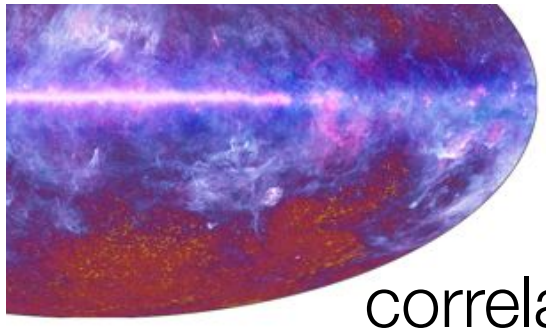

lecture 2: from P(k) to galaxies: correlation function

correlation functions, P(k) – 1.
angular correlation function – 2.
measurements of bias – 3.
BAOs – 4.

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http://www.ias.u-psud.fr/dole/m2.php

1. 2-pt correlation function, P(k)

correlation lengths of galaxies

CFHTLS
100000 redshifts

McCracken et al., 2008
astro-ph/0711.4204

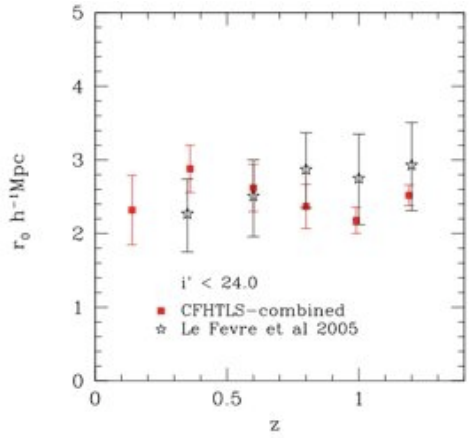
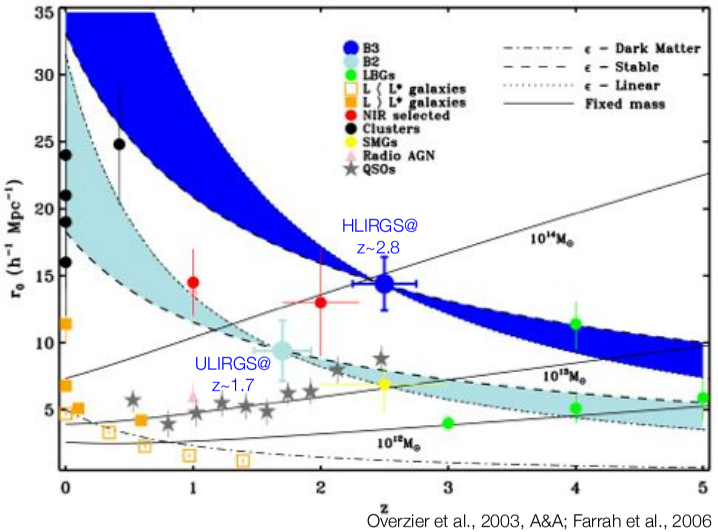


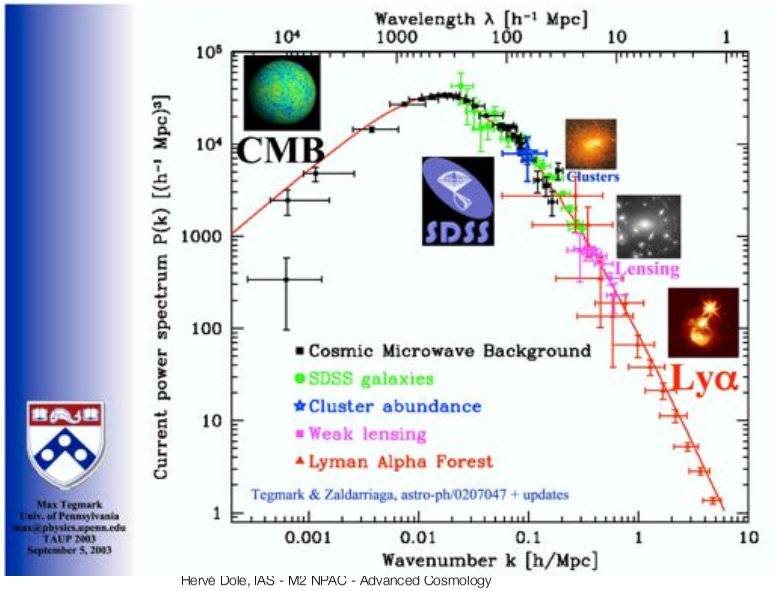
Fig. 3. The comoving correlation length, r_0 as a function of redshift for the four combined CFHTLS fields (filled squares) compared to literature values (open symbols) computed for a galaxy sample limited at $i' < 24.0$. For these

3D correlation function of galaxies



Overzier et al., 2003, A&A; Farrah et al., 2006

P(k)



2. angular correlation function

link between 3D and 2D

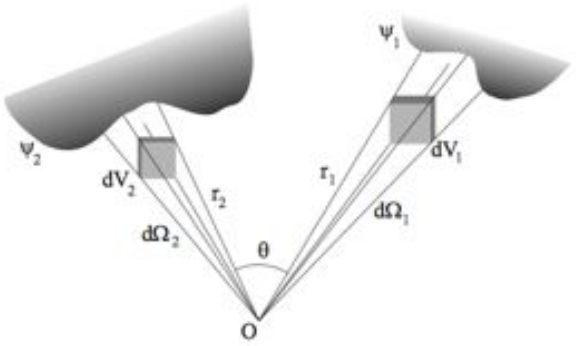


Figure I.6 – *Illustration du passage de la fonction de corrélation $\xi(r)$ à la fonction de corrélation angulaire $\omega(\theta)$. D'après H. Dole (cours du M2 NPAC).*

thèse Nicolas Bavouzet, 2008 – TEL: http://tel.archives-ouvertes.fr/tel-00363975

angular correlation function

CFHTLS
100000 redshifts

McCracken et al., 2008
astro-ph/0711.4204

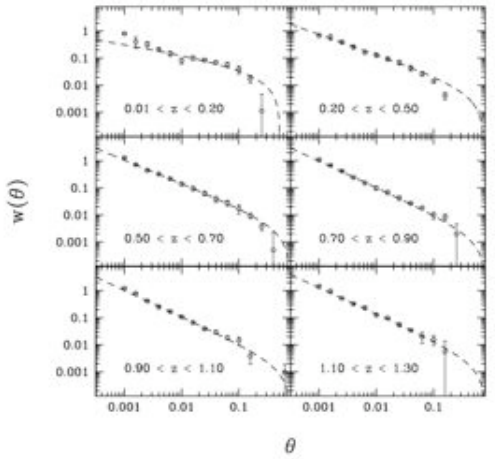


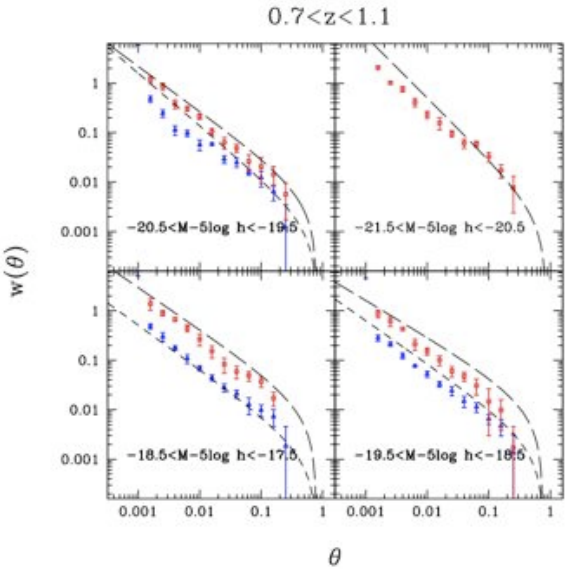
Fig. 2. The amplitude of the angular correlation w as a function of angular separation θ (in degrees) for $17.5 < i' <$ 24 galaxies selected in the four deep fields of the CFHTLS

angular correlation function

CFHTLS
100000 redshifts

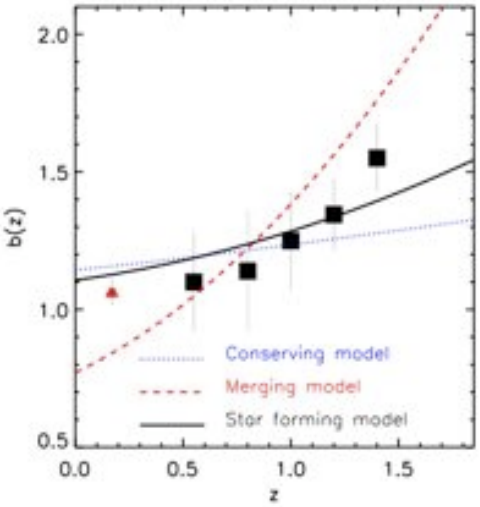
ACF par redshift,
luminosité absolue,
et type (bleu/rouge)

McCracken et al., 2008
astro-ph/0711.4204



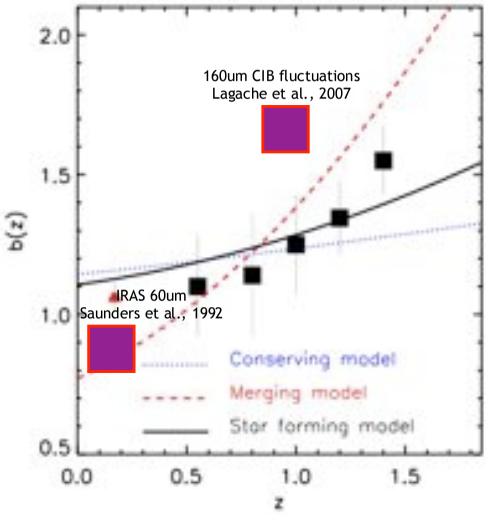
3. measurements of bias

constraints on the bias



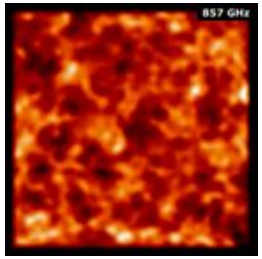
Marinoni et al., 2005, A&A

bias of infrared galaxies



Adapted from Marinoni et al., 2005

structure of the cosmic infrared background



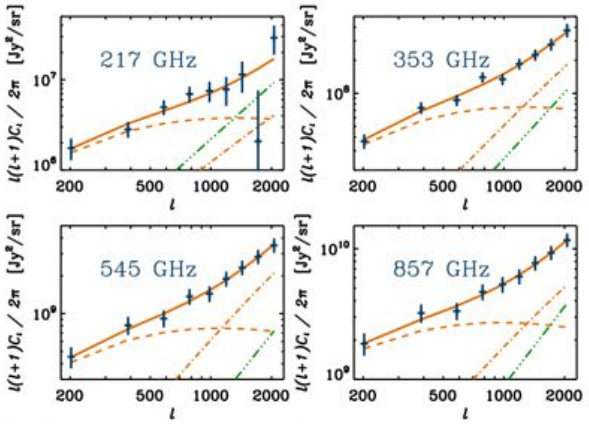
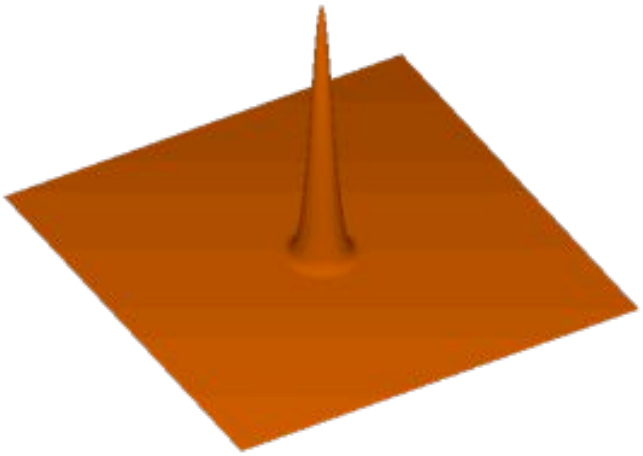


Figure 19. Each panel corresponds to one frequency. For each frequency, the blue points correspond to the angular auto power spectra as well as the associated error bars including statistical and systematic errors. The best fit model per frequency (including shot noise) corresponds to the solid orange line. The dashed (dot-dashed) orange lines correspond to the 2h (1h) contributions. The green triple dot dashed curve corresponds to the Poisson noise level, fixed to its expected value. To obtain those fits, three parameters per frequency were varied: $\log_{10} M_{min}$, σ_{sat} and f_{sat}. The fits are obviously qualitatively very good.

Planck collaboration 2011 – arXiv:1101.2028
http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=48205

4. Baryonic Acoustic Oscillations

BAO: one oscillation



D. Eisenstein, UofA, SDSS, 2005
http://cmb.as.arizona.edu/~eisenste/acousticpeak/

BAO: history of a peak

-Densité de la perturbation

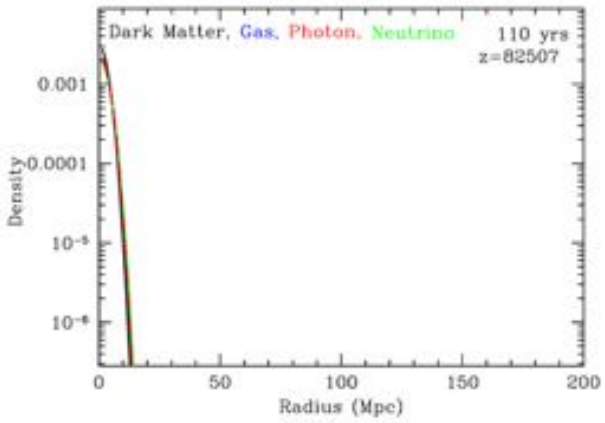
- petite perturbation
- la matière noire évolue selon la gravité
- la densité est dominée par les photons+neutrinos => la matière noire tombe doucement dedans (élargissement)

- les photons commencent à sortir du plasma qui devient neutre (Silk damping) z~1200

-Les photons sont découplés (CMB): le gaz « libre » peut enfin s'effondrer z < 1000
-Vitesse du son diminue

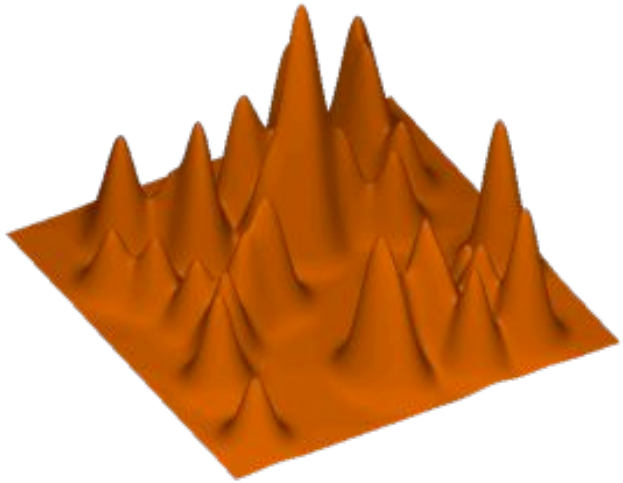
-La matière noire (en surdensité à l'origine) tombe doucement dans les régions surdenses formant une coquille de rayon 150 Mpc; le gaz suit la matière noire et revient aussi en r=0

-Les galaxies se forment plus (1%) dans cette coquille de 150 Mpc: ce sont les pics acoustiques



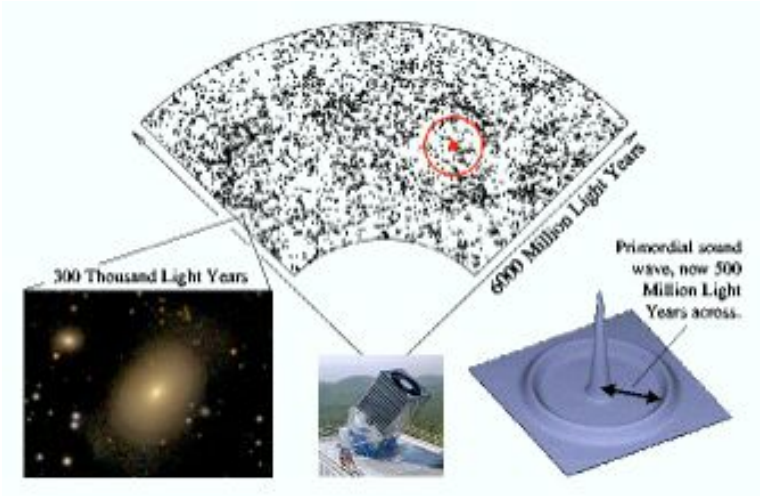
D. Eisenstein, UofA, SDSS, 2005
http://cmb.as.arizona.edu/~eisenste/acousticpeak/acoustic_physics.html

BAO: many oscillations



D. Eisenstein, UofA, SDSS, 2005
http://cmb.as.arizona.edu/~eisenste/acousticpeak/

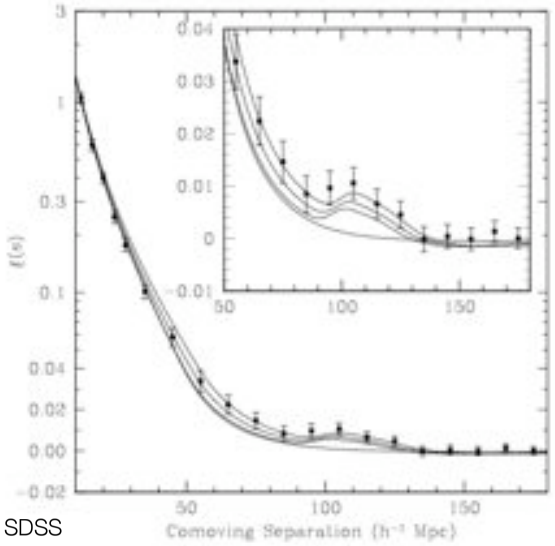
BAO: on the sky



D. Eisenstein, UofA, SDSS, 2005
http://cmb.as.arizona.edu/~eisenste/acousticpeak/

BAO: correlation function

physical distance ?



Eisenstein et al., 2005, ApJ - SDSS

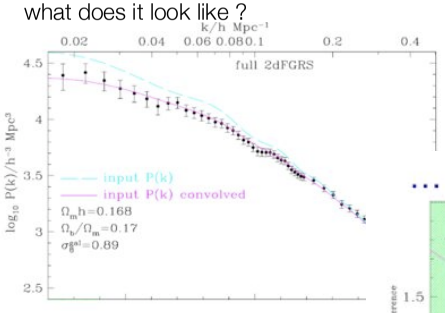
BAO on the matter power spectrum P(k)

what does it look like ?

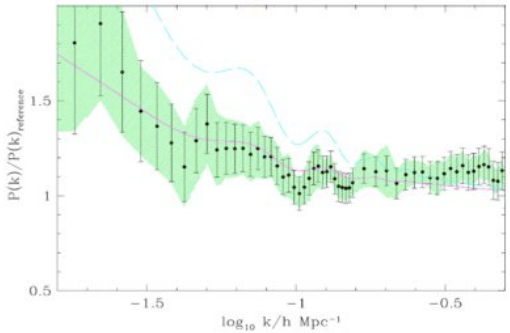
Cole et al., 2005, MNRAS - 2dF

BAO: spectre de puisance P(k)

what does it look like ?



… after dividing out smooth line



Cole et al., 2005, MNRAS - 2dF