

La Cosmologie avec les données BOSS et eBOSS

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Credit: The Millennium Simulation

Mon parcours

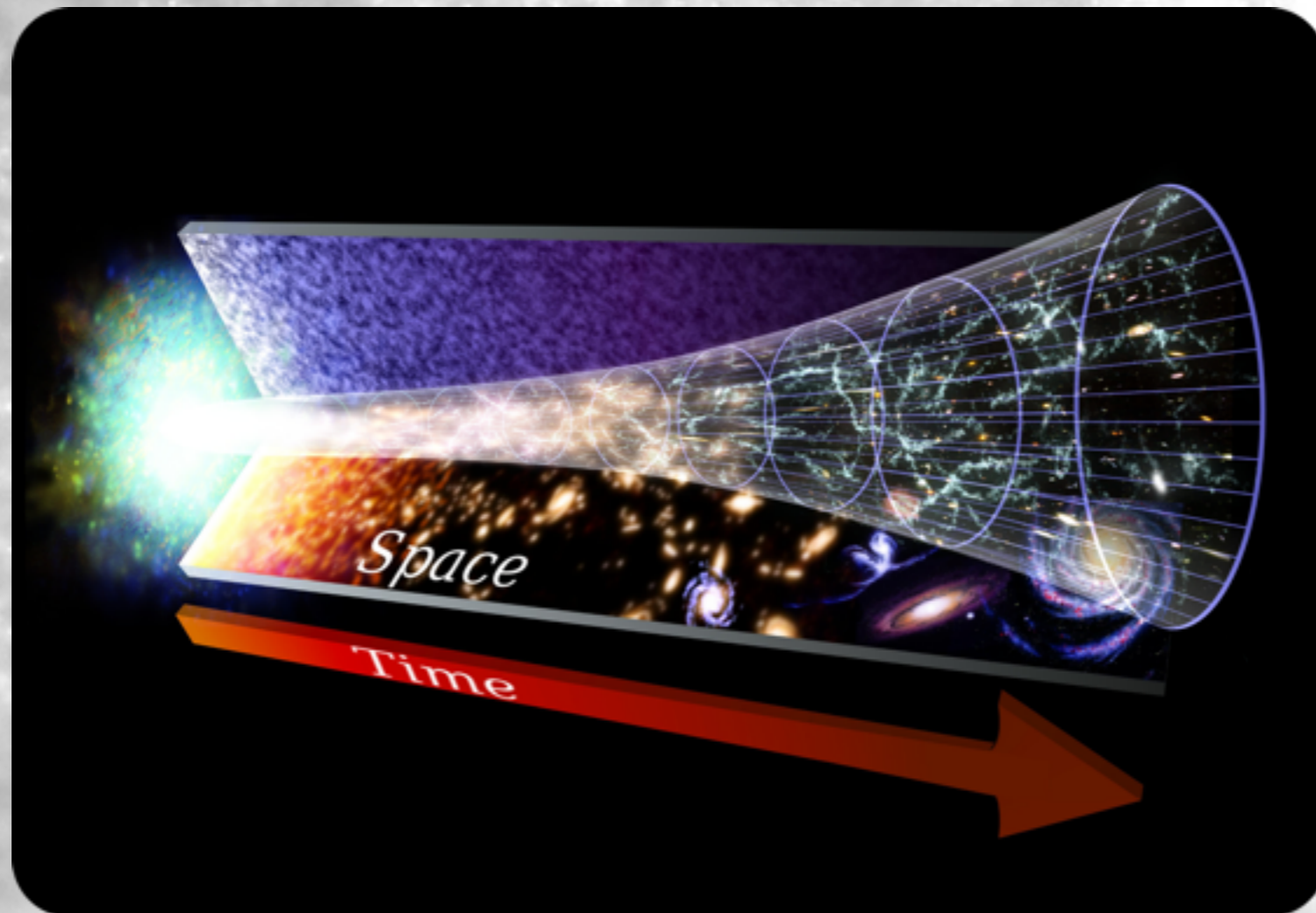


- Licence + Master Roma (Italie) => La Sapienza
- Thèse en Cosmologie à l'Institut d'Astrophysique de Paris
- Post-doc CPPM

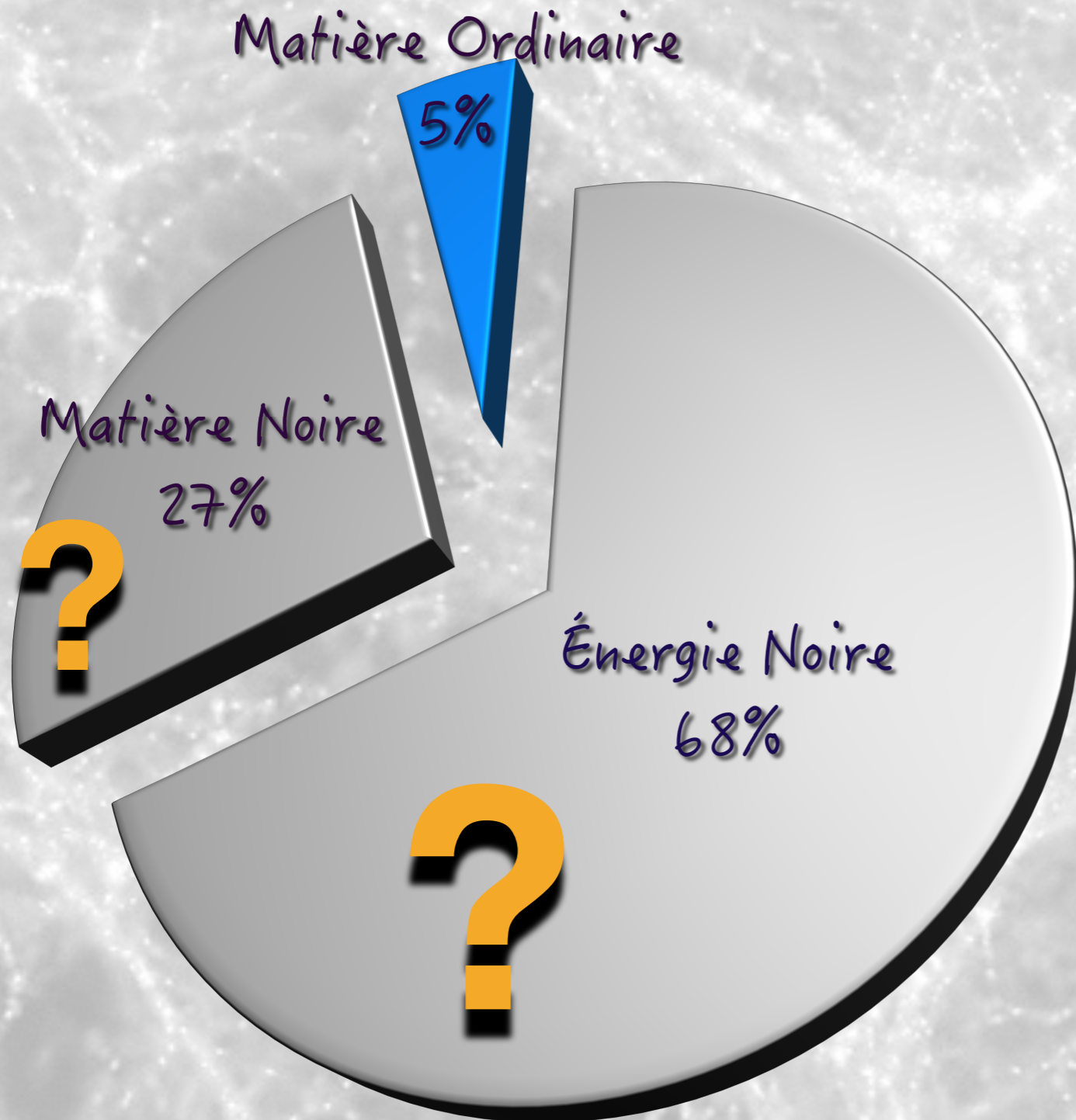


La Cosmologie

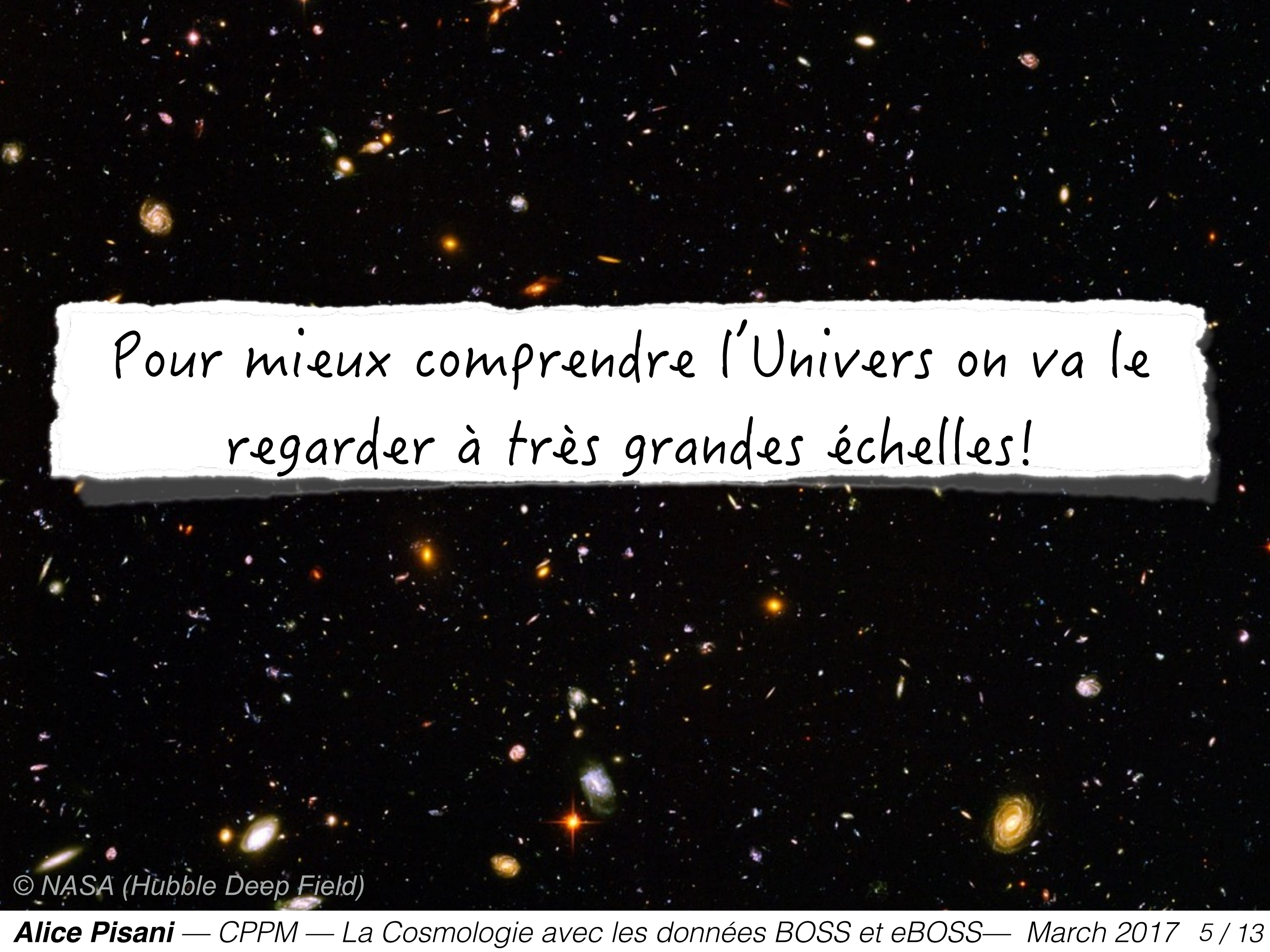
C'est la science qui étudie
l'Univers dans son ensemble.



Que sait on au sujet de notre univers?



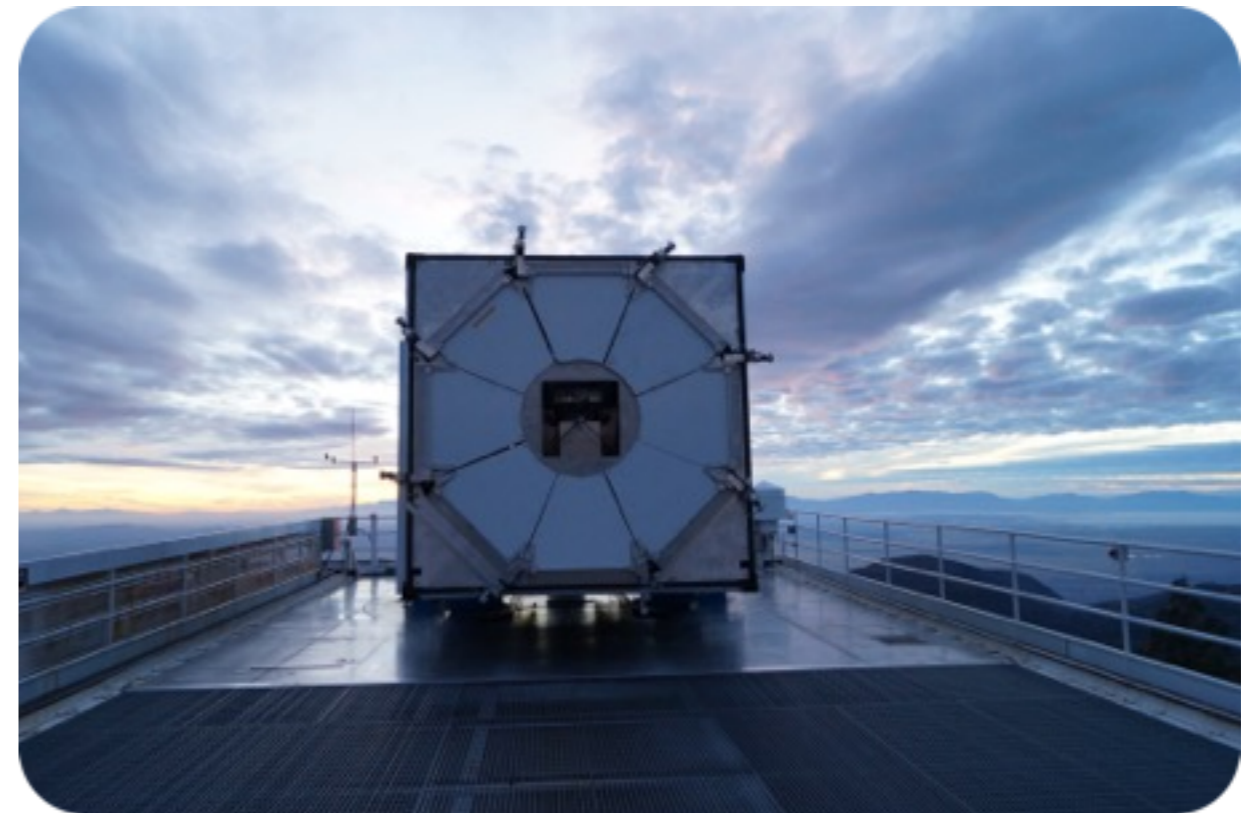
Pas beaucoup!



Pour mieux comprendre l'Univers on va le regarder à très grandes échelles!

Regarder l'Univers à grandes échelles avec BOSS et eBOSS

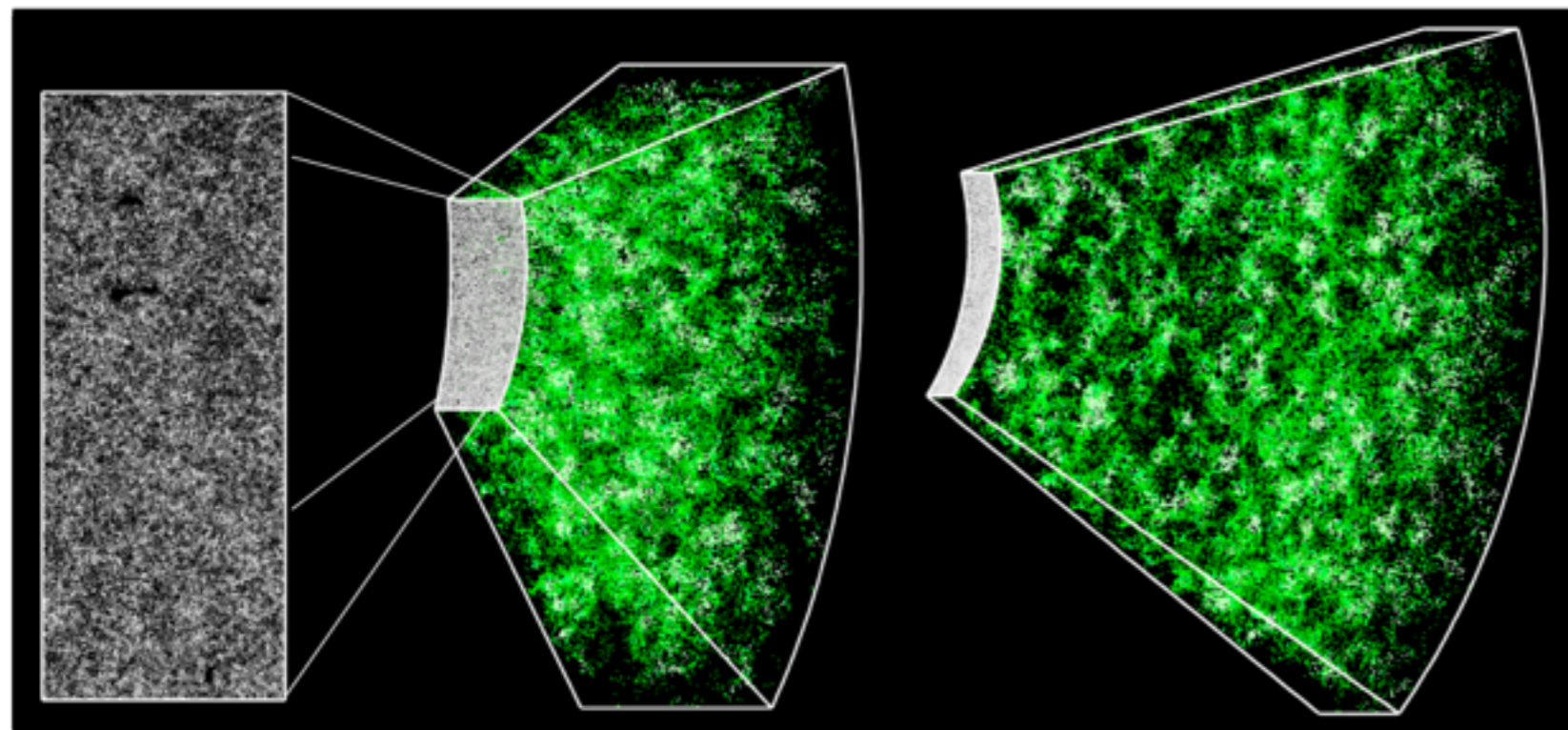
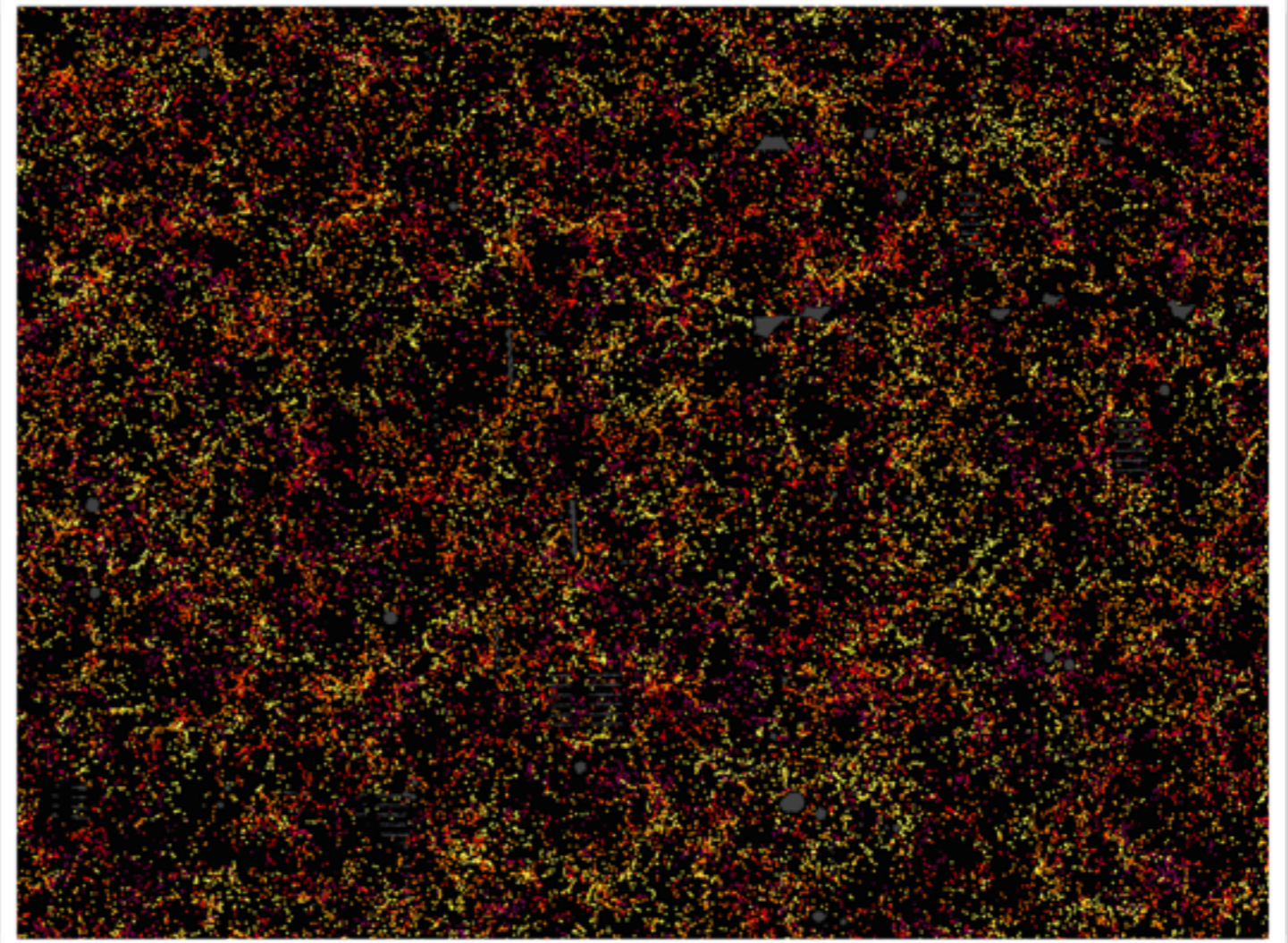
Le projet BOSS a pour but de cartographier la structure tridimensionnelle de l'Univers



L'instrument

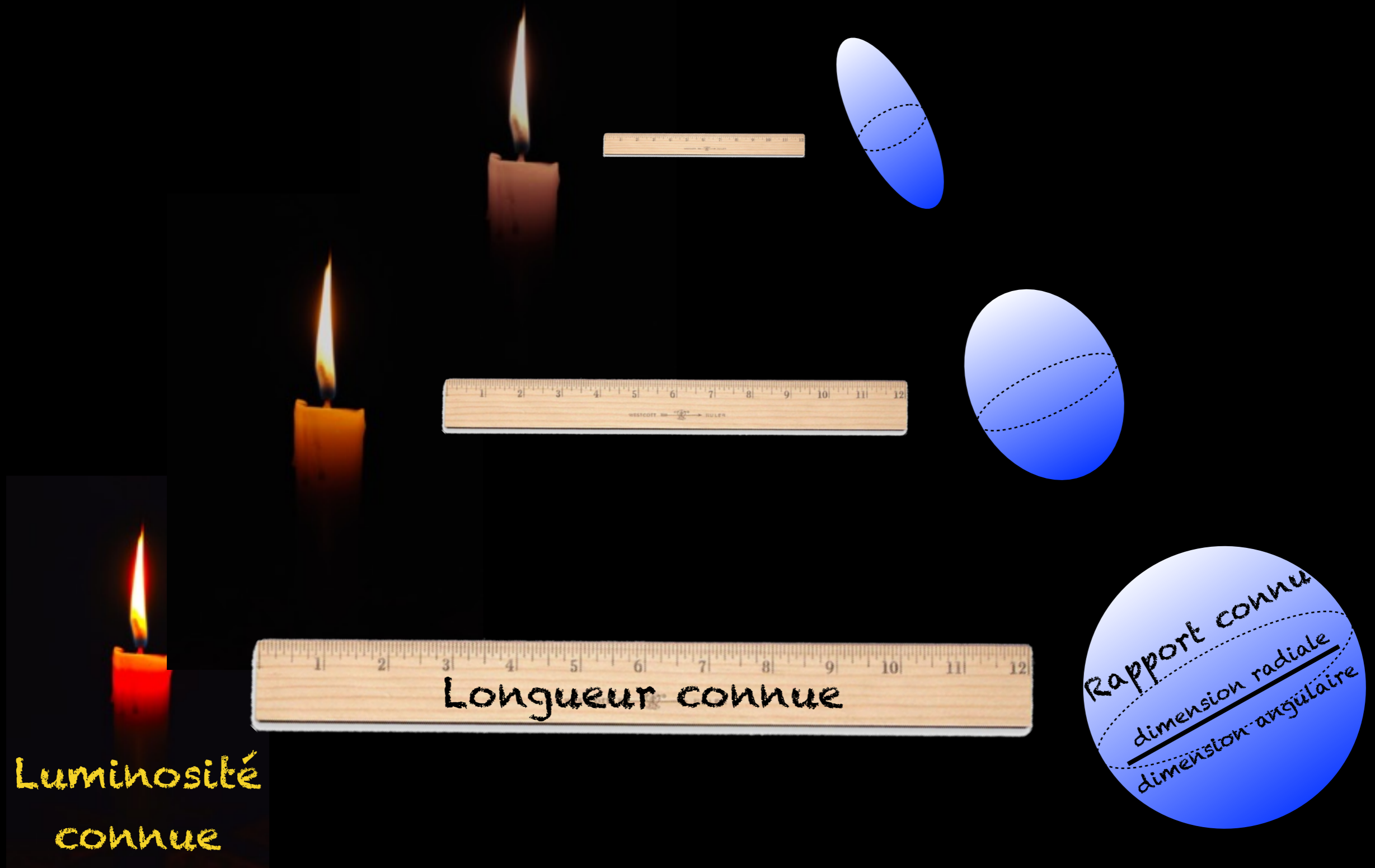
Le télescope à large champ de vue situé à l'Apache Point Observatory (au nouveau Mexique) a un diamètre de 2.5 mètres.

Mesurer la position
de 1.2 million de
galaxies pour
construire la plus
grande carte de
notre Univers !



BOSS

En Cosmologie on utilise les objets standard...



BOSS

Baryon Oscillation Spectroscopic Survey

Plasma primordial

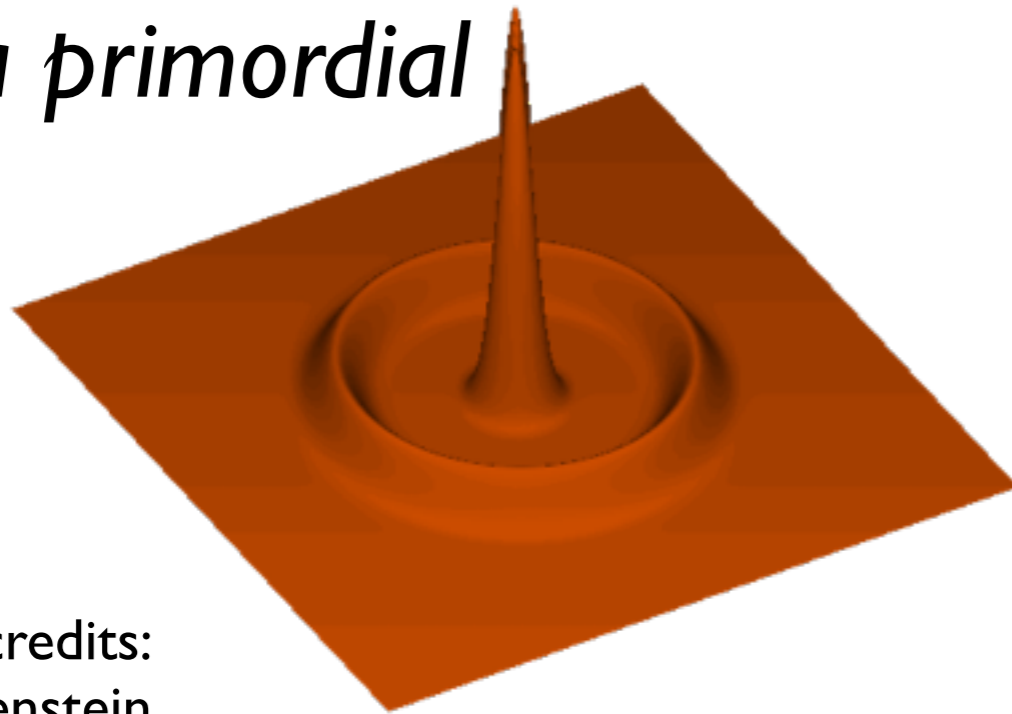
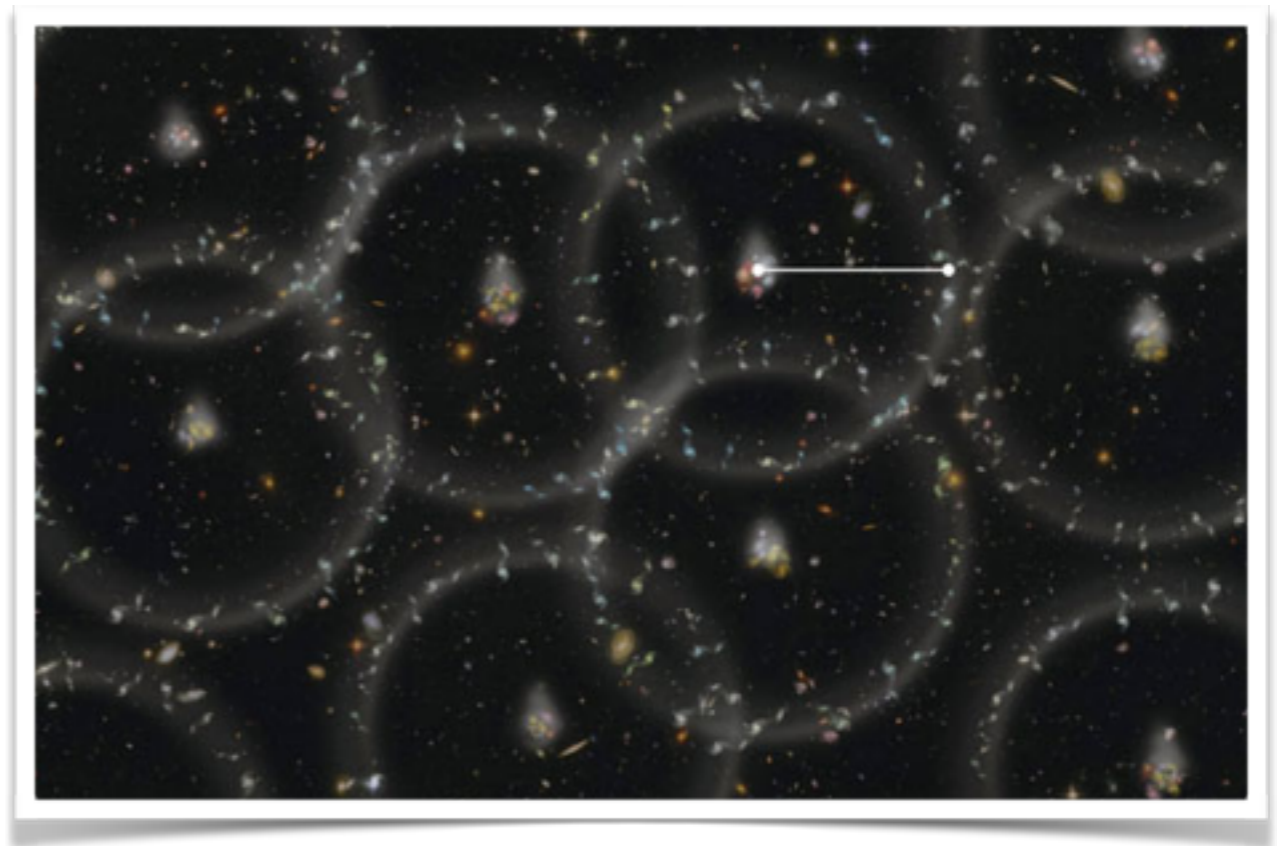


Image credits:
Hu, Eisenstein

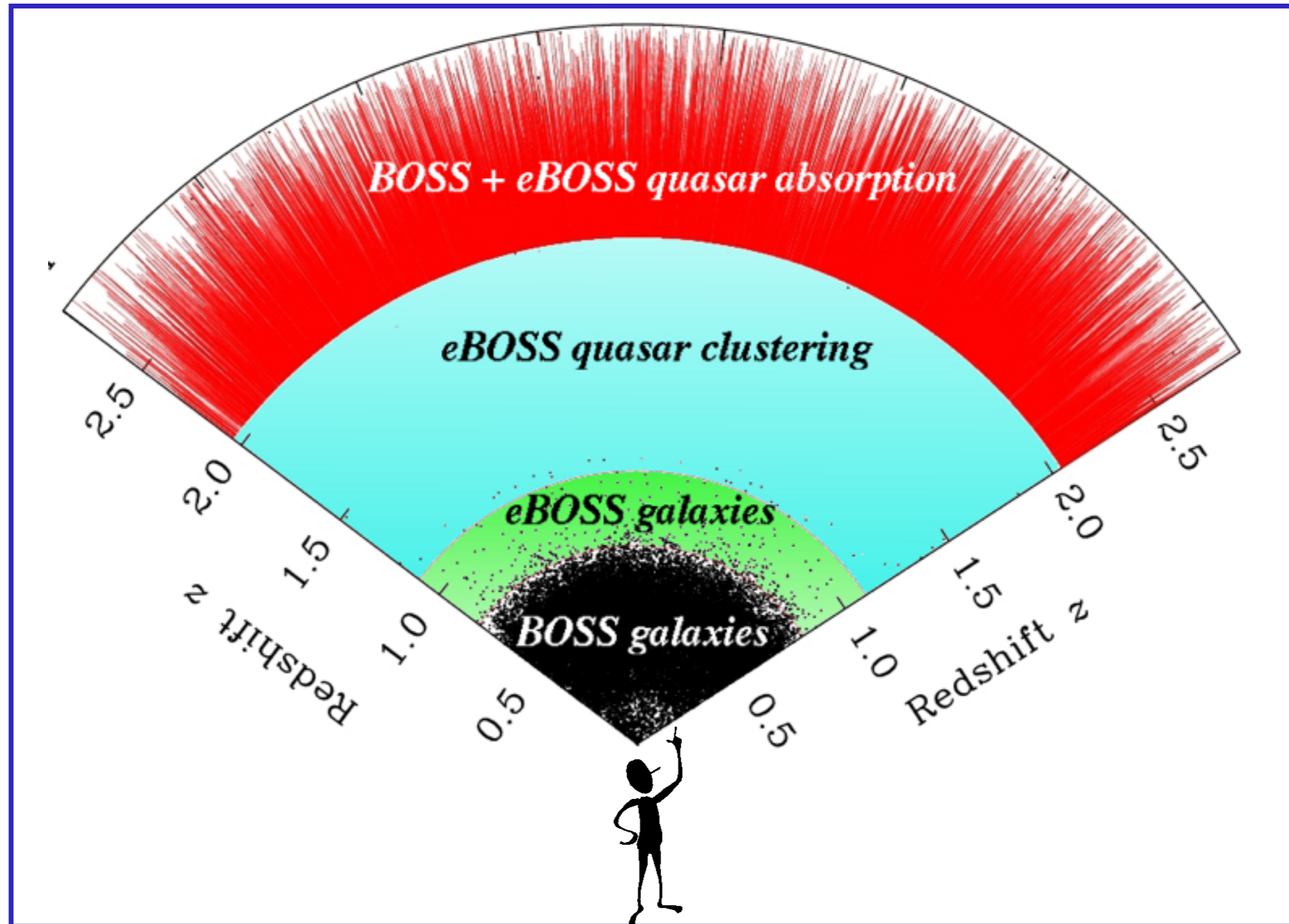


Oscillations de baryons (BAO) qui ont débuté lorsque des ondes de pression se sont propagées dans l'Univers primordial...

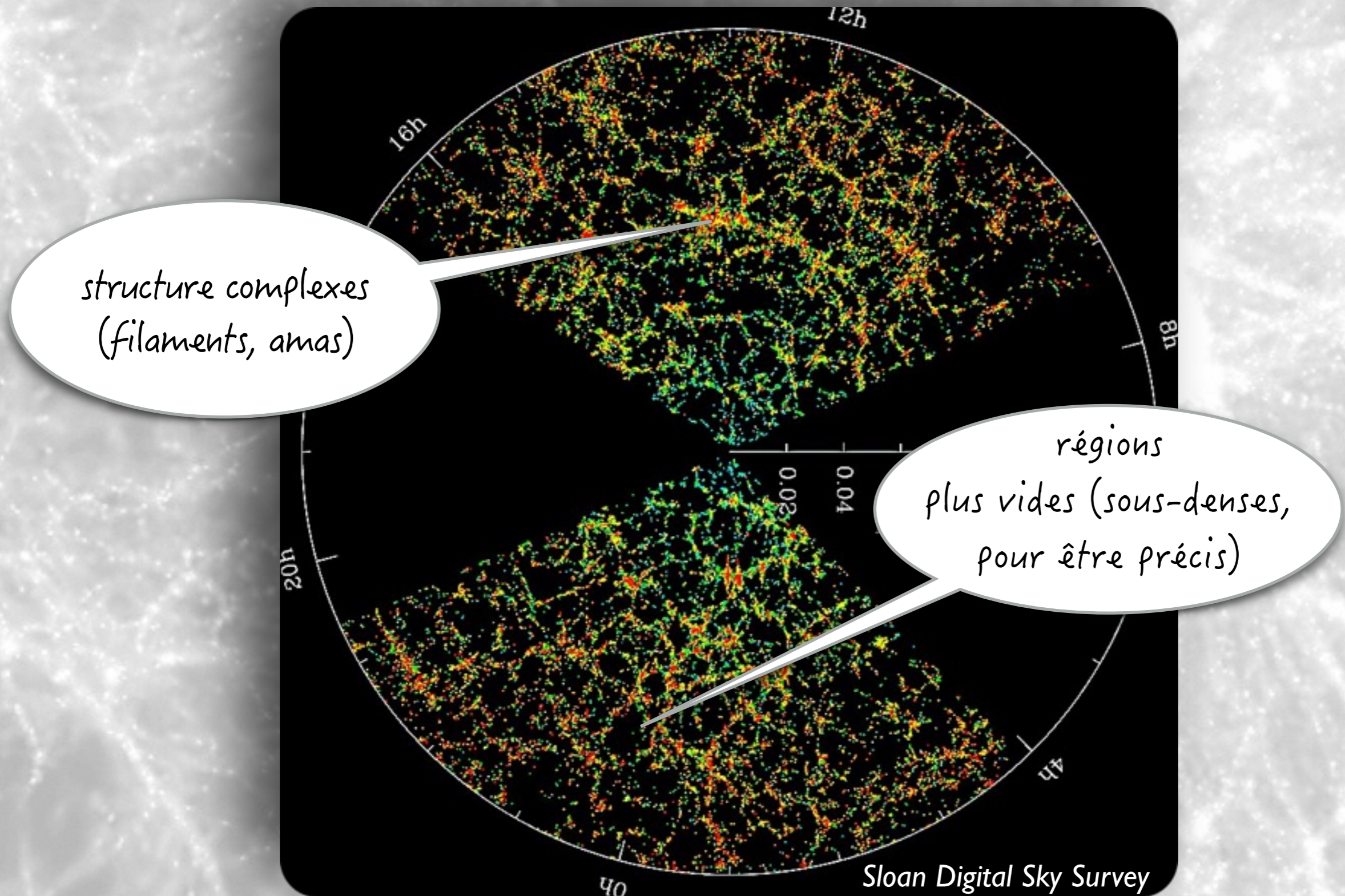
Une trace dans la distribution de galaxies... qui nous permet de mieux comprendre l'Univers!

eBOSS

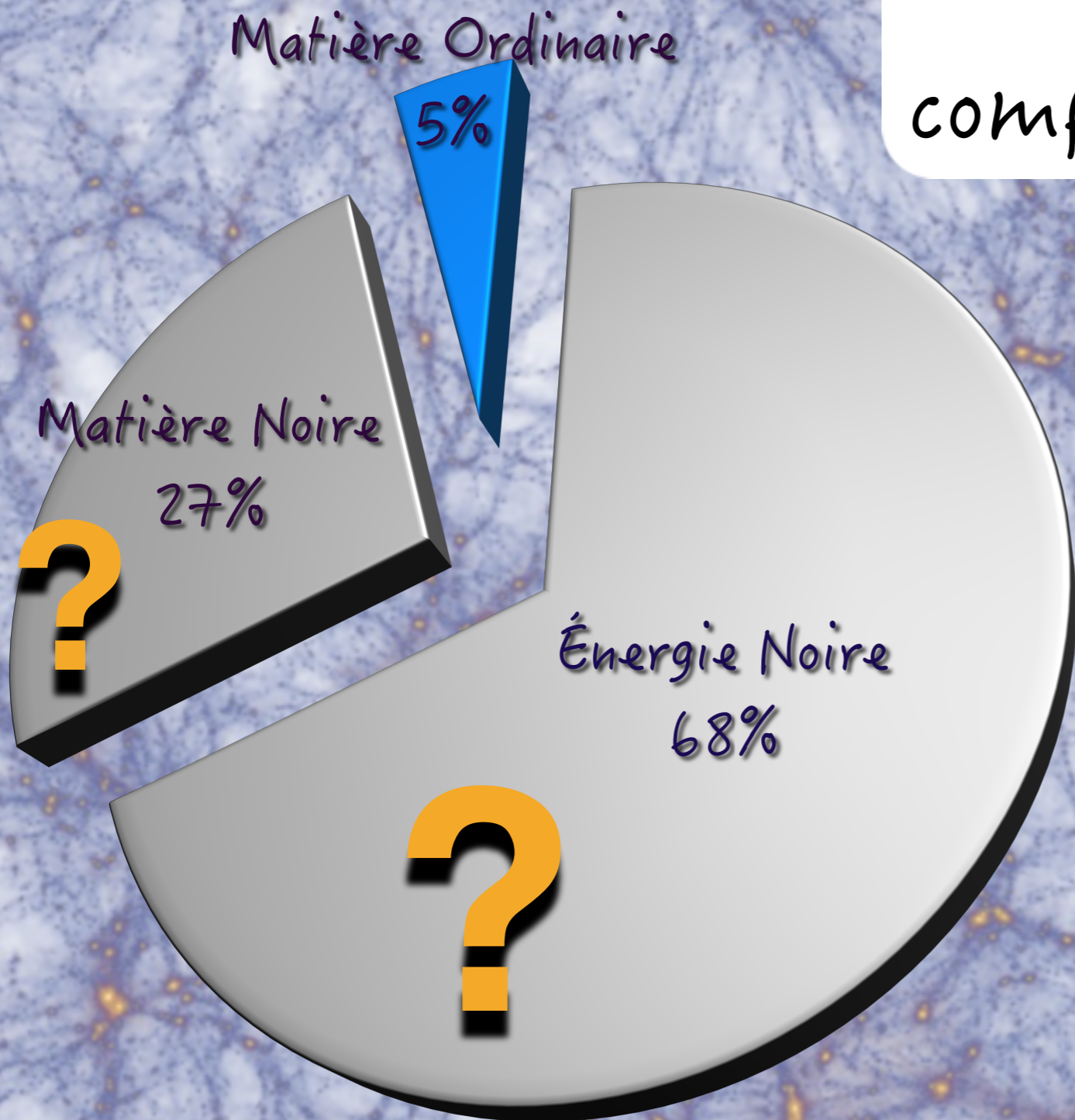
extended Baryon Oscillation Spectroscopic Survey



Pourquoi regarder la toile cosmique?

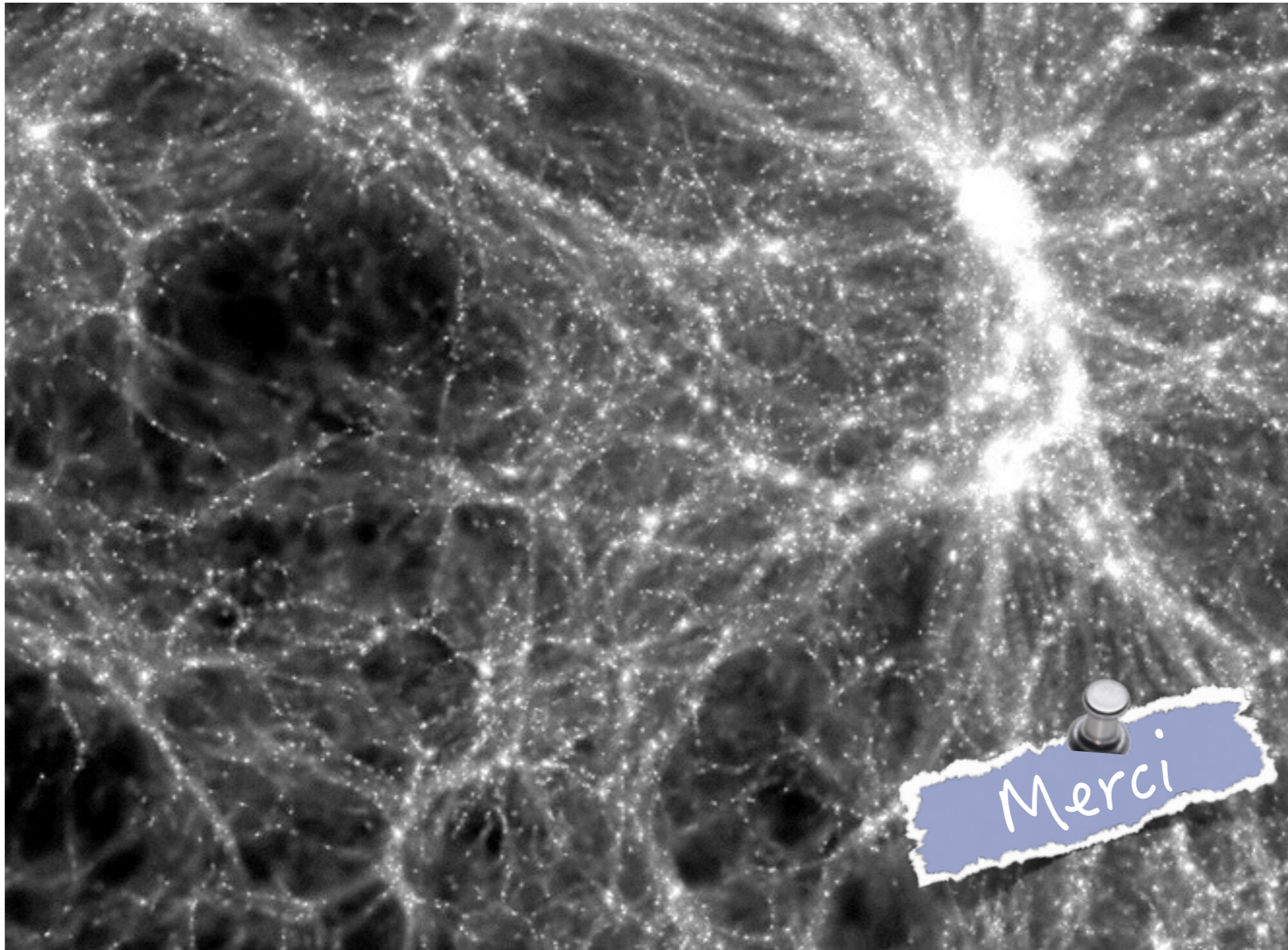


Les propriétés des vides nous permettent de comprendre notre univers.



forme, nombre de vides

Mon travail aujourd'hui: chercher et étudier les vides cosmiques pour comprendre l'Univers!

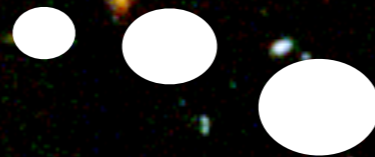


A visualization of the cosmic web, showing a complex network of dark blue filaments and nodes. The nodes are highlighted with bright orange and yellow colors, representing galaxy clusters and superclusters. The background is a light blue, textured surface.

Supplementary slides

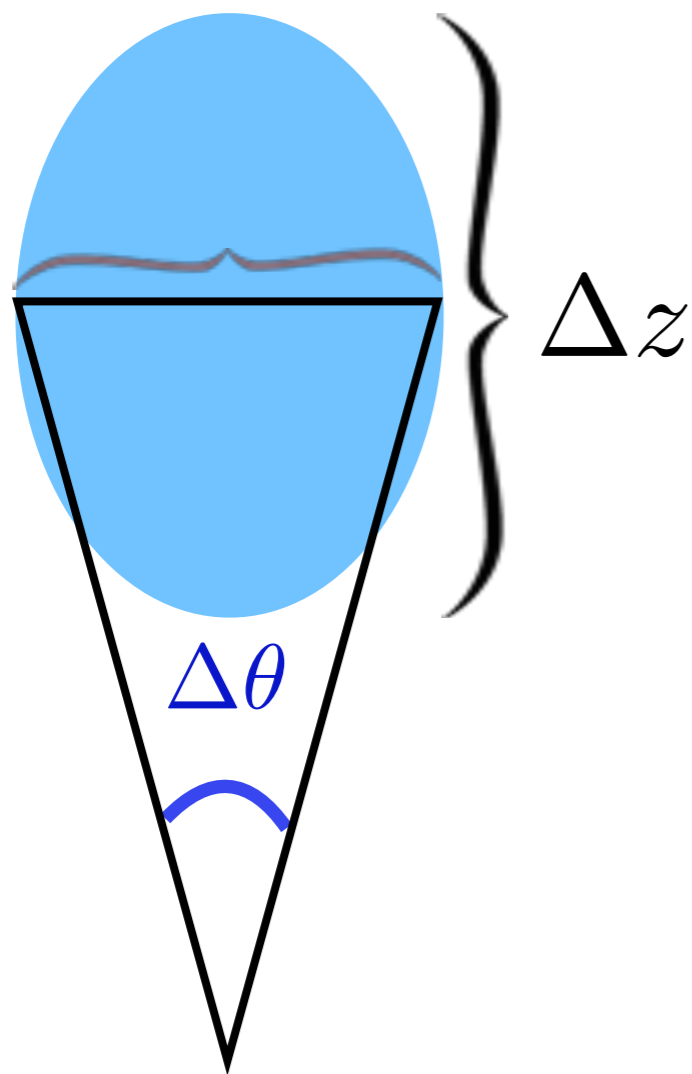
“Just” understanding the evolution of the universe.

(My goal as a cosmologist.)

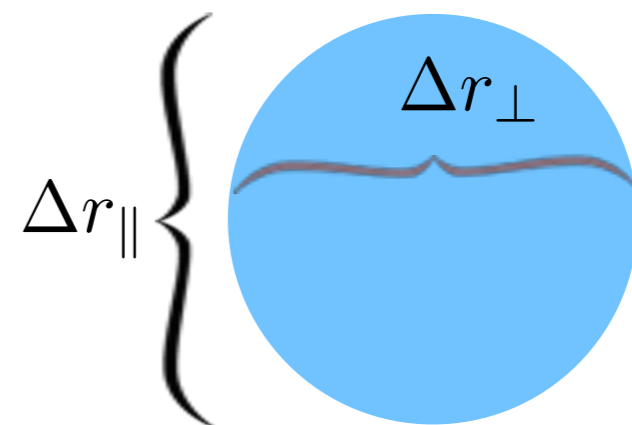


What is he
looking at??

What we measure:



Real length scales:



physical sizes of the object

Δr_{\perp} *in the transverse direction*

Δr_{\parallel} *in the longitudinal direction*

Cosmology, of course !

$$\Delta r_{\perp} = D_A(z) \Delta \theta$$

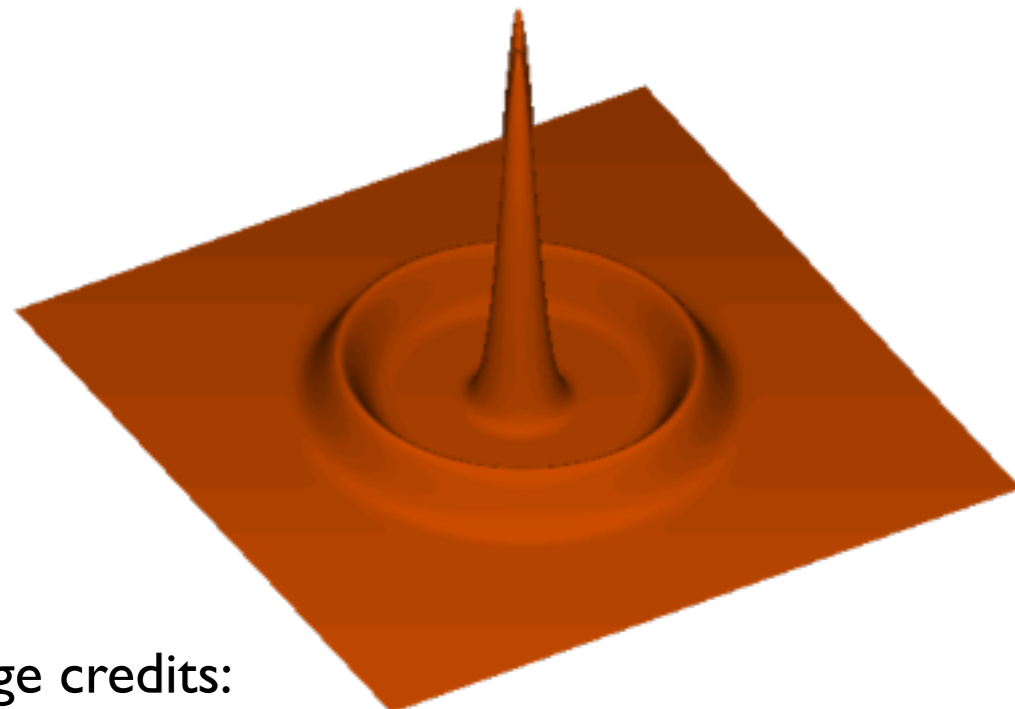
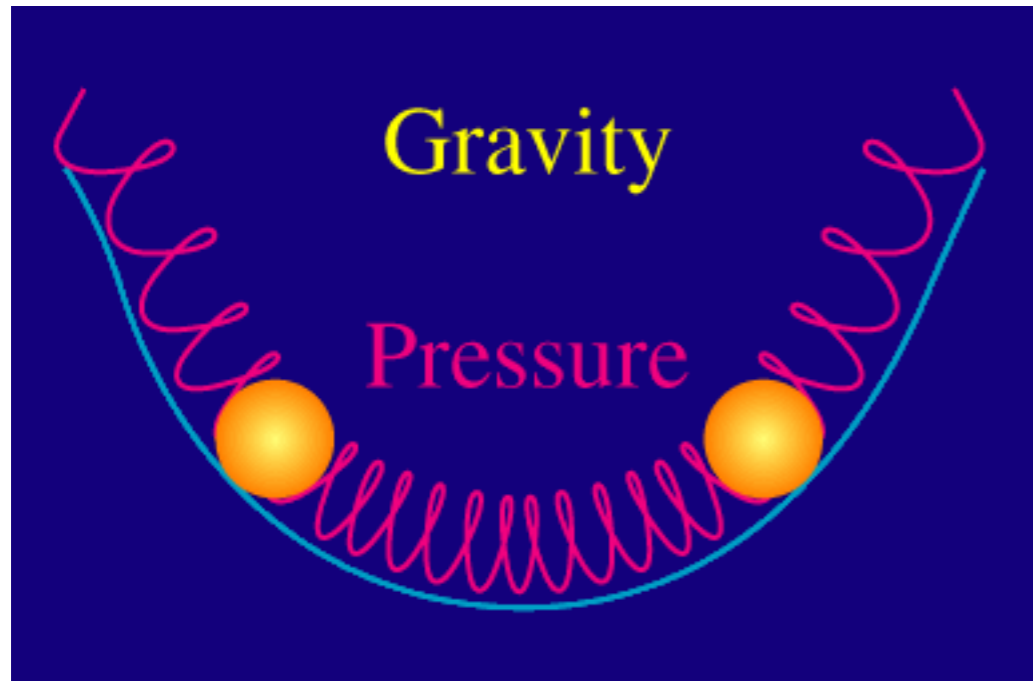
*angular diameter
distance*

$$c \Delta z = H(z) \Delta r_{\parallel}$$

Hubble parameter

Baryonic Acoustic Oscillations

Primordial plasma



Overdense region
Dark matter, baryons, photons



Oscillations of baryons
and photons



Decoupling: Photons diffuse
away, pressure ends



Shell of baryonic matter at
fixed radius

BAO can be considered an absolute AP test (i.e. with standard ruler)

A standard ruler $\left\{ \begin{array}{l} \Delta r_{\perp} = 150 Mpc \text{ (theory)} \\ \Delta r_{\perp} = D_A(z) \Delta \theta \end{array} \right.$

$D_A(z) H(z)$ *(our friend AP test)*

 $H(z)$