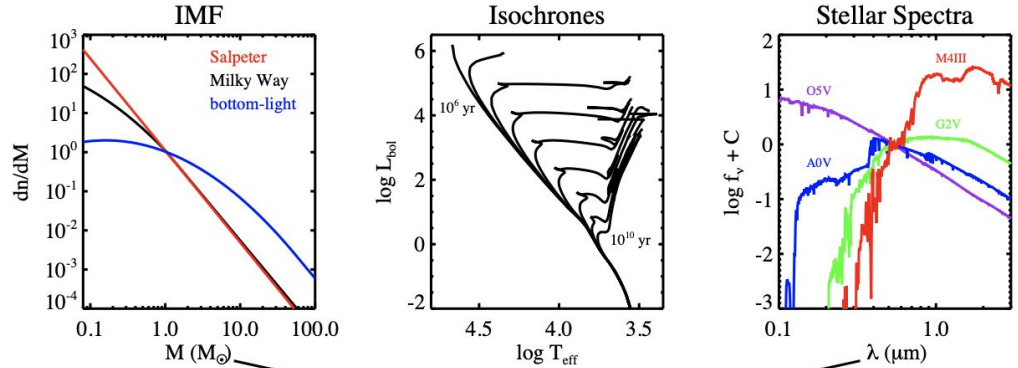
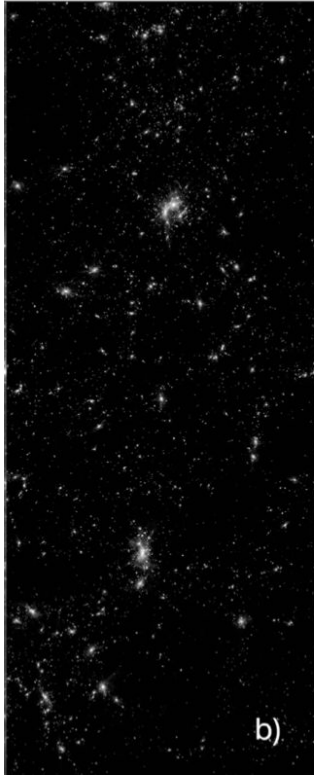
[Lee, Shin+\(2021\)](#)

# What we get from observations

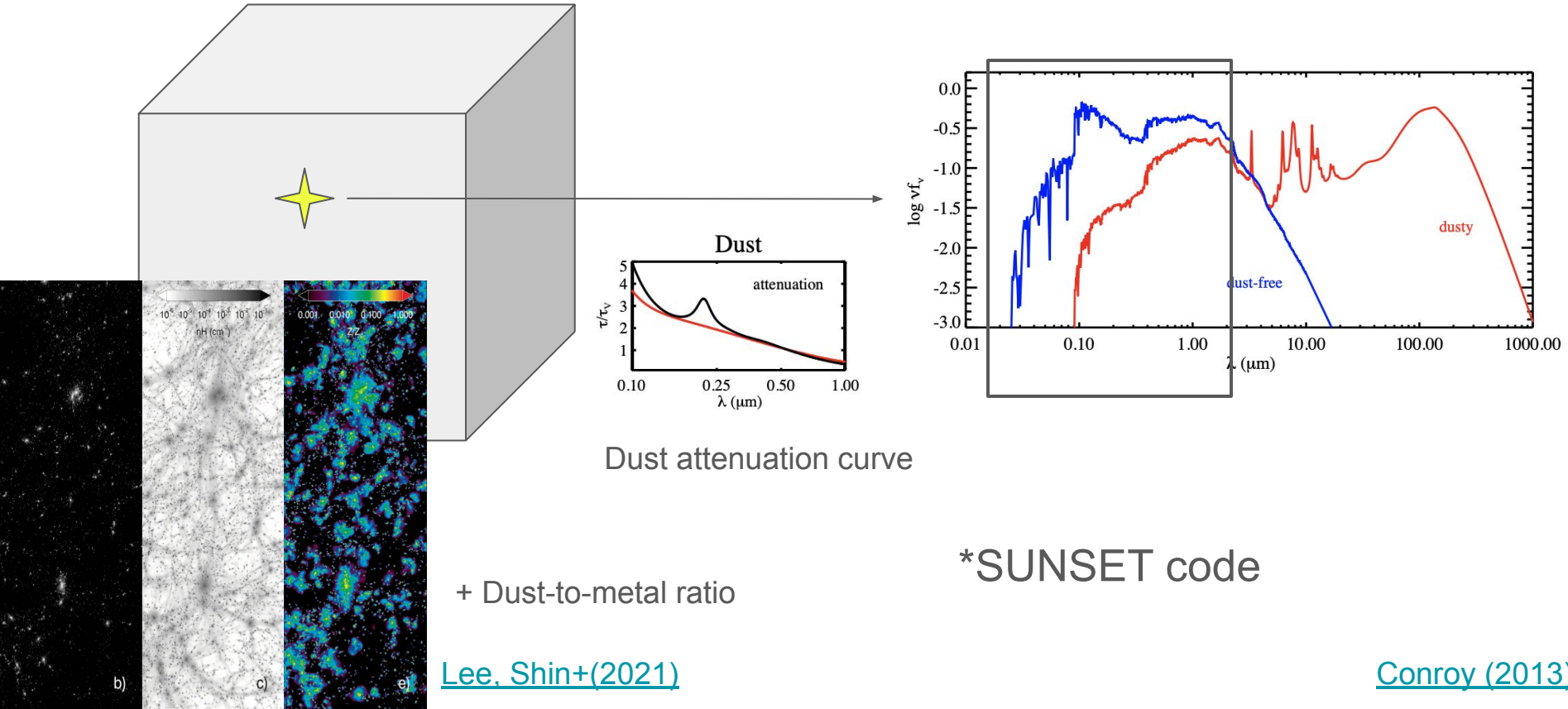


[Angel Lopez-Sanchez](#)

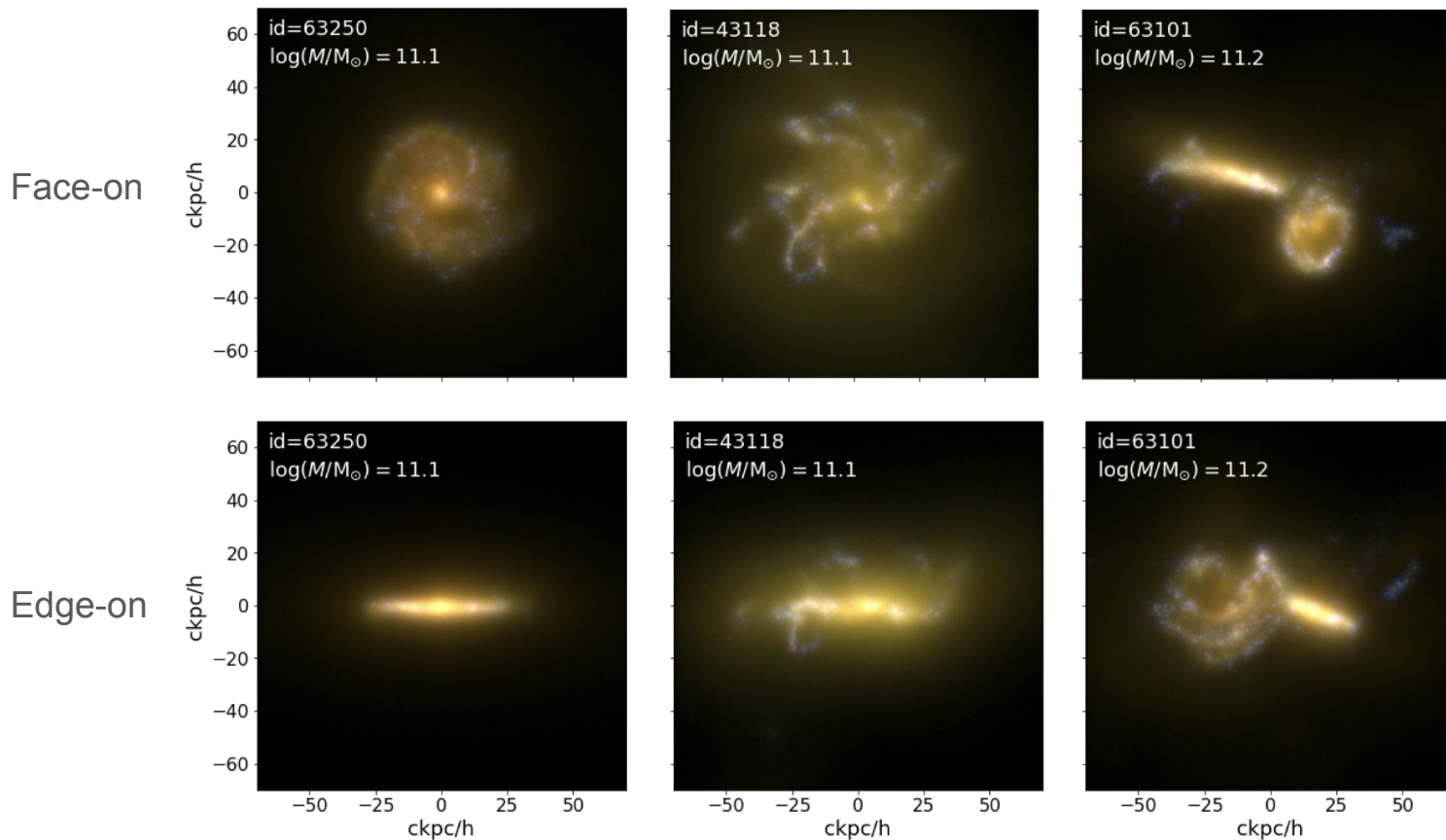
# How to compute stellar spectra



# How to compute stellar spectra + dust attenuation



Some examples of HR5 galaxies at  $z=5$  in rest-frame NUV, r, Ks filters

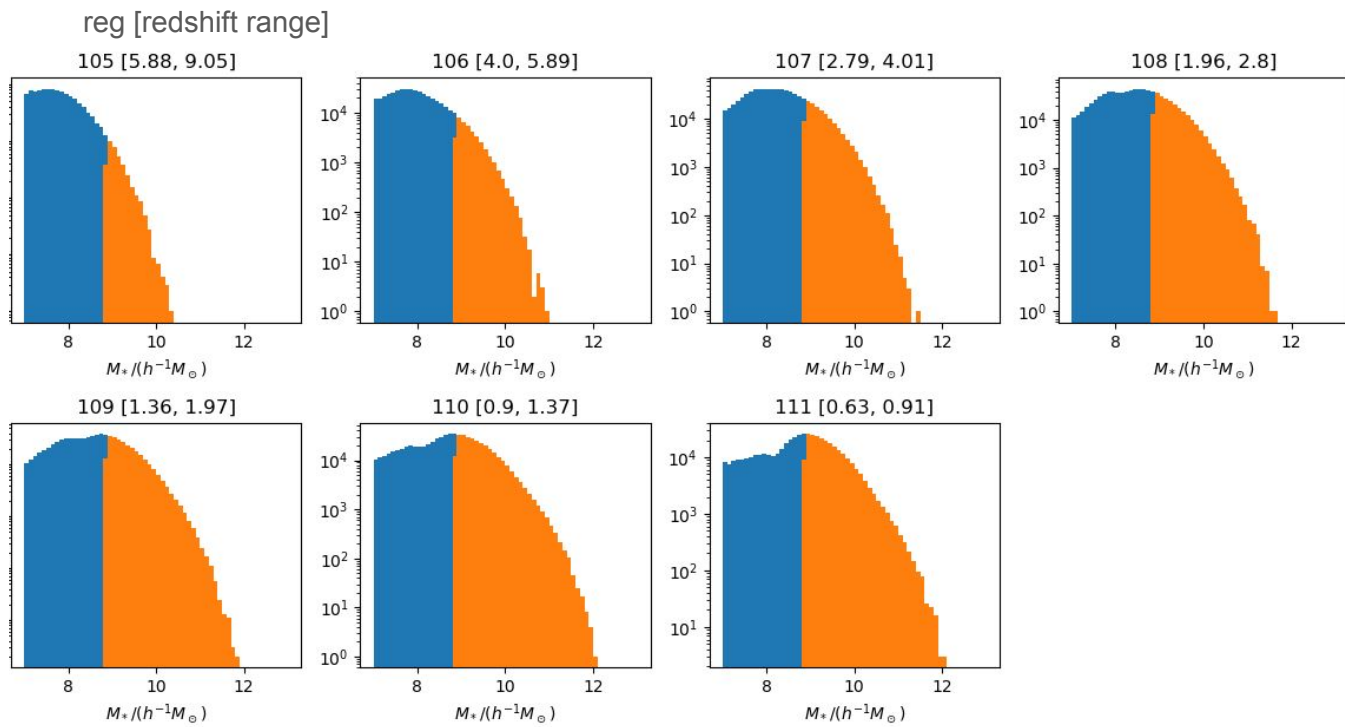
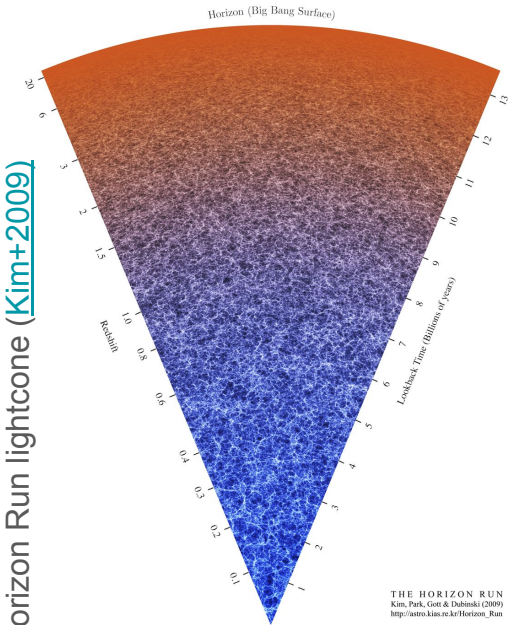


# Our goal

- To model galaxy SEDs that well reproduce observed UV luminosity functions and dust-to-stellar mass relations across a redshift range with a realistic dust implementation

# HR5 lightcone data ( $0.63 < z < 9.05$ )

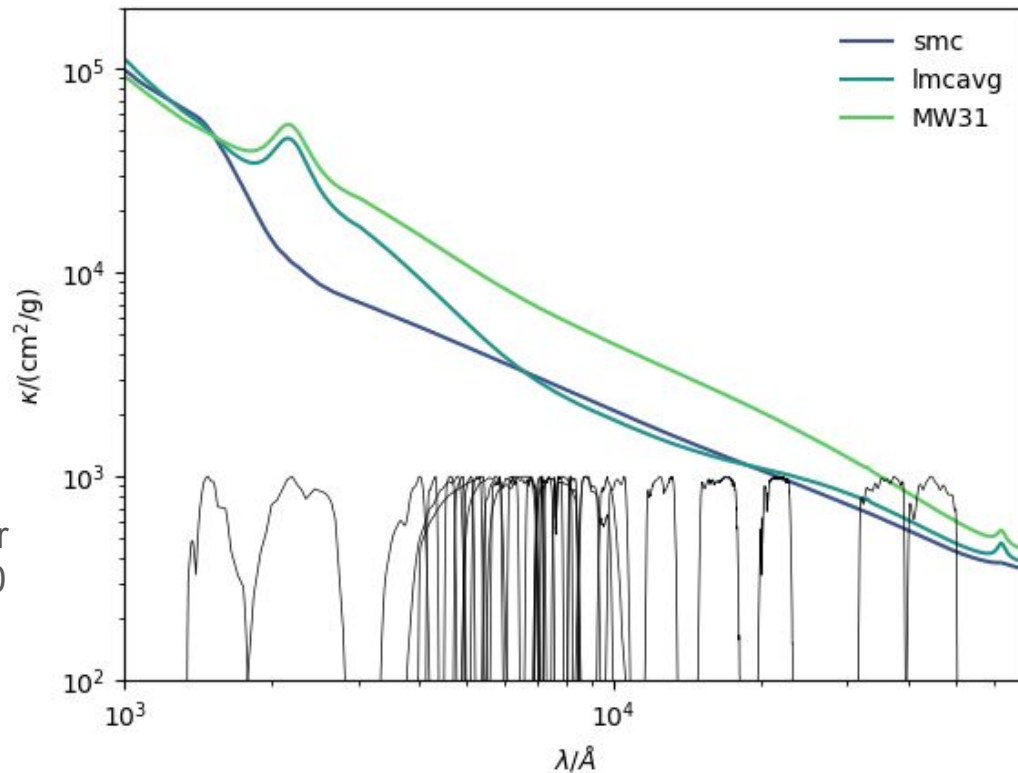
Horizon Run lightcone (Kim+2009)



Stellar mass histograms of all galaxies (4,085,916)  
and those selected for SED calculation (1,210,865)



# Dust extinction curves

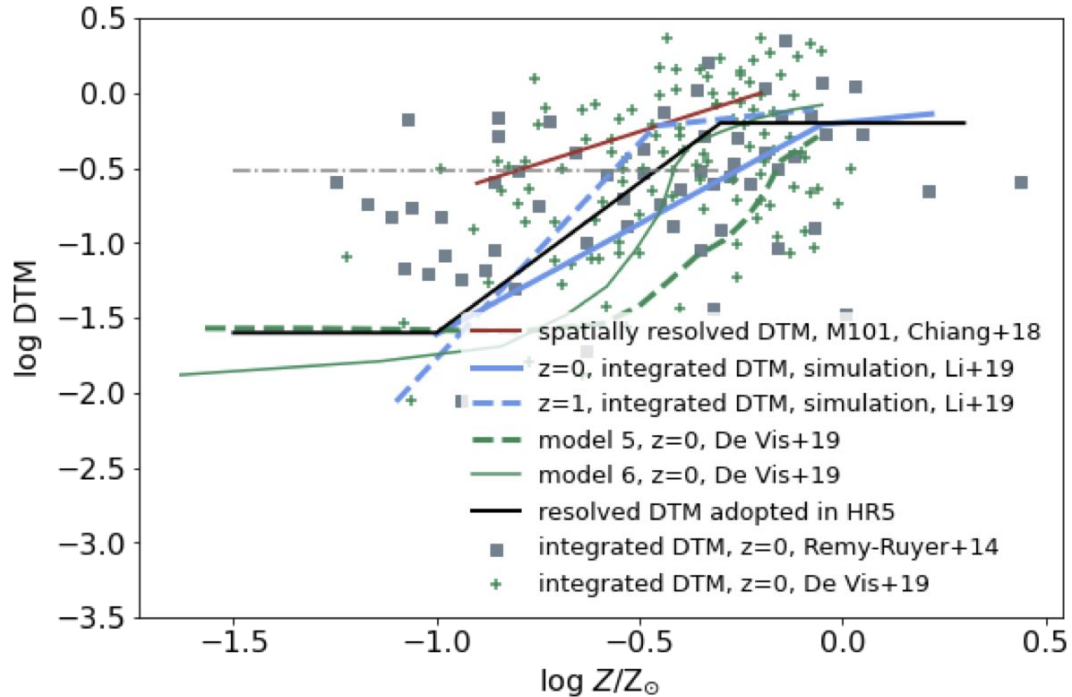


Filters available for  
the COSMOS2020  
([Weaver+2022](#))

[Weingartner  
& Draine \(2001\)](#)

# Dust-to-metallicity ratio

By default, we set  $\text{DTM}=0.4$ . However, we also consider a metallicity-dependent DTM.



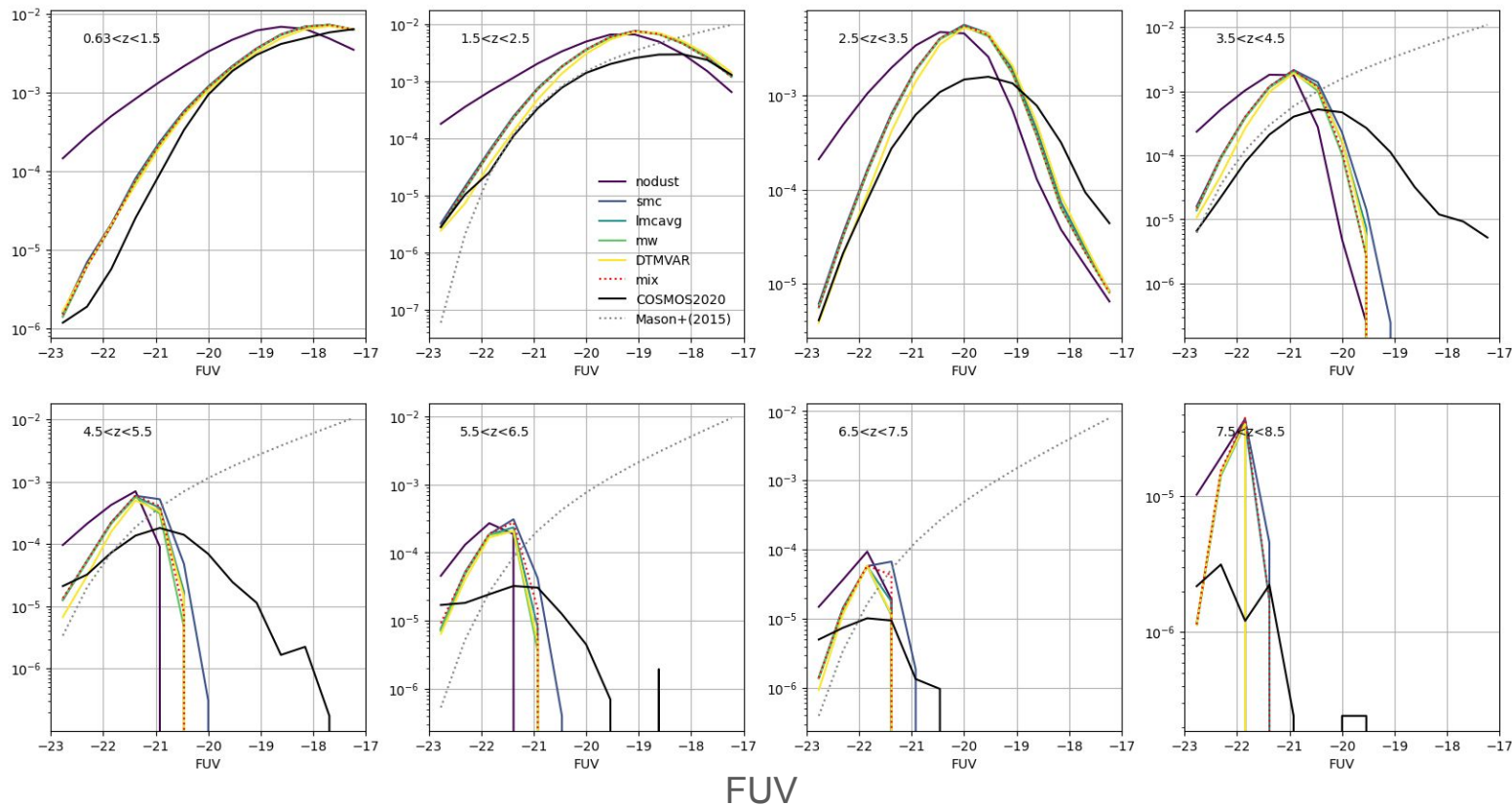
# Options for dust

- No dust (nodust)
- SMC attenuation curve & DTM=0.4 (smc)
- LMC AC & DTM=0.4 (lmcavg)
- MW AC & DTM=0.4 (mw)
- MW AC & metallicity-dependent DTM (DTMVAR)
- Metallicity-dependent attenuation curves & DTM=0.4 (mix)

# UV Luminosity function

Obs: COSMOS2020, [Mason+\(2015\)](#)

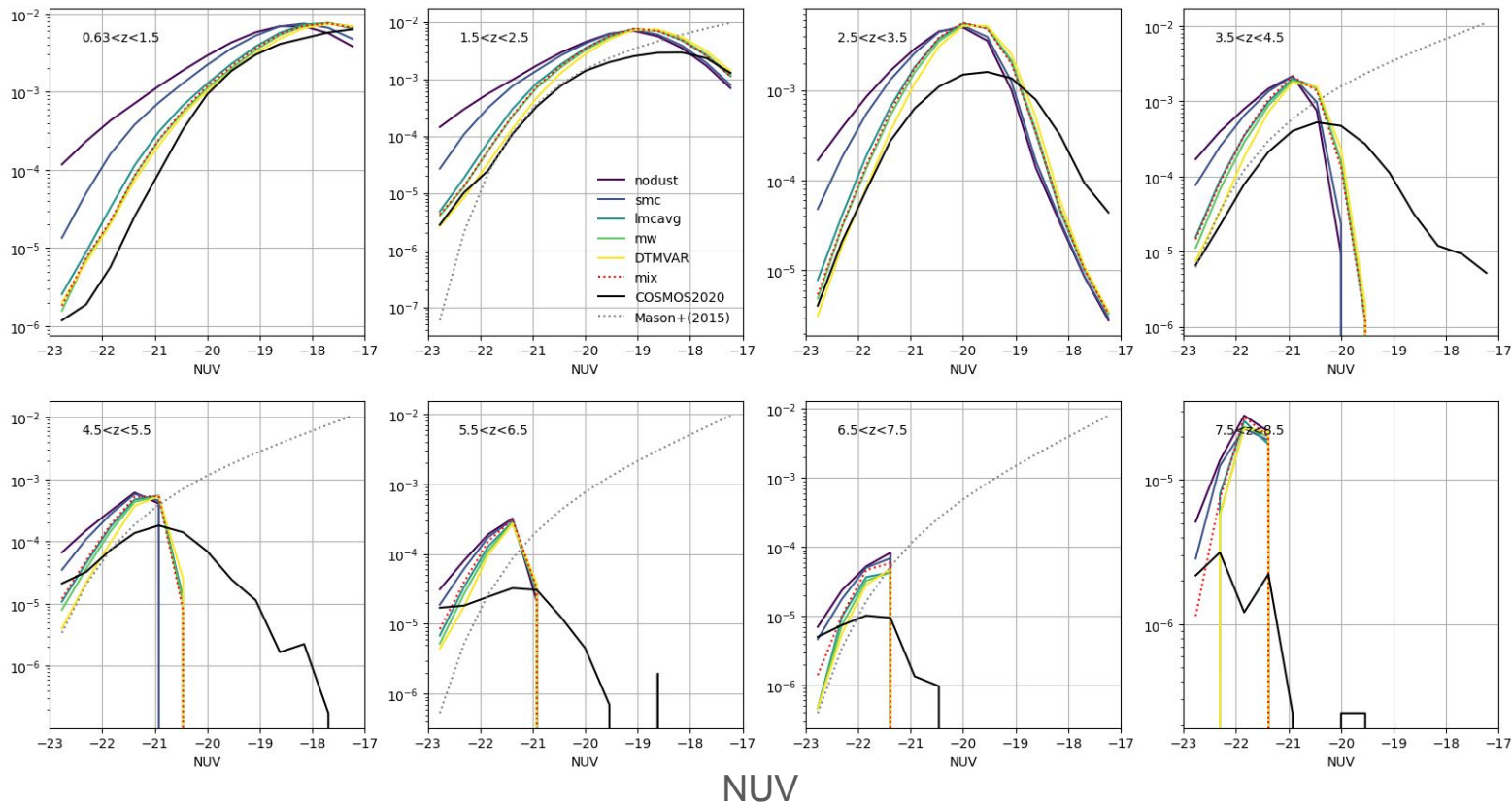
HR5: **nodust**, **smc**, **lmcavg**, **mw**, **DTMVAR**, **mix**



# UV Luminosity function

Obs: COSMOS2020, [Mason+\(2015\)](#)

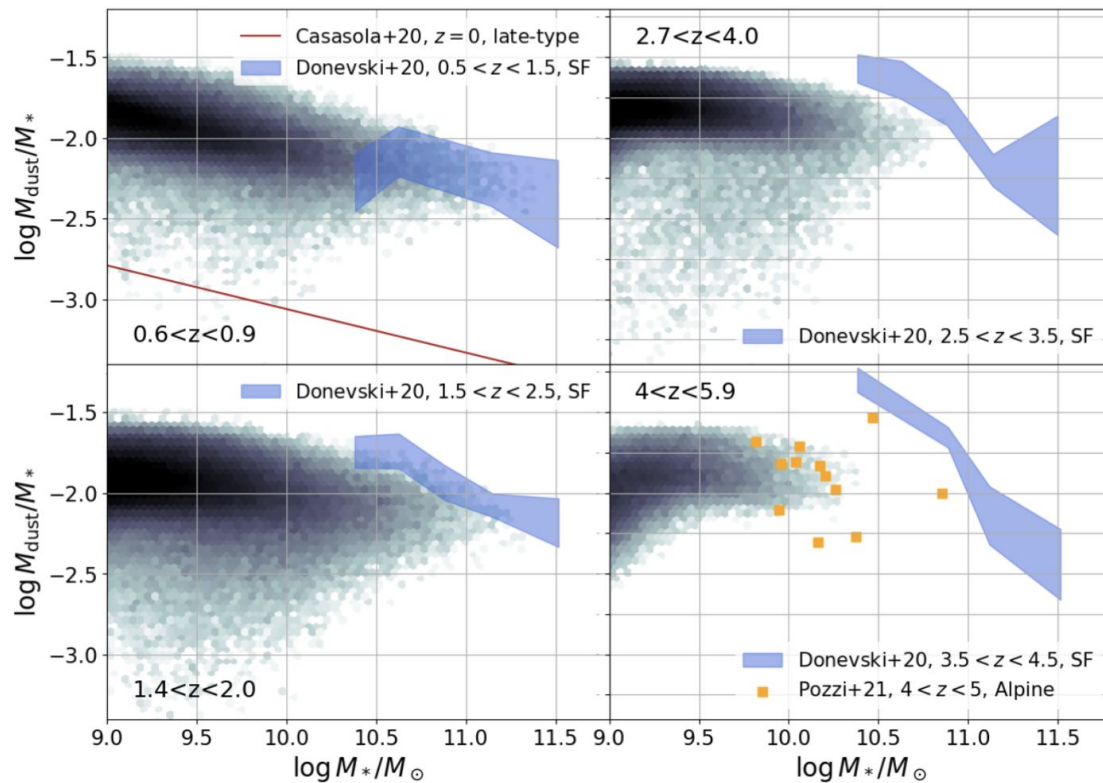
HR5: **nodust**, **smc**, **lmcavg**, **mw**, **DTMVAR**, **mix**



# Dust-to-stellar mass ratio

Obs: [Casasola+\(2020\)](#), [Donevski+\(2020\)](#)

HR5: DTMVAR



# Summary

- We tried to model galaxy SEDs that well reproduce observed UV luminosity functions and dust-to-stellar mass relations across a redshift range.
- Given the large scatter in observations, the dust mass content in HR5 galaxies is in broad broad agreement with observations.
- HR5 galaxies tend to be brighter in UV than observed galaxies, especially at higher redshifts (error bars to be added).
- To resolve this issue, we may need to adopt other attenuation curves or SSP models.