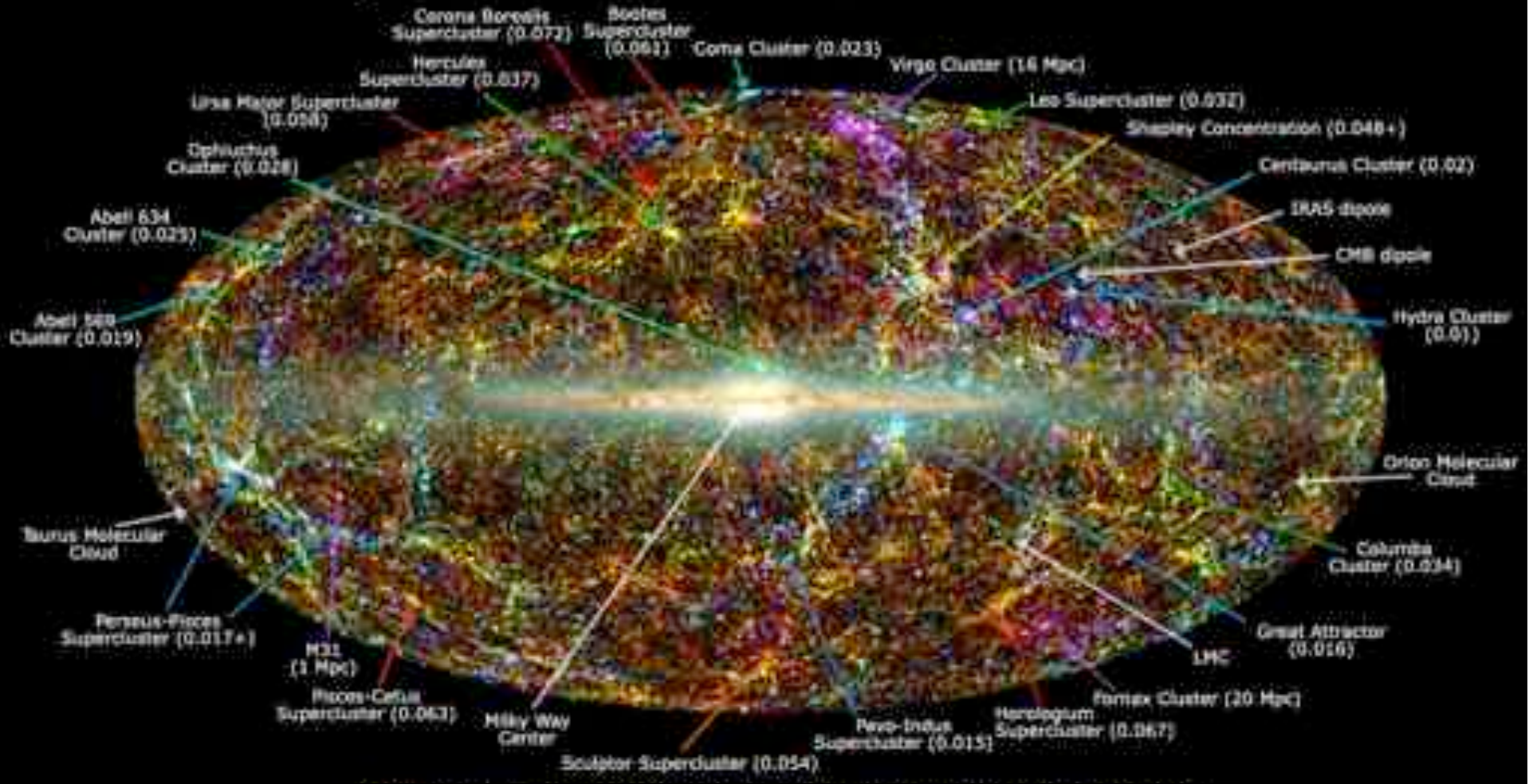


The Context of the Local Volume

Structures and Motions in the Nearby Universe



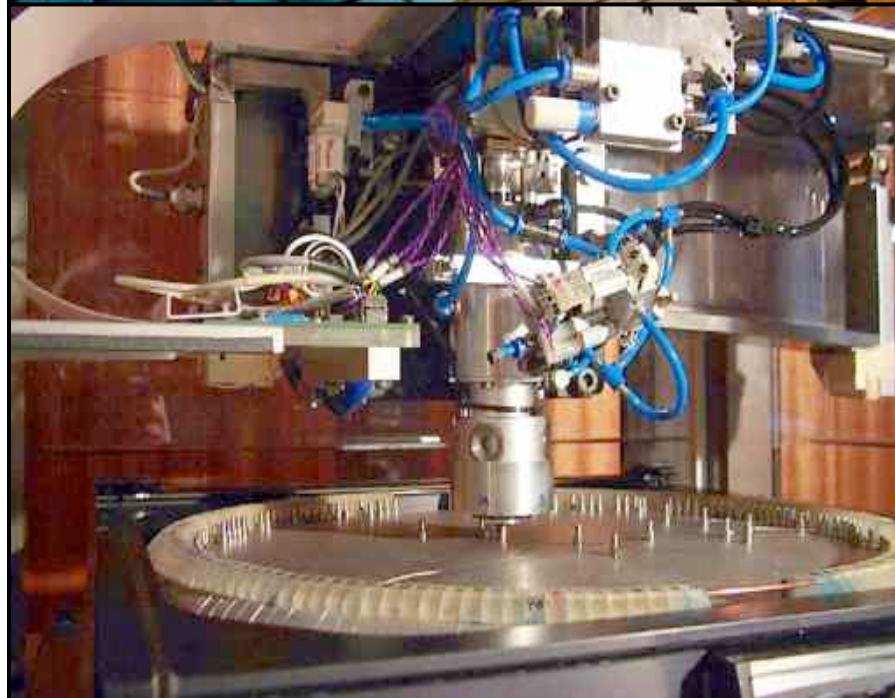
Matthew Colless

Heath Jones, Lachlan Campbell, Will Saunders, Tom Jarrett, John Huchra, Pirin Erdogdu, Ofer Lahav, Mike Read & the 6dFGS team

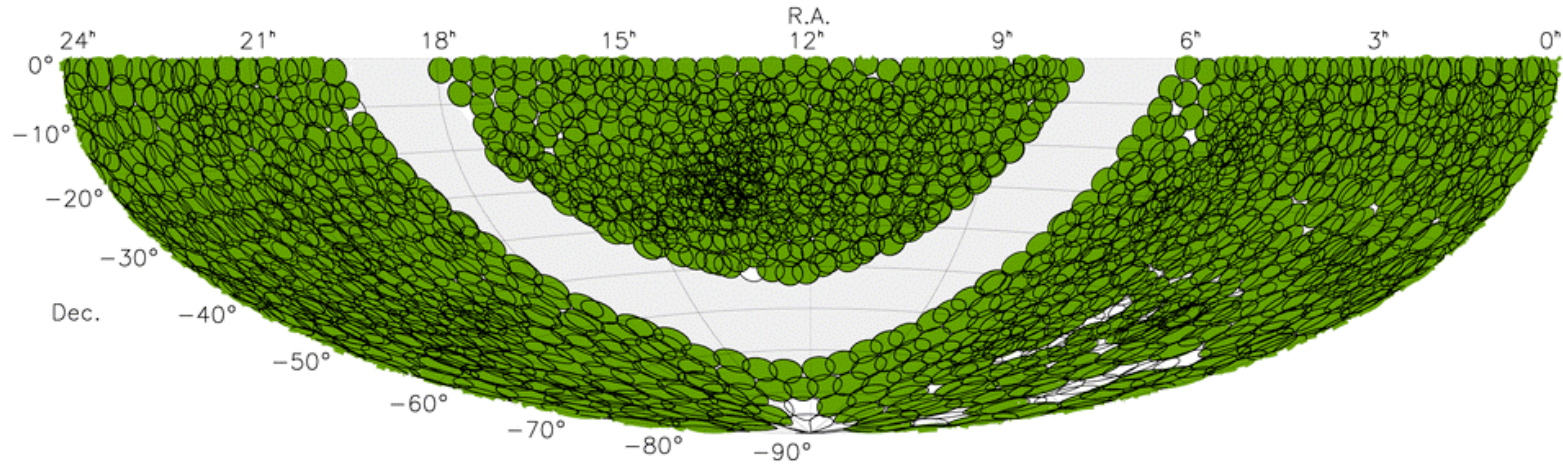
"Galaxies in the Local Volume", Sydney, 9 July 2007

The 6dF Galaxy Survey

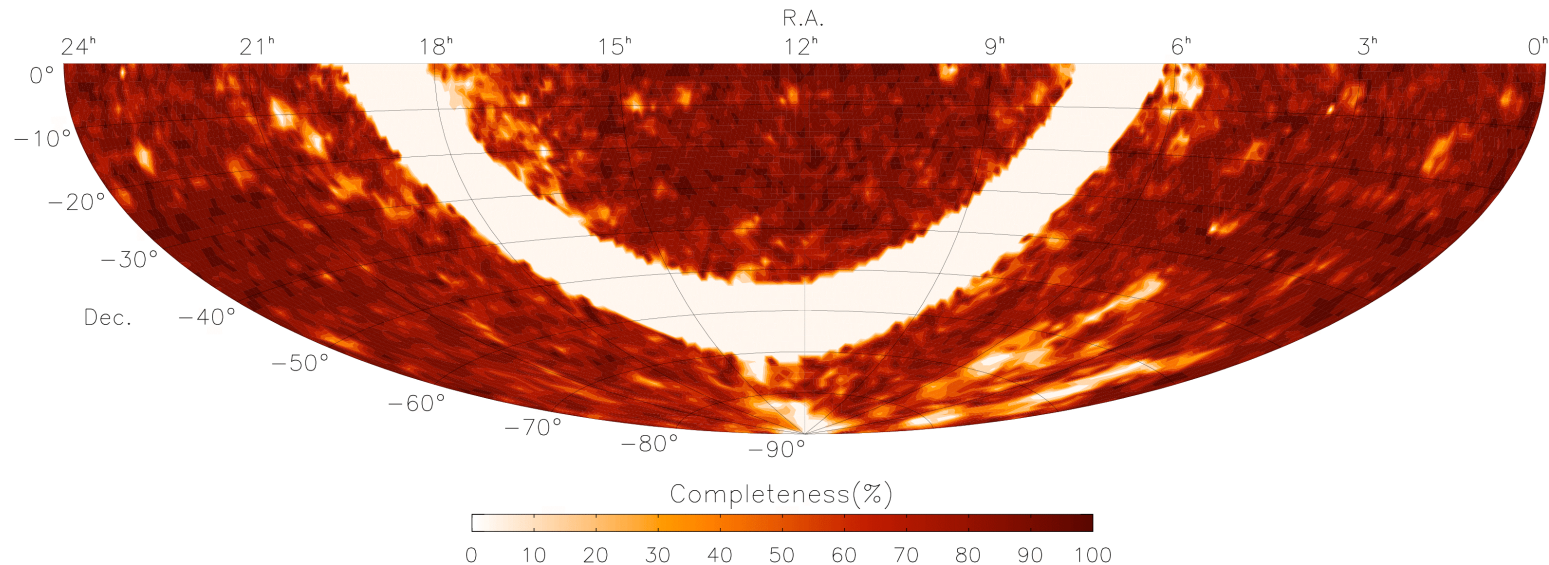
- *A redshift and peculiar velocity survey of galaxies in the local universe*
- *Covers the southern sky with $l \geq 10^\circ$*
- *Primary galaxy sample selected from 2MASS with $K_{\text{tot}} < 12.75$*
- *Also $H < 13.0$, $J < 13.75$ (2MASS) and $r < 15.6$, $b < 16.75$ (SuperCosmos)*
- *11 other samples (radio, X-ray, IRAS...)*
- *Peculiar velocity survey uses FP for 15,000 bright early-type galaxies*
- *Observations obtained May 2001 to Jan 2006 using 6dF spectrograph on the UK Schmidt Telescope*
- *Database: 137k spectra, 124k galaxy redshifts over 80% of southern sky*
- *Data releases: Dec 2002, Mar 2004, May 2005 & Aug 2007*



Sky coverage and redshift completeness



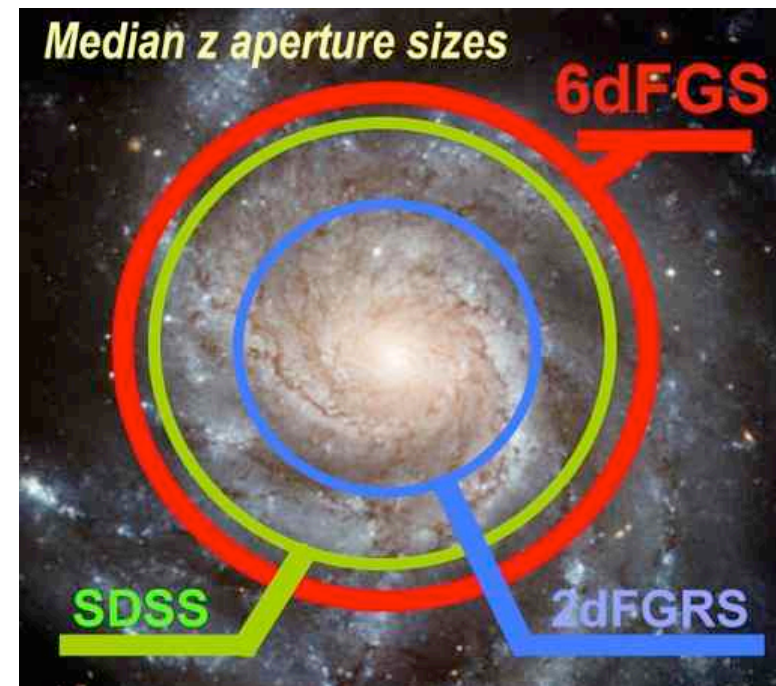
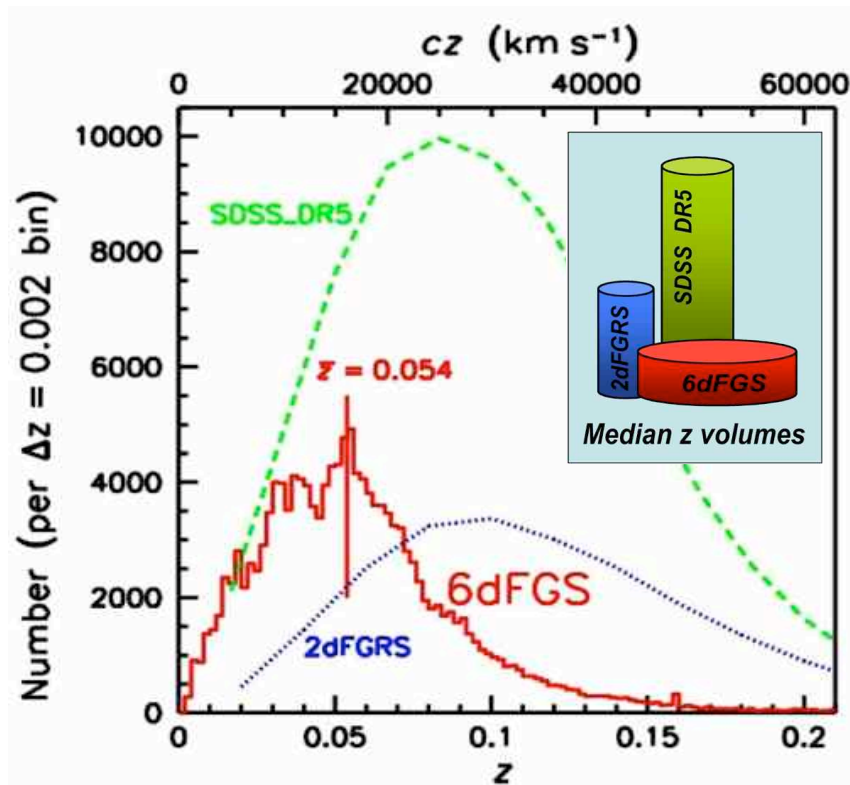
Observed 1464/1598 fields; 92% of the southern sky with $l|l > 10^\circ$



Mean redshift completeness for the K-band primary sample is 88%

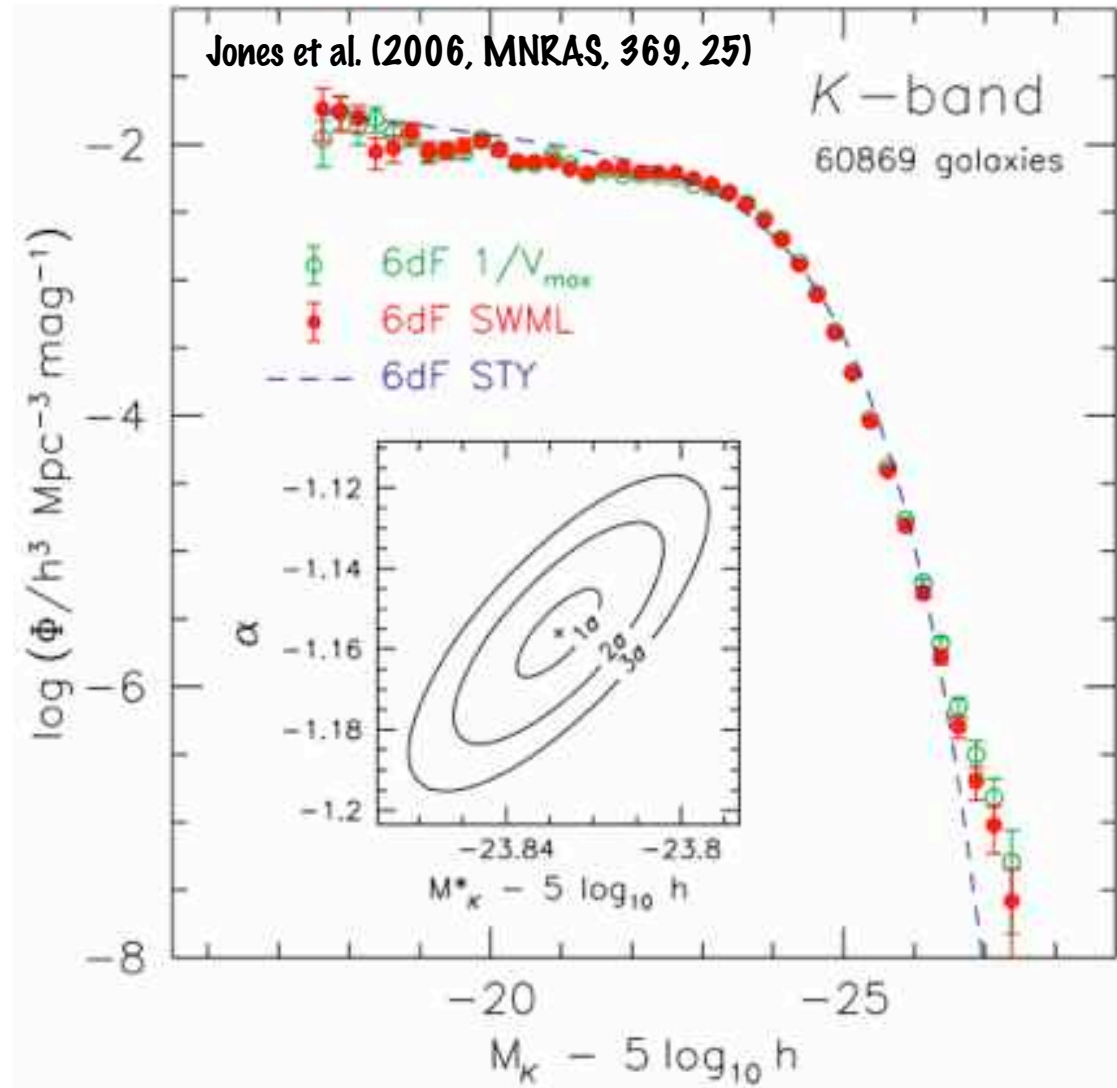
Comparison with other z-surveys

- **Comparing the 6dFGS to the 2dFGRS and SDSS...**
 - 6dFGS galaxy sample is near-infrared selected rather than optically-selected
 - 6dFGS surveys the local universe with $\langle z \rangle = 0.05$ (cf. 2dFGRS/SDSS $\langle z \rangle = 0.1$)
 - 6dFGS volume is comparable to the 2dFGRS, but 3x smaller than SDSS
 - Large fibres mean aperture effects are less for 6dFGS than 2dFGRS/SDSS



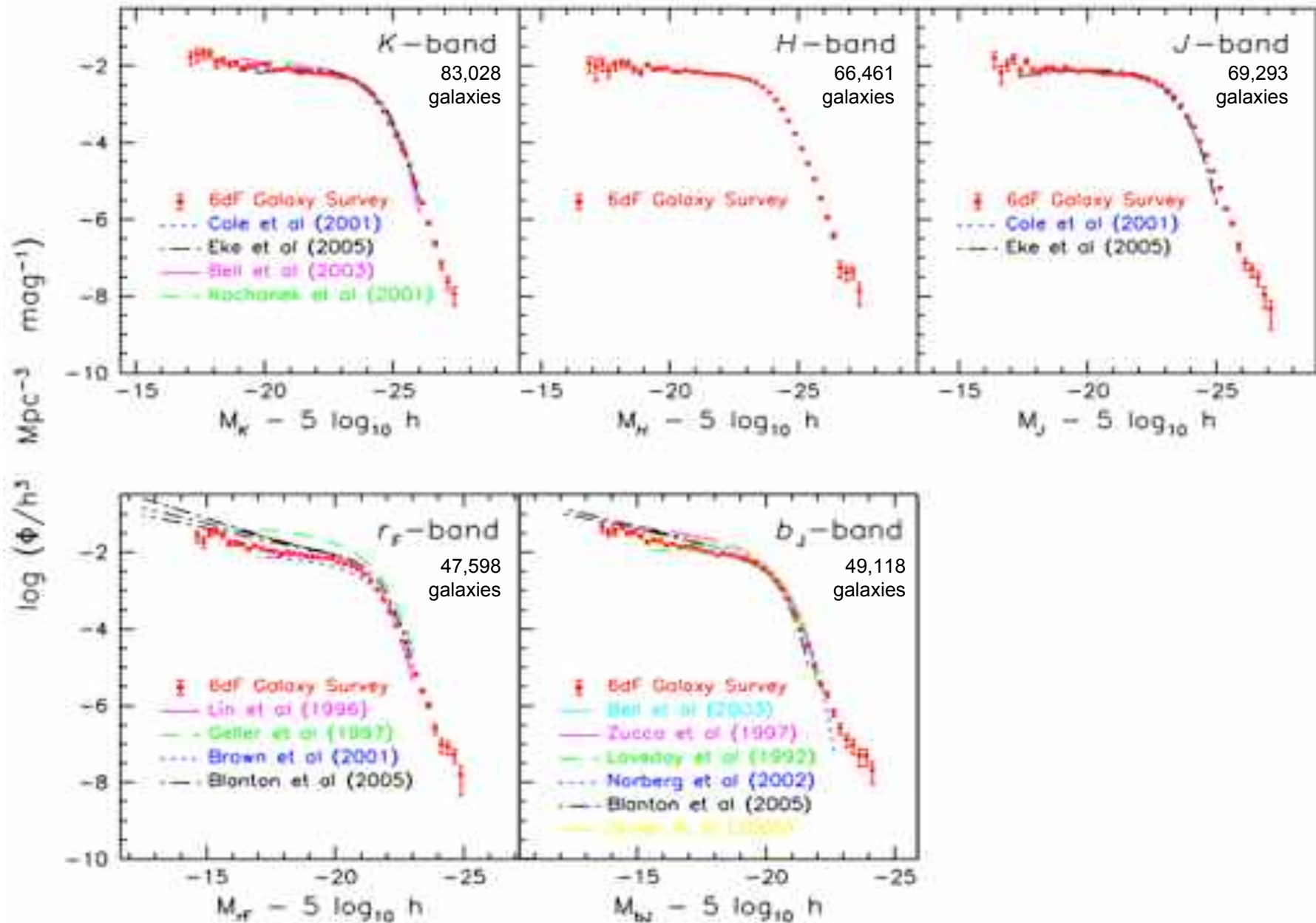
Near-infrared luminosity functions

- The 6dFGS K-band LF extends 1.5-2 mags further at both bright and faint ends (covers a factor of 10^4 in L)
- Agrees with most other recent LF measurements up to small differences between magnitude systems
- Previous, smaller samples have larger uncertainties in their normalisations

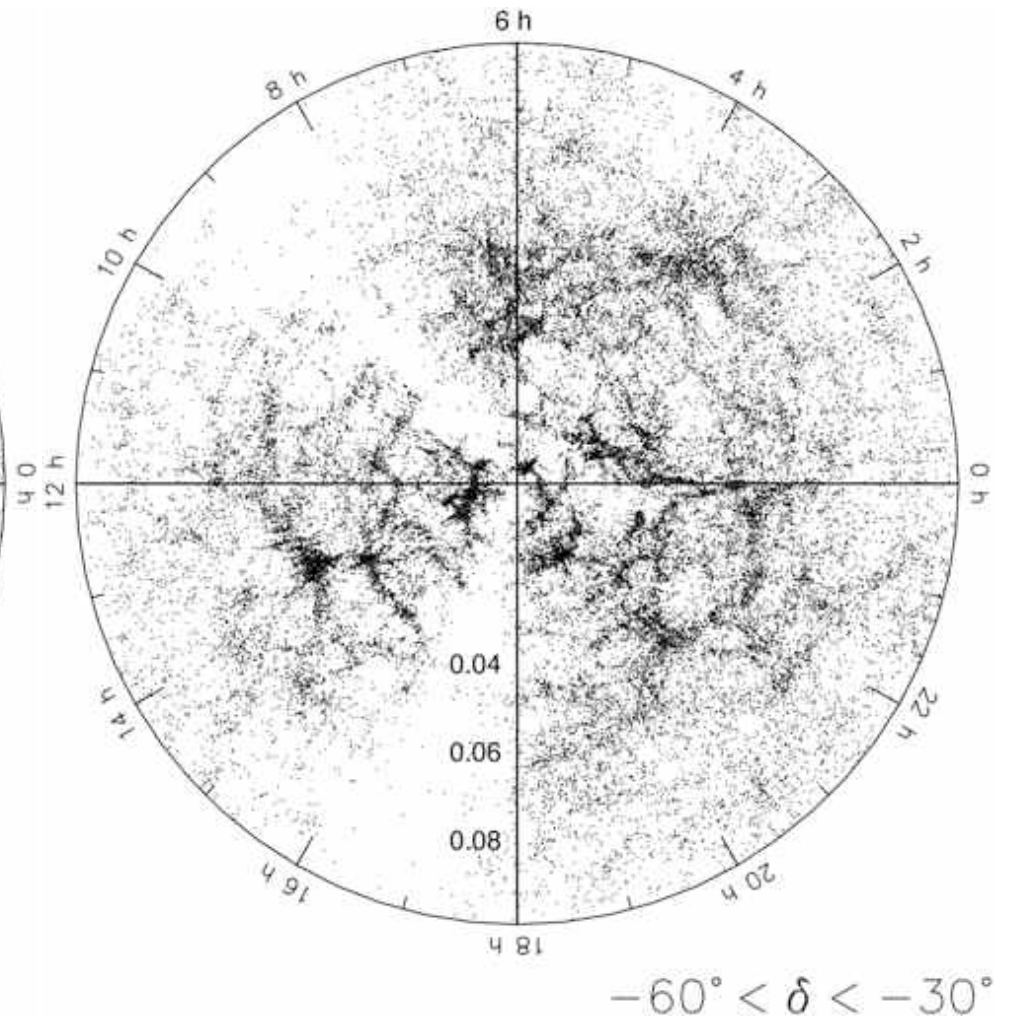
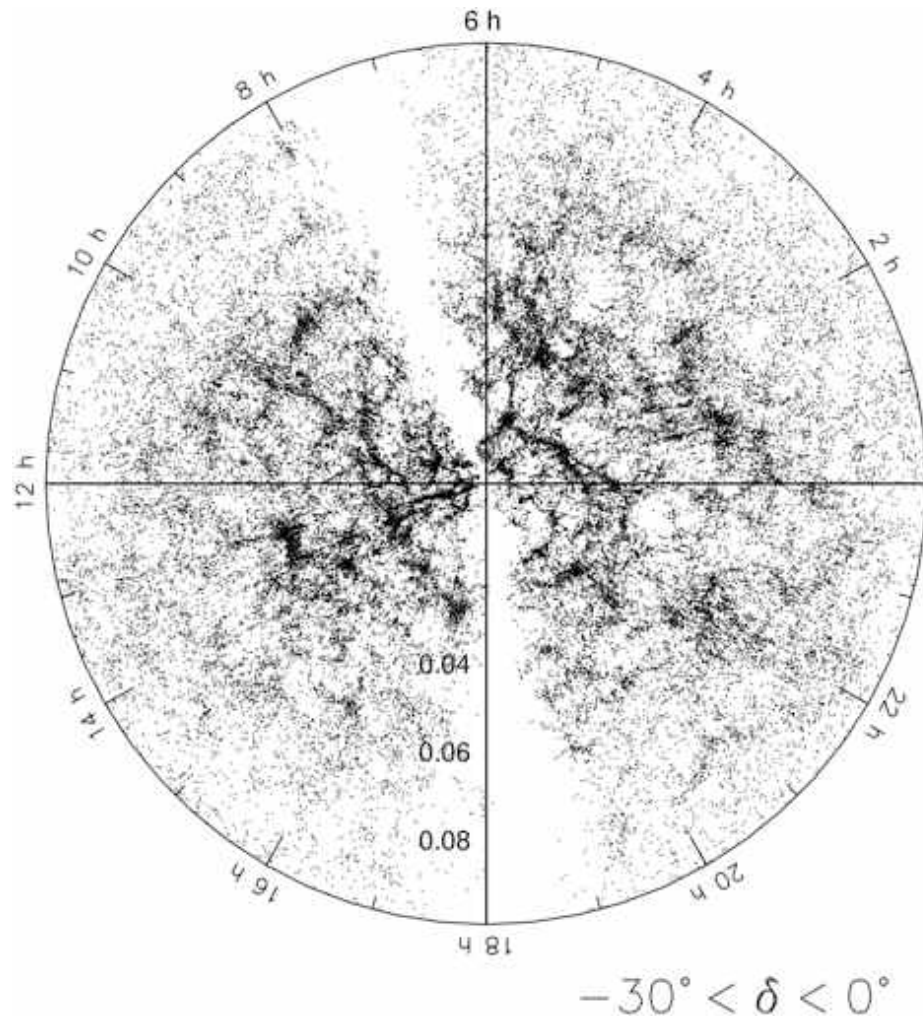


9500 sq deg	6dFGS	83028 galaxies
	2MASS + 2dF	
	2MASS + ZCAT	
	2MASS + SDSS	

Near-infrared & optical luminosity functions



Redshift space maps





**6°-Field Galaxy Survey
(6dFGS)**

of the Southern Hemisphere

**visualized in 3-dimensions with
“Partiview” (Digital Universe of the
Hayden Planetarium)**

created by T.H. Jarrett for the 6dFGS team

**6°-Field Galaxy Survey
(6dFGS)
of the Southern Hemisphere**

The 6dFGS View of the Local Universe



The 6dF Galaxy Survey covers the entire southern hemisphere in which 12 segments of the Galaxy plane. The map below shows the sky in Galactic coordinates with l (0 to 360) on the x-axis.

Shapley supercluster (2.545+)

Carinae cluster (0.02)

Sagittarius stream (0.02)



High redshift galaxies (0.02)



Carinae cluster (0.02)

Wrightshere supercluster (0.02)

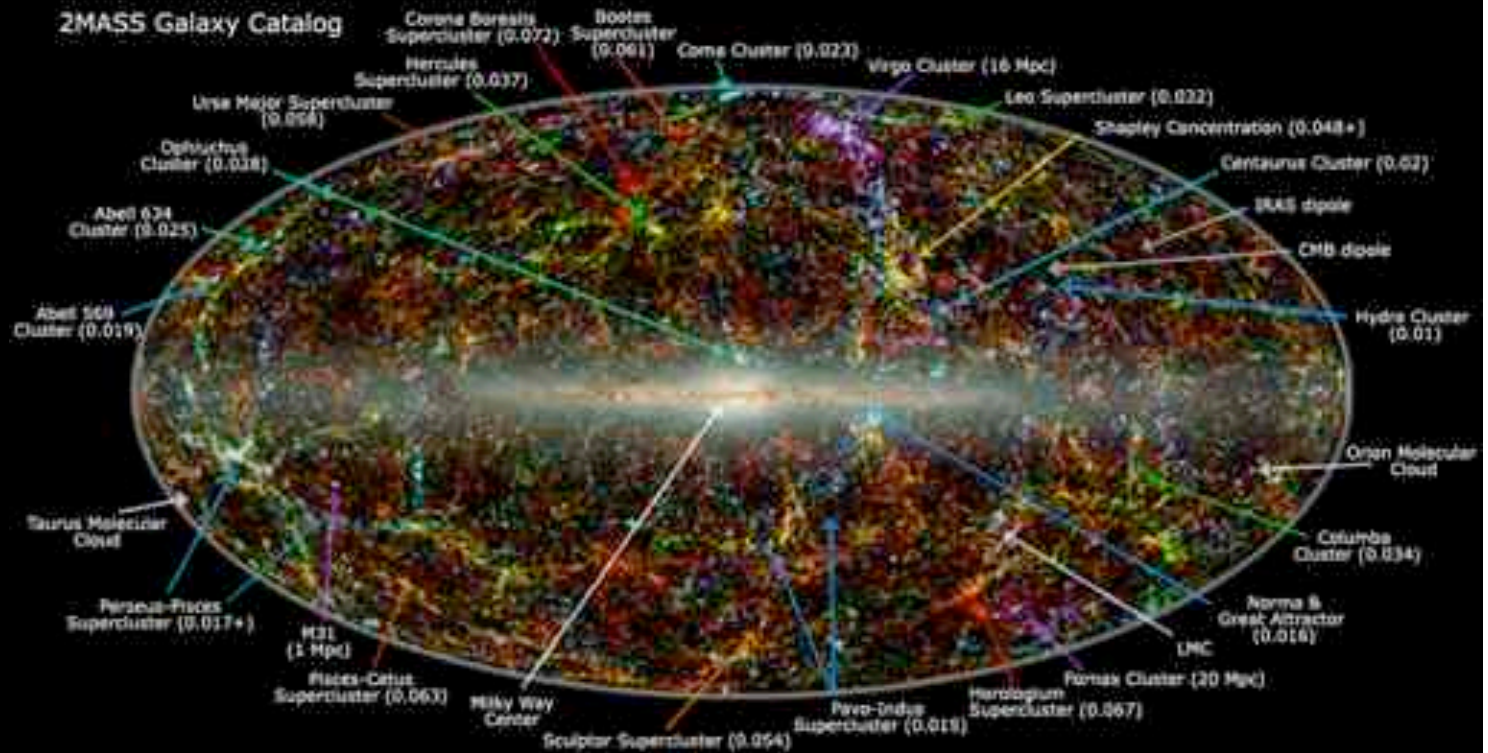
Local group (0.02)

Sculptor supercluster (0.02)

Graphic: M. Jones (AAO),
T. Jarrett (PAC/Caltech)
Galactic Plane image courtesy of JMASB

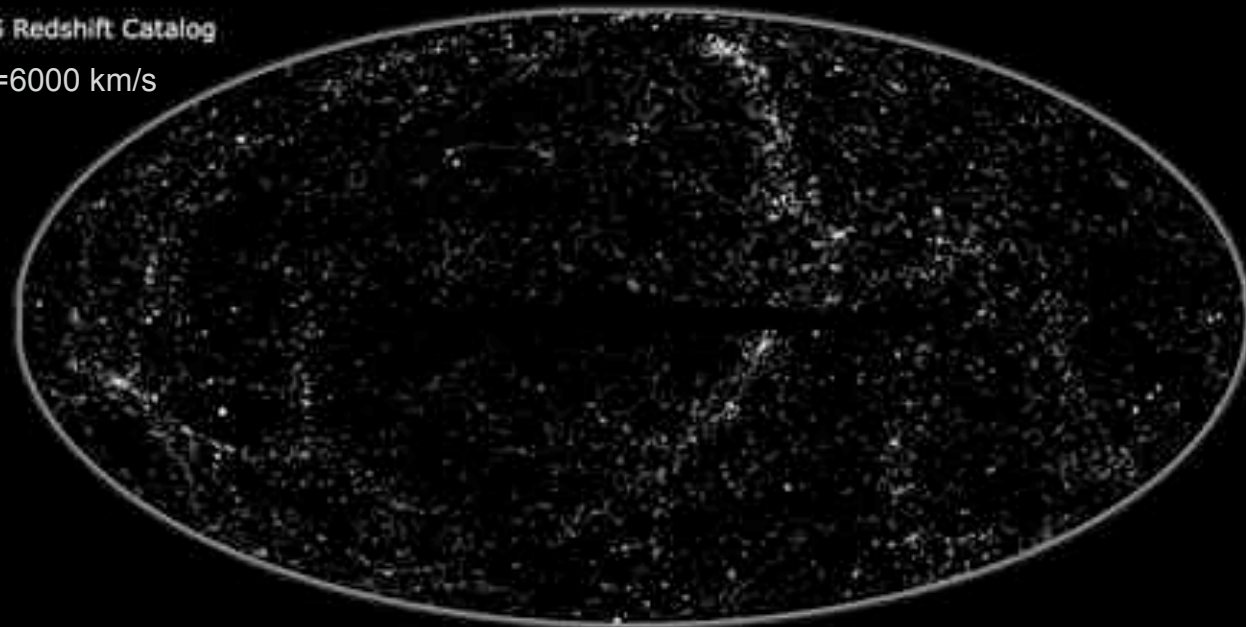
2MASS Redshift Survey

- *2MRS is the densest all-sky redshift survey to date*
- *Contains more than 23,000 galaxies with $K_s < 11.25$*
- *93% complete with z 's from Arecibo, Green Bank & FLWO 1.5m in North and 6dFGS & CTIO in South*



2MRS Redshift Catalog

$\langle cz \rangle = 6000$ km/s



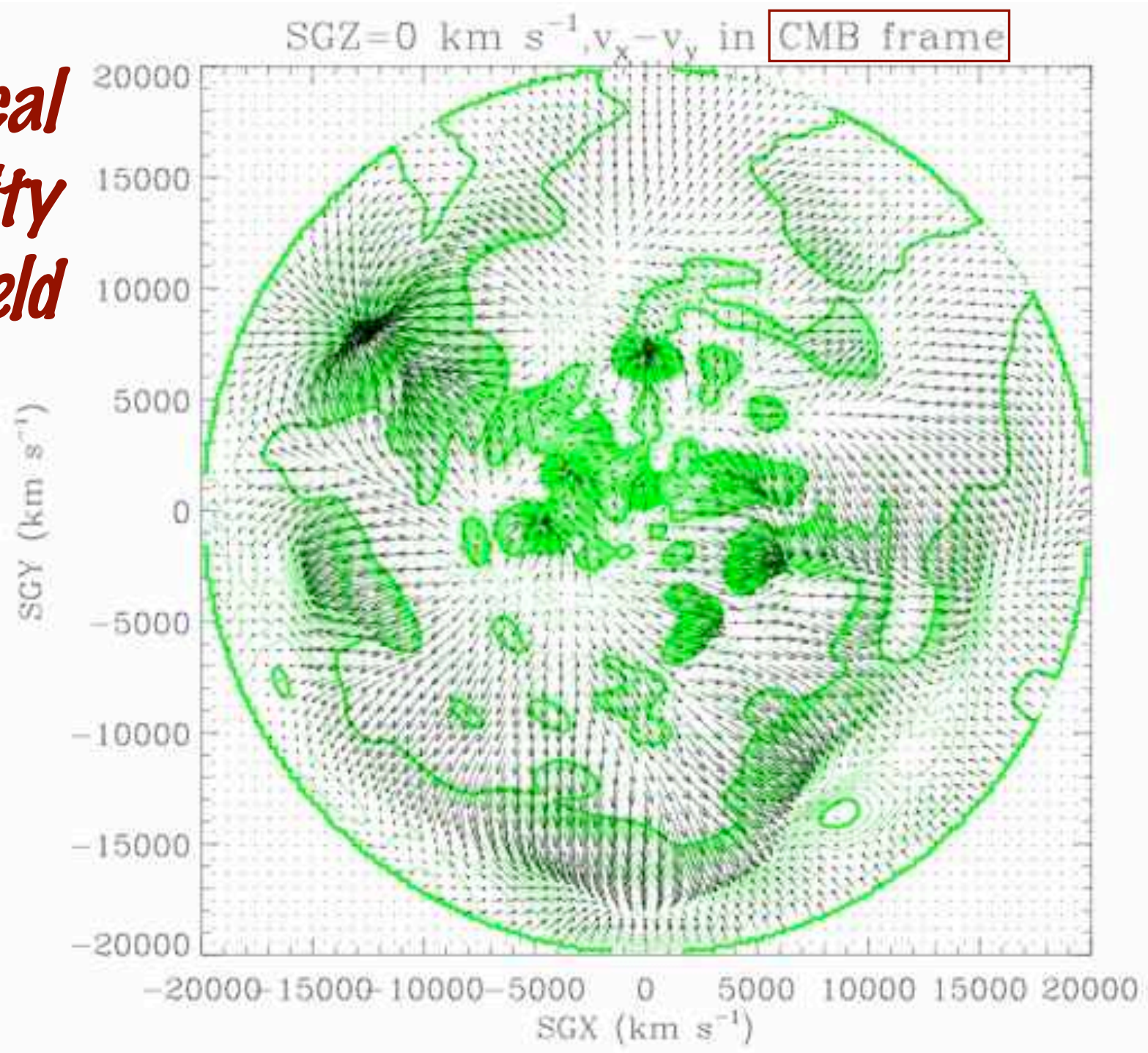
The local universe - structure in shells

2MASS Redshift Survey tour

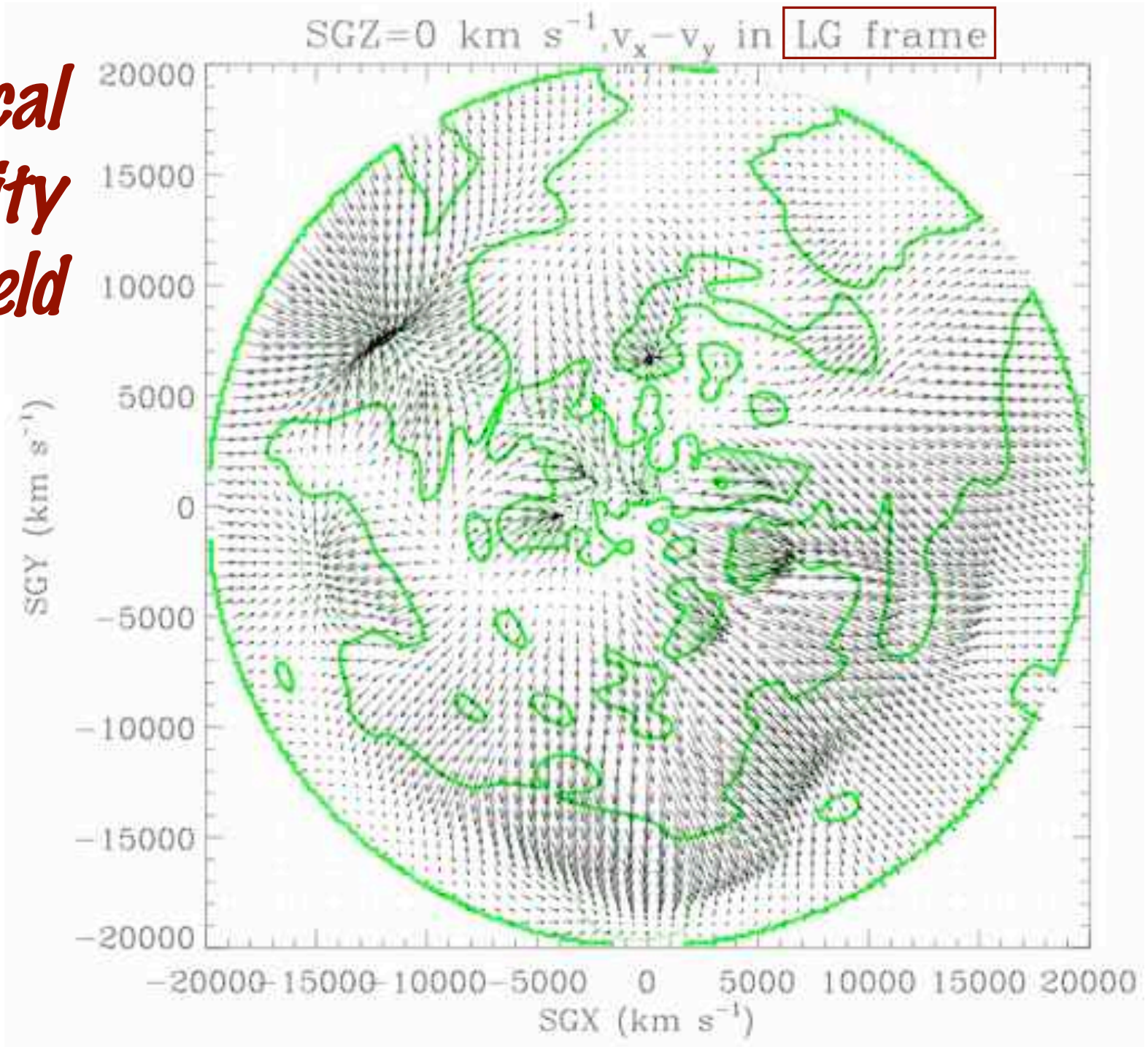
The local density field - reconstruction

Erdogdu et al., 2006, MNRAS, 368, 151 & Erdogdu et al., 2006, MNRAS, 373, 45

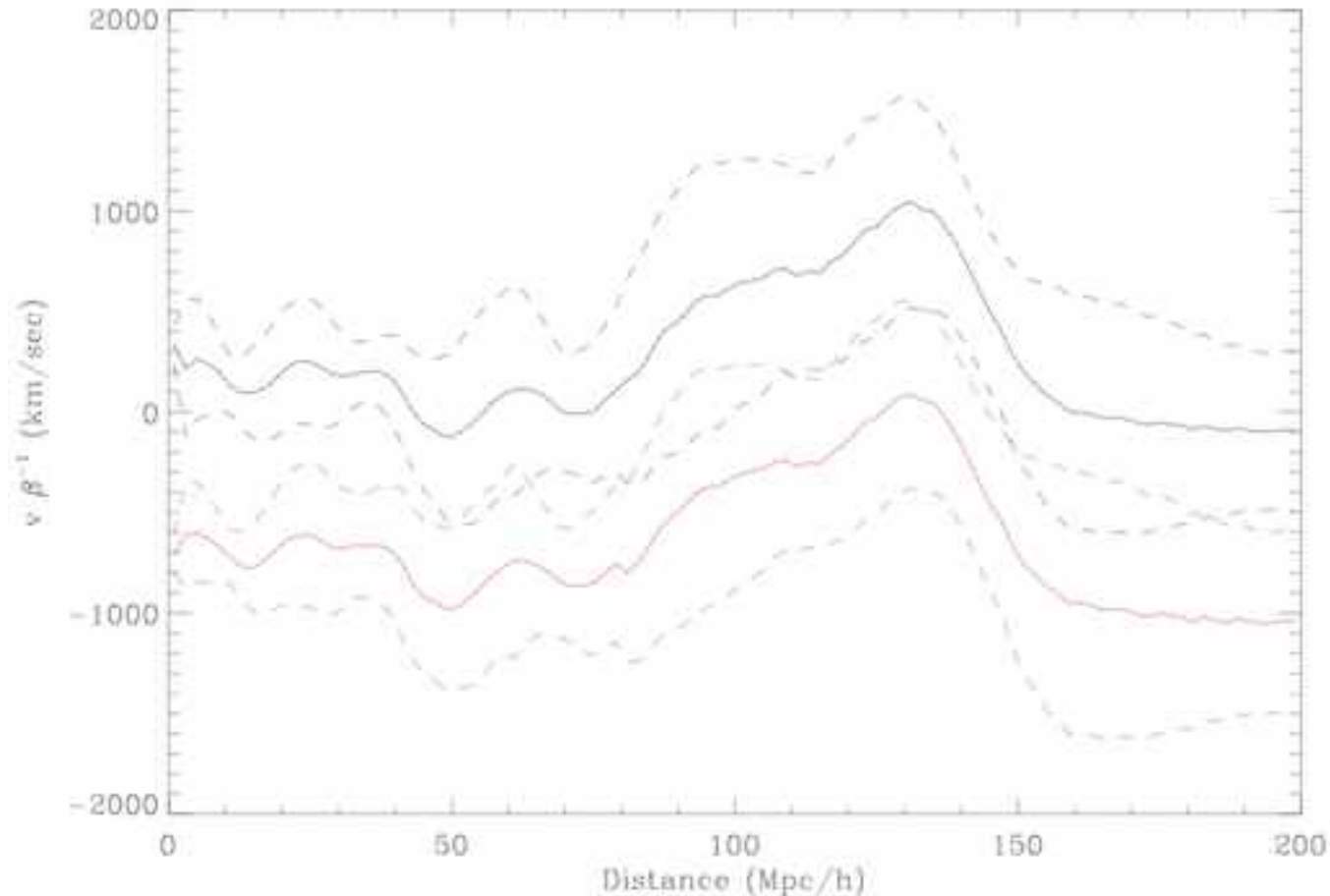
*Local
velocity
field*



*Local
velocity
field*



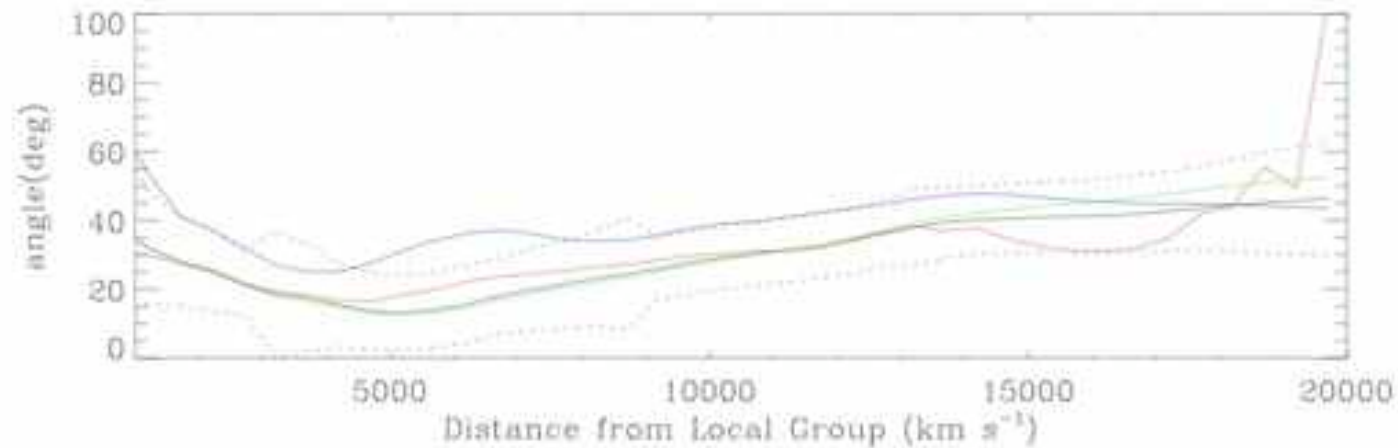
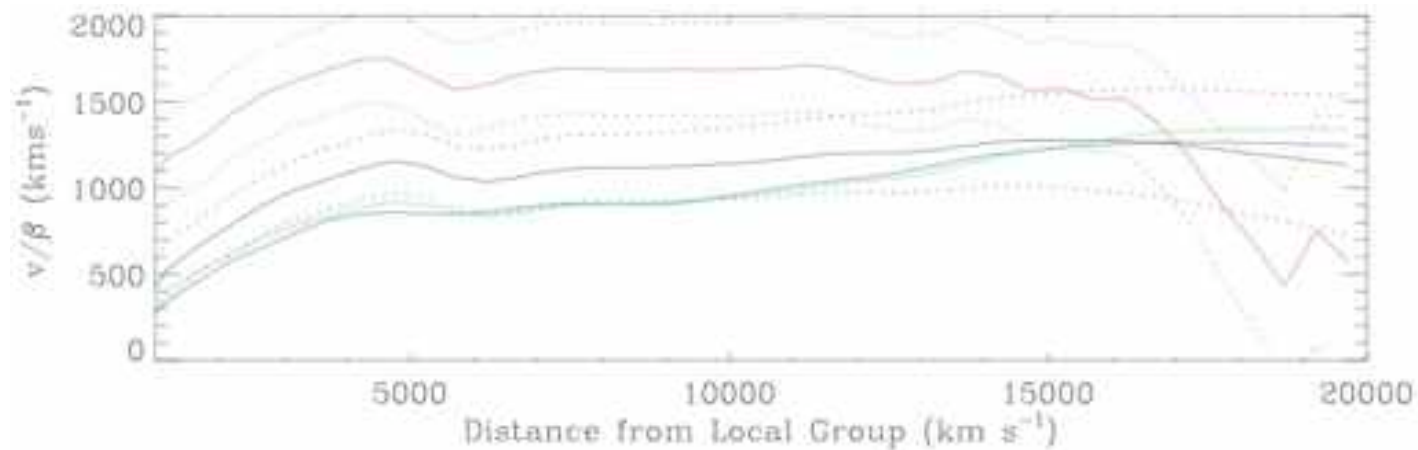
Velocity field towards GA/Shapley



Solid lines show radial velocity field in direction of Great Attractor and Shapley Supercluster (black = CMB, red = LG; dashed = uncertainties)

Local Group dipole motion

- *LG dipole amplitude has largely converged by 5000 km/s*
- *At 5000 km/s the LG dipole lies within 13° of CMB dipole*



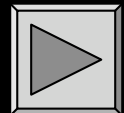
The Not-So-Local Void

Labyrinth view of
6dFGS volume out to
 $cz = 15000$ km/s
(Tony Fairall)

Shapley
Supercluster

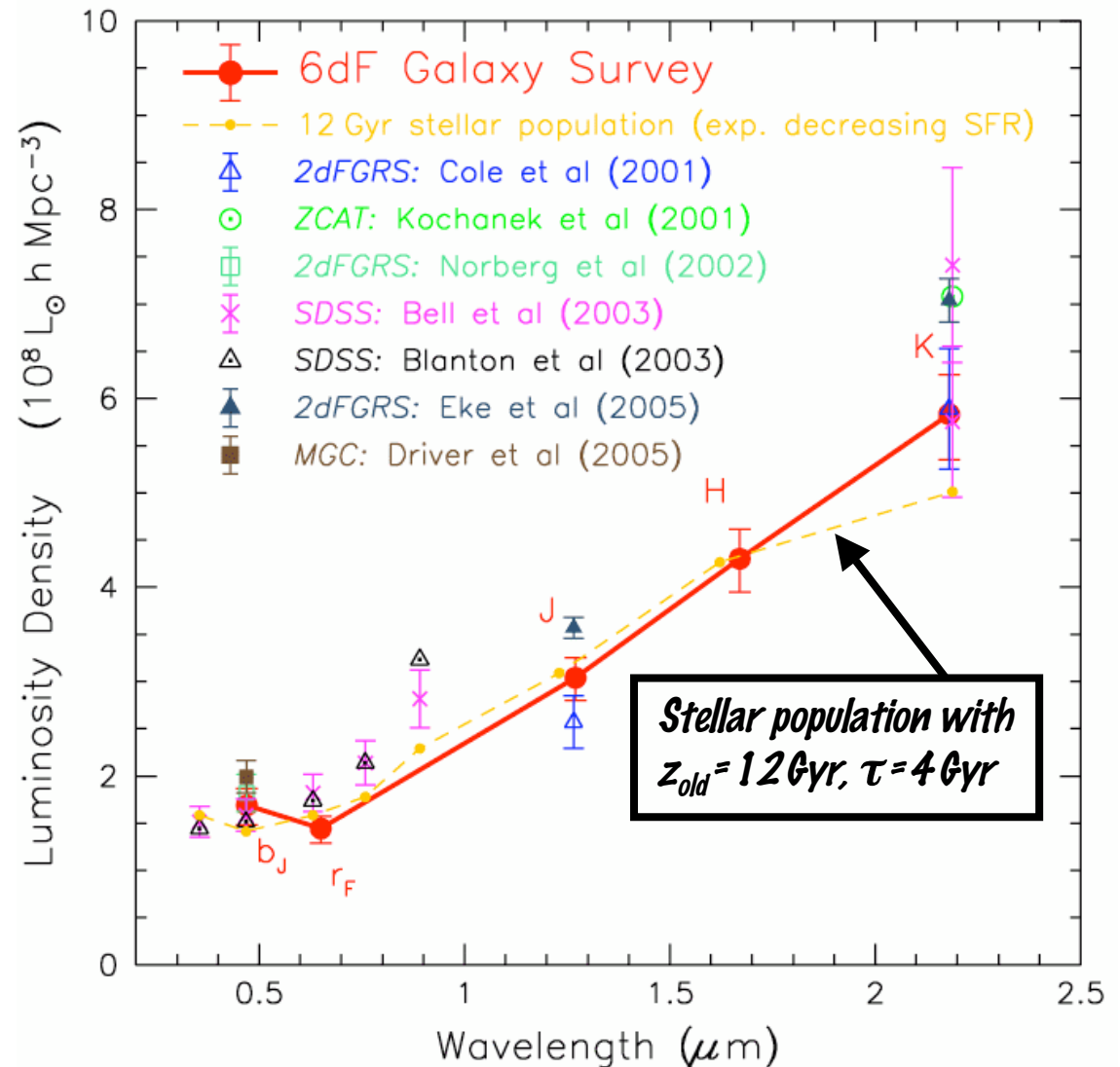
6.45995 fps

ViewZ: -0.994150
ViewY: -0.106394
ViewX: 0.018720
Z: 239.110977
Y: -0.532426
X: 1.214136



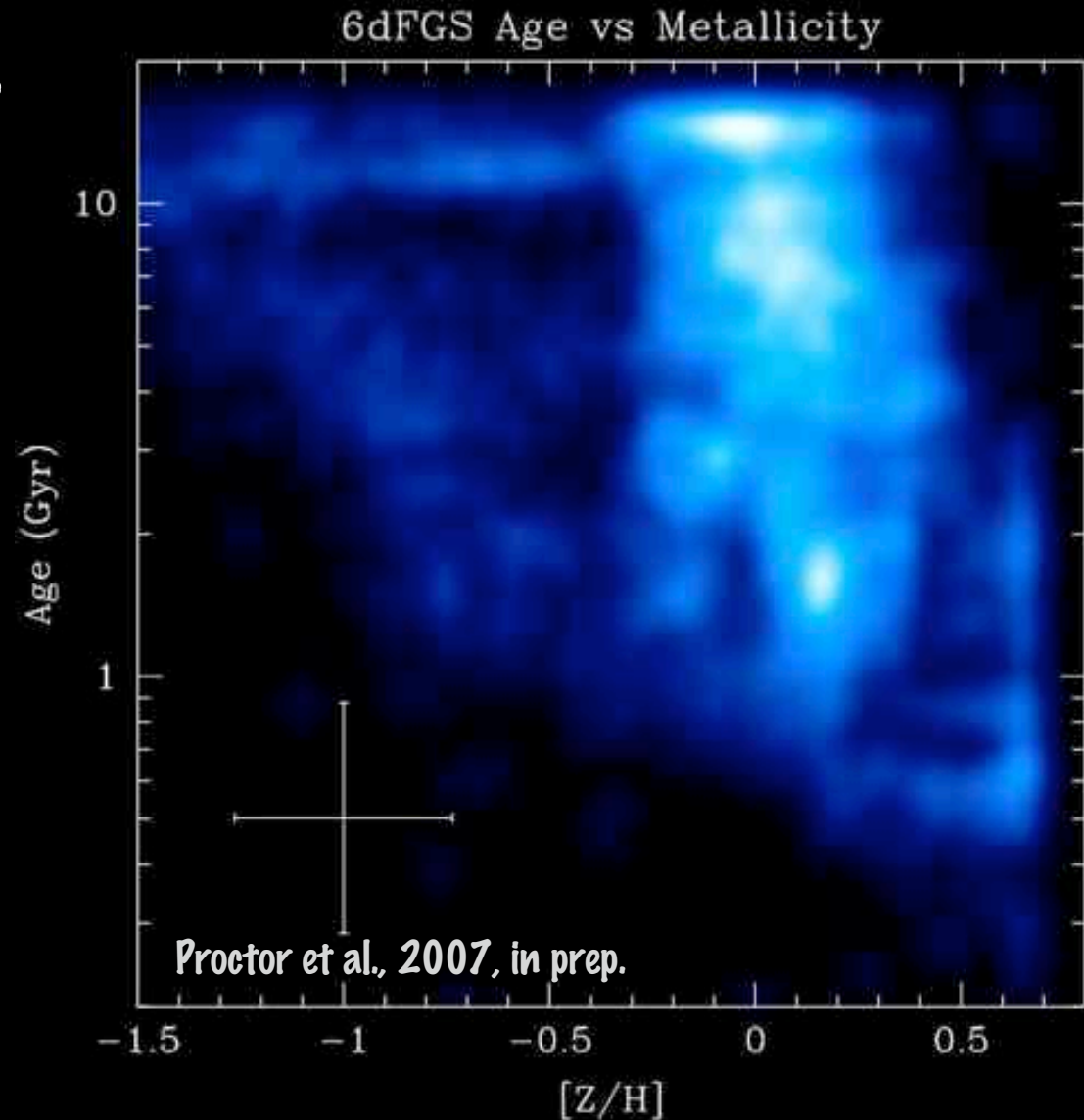
Luminosity density in optical and NIR

- *The luminosity densities in optical and NIR estimated from 6dFGS are broadly consistent with 2dFGRS/SDSS*
- *K-band luminosity density lies at lower end of range*
- *From optical through NIR, the variation of luminosity density with wavelength is consistent with an old stellar population*
- *The 6dFGS data provides (up to errors in the models) the most precise measurement of the low- z stellar mass density:*
 $\rho_{\star} = (5.0 \pm 0.1) \times 10^8 h M_{\odot} \text{ Mpc}^{-3}$
 $\Omega_{\star} h = (1.80 \pm 0.04) \times 10^{-3}$




Galaxy ages and metallicities

- *For 7000 DR1 galaxies we can measure Lick indices and emission lines at high S/N and get ages & metallicities*
- *The distribution of ages & metallicities shows...*
 - *The youngest galaxies have higher minimum metallicities*
 - *The least metal-rich galaxies have older minimum ages*




6dFGS Database

- **Final Data Release**
 - *Expected August 2007*
 - *Complete 6dFGS dataset May 2001 - Jan 2006*
 - *1464 fields*
 - *137,000 spectra*
 - *124,000 unique z's*
- **6dFGS online database**
 - *Searchable via SQL query commands or WWW form*
 - *Each source has its own multi-extension FITS file, (spectra, image stamps)*
 - *Target catalogues are fully searchable online*



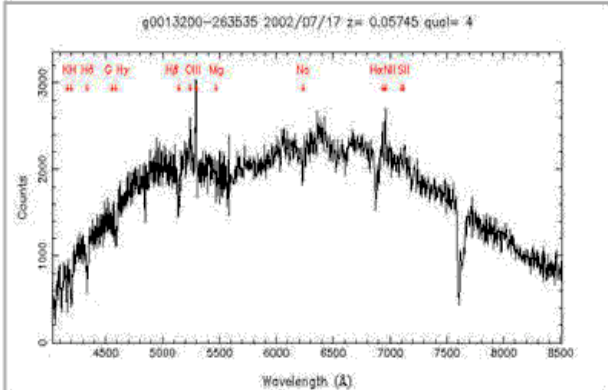
6dF GS Database

- [Database Home](#)
- [Introduction](#)
- [Database Schema](#)
- [FITS files](#)
- [Database Access](#)
- [AAO 6dF pages](#)
- [RSAA 6dFGS pages](#)
- [Publications](#)


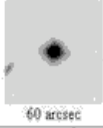


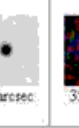



IFA ROE

6dF Galaxy Survey Database



g0013200-263535 2002/07/17 z= 0.05745 qual= 4

UKST B	UKST R	2MASS J	2MASS H	2MASS K	2MASS color
 60 arcsec	 60 arcsec	 35 arcsec	 35 arcsec	 35 arcsec	 35 arcsec

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[Schema](#) | [Access](#) | [FITS files](#)

<http://www-wfau.roe.ac.uk/6dFGS/>

6dFGS fly-through movie

