

Dark Matter Halos Assembly in the Frame of the Saddle Points of the Cosmic Web

or how does the cosmic web impacts assembly bias

Corentin Cadiou – PhD Student – IAP, Paris, France

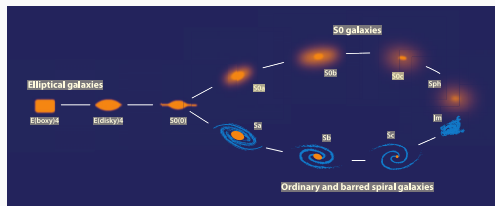
Supervisors: C. Pichon & Y. Dubois

KIAS, October 30, 2017

Introduction

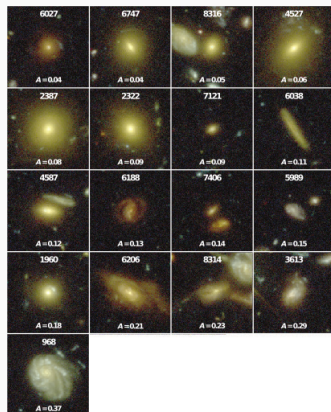
Describing galaxies?

Theory



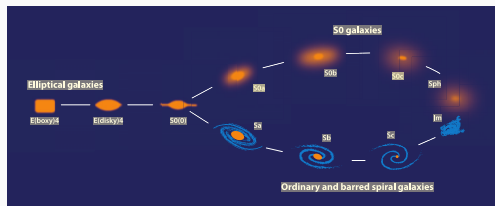
- + star forming?
- + bulge?
- + mass?
- + DM halo mass?
- + DM profile?
- + ...

Observations (HDF)



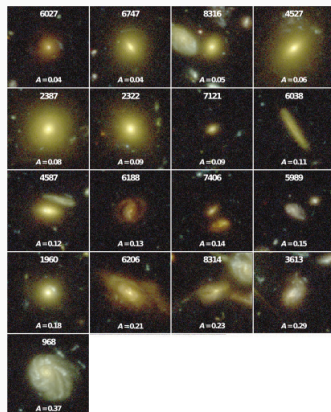
Describing galaxies?

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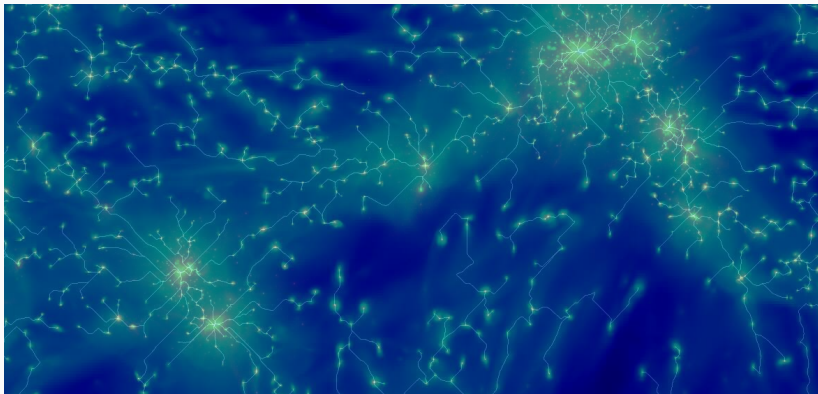
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- + ...

Observations (HDF)



And all the properties change with cosmic time...

The Cosmic Web



Horizon-AGN simulation with skeleton, Dubois+12

And all the properties **change with cosmic time** and location
w.r.t. **the cosmic web!**

Today: DM halo assembly in the
frame of the cosmic web

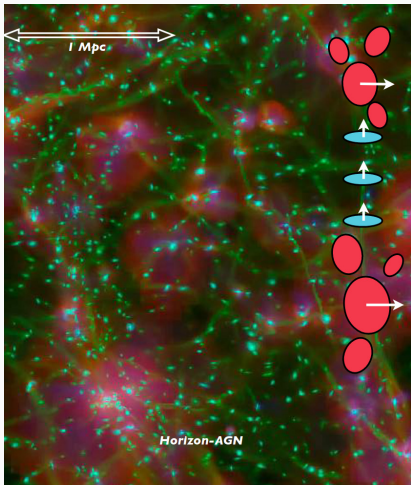
Gravitational only \rightarrow theoretical predictions

Gravitational only → theoretical predictions

How much of galaxy formation is due to DM (gravitational only) effects?

1. *Predict DM halo properties*
2. Infer galactic properties
3. Measure non explained signal

DM Halo – motivation 2

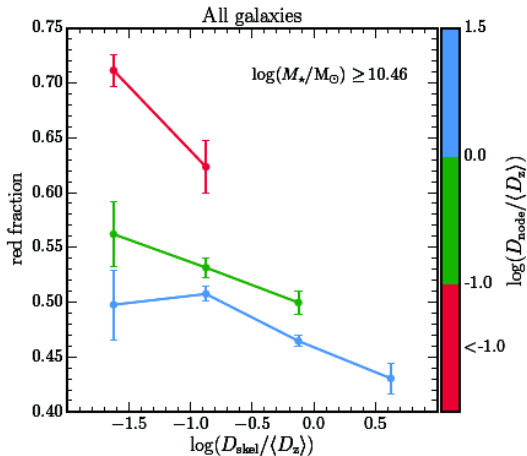


S. Codis

To understand *theoretically* weak lensing:

1. intrinsic alignment (see e.g. Codis+12);
2. galactic properties (mass, morphology, color,...).

Observed gradients

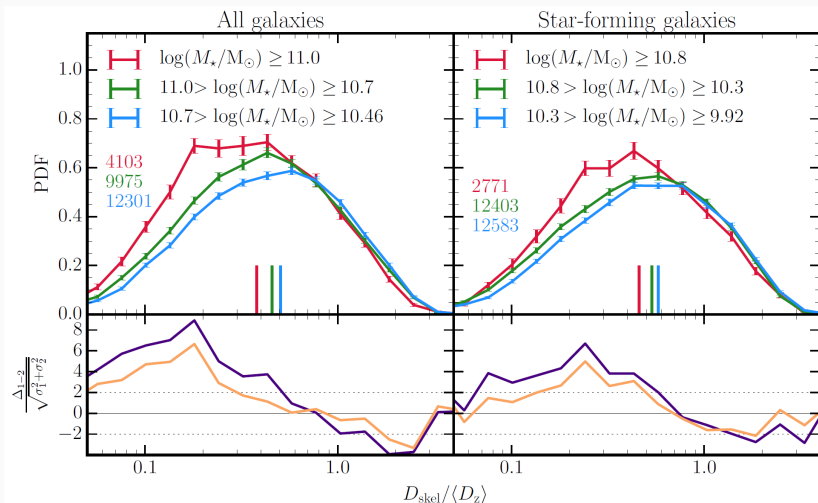


From void to filament
From filament to node
More massive, red and dead

K. Kraljic, S. Arnouts, C. Pichon, C. Laigle, S. de la Torre, D. Vibert, C. Cadiou et al.,
MNRAS

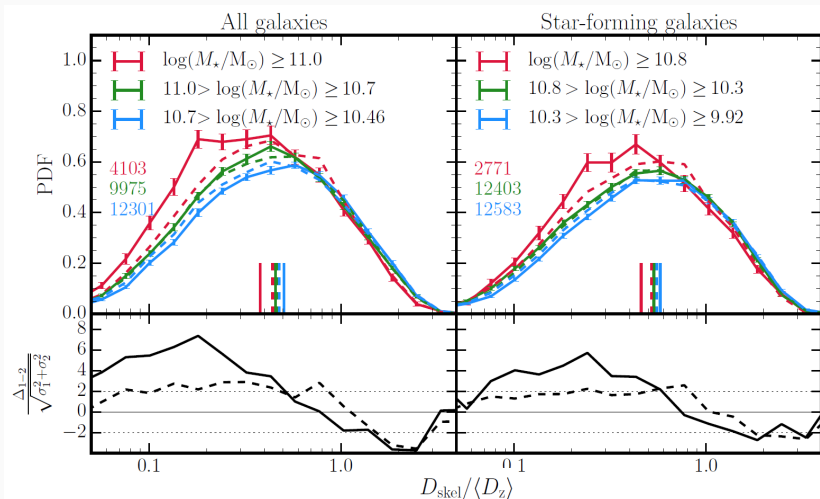
Advanced explanations

- Mass effect (not only)



Advanced explanations

- Mass effect (not only)
- Density effect (not only)



Need to take into account large-scale
environment

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For 1st order effects

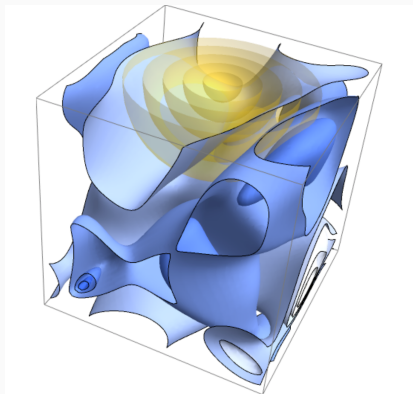
Need to take into account large-scale environment

For 1st order effects

How?

Excursion set

Excursion set in a nutshell – spherical collapse

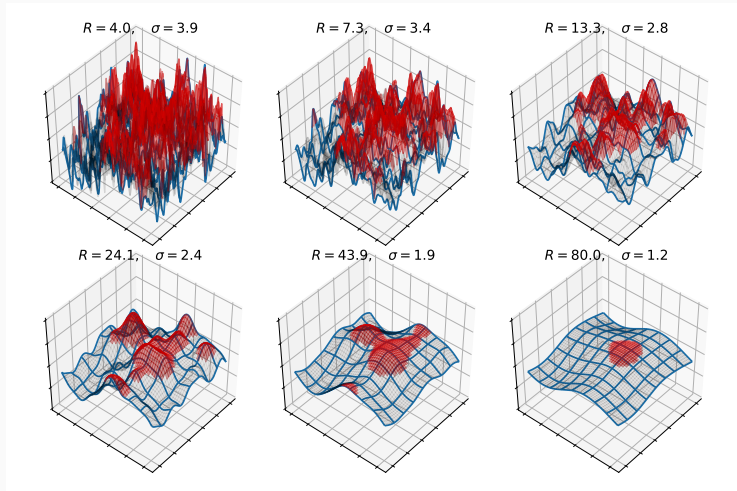


Christophe Pichon

- Gaussian random field
(initial conditions \leftrightarrow CMB)
- Over-density $\delta \equiv \frac{\rho - \bar{\rho}}{\bar{\rho}}$
- $\delta = \delta_c / D(z) \Rightarrow$ spherical collapse at $z = 0$
(a DM halo will form)

Excursion set in a nutshell – mass

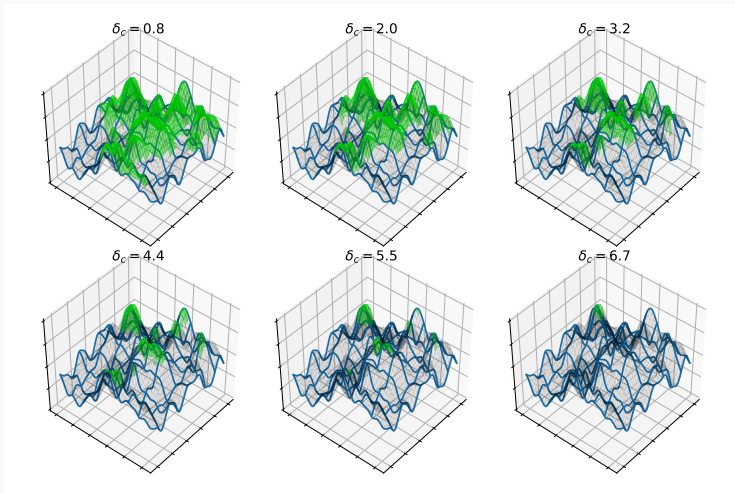
Small mass/radius, high σ \longrightarrow



\longrightarrow large mass/radius, small σ 9/34

Excursion set in a nutshell – time

Low δ_c , late time, low $z \longrightarrow$



\longrightarrow high δ_c , early time, high z ^{10/34}

Excursion set in a nutshell

Mass proxy

At given z_0 , R such that

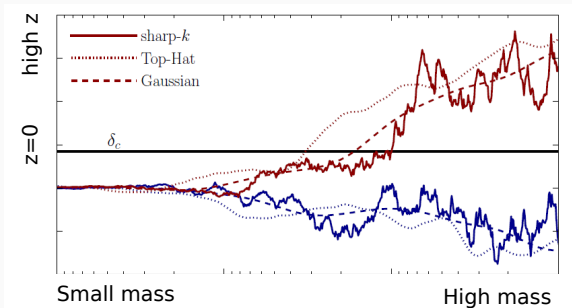
$$\delta(R) = \delta_c / D(z_0)$$

Time proxy

At a given R_0 , z such that

$$\delta(R_0) = \delta_c / D(z)$$

Time and mass
evolution:
assembly of DM
halo



Desjacques, Jeong, Smith 16