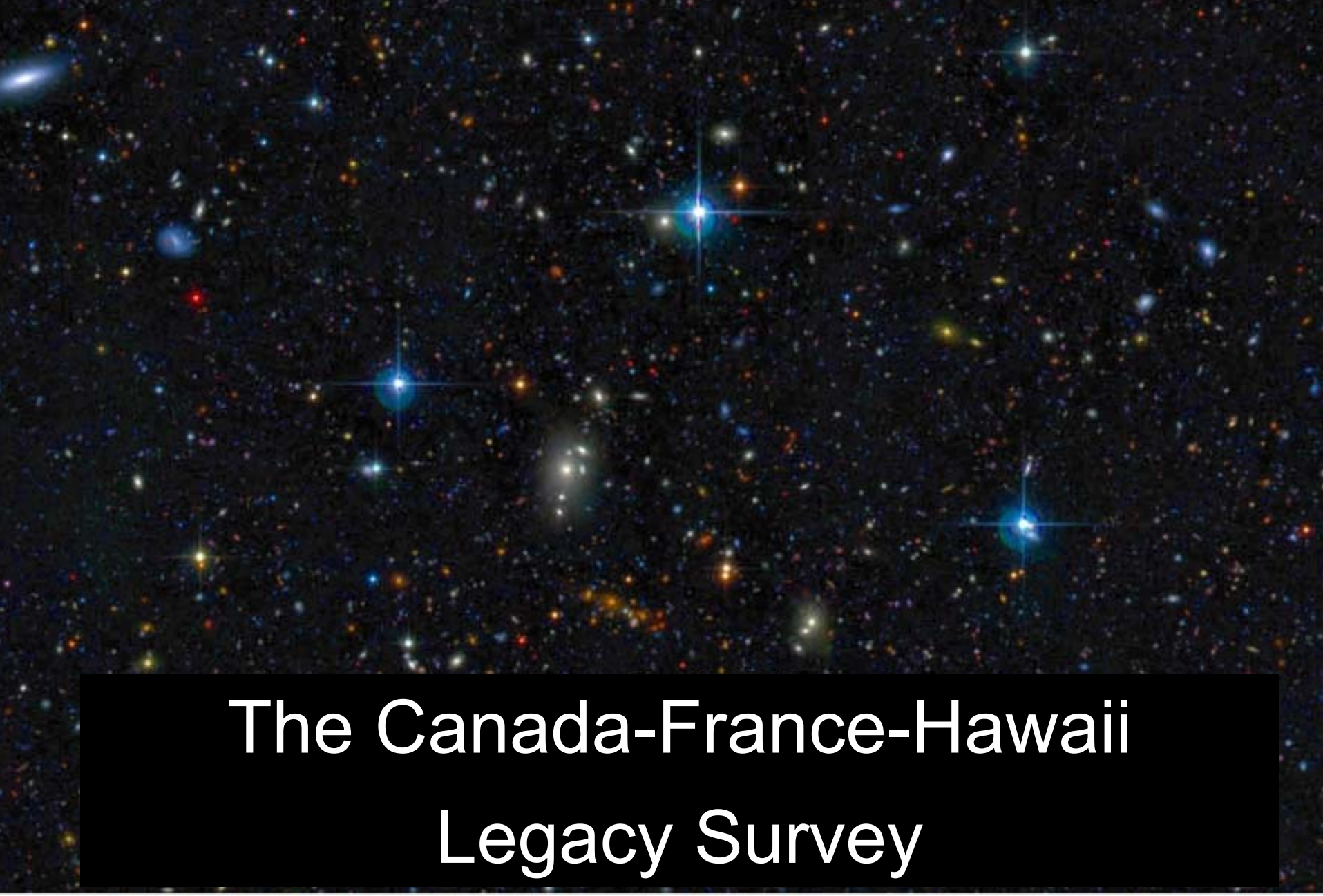


The Canada-France-Hawaii Legacy Survey

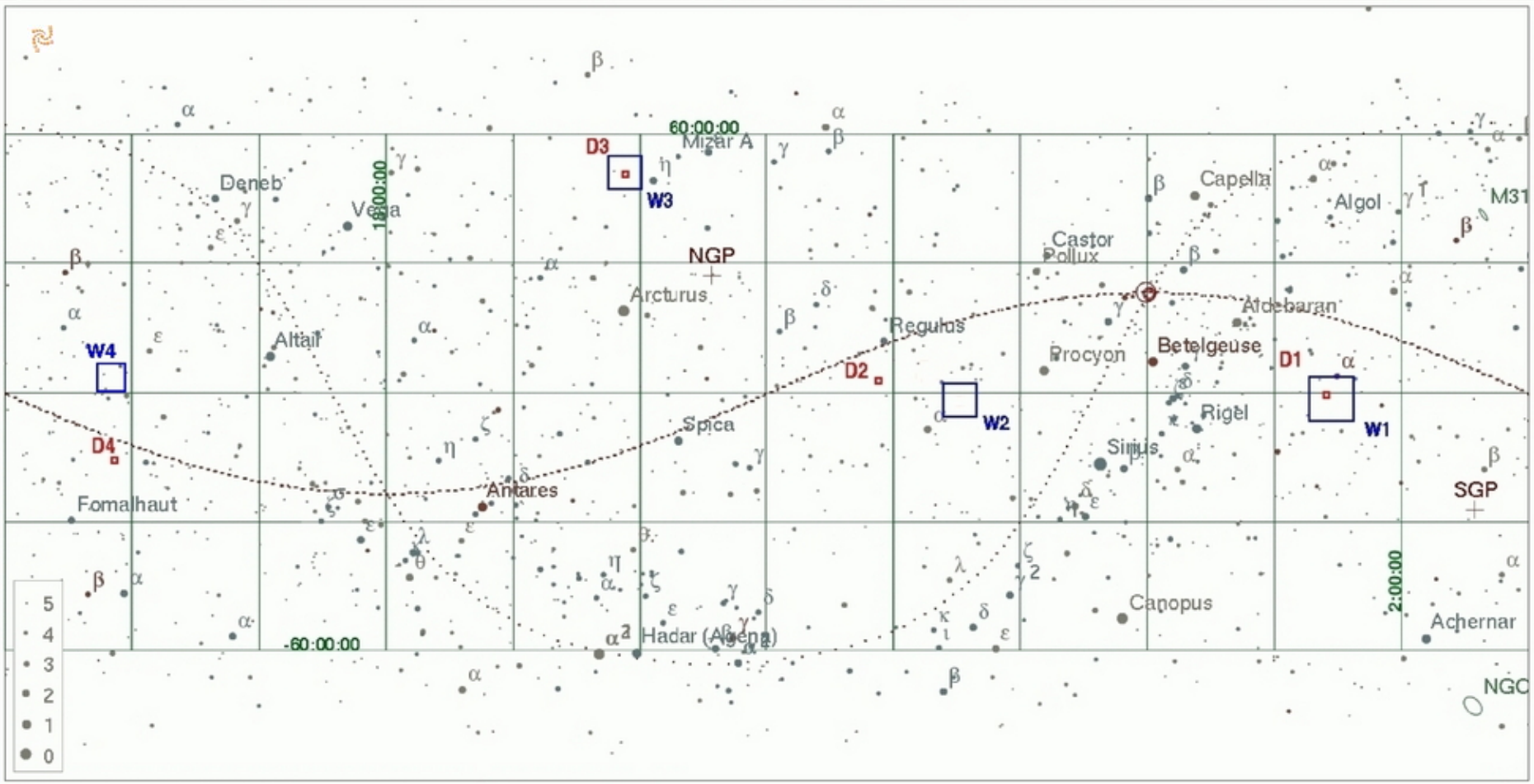
NATIONAL RESEARCH COUNCIL CANADA
CONSEIL NATIONAL DE RECHERCHES CANADA

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

cea

CFH

CFHTLS : a 5 years, 500 nights program started 4.5 years ago

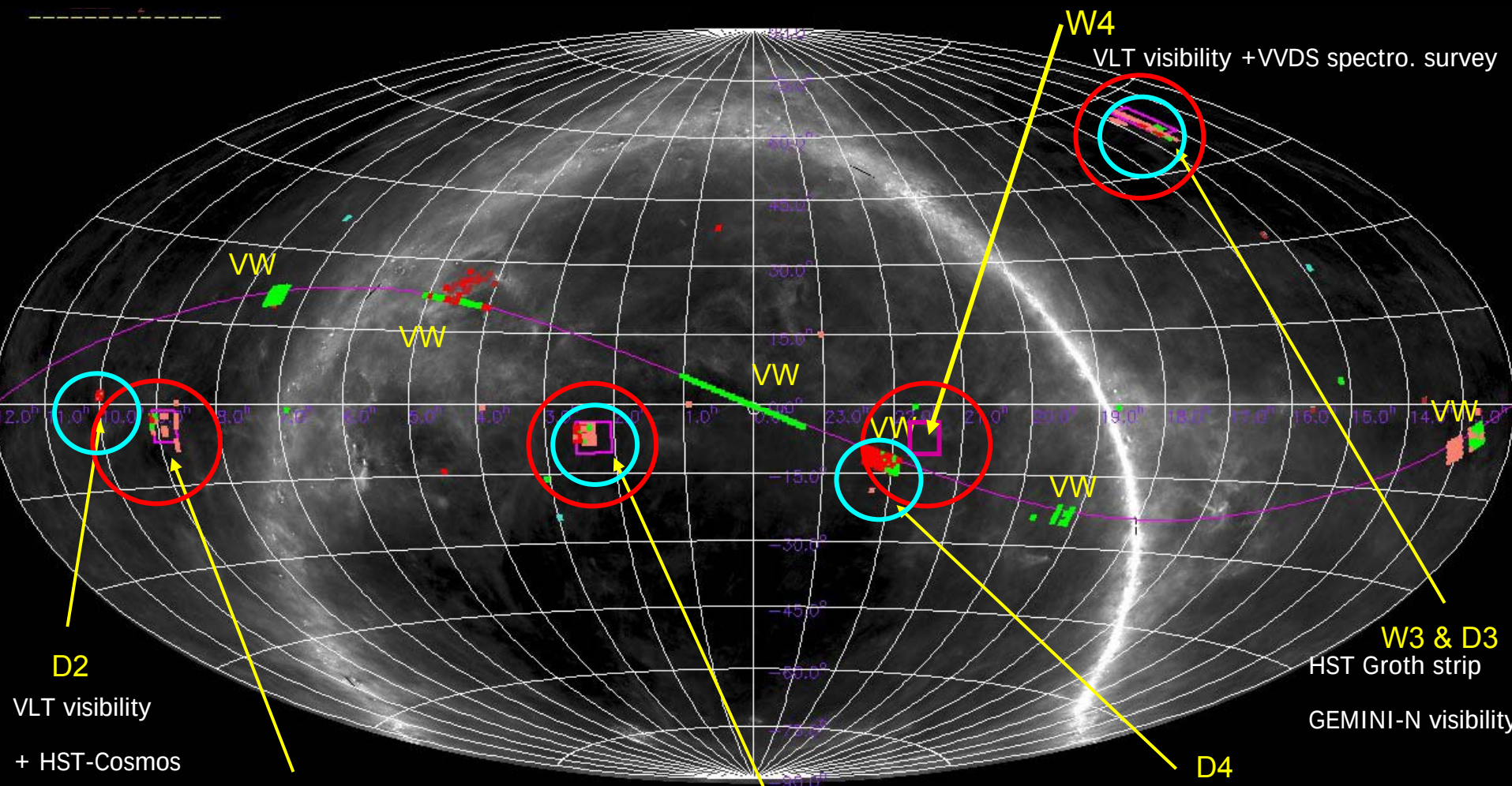


Survey	Area (sq. deg.)	Location	u*	g'	r'	i'	z'
Deep	4	D1/2/3/4	28.7	28.9	28.5	28.4	27.0
Wide	170	W1/2/3/4	26.4	26.6	25.9	25.5	24.8
Very Wide	410	On ecliptic		25.5	25.0	24.4	

CFHTLS

Canada-France-Hawaii Telescope Legacy Survey: Canada-France collaboration

- **4 W-fields of 50 deg²** (CFHTLS-Wide, 1h/filter), **4 D-deep fields of 1 deg²** (CFHTLS-Deep, 50hrs/filter)



Terapix/Skywatcher : all data 03A-08B : 25000 Megacam images

+command line : skywatcher

CFHTLS observations : Status Nov. 2007

The Deep: 916 hours (11/07)

Field	D1 – 1x1 sq.deg.	D2 – 1x1 sq.deg.	D3 – 1x1 sq.deg.	D4 – 1x1 sq.deg.
Integration	267 hr.	167 hr.	222 hr.	260 hr.
Mean IQ	0.81"	0.80"	0.82"	0.83"

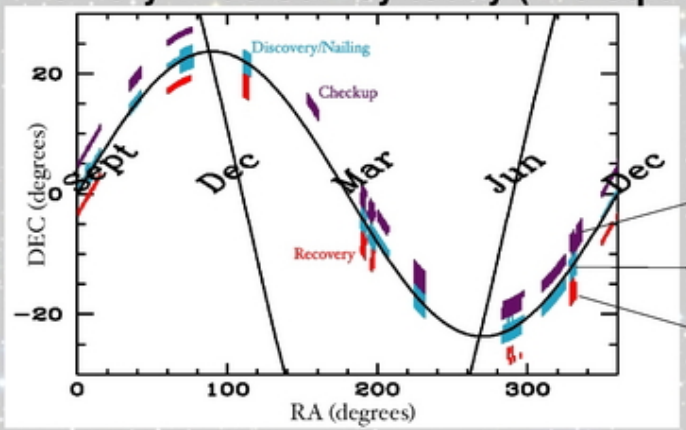
The Wide: 678 hours (11/07)

Field	W1 – 8x9 sq.deg.	W2 – 5x5 sq.deg.	W3 – 7x7 sq.deg.	W4 – 4x4 sq.deg.
Integration	262 hr.	123 hr.	189 hr.	104 hr.
Mean IQ	0.79"	0.81"	0.80"	0.74"

The Very Wide: 186 hours (11/07)

Filter	g'	r'	i'
Integration	47 hr.	69 hr.	70 hr.
Mean IQ	0.88"	0.78"	0.76"

The Very Wide Survey today (410 sq.deg.)



CFHTLS

Serving the CFHTLS Community

80% PNC/PNG → **LS Community = 310**

Canada = 102

France = 175

Other = 33

SAC

TACs

Data Group

Steering Group

QSO Team

Data Group	Steering Group
CFHT – K. Withington	CFHT – J.–C. Cuillandre
CADC – JJ Kavelaars	CADC – D. Schade
Terapix – F. Magnard	Terapix – Y. Mellier
	SNe Coordinator: C. Pritchet
	Deep Coordinator: G. Soucail
	Wide Coordinator: H. Aussel
	Very Wide Coordinator: JJ Kavelaars
	Member at large: R. Carlberg
	Member at large: C. Reyle

CFHTLS

Some words on Terapix

- Software production: all public
- Data production:

  CFHTLS, PI (53+27), Megacam, WIRCam
- Technical assistance to PI's
- Participations/help/preparation for other surveys:

CFHT-LP's, ESO, DES, PannStar, PAU, GaBoDS, DUNE, etc…

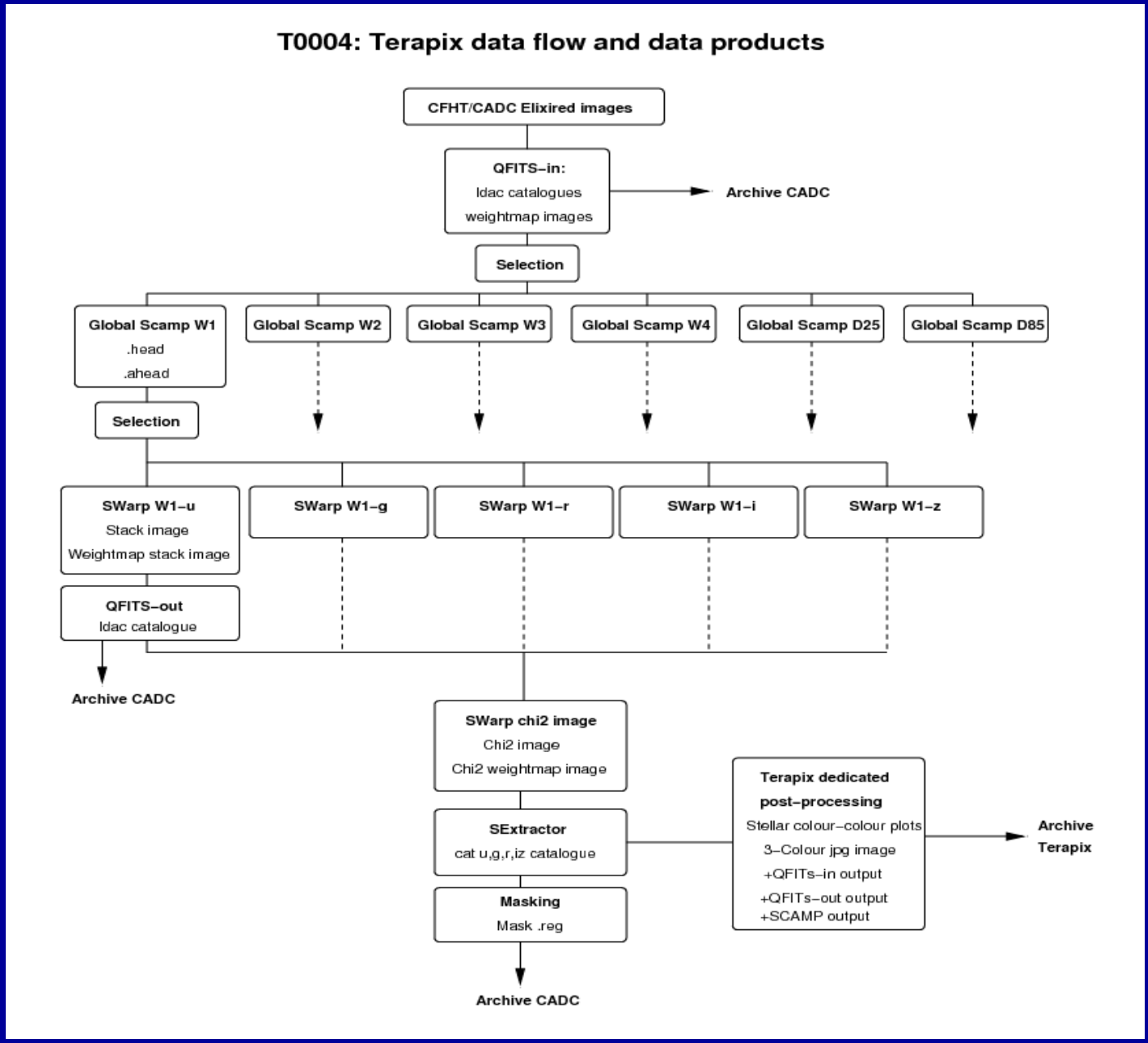
- Funded by : INSU, PNC, CEA, IAP, FP5 AVO, FP5 AstroWise

Terapix : Megacam CFHTLS / PI

- Terapix activities metrics
  - 96 published refereed papers acknowledge Terapix since 1999 (36 in 2007), all Megacam
  - 17 papers on pure CFHTLS data since 2006
  - > 45 papers on PNC/PNG big surveys :

    CFHTLS +COSMOS+XMMLSS+VVDS

T0004: CFHTLS pipeline



Release T0004 products:

T0004 synoptic table

Table: http://terapix.iap.fr/cplt/table_syn_T0004.html

- Access to all free meta-data.
- Links to CADC with no free access.

Detailled table column description:

http://terapix.iap.fr/article.php?id_article=715

The table has 37 columns and 1 row per field (D1-25, D2-25, D3-25, D4-25, then D1-85, D2-85, D3-85, D4-85, then W1, W2, W3 and W4):

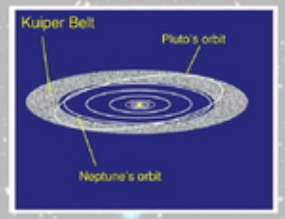
Column	Description
Column 1-3	Target identification and RA, DEC center position of each stack
Column 4-8	FITS images (Im), their weight map images (W) and FITS ldac catalogues (L)of u,g,r,i and z T0004 stacks
Column 9	FITS chi2 images (Im) and their weight maps image (W) of stacks having at least g,r and i images
Column 10	u,g,r,i and z chi2-based catalogues
Column 11	Mask reg file
Column 12	Merged ugriz catalogues
Column 13-15	Galaxy counts, stellar colour-colour track plots and jpg 3-color image
Column 16-35	Stack description, quality assessment data and properties of all Deep and Wide stacks
Column 36	Effective field of view after masking
Column 37	Right-hand target identification

A short summary of the T0004 release is given in the last row of the table, as well as 2 merged stellar ps files containing all colour-colour plots of Deep or Wide stacks.

Important notice: It is strongly recommended to read the T0004 explanatory table as well as the T0004 summary page and other links.

Science with the CFHT Legacy Survey

Solar System



Very Wide

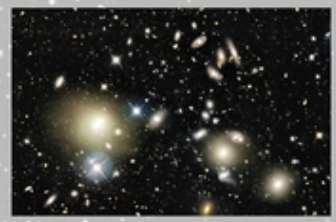
- The Kuiper Belt
- Asteroids

The Galaxy

Very Wide / Wide / Deep

- Stellar Populations
- Brown Dwarfs
- Low Mass Stars
- White Dwarfs
- Dynamics
- Variability

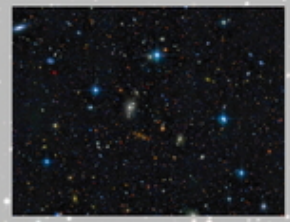
Galaxies & Clusters



Wide / Deep

- Redshift Distribution
- Evolution
- Clusters
- Morphology
- Clustering
- Weak Lensing
- Star Formation
- Luminosity Function
- Environment
- AGNs
- Biasing (WL and S3)
- Gal-gal lensing

Cosmology



Very Wide / Wide / Deep

- Dark Energy
- Cosmic Shear
- Strong Lensing
- Large Scale Struct.
- Supernovae
- GRBs
- QSOs
- Test gravity
- Test quintessence

CFHTLS

The 5 most cited CFHTLS publications

Article, citations, CFHTLS component, and title (March 08)

Astier et al. 2006	594	SNLS	The Supernova Legacy Survey: Measurement of Omega_M, Omega_Lambda and w from the First Year Data Set
Hoekstra et al. 2006	86	Wide	First cosmic shear results from the Canada–France–Hawaii Telescope Wide Synoptic Legacy Survey
Ilbert et al. 2006	66	Deep	Accurate photometric redshifts for the CFHT Legacy Survey calibrated using the VIMOS VLT Deep Survey
Semboloni et al. 2006	51	Deep	Cosmic Shear Analysis with CFHTLS Deep data
Sullivan et al. 2006	62	SNLS	Rates and Properties of Type Ia Supernovae as a Function of Mass and Star Formation in Their Host Galaxies

Hoekstra et al and

Semboloni et al are

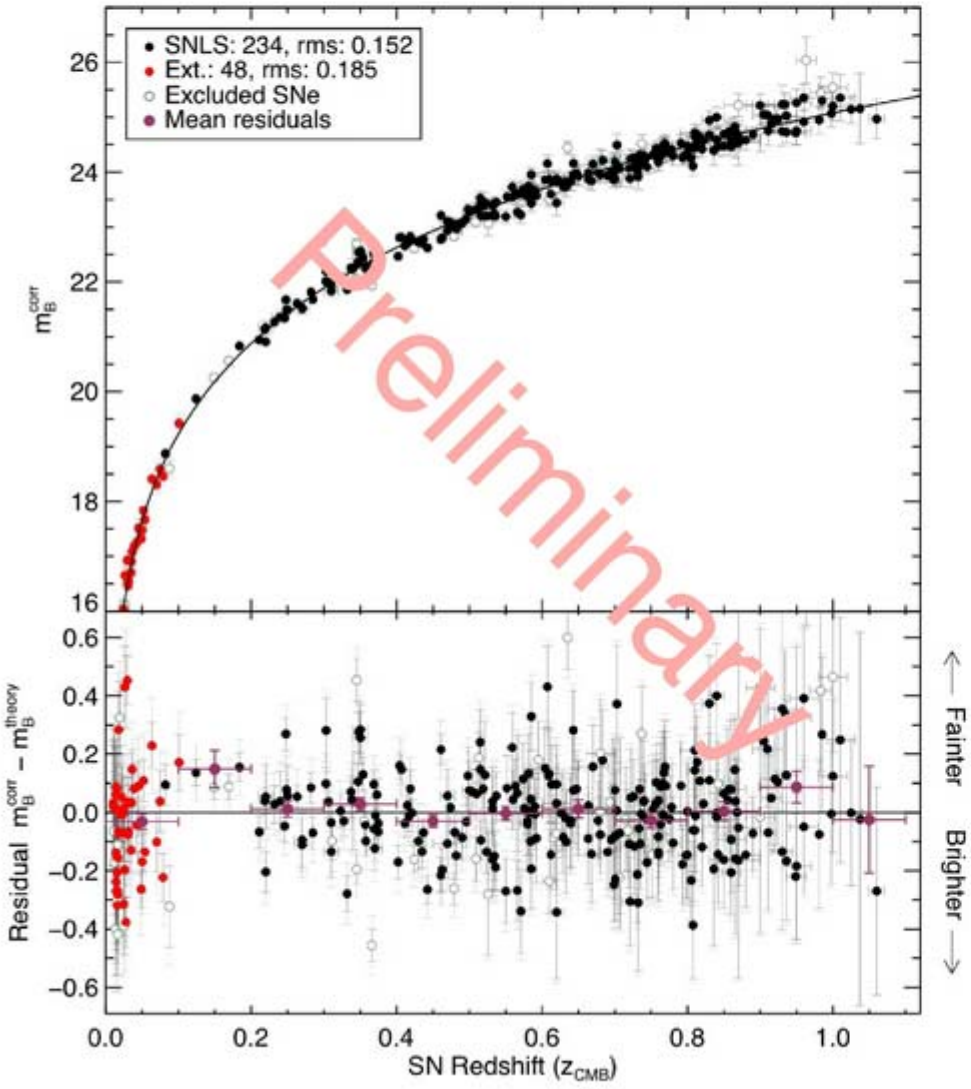
Join cosmic shear Deep +Wide papers

CFHTLS March 2008: 71 papers

1200 citations

CFHTLS

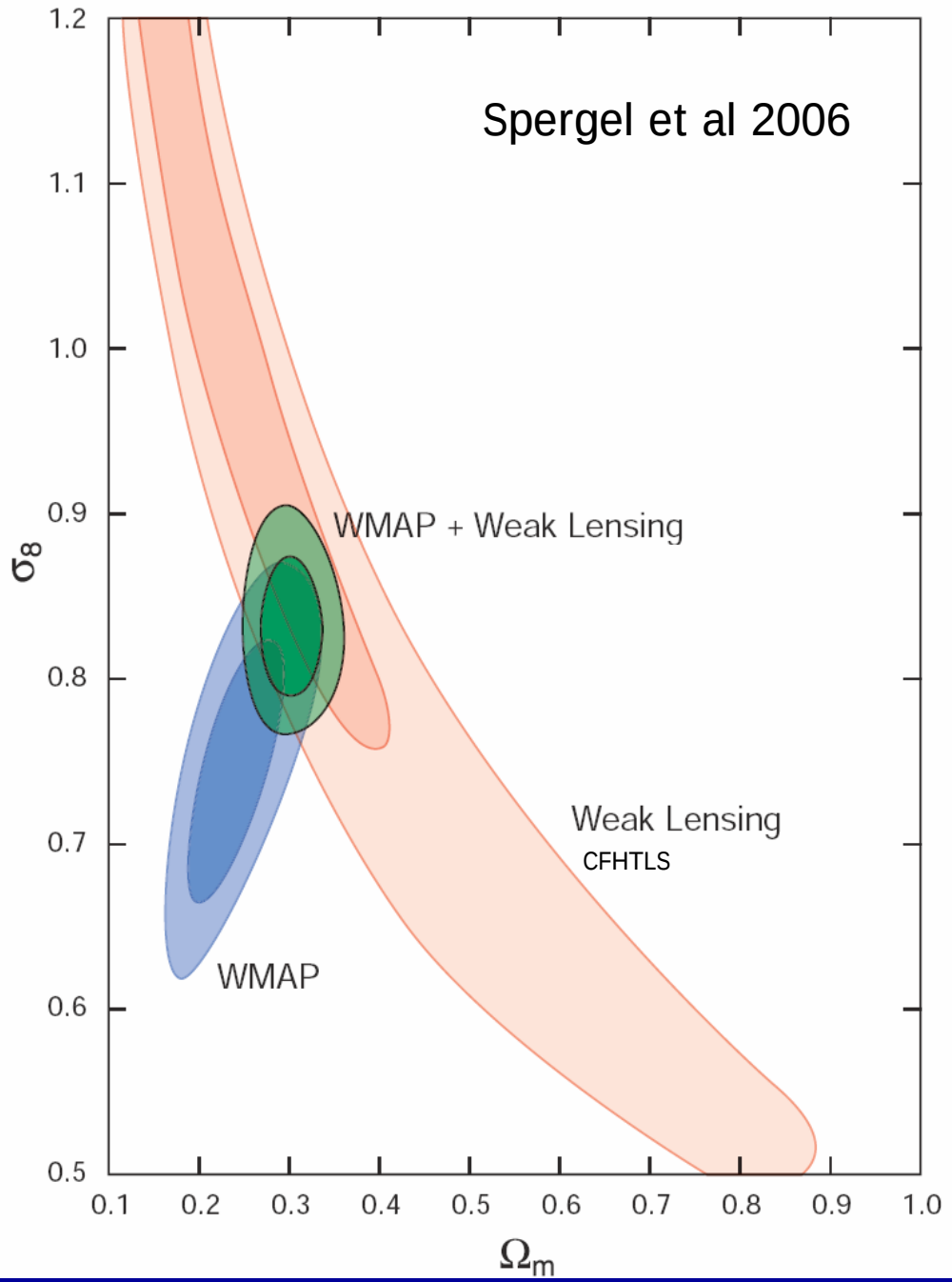
SNLS 3rd year analysis



- **2007** – prelim!
- ~230 out of 270 SNeIa, to Aug 2006
- Fit - w=-1

Cuts:
Stretch 0.75<s<1.25
Colour
Light curve coverage

Intrinsic scatter:
SNLS ±0.09
Low z ±0.13



Cosmic shear with T0001:

Hoestral et al 2006
Semboloni et al 2006

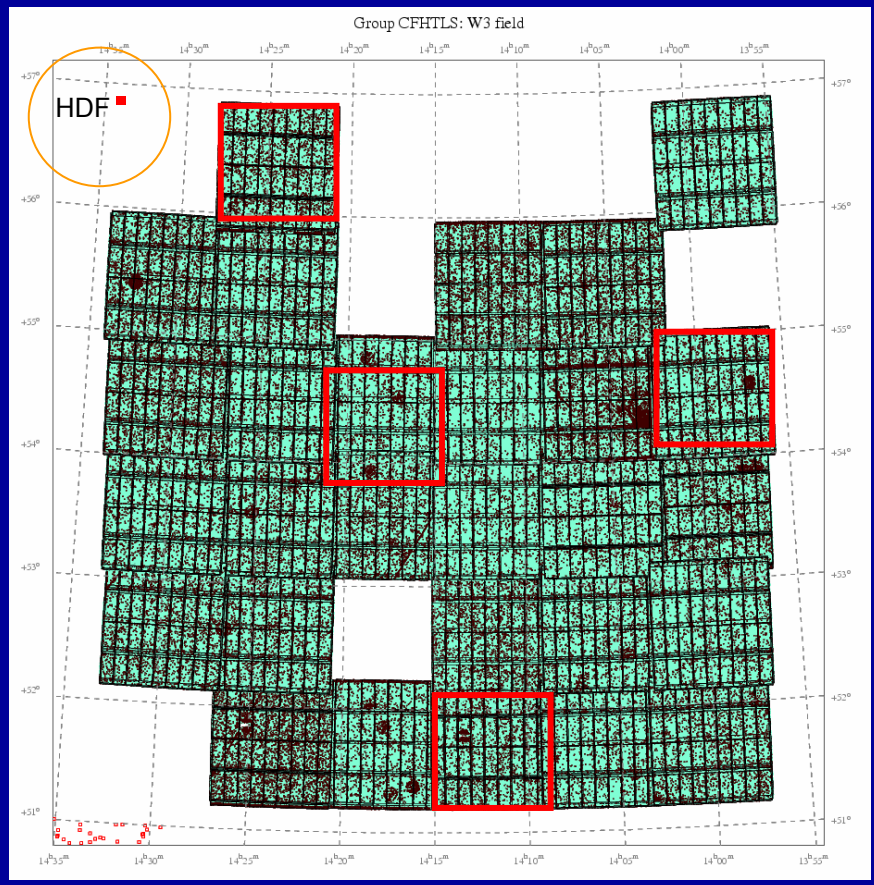
The puzzle :

WMAP3 and CFHTLS 1.5yr :

1.5-σ tension

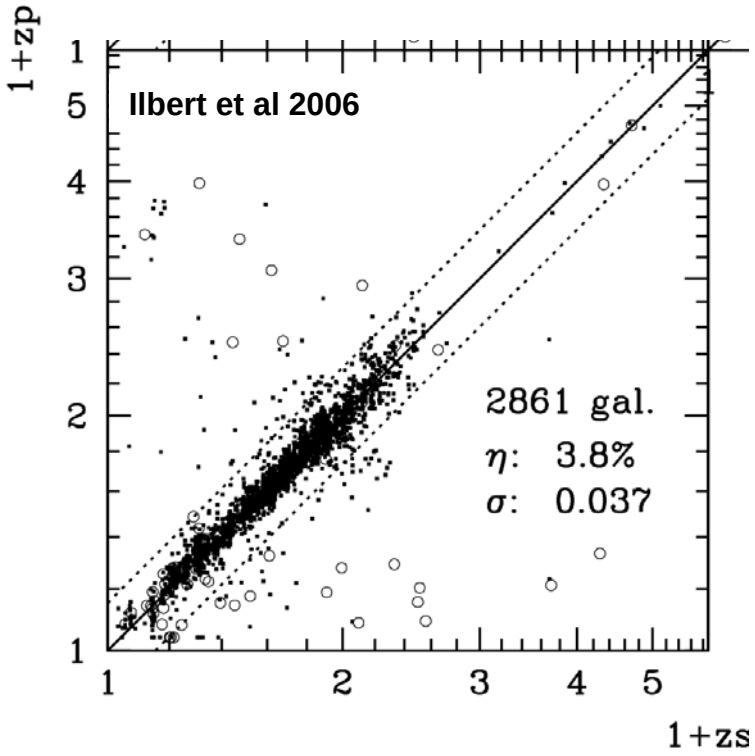
CFHTLS 3 yr weak lensing data :

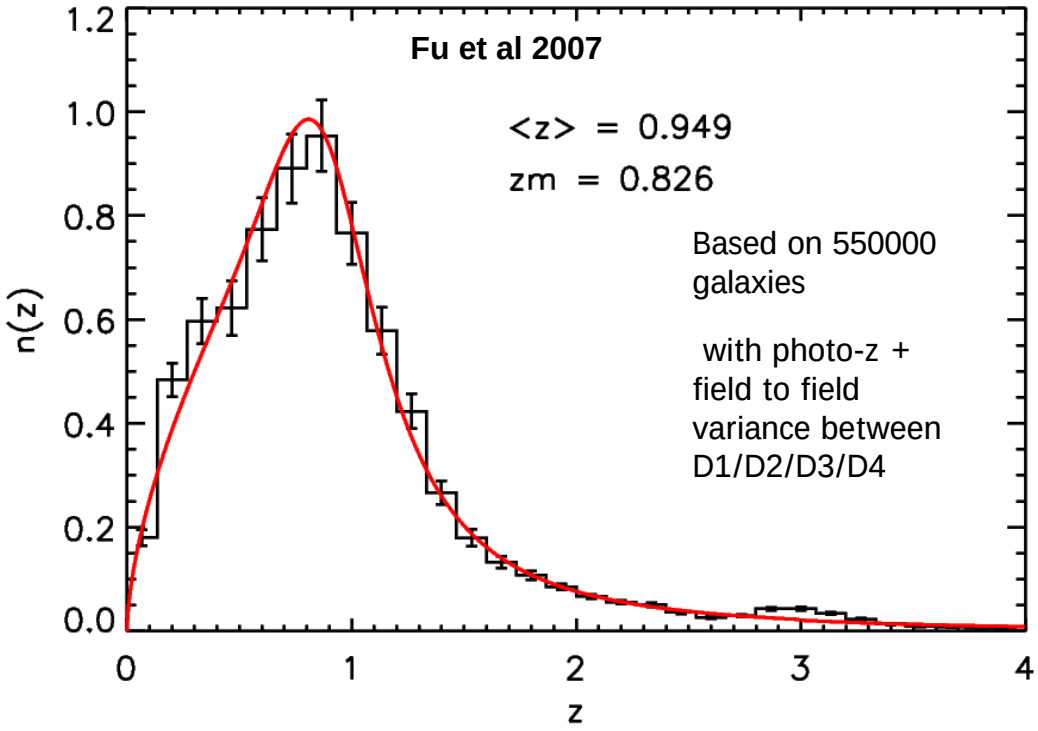
redshift calibrated with 4 VVDS fields chosen inside the CFHTLS fields



Illustration, not true VVDS field location

CFHTLS T0003 Deep+Wide calibrated with VVDS spectra

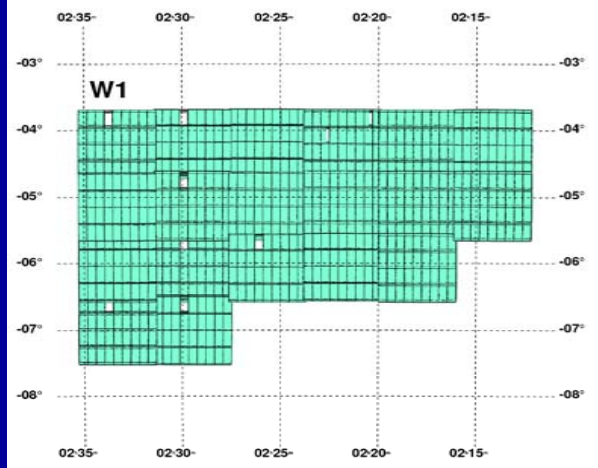


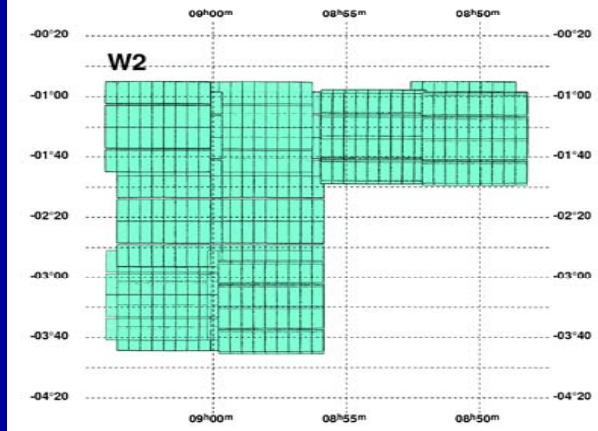


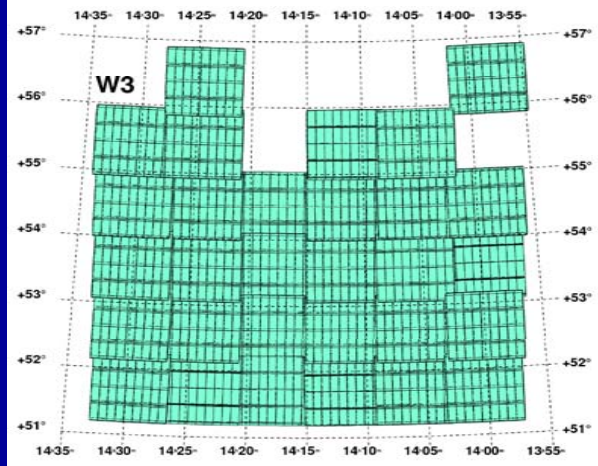
- CFHLTS Deep photometry + VLT / VVDS spectroscopic survey of CFHTLS D1 field (Le Fèvre et al 2005, Ilbert et al 2006) :

wide survey calibrated by internal spectoscopic data

- Accurate redshift distribution, field to field scatter controled, the mean redshift peaks at higher *z* than the HDF *z*-calibration.







Use: CFHTLS 3 yrs

- More sky coverage: 55 deg^2

-One more field: W1, W2, W3

- Explore very large angular scale : 7deg.

(1' – 4 degrees: 85 Mpc at z=0.5)

-Homogenous data set :

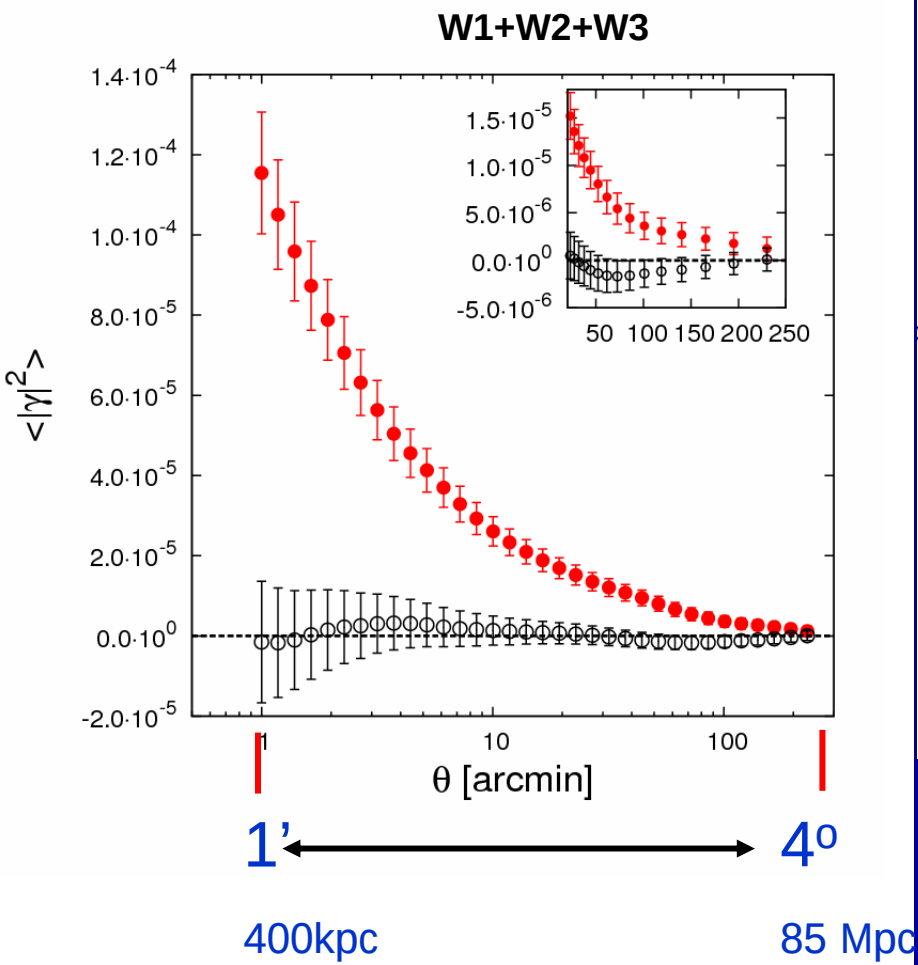
WL catalogs from CFHTLS T0003 Wide with photo-z from CFHTLS T0003 Deep

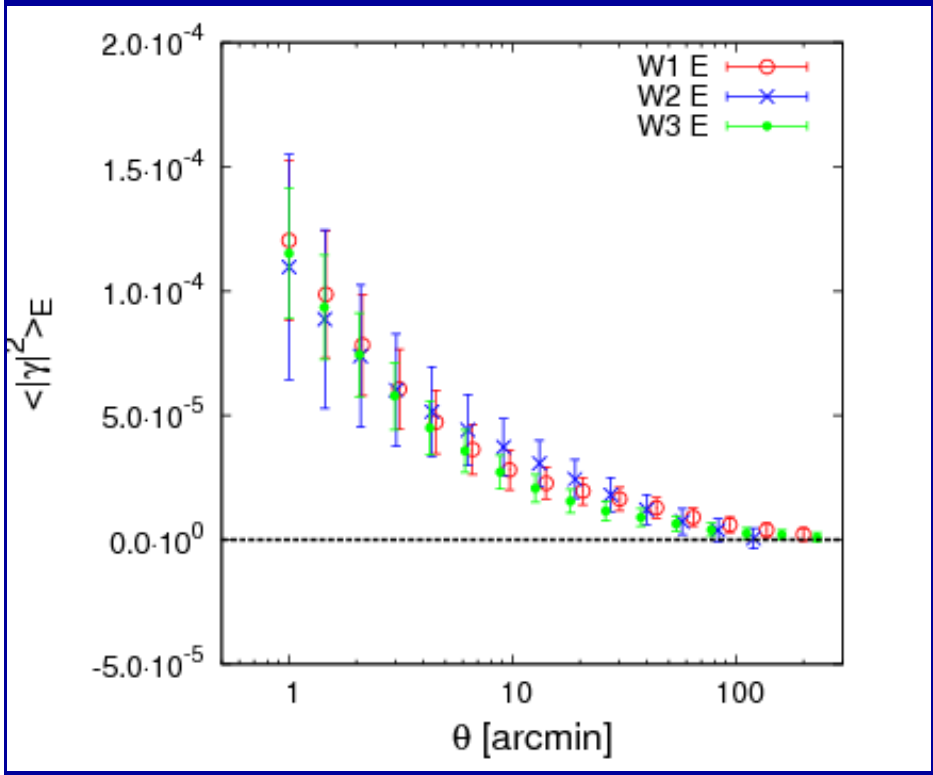
Wide fields include Deep fields

Fu et al 2008

CFHTLS T0003 3yr: 3 fields W1, W2, W3

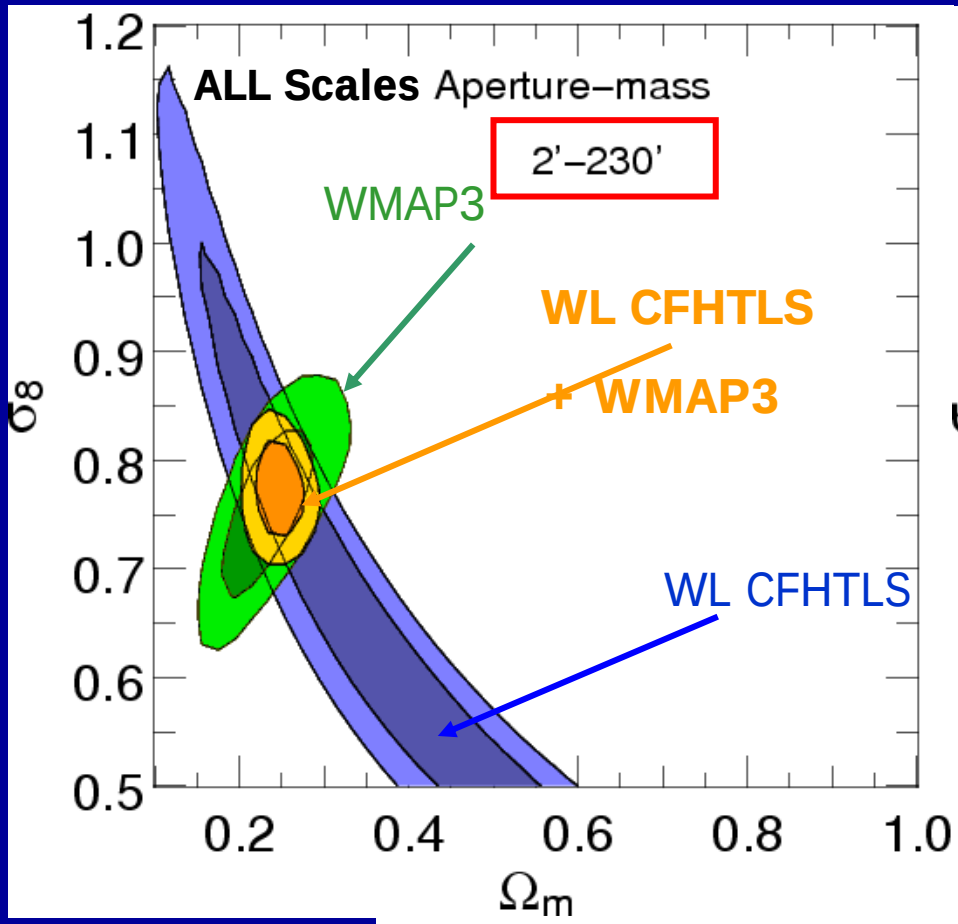
much wider and very large scales covered

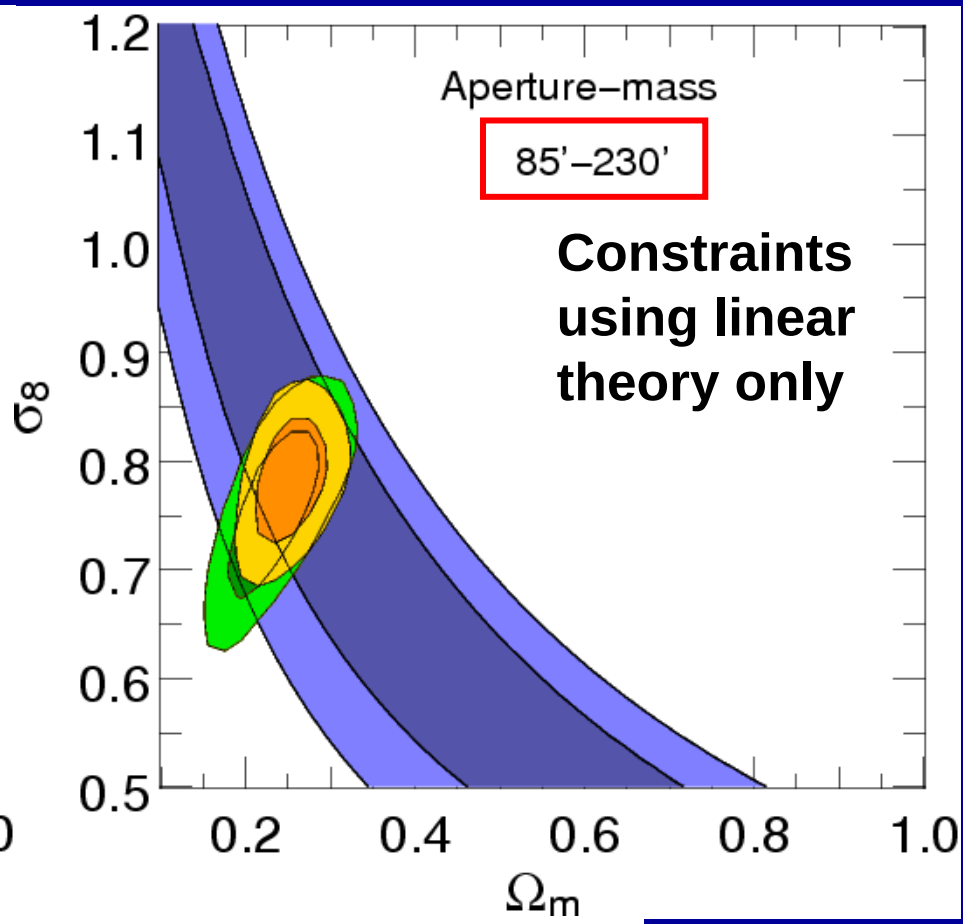




Fu et al 2008

CFHTLS T0003 and WMAP3





Two-point function	Angular scales	Ω_m	σ_8
ξ_E	$(1' < \theta < 230')$	0.243 ± 0.020	0.771 ± 0.030
$\langle\|\gamma\|^2\rangle_E$	$(2' < \theta < 230')$	0.249 ± 0.019	0.776 ± 0.029
$\langle M_{ap}^2\rangle$	$(2' < \theta < 230')$	0.248 ± 0.019	0.771 ± 0.029
$\langle M_{ap}^2\rangle$	$(85' < \theta < 230')$	0.255 ± 0.027	0.782 ± 0.038

Fu et al 2008

WMAP5, CFHTLS-T0003 and other cosmic shear surveys

Data	Parameter	Lensing limits	5-year *WMAP* limits
CFHTLS Wide	$\sigma_8(\Omega_m/0.25)^{0.64}$	0.785 ± 0.043	0.814 ± 0.090
100 Sq Deg	$\sigma_8(\Omega_m/0.24)^{0.59}$	0.84 ± 0.07	0.832 ± 0.088
COSMOS 2D	$\sigma_8(\Omega_m/0.3)^{0.48}$	0.81 ± 0.17	0.741 ± 0.069
COSMOS 3D	$\sigma_8(\Omega_m/0.3)^{0.44}$	$0.866^{+0.085}_{-0.068}$	0.745 ± 0.067

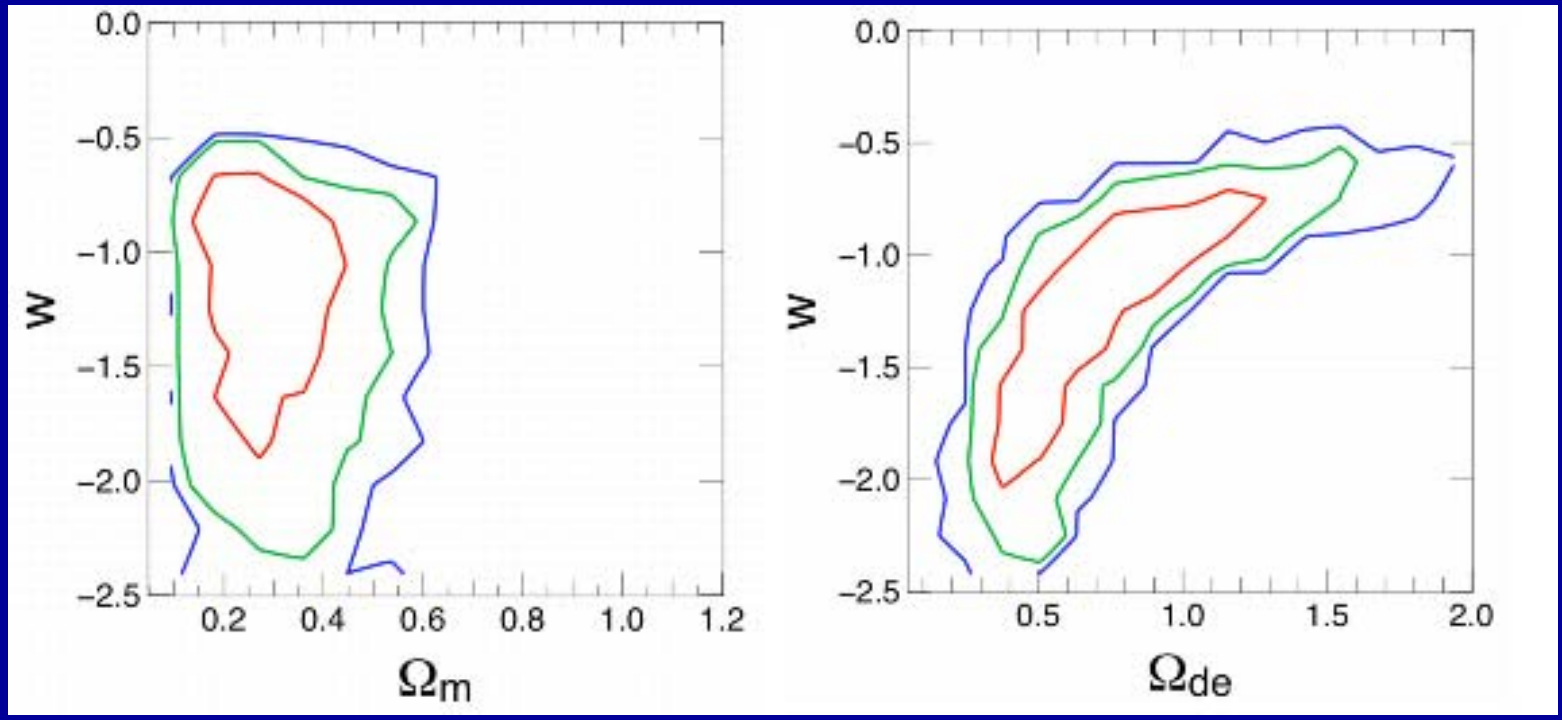
Table from WMAP5: J. Dunkley et al 2008
Astro-ph/0803.0586

CFHTLS Cosmic shear T0003 (Fu et al 2008) :

best cosmological constraint so far.

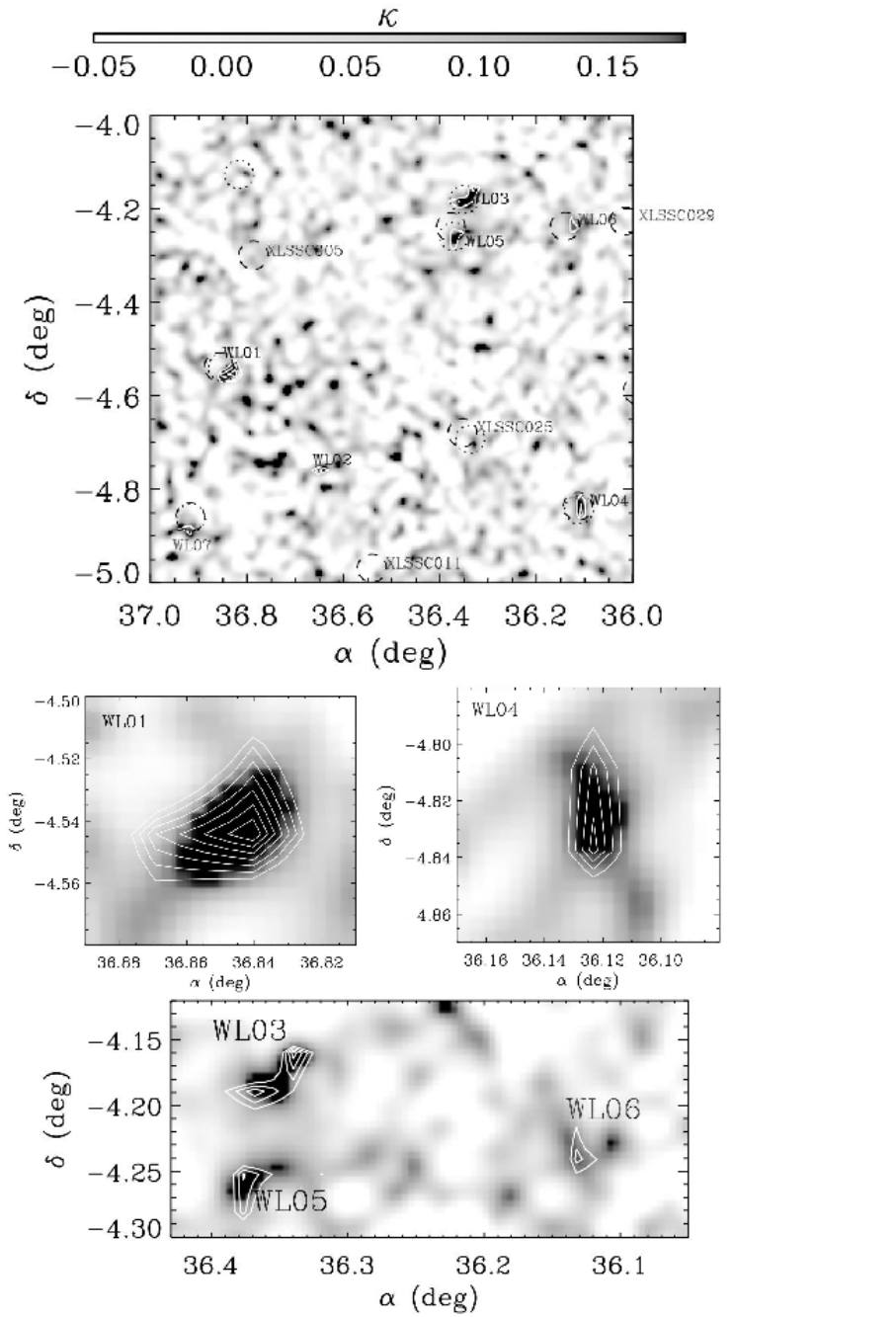
Reach the initial goal of CFHTLS/Wide cosmic shear proposal: 5% on (σ_8, Ω_m)

Dark energy from join CFHTLS SNLS + CFHTLS Cosmic shear



Kilbinger et al 2008:

preliminary

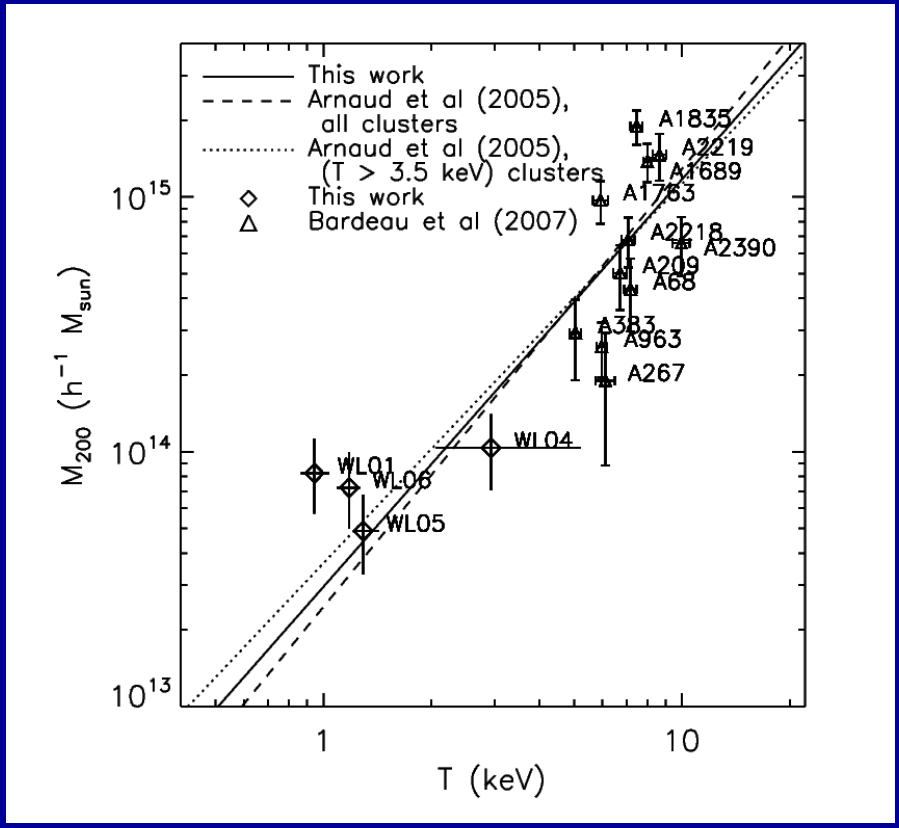


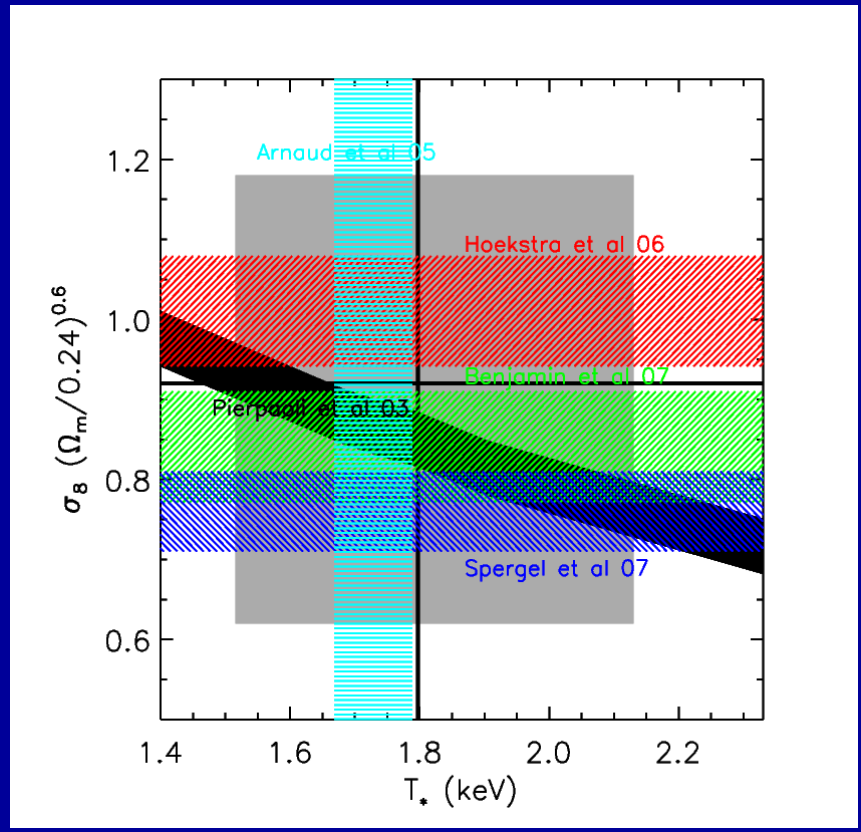
Clusters: WL and X-ray

CFHTLS : Bergé et al 2008

Deep D1 and Wide W1

Clusters: WL and X-ray





CFHTLS : Bergé et al 2008

Deep D1 and Wide W1 :

$\sigma_8 = 0.92^{+0.26}_{-0.30}$

for $\Omega_m = 0.24$

Exploring halos properties from galaxy to cluster scales: the CFHTLS SL2S strong lensing survey

Cabanac et al 2007

Galaxies,

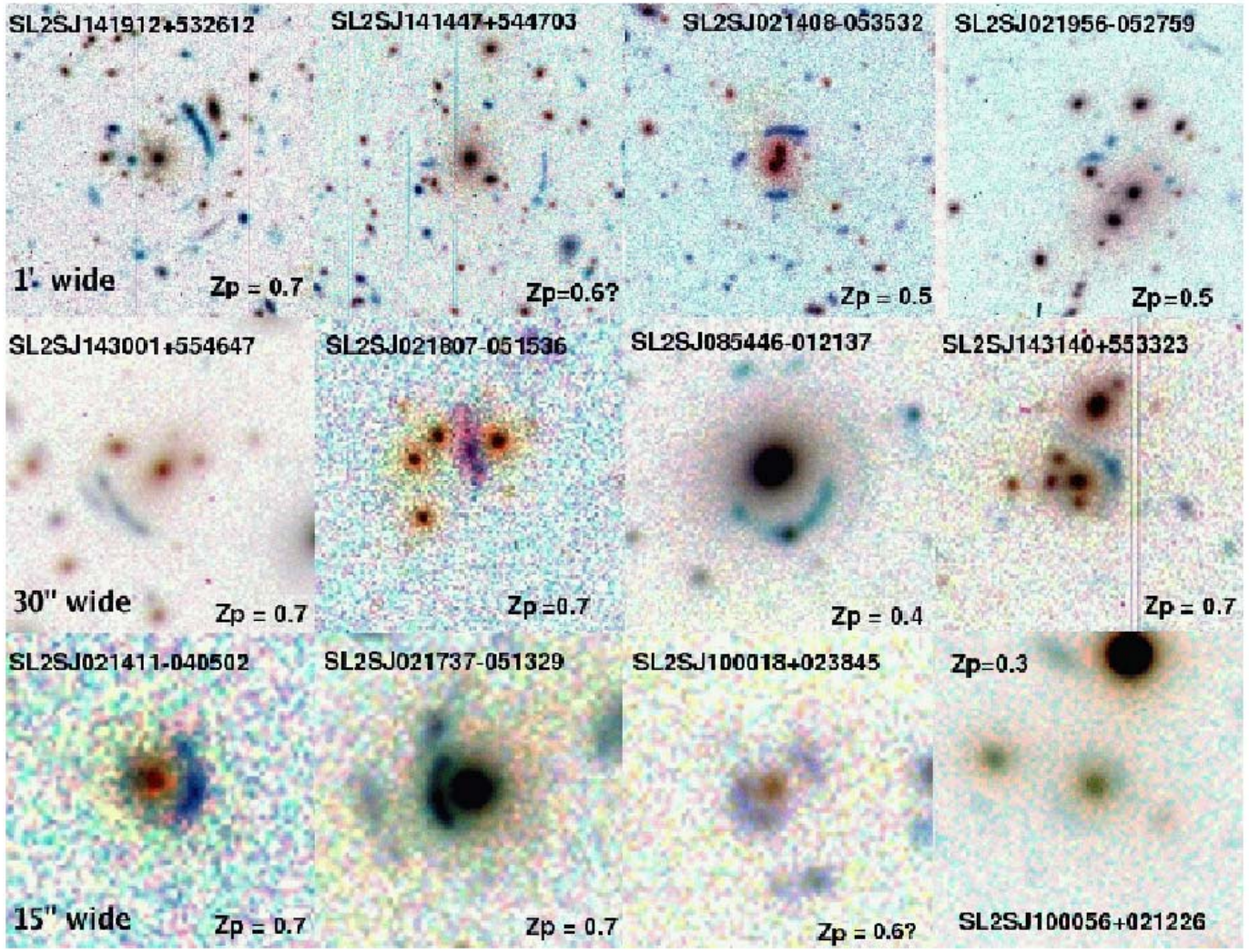
Groups,

Clusters

+ gal-gal lensing

From CFHTLS WL:

Parler et al 2007



CFHTLS 2008 periods: end of observations expected by 2008B

- **Time Allocation: 08A & 08B**
  - Maximum request in 08A: 228 hours, in 08B: 99 hours (regular allocation = 293 hours)
  - Priority of the CFHTLS over PIs in 08A & 08B
  - New i' references for SNLS D1/2/3/4 : 4x10 hours = 40 hours
    4x10 hours = 40 hours (10 hours in 08A, 30 hours in 08B)
  - Finishing the Wide: 50+ hours in 08B
  - Polishing the Wide: 15 hours in 08A + 15 hours in 08B
  - Calibrating the Wide: 10 hours in 08A + 4 hours in 08B

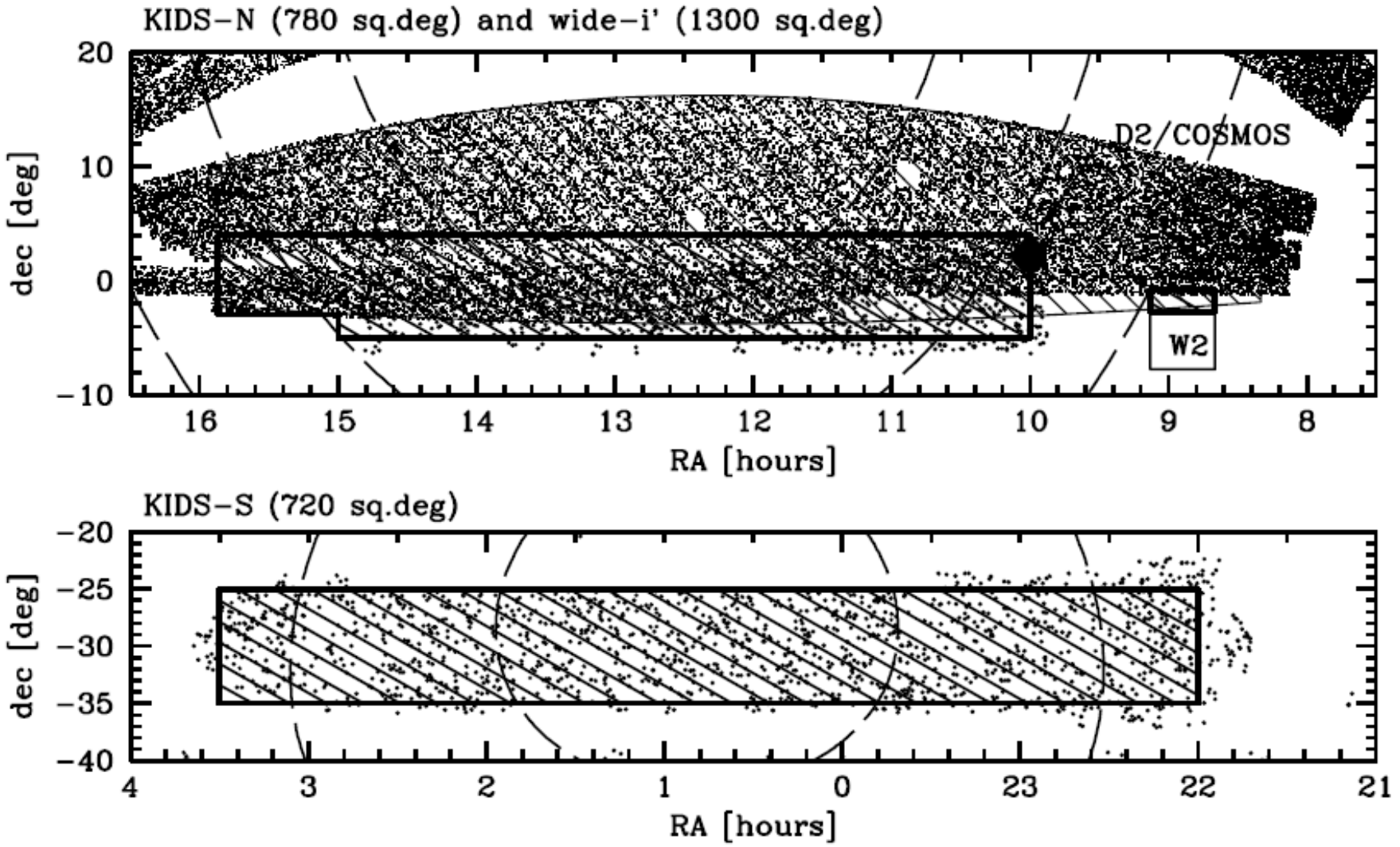
- **T0005 release: 2008**
  - Deep & Wide release date: **July 2008 (delays in new calibration data delivery)**
  - Very Wide release date: July 1st 2008

CFHTLS follow up

- VVDS/CFHTLS
- COSMOS/CFHTLS: HST+VLT LPs
- XMM-LSS
- Galex (VVDS related)
- Spitzer (VVDS related)
- WIRDS: WIRcam Deep Survey
- WUDS: Wircam Ultra Deep Survey
- KIDS: KIlo Degree Survey
- VIKING: VIsta KIlo degree Infrared Galaxy survey
- UltraVISTA: ULTRA deep survey with VISTA
- SL2S (HST and VLT/Gemini/Keck spectroscopic follow up (targets)
- QSO VLT/Gemini spectroscopic follow (targets)
- 2008 : WIRCam Large Programme (proposed)

Terapix: involved in all

	WIRDS	WUDS	KIDS	VIKING	Ultra-VISTA	
PI	Kneib/Willot	Pello	Kuijken	Sutherland	Dunpol/Le Fevre Franx/Fynbo	
Tel./Cam.	CFHT/WIRCam	CFHT/WIRCam	ESO/VST	ESO/VISTA	ESO/VISTA	
Fields	CFHTLS-Deep COSMOS	CFHTLS-Deep	CFHTLS-Wide COSMOS	CFHTLS-Wide COSMOS	CFHTLS-Deep COSMOS	
Sky cov.	3 deg^2	1 deg^2	1500 deg^2	1500 deg^2	0.73 deg^2	1.5 deg^2
Depth						
u	28.7(5sig.)		26.4	24.8 (5sig)		
g	28.9		26.6	25.4		
r	28.5		25.9	25.2		
i	28.4		25.5	24.2		
z	27.0		24.8	23.1 (5sig.)		
Y		25.2 (5sig.)		22.4	26.7	25.7
J	23.6(5sig.)	25.2		22.2	26.6	25.5
H	23.6	24.7		21.6	26.1	25.1
Ks	23.6	24.7		21.3	25.6	24.5
NB					24.1	
Status	Started	Started	Accepted	Accepted	Accepted	Accepted
First release: spring 2008						
Main Science Goals	Gal. 1.5<z<3.0 Photo-z gal-clustering	Gal. z>7. Photo-z gal-clustering	Cosmic shear gal-gal lensing gal-clustering High-z QSOs Photo-z	gal-gal lensing High-z QSOs gal-clustering Photo-z	Gal. 1.5<z<3.0 Photo-z gal-clustering	Gal. z>7. Photo-z gal-clustering


KIDS−N (780 sq.deg) and wide−i' (1300 sq.deg)
D2/COSMOS
W2
dec [deg]
RA [hours]
KIDS−S (720 sq.deg)
dec [deg]
RA [hours]

Summary

- CFHTLS is in the science production and follow up period
- We are just entering in the most active and intersting periods for the wide (ugriz in ~ 50-150 deg^2): Tomography for WL
- Direct + indirect science papers from CFHTLS : ~ 100 and more than 1200 citations
- Terapix strongly involved in CFHTLS + follow up and dedicated to its tasks.
- Terapix will follow new surveys and is ready to move on : DUNE/LSST , others ?