

# Introduction to the **CORTES** project

## Cosmological Radiative Transfer in Early Structures

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in collaboration with:

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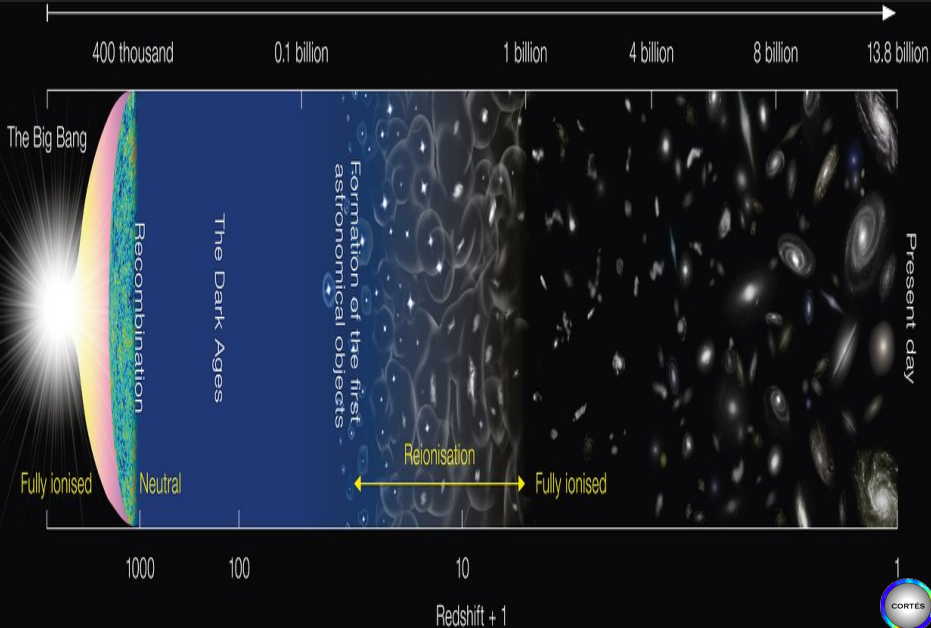


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# Early structures in the cosmological context

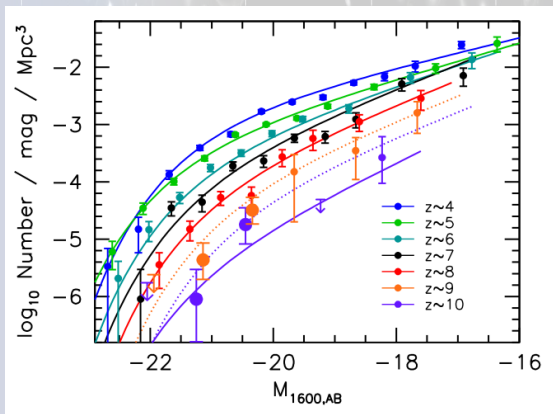
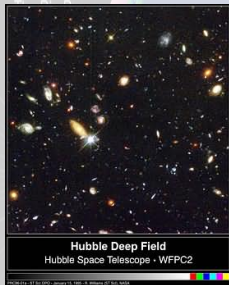


# The radiation seen from high-z galaxies

Optical/NIR surveys

Observed UV luminosity functions e.g. Bouwens+2016

13.8 billion



Present day

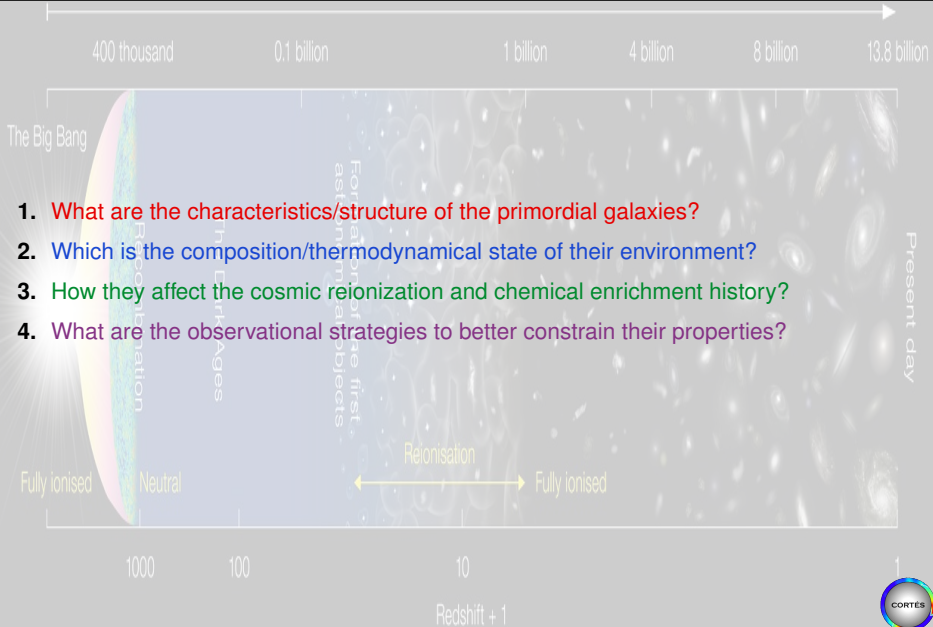
Fully ionised Neutral

Additional probes are needed to characterize high-z galaxies  
(metallicity, dust, feedback, outflow, ...)

Redshift + 1



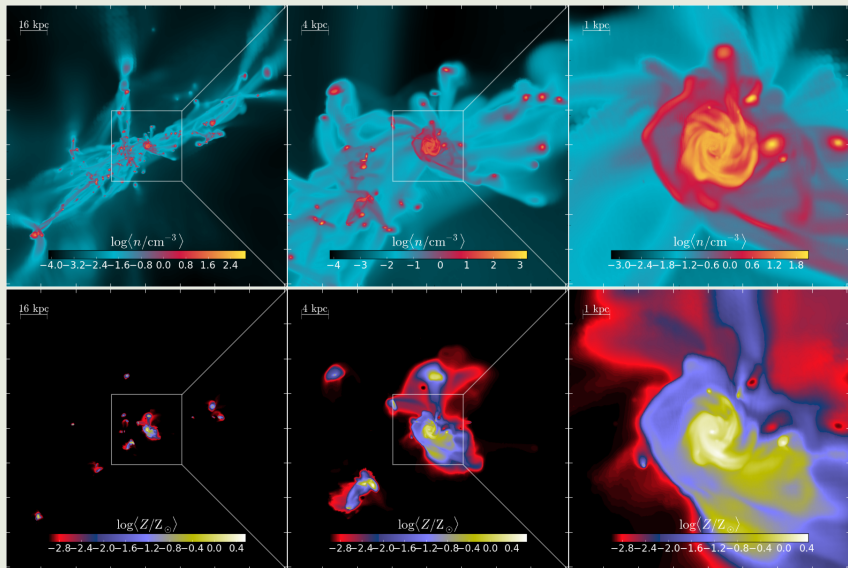
# Key questions of high-z galaxies



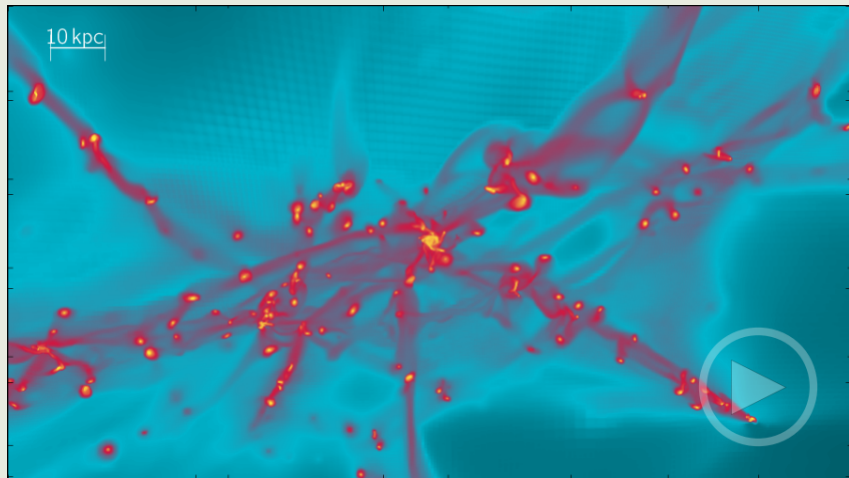
# Studying high-z galaxies with numerical simulation

“Dahlia”: a typical high-z galaxy

Pallottini+2017



# A zoomed view of Dahlia from cosmological simulation



Density field view at  $z \sim 6$

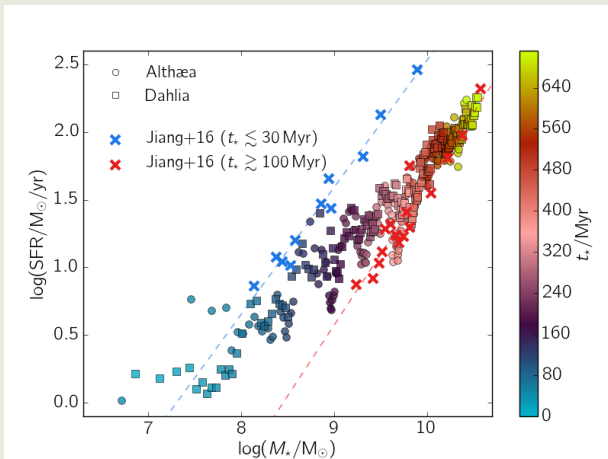
nomination for best image set for Wikimedia (Eesti European Science Photo Competition 2015)

more movies: [https://www.researchgate.net/profile/Andrea\\_Pallottini](https://www.researchgate.net/profile/Andrea_Pallottini)



# Comparisons with current observations

## Star formation and stellar mass history

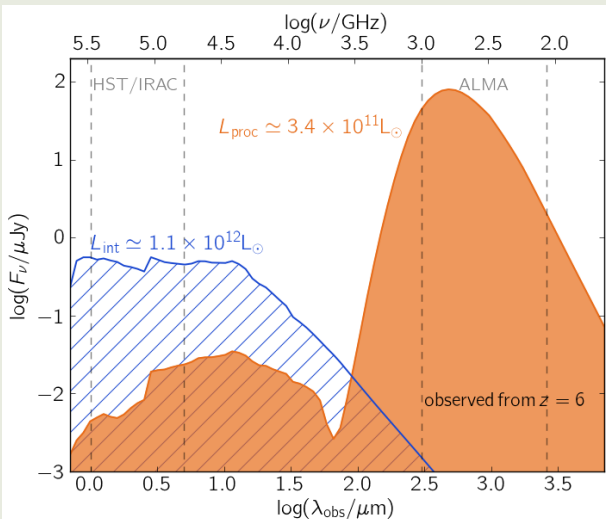


SFR and  $M_*$  for Dahlia (and Althæa) compatible with observations

# Predictions: preliminary deliverables of CORTES

Radiation spectral energy density from high- $z$  galaxies

Pallottini *in prep*; Behrens *in prep*



Predictions to be tested with existing (e.g. ALMA) and upcoming telescopes (e.g. JWST)

Modelling to be improved (e.g. accounting line radiation transfer, chemical networks, ...)





# Summary of CORTES

## 1) Aim:

characterization of the of the early structures

## 2) Challenge:

develop theoretical models constrained by (able to explain) current state of the art observations

## 3) Goal:

improve our physical understanding and guide upcoming observational campaigns

