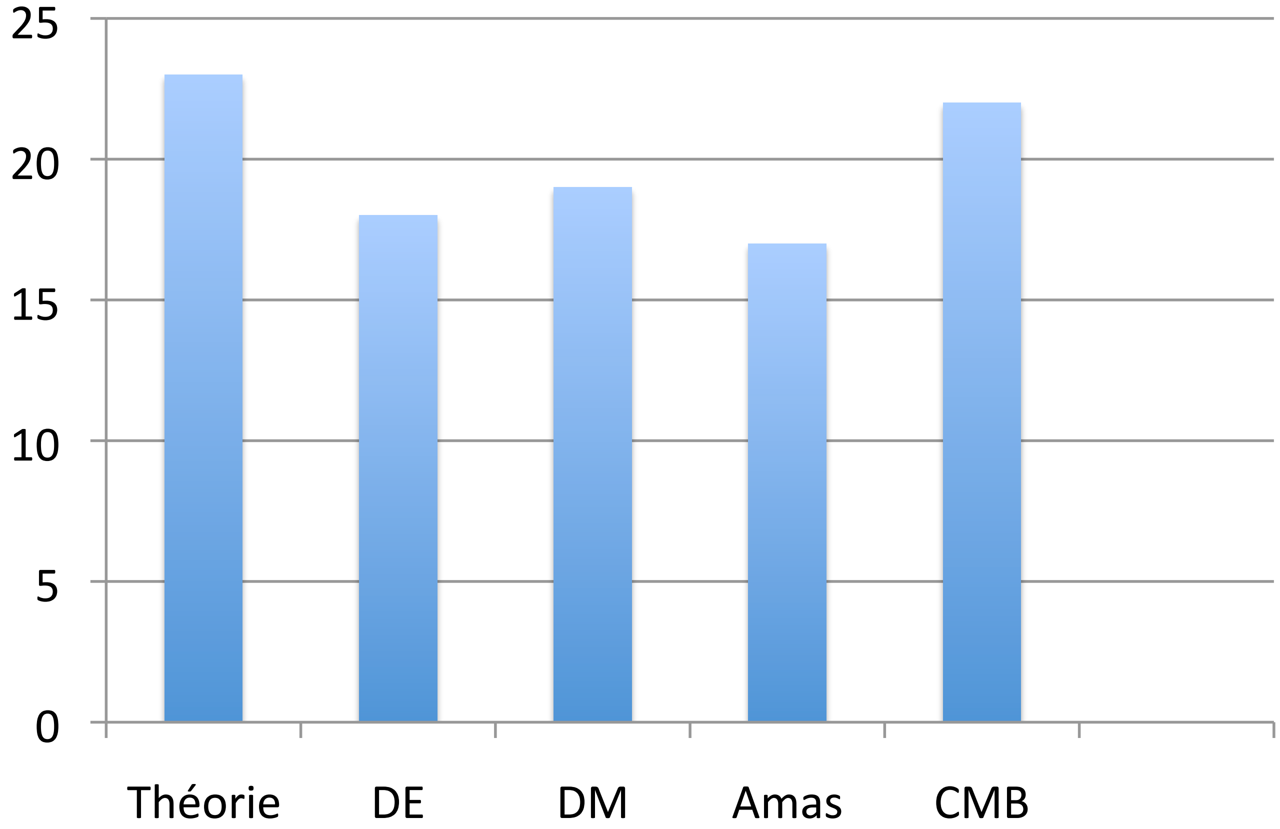
Moriond Cosmology – Morceaux choisis

Nathalie Palanque-Delabrouille

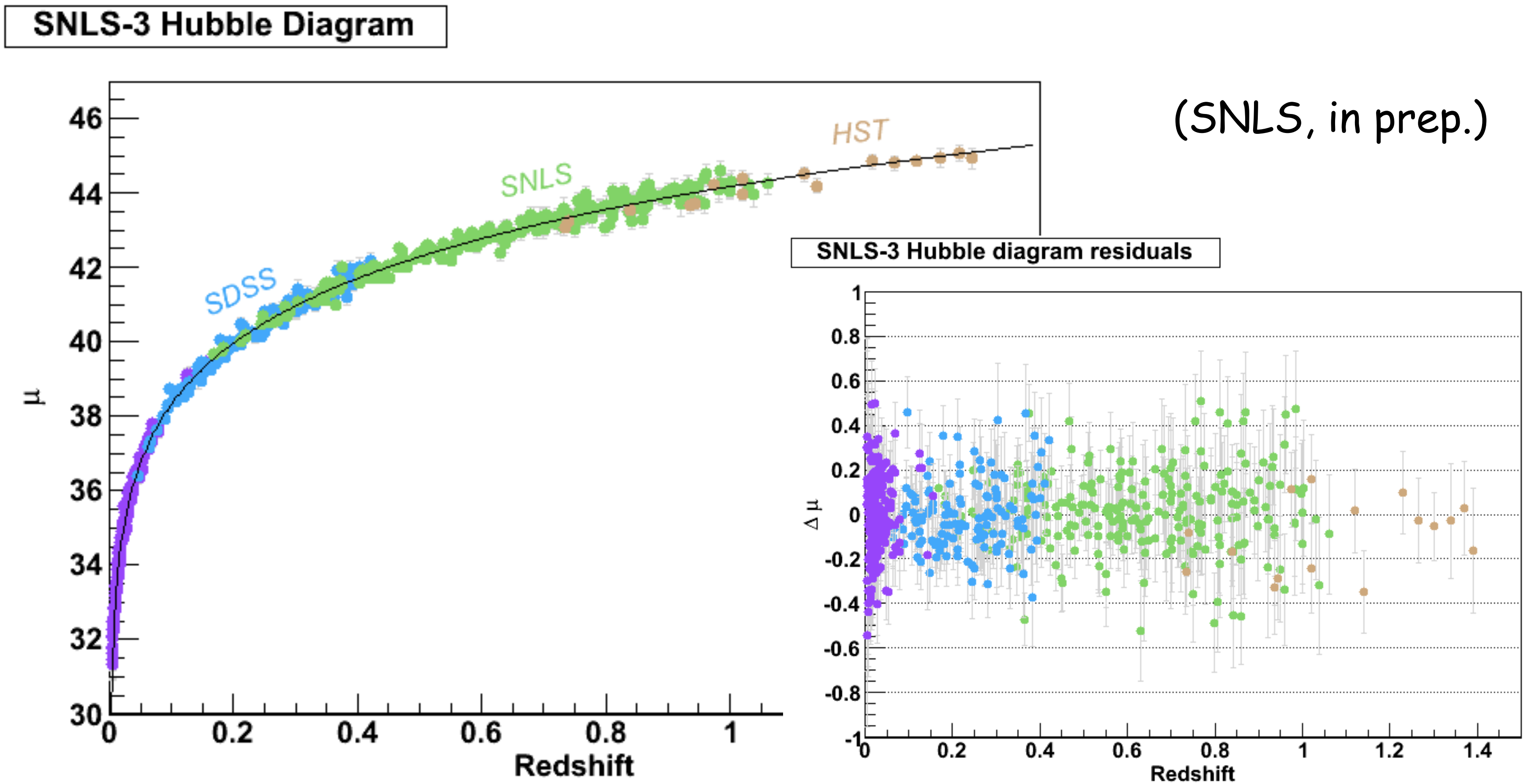
150 participants



excellents review talks pour chacune des thématiques
http://moriond.in2p3.fr/J10/schedule2010.html

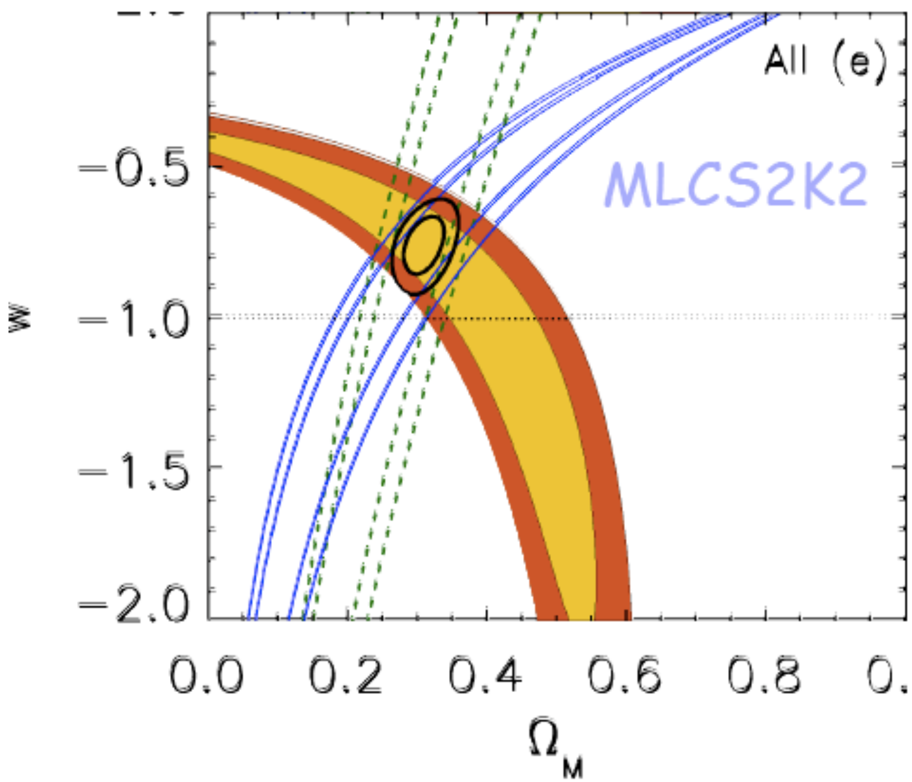
Energie noire - SN

- Echantillons photométriques et spectroscopiques toujours plus importants
- Etudes de corrélations de luminosité des SN avec
  - lentilles gravitationnelles (sur ligne de visée)
  - environnement galactique

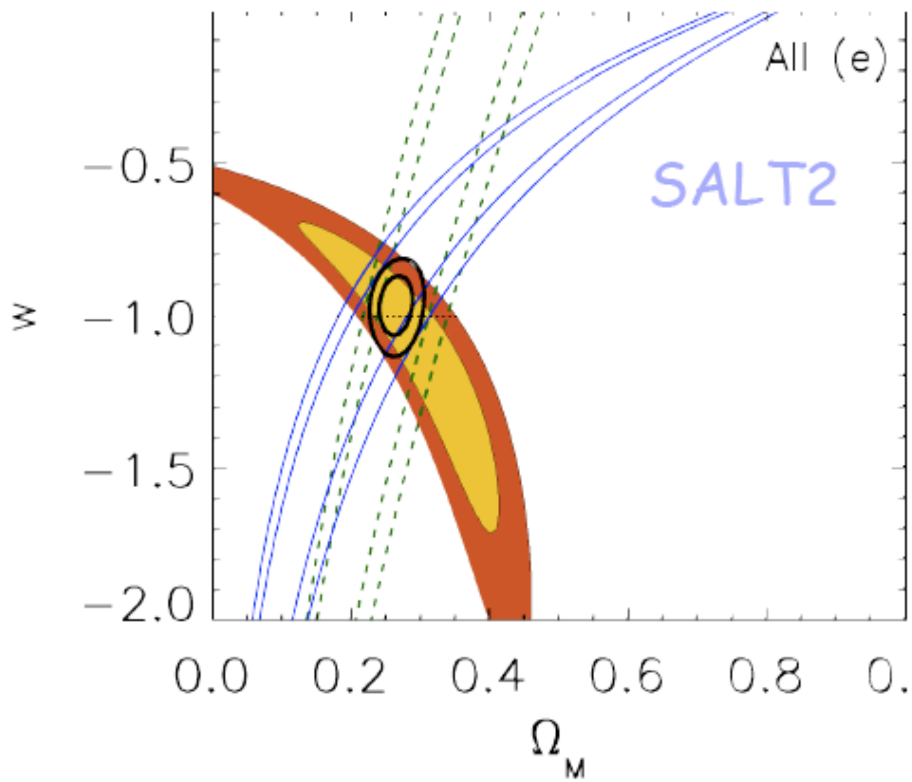


(SNLS, in prep.)

Pourtant … pas de SN dans WMAP7
« For example, Ω_Λ [using MLCS2K2 or SALT2] are different by nearly 2σ despite being derived from the same data sets » (Komatsu et al., 2010)



w=-0.76 +- 0.07 +- 0.11



w=-0.96 +- 0.06 +- 0.12

(SDSS: Kessler et al. 2009)

Energie noire - SN

Origins of the "discrepancy" well identified (talk Regnault)

(1) Model restframe UV calibration

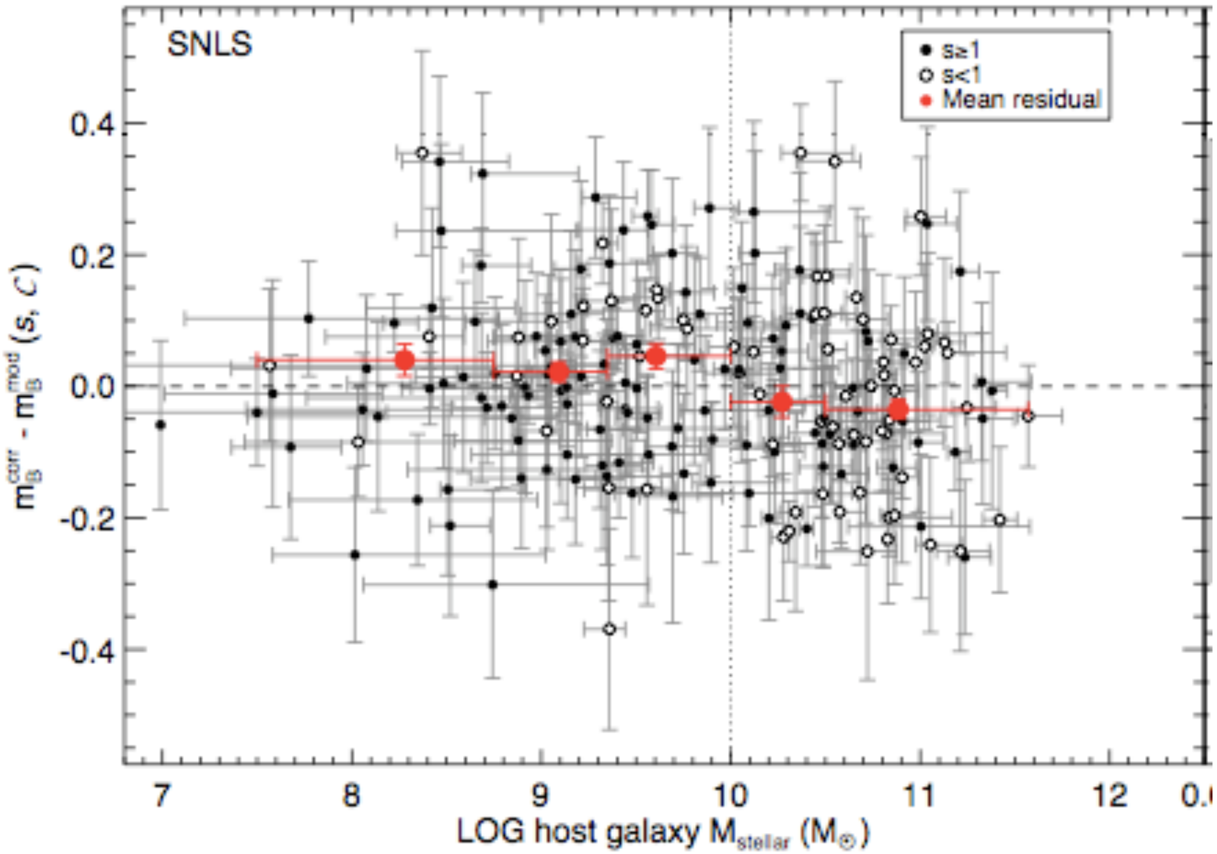
→ disappears with improved photometric calibration

→ future imagers with better near-IR sensitivity (DarkCam) will be less sensitive to the model UV calibration.

(2) assumptions on the nature of the color variability of the SNe Ia.

→ not a systematic uncertainty.

Energie noire - SN



SNLS-3: dependence of standardized SN luminosity distances with host galaxy stellar mass (~4σ significance)

Accounted for by adding a host specific term in the cosmological fit.

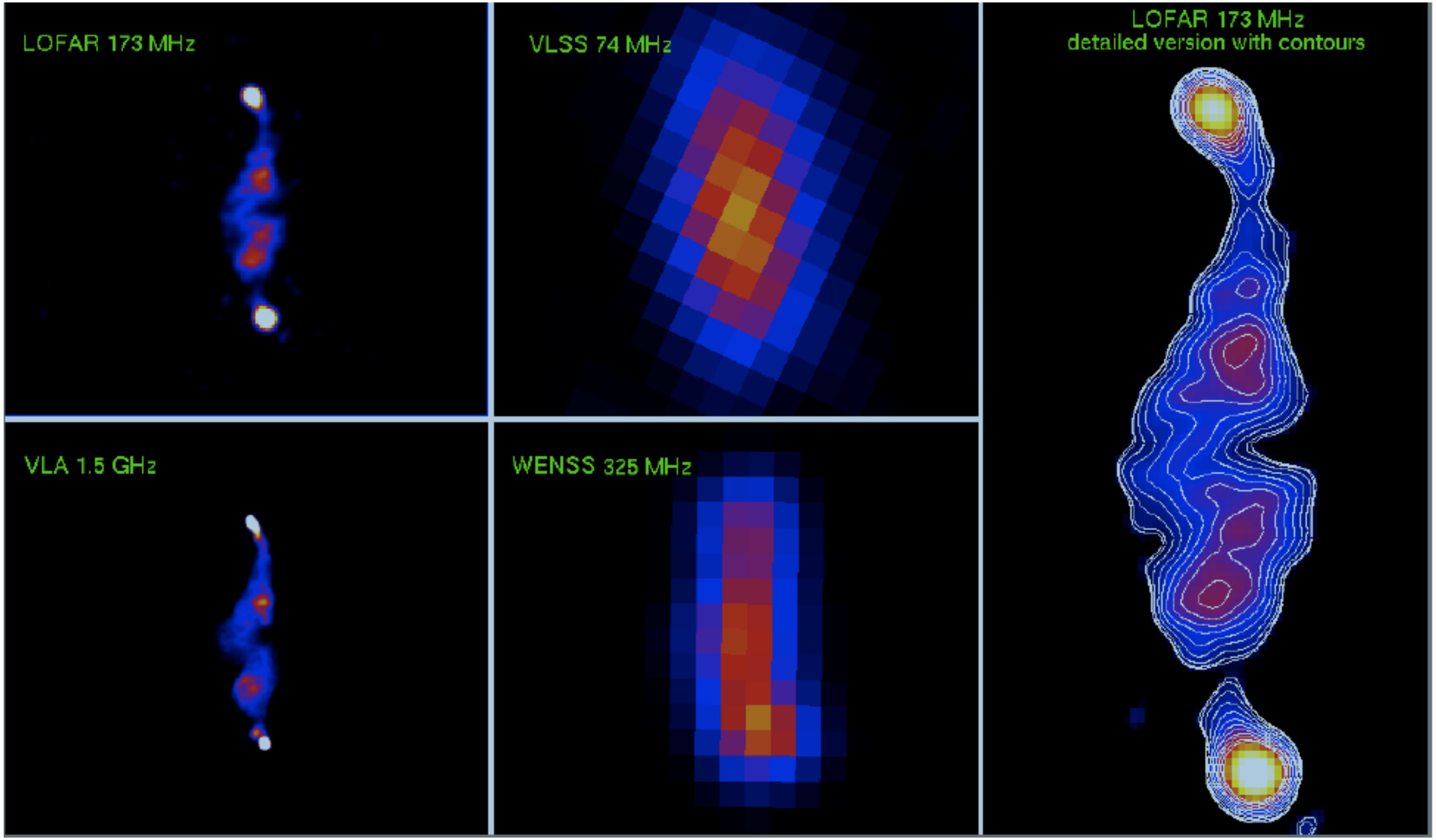
(SNLS: Sullivan et al. 2010)

radio – LOFAR et la réionisation

21cm(1+z) -> ~160 MHz pour z=8

Construction : 50% fait
Démarrage: juin 2010
Runs de science: automne/hiver 2010

3C61.1



Amas de galaxies

(talk Eduardo Rozo)

- $$\frac{dn}{dM} \propto \left(\frac{\Omega_m}{M}\right) \times \exp\left[-\frac{\alpha(M/\Omega_m)}{\sigma_8^2(z)}\right]$$

- The universe is accelerating. Two possible culprits:
  - dark energy exists
  - GR breaks down at large scales

  Once the *geometry* of the universe is measured (e.g. from BAO +SN), *GR+CMB predict the growth of LSS.*

  (cf JP Uzan)

  Clusters test gravity on cosmological scales in a way that is *fundamentally different* from geometrical probes.

Amas de galaxies

13000 amas en optique (SDSS maxBCG cluster catalog), Koester et al 2007
-> faciles à identifier, redshift ok

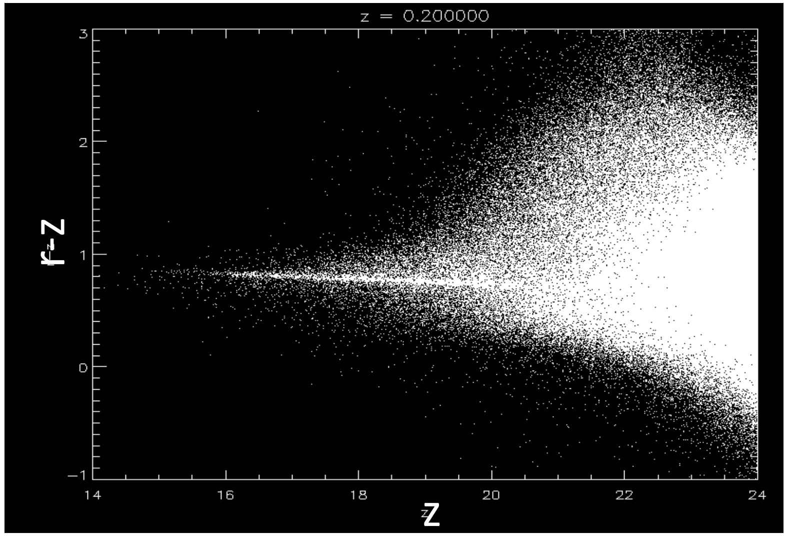


diagramme couleur-magnitude des galaxies

redshift photométrique, $\Delta z = 0.01$ (dans gamme 0.1 - 0.3)

<2000 amas en X

100+ amas en SZ

-> estimation de Masse

Amas de galaxies

Modèle des amas affiné avec observations XMM (lois d 'échelle L_X – M)

Futur catalogue Planck (>1000 amas SZ)

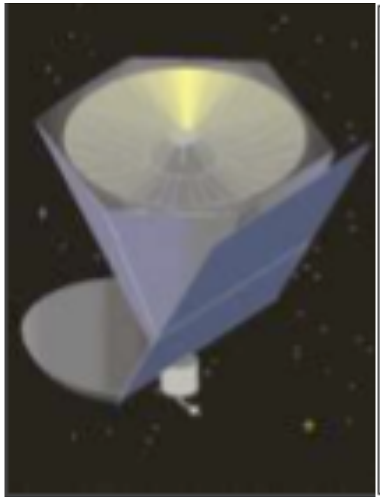
2010 : vérification de connexion Y(flux SZ) – M
sur ~1000 amas ROSAT dans données WMAP

(Melin et al., 2010)

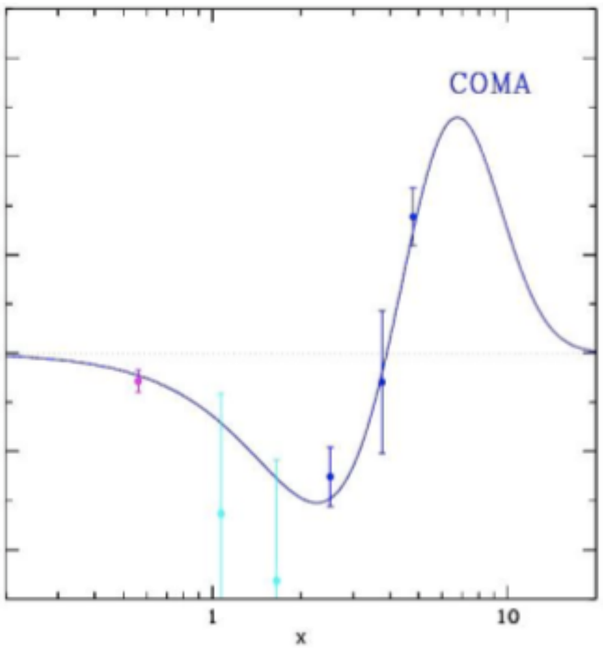
Amas de galaxies

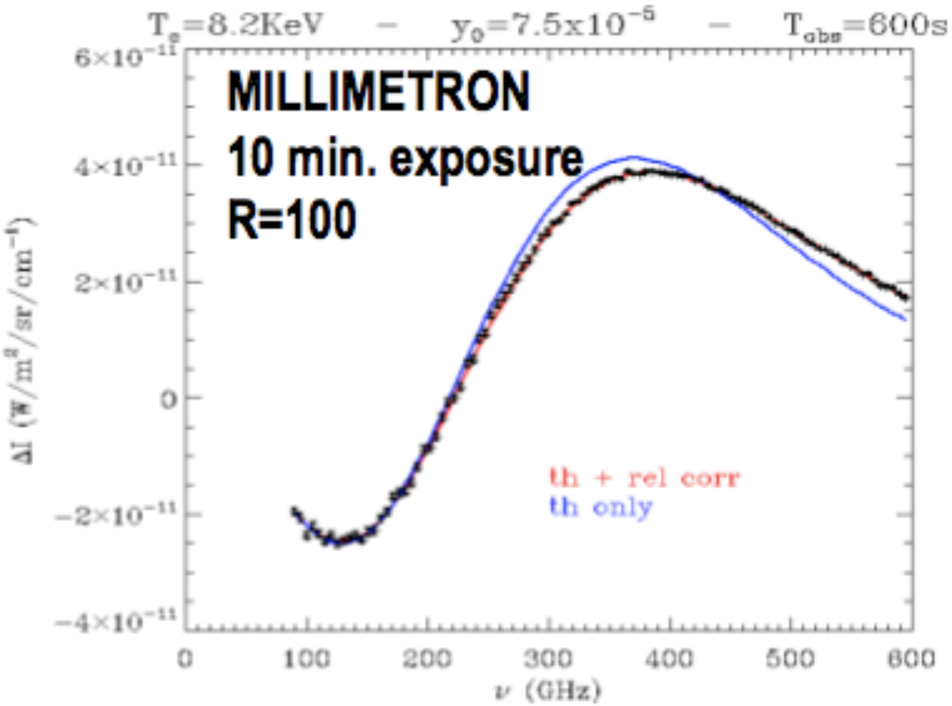
MILLIMETRON? 2016, Italo-Russe, accepté

(talk Colafrancesco)



12 m dish
Active cooling
(4 K)
Θ< 0.1-1.0 arcmin
Noise<0.1 mJy/√Hz
FTS spectroscopy
Polarimetry
L2





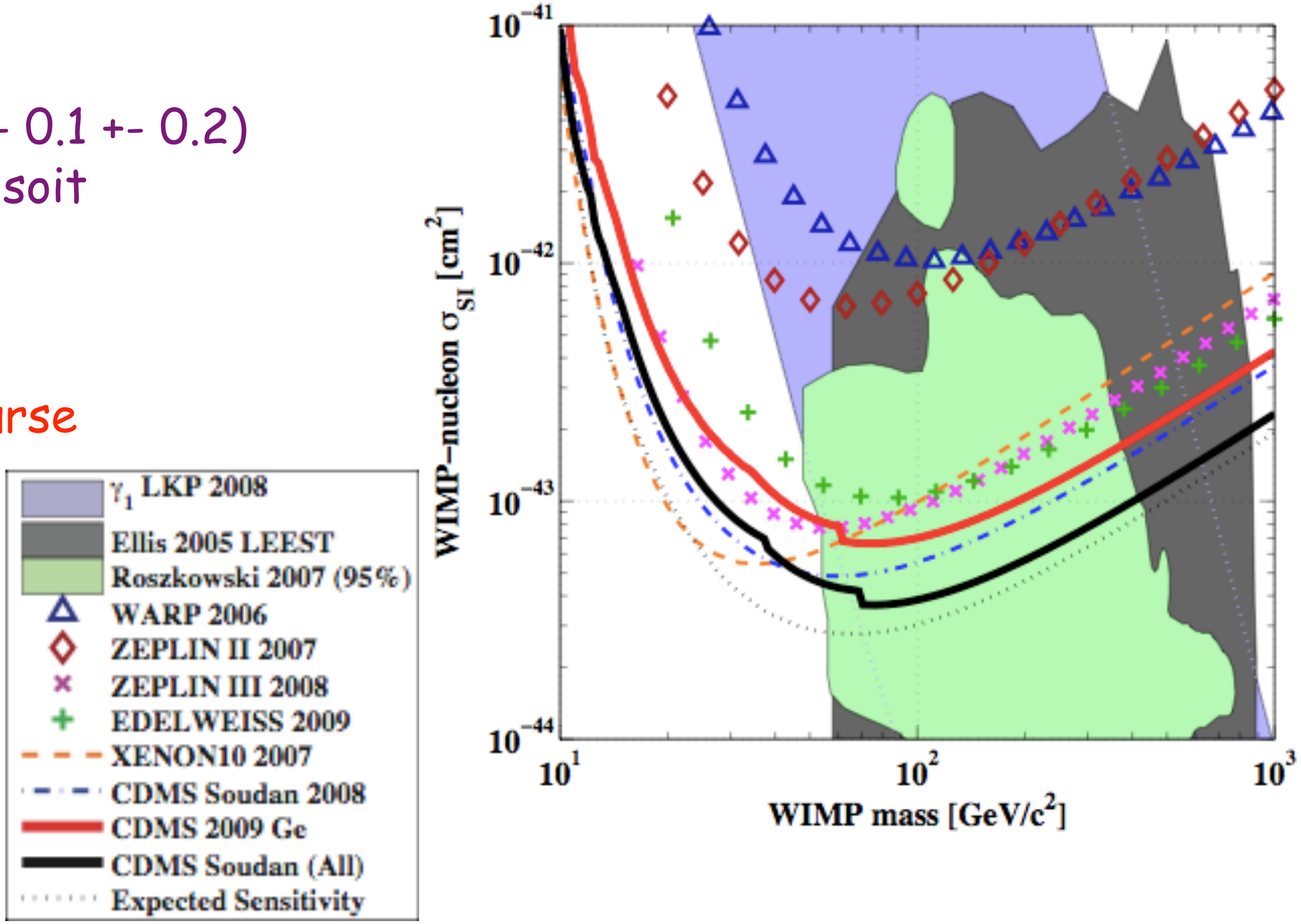
Matière noire – détection directe

cf. séminaire CDMS 29/03 + apéro Edelweiss 31/03

- SuperCDMS 15kg
  passe aux ID, 2.5cm d'épaisseur (vs. 1cm pour les evts de surface)
  substrats de 5kg (vs. 250g) pour atteindre 100kg

- CDMS :
  2 evts (fond de 0.8 +- 0.1 +- 0.2)
  Proba de 20% que ce soit
  des evts de surface

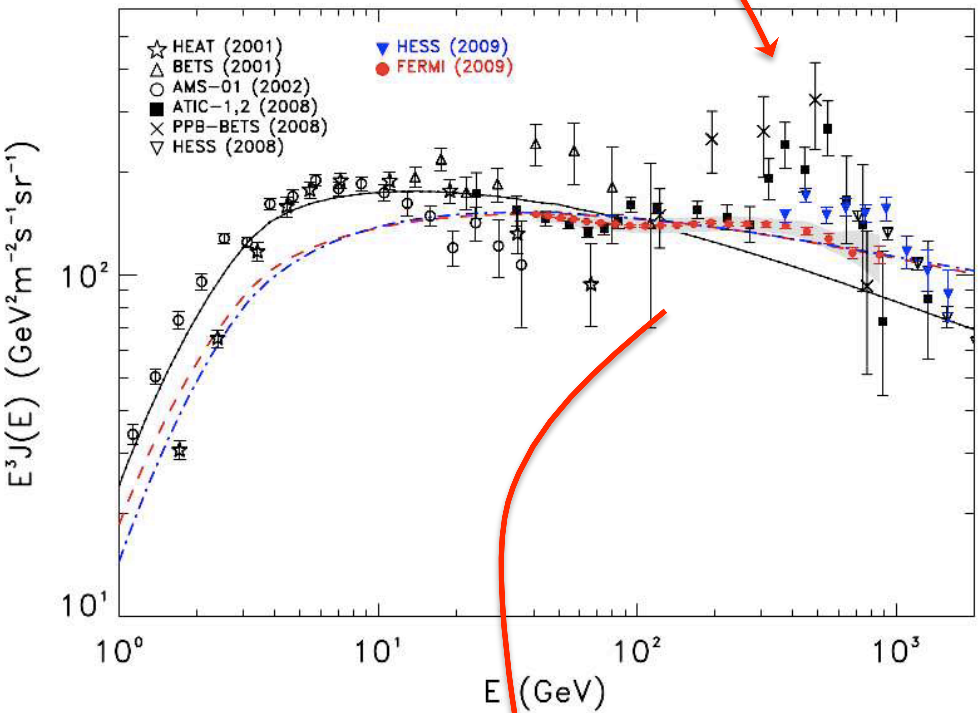
- Edelweiss dans la course

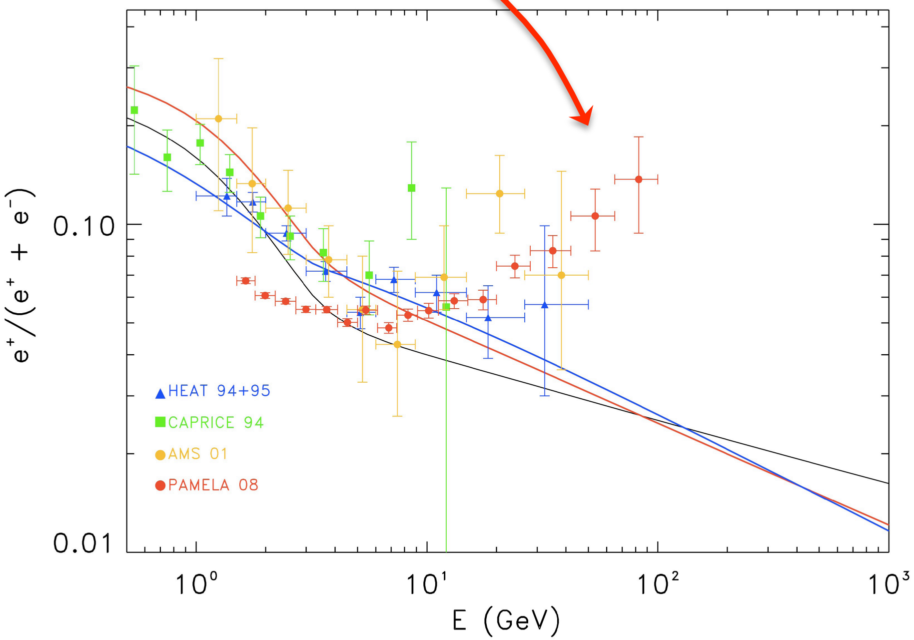


Matière noire – détection indirecte

atic : excès de ($e^+ + e^-$)

pamela : excès de (e^+)



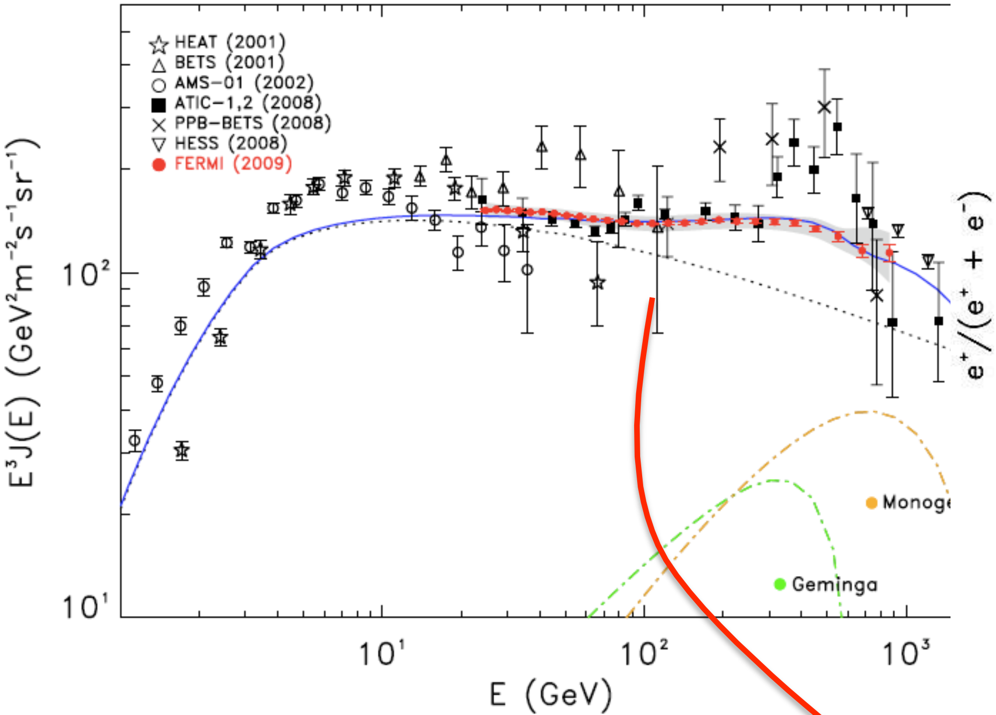


Exclu par Fermi et HESS

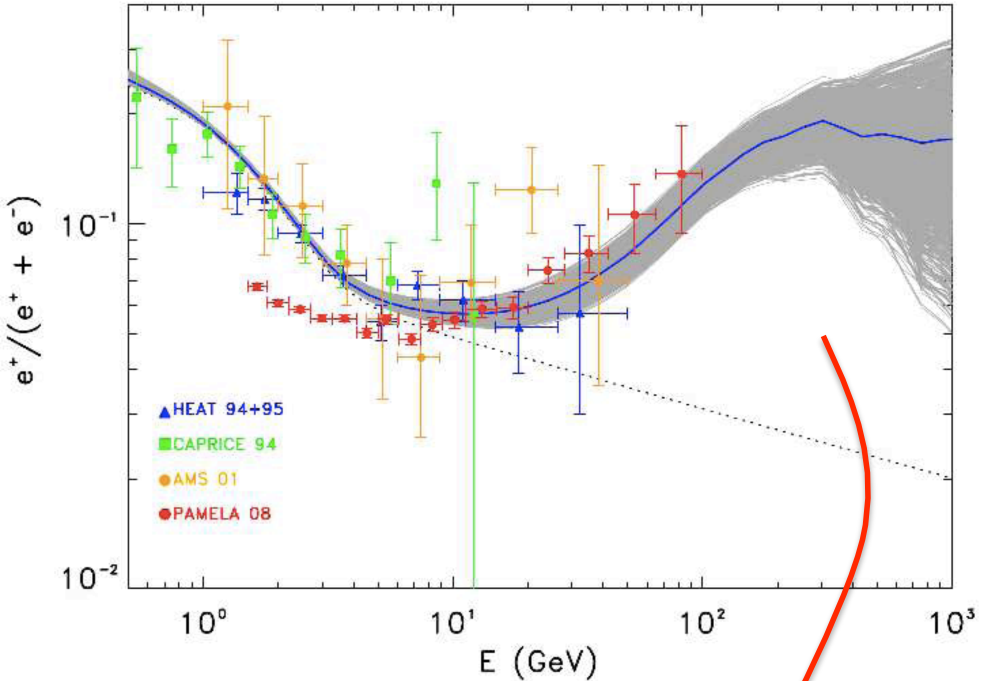
(Publication Fermi, 2009)

Matière noire – détection indirecte

atic : excès de $(e^+ + e^-)$



pamela : excès de (e^+)



Explication avec pulsars proches

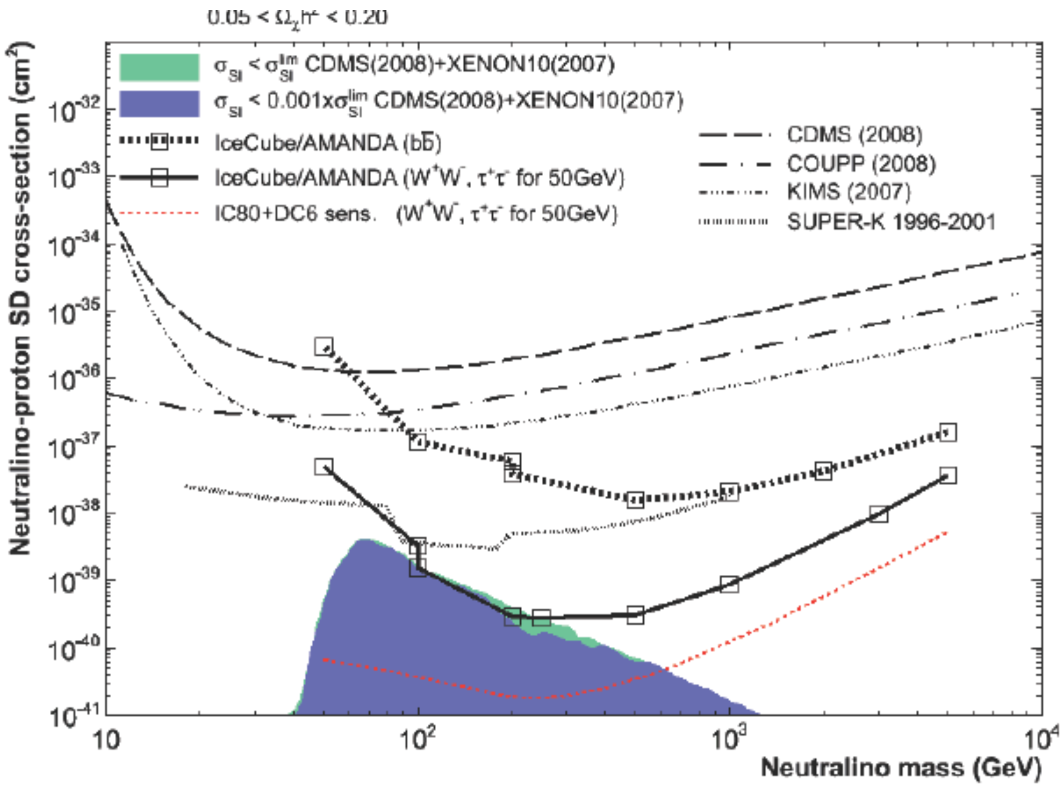
courbe bleue = 1 modèle unique, avec pulsars connus, pour Fermi + HESS + Pamela

Neutrinos de hautes énergies
Ice Cube

79 lignes déployées (sur 80 + 6)
Complet en 2011
6 lignes de cœur dense pour E_{th} = 10 GeV (DM)

Analyses sur 22 lignes :

aucun excès en provenance du Soleil



Neutrinos de hautes énergies
ANITA

$$p + \gamma_{cmb} \to \Delta^+ \to n + \pi^+$$
$$\to \mu^+ + \boxed{\nu_\mu}$$
$$\to e^+ + \boxed{\bar{\nu_\mu} + \nu_e}$$

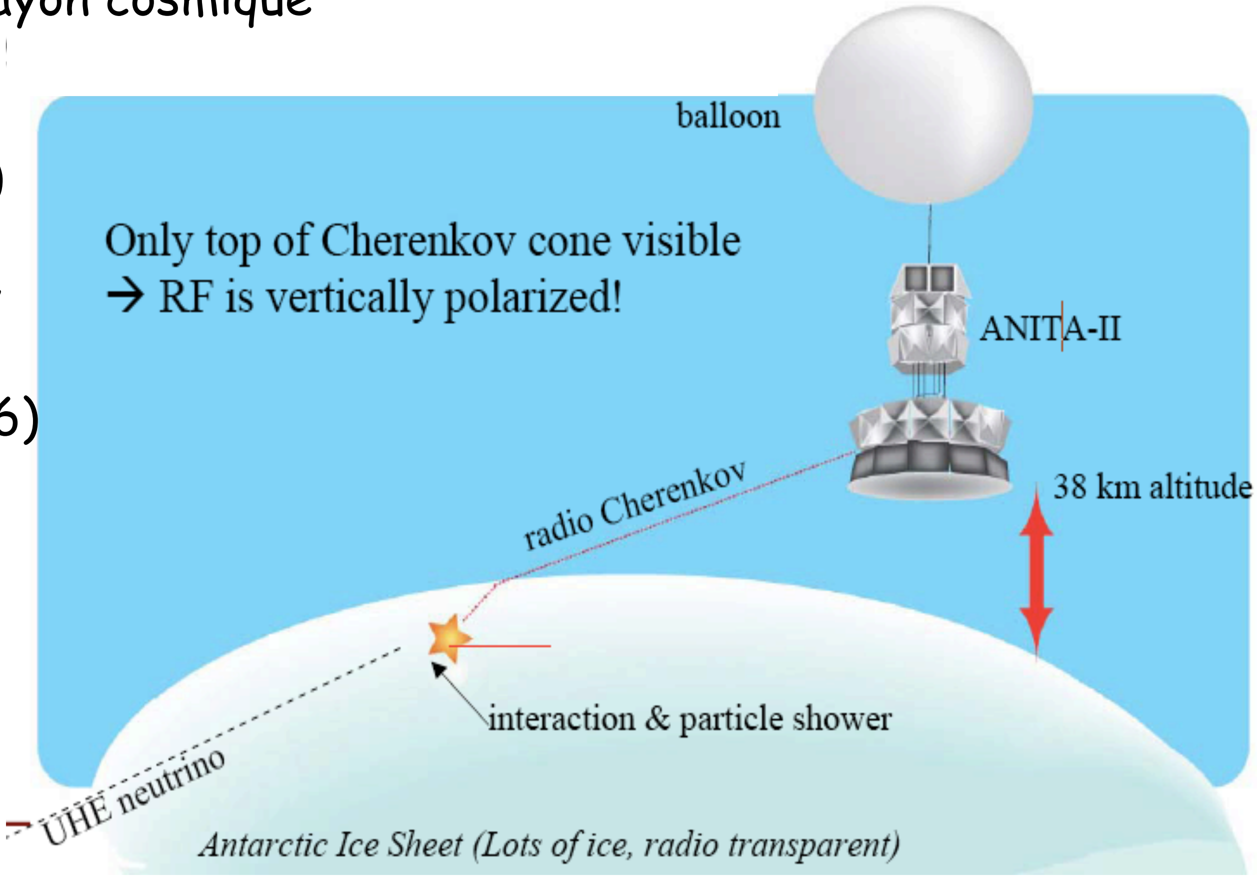
neutrinos GZK (10^{18} - 10^{20} eV)
vols de 30 jours

Polarisation verticale = ν
Polarisation horizontale = rayon cosmique

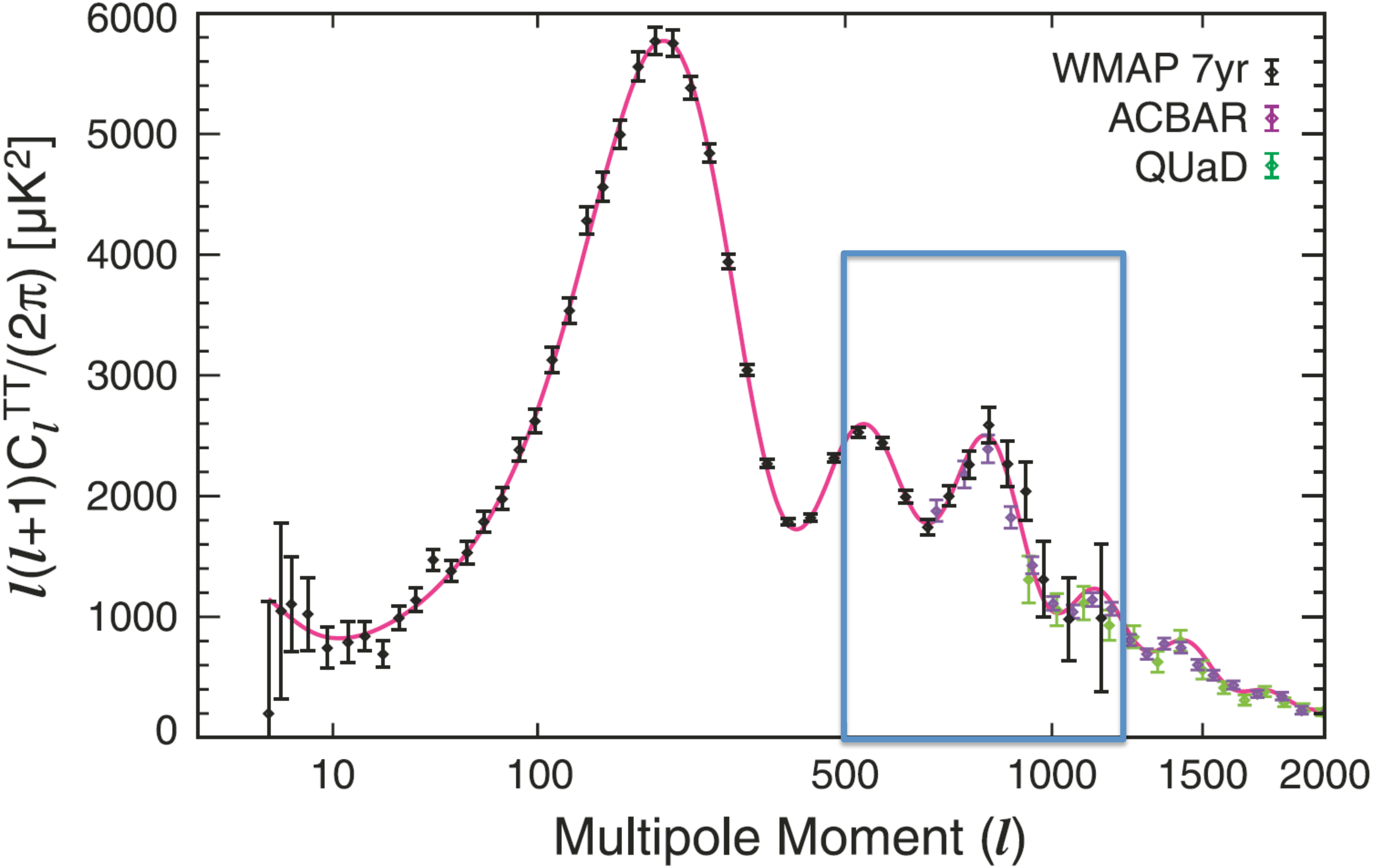
ANITA I : 1 ν (fond =1)
16 CR (fond =2)

ANITA II : optimisé pour ν
2 ν (fond = 1)
3 CR (fond = 0.6)

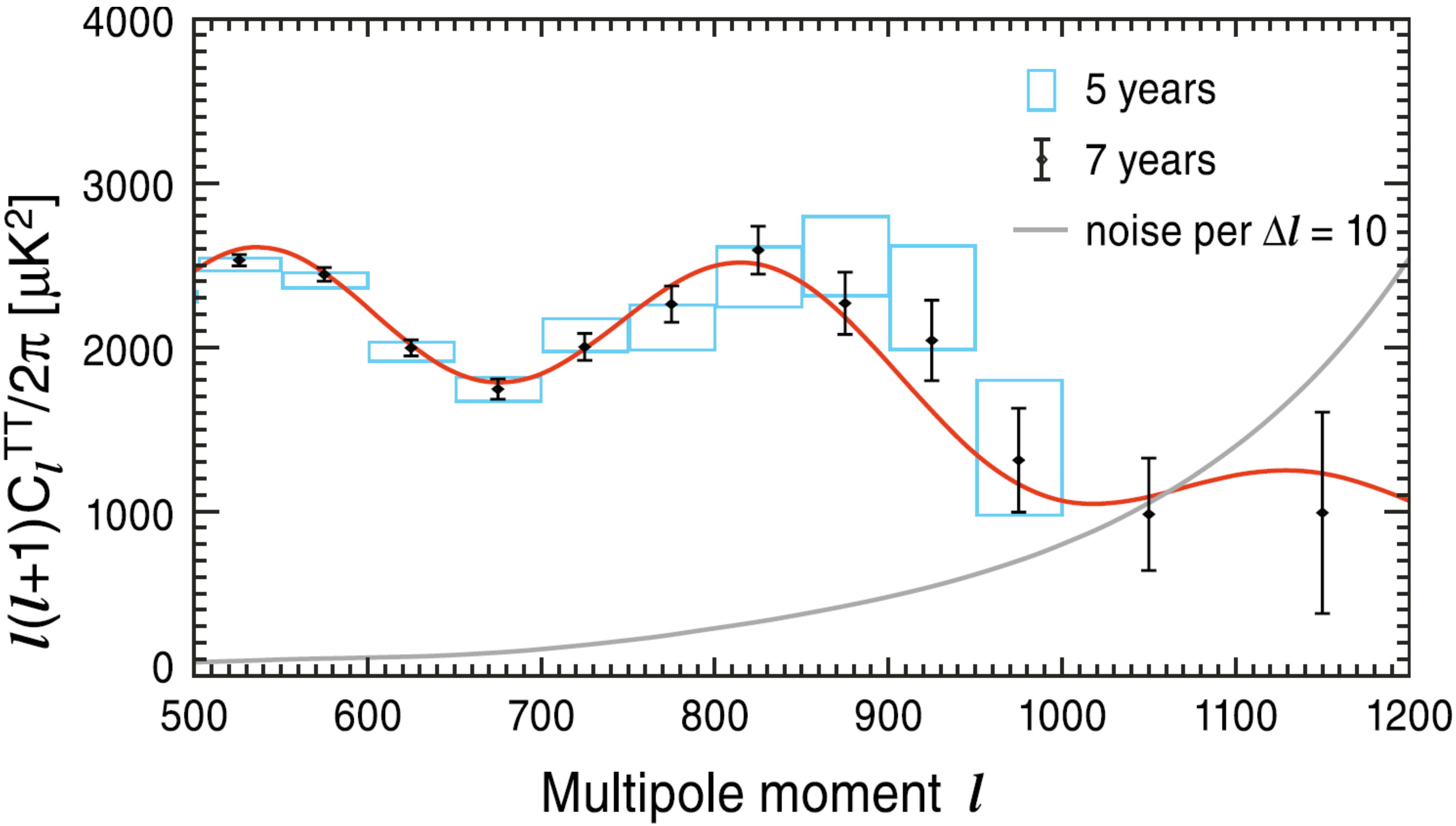
ANITA III à venir



CMB – WMAP 7 ans

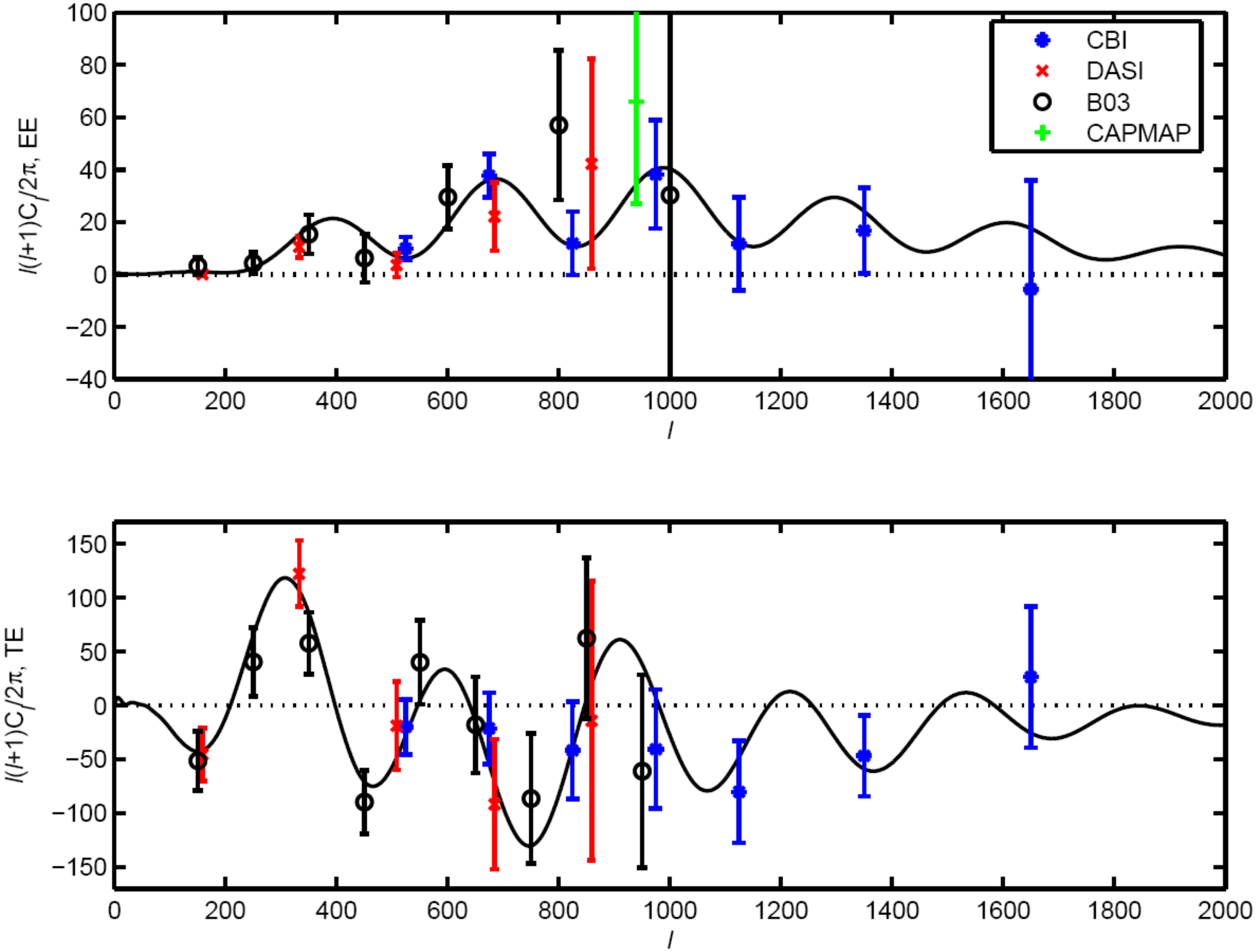


CMB – WMAP 7 ans



CMB - Polarisation

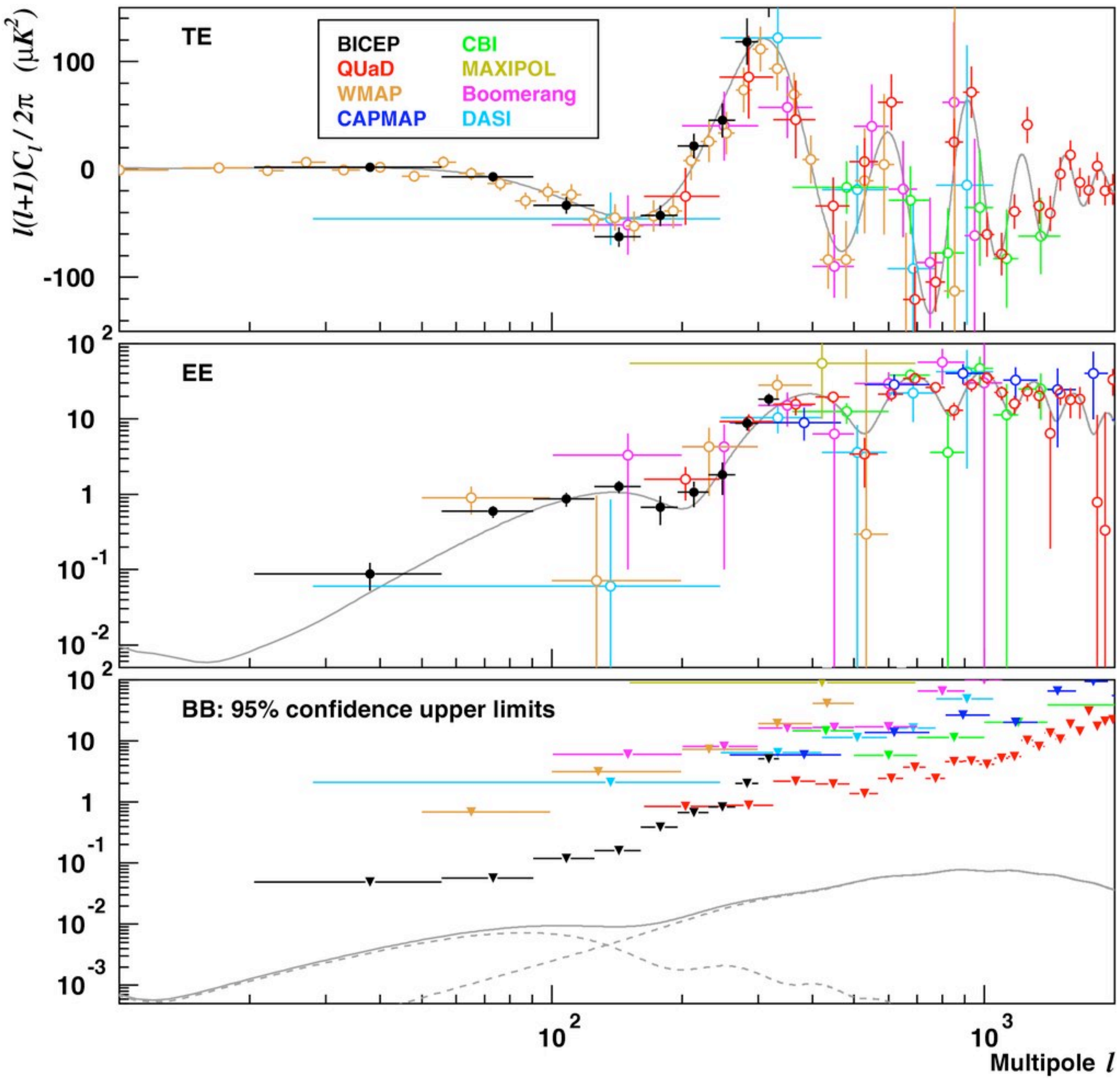
2005 :
détection statistique
(DASI, CBI, WMAP)



CMB - Polarisation

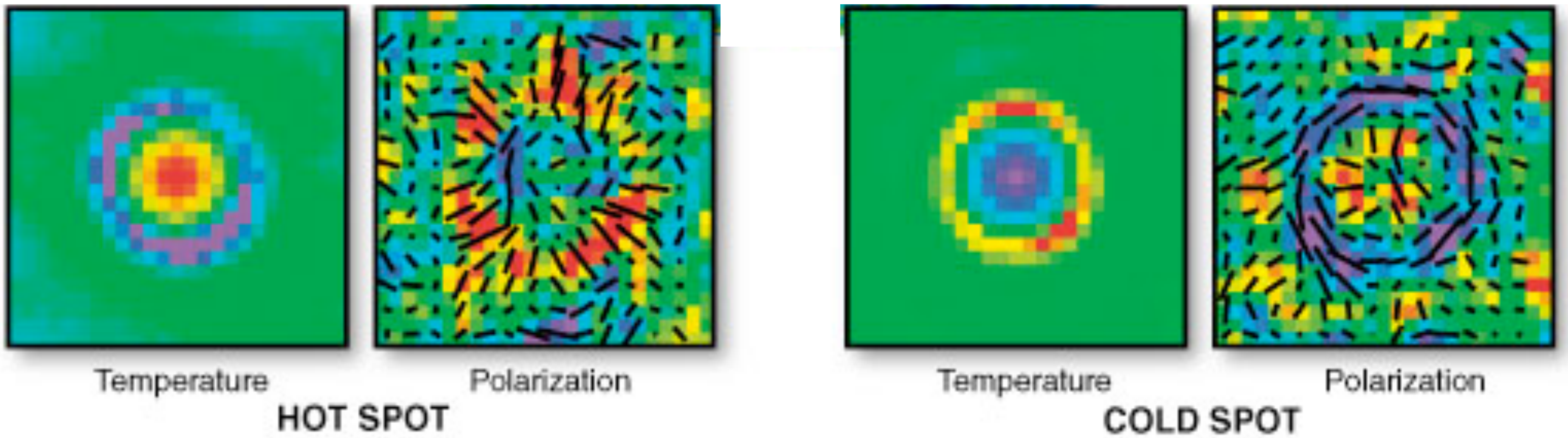
Chiang et al, ApJ, mars 2010

2010 :
mesures (BICEP, QUAD)



CMB
Polarisation

WMAP 7 ans,
après empilement



The imprint of sound waves is visible in the co-added degree-scale hot (left) & cold (right) spots. The expected radial/tangential polarization pattern around these extrema is now clearly seen in the 7-year WMAP data.

This pattern is also imprinted on the baryon gas (baryon acoustic oscillations or BAO) that evolves to form large scale structure.

CMB – WMAP 7 ans

- Direct visualization of the predicted oscillation and **polarization** pattern around hot/cold spots.

- ~50% reduction in allowable volume of 6-d ΛCDM parameter space.

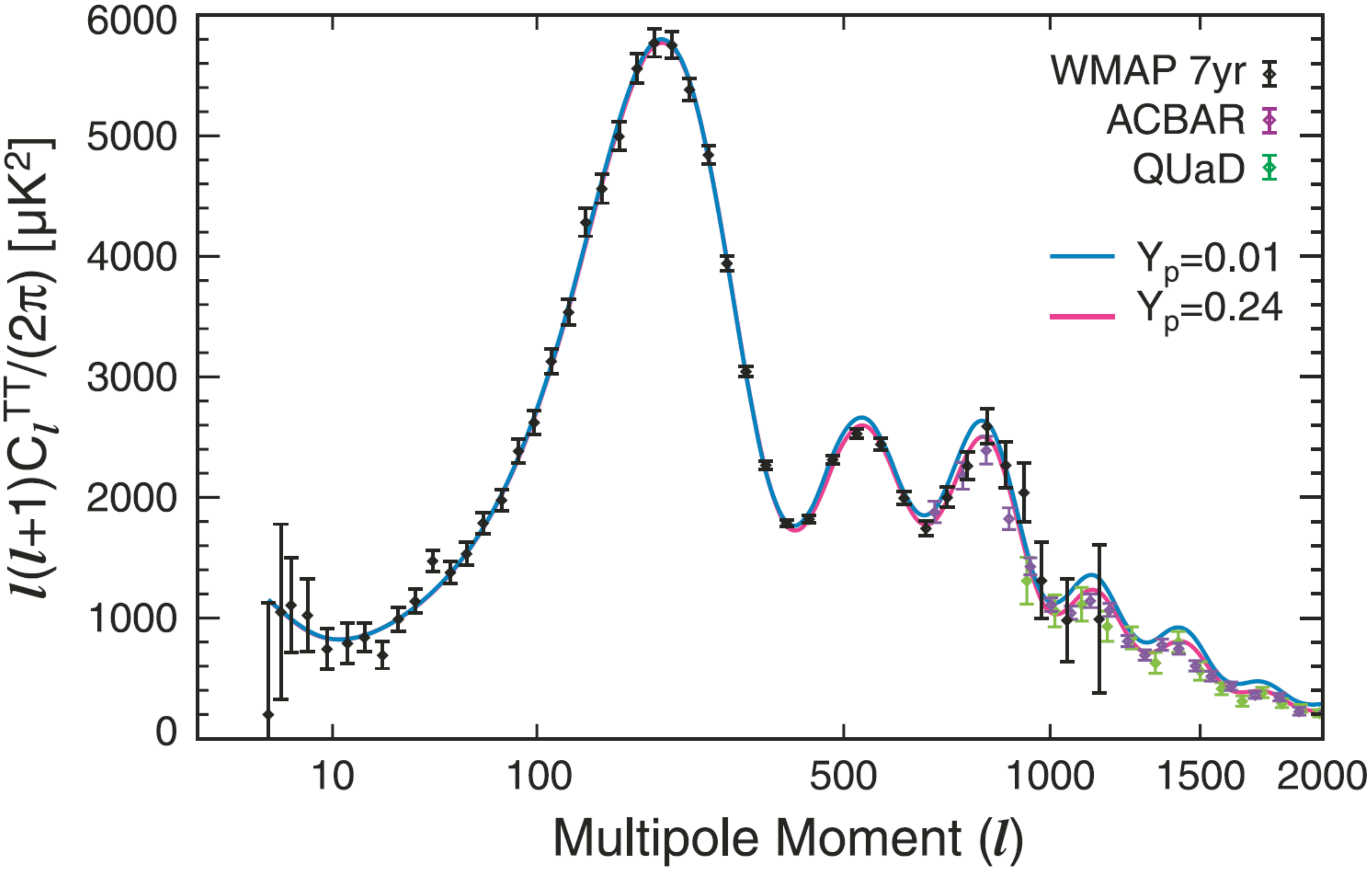
- 1st detection (>3σ) of the effect of **pre-stellar helium** on the temperature power spectrum (w/ Acbar+QUaD)

- Improved limits on **neutrino** parameters:
  $\Sigma m_\nu < 0.58$eV (95% CL) $N_{eff} = 4.3 \pm 0.9$ (68% CL)

- The primordial spectral **tilt** is less than one at >3σ:
  $n_s = 0.96 \pm 0.01$ (68% CL).

Detection of Pre-Stellar Helium - I

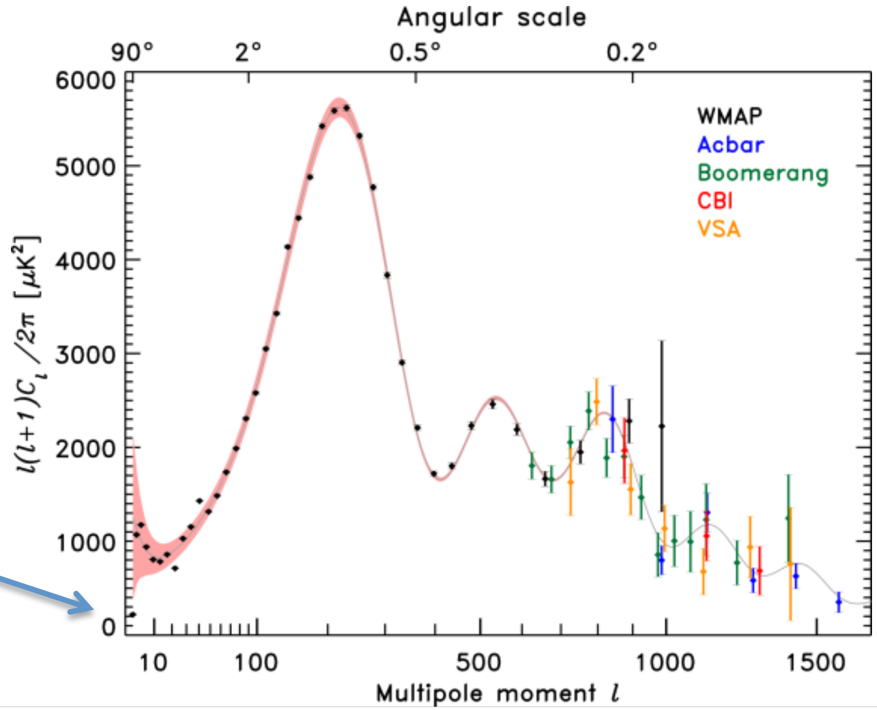
CMB



CMB : anomalies dans WMAP

. large-scale power deficit
Pas d'explication (avant-plans, nouvelle physique ne fond qu'aggraver)

-> Fluctuation stat.



. Asymétrie Nord-Sud
Pas un effet « a posteriori » car indépendant de l

Axe = écliptique
-> effet local?