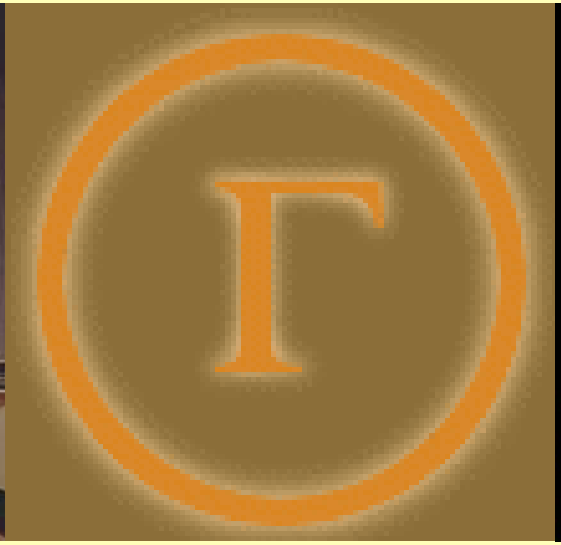
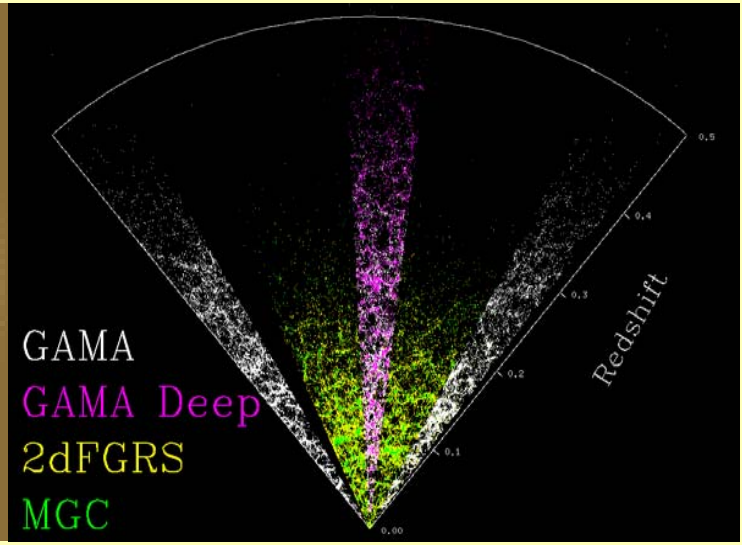
Galaxy Mass And Assembly – GAMA



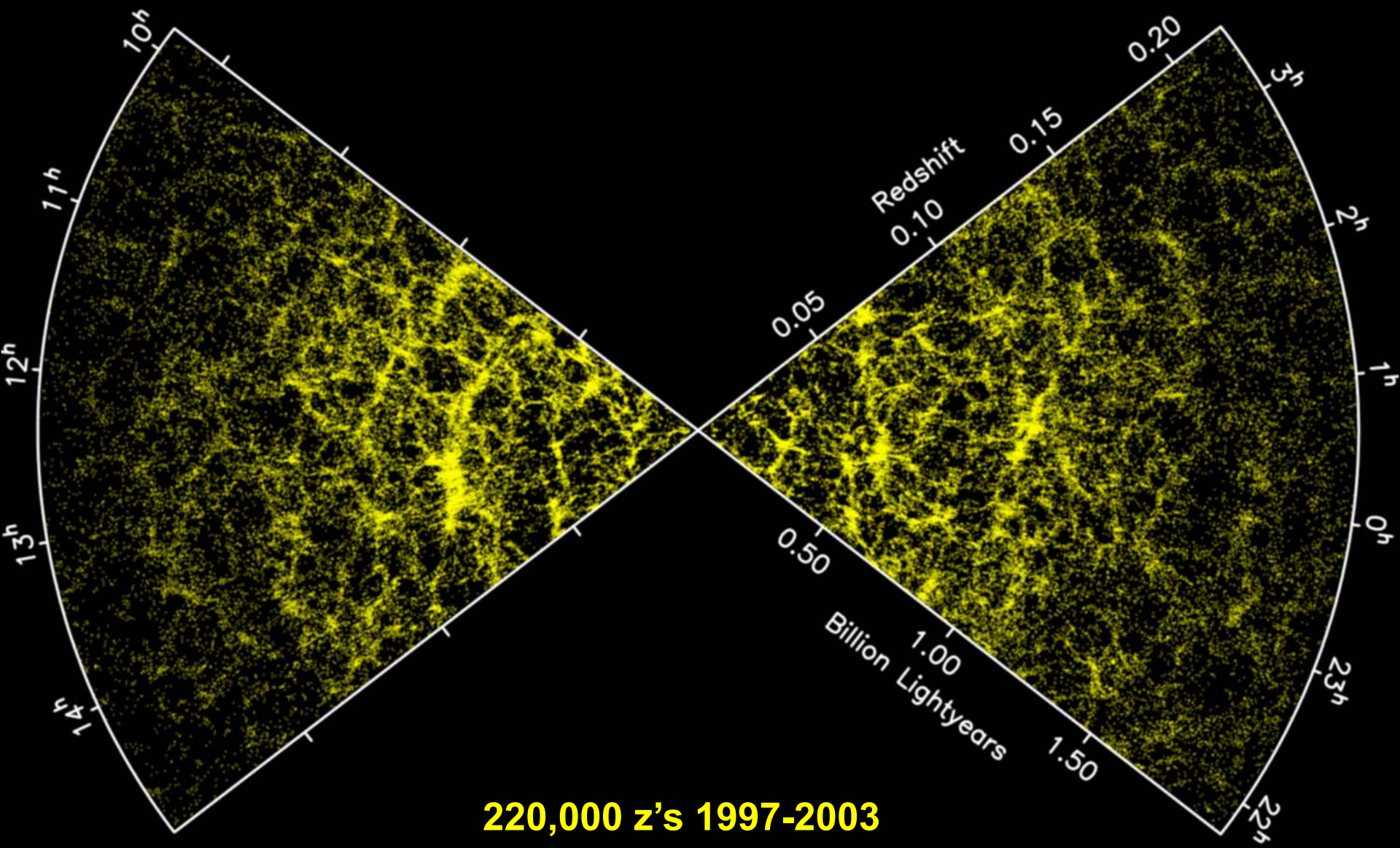


John Peacock

DEX 2008

Edinburgh 4 Sept 2008

Cosmology after 2dFGRS



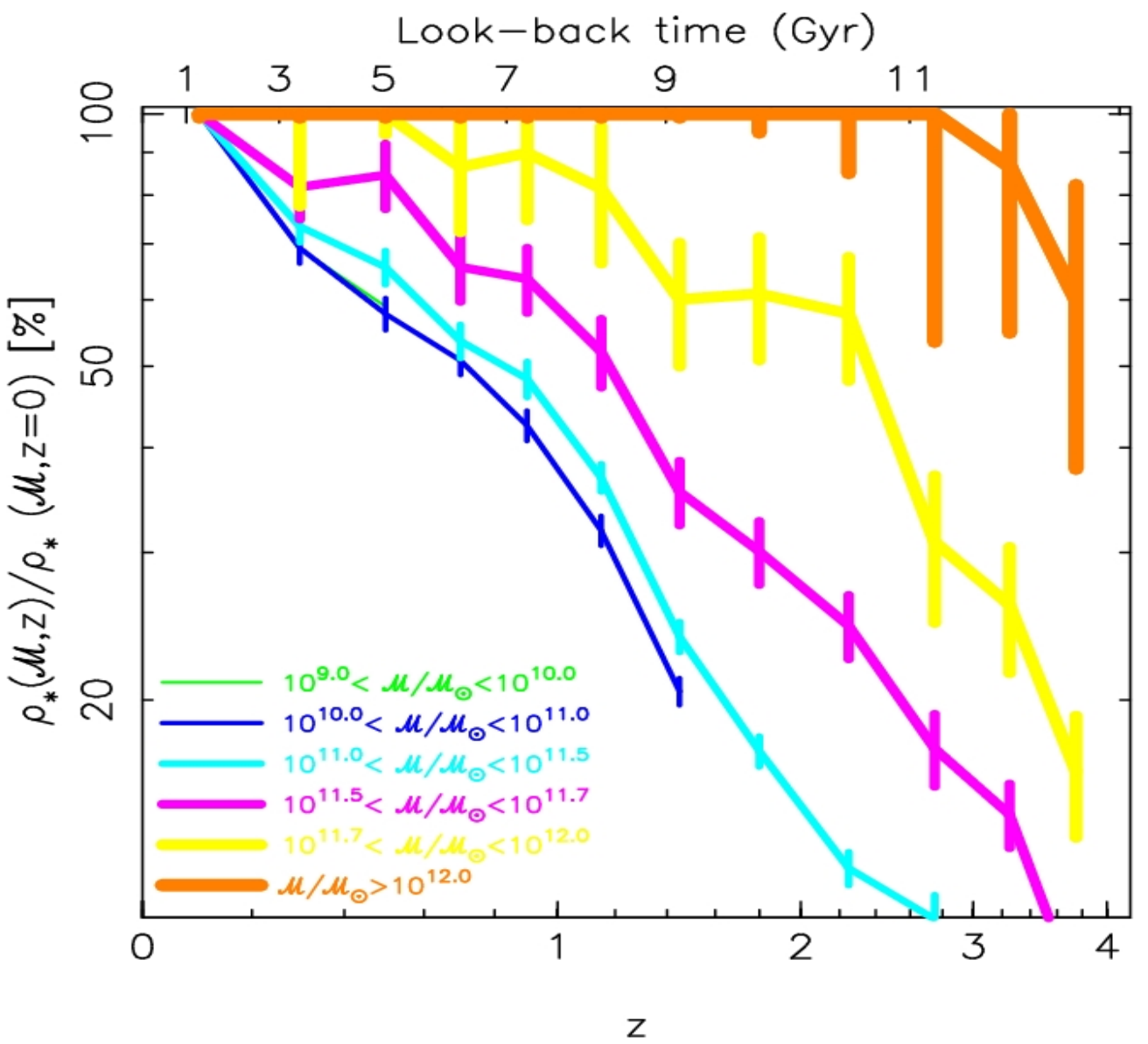
220,000 z's 1997-2003

Open questions

- Fundamental cosmology issues
  - Baryon oscillations
  - Evolution of dark energy
  - Testing modified gravity
- Formation of galaxies and nonlinear structures
  - Hierarchical collapse & nature of DM
  - Feedback and galaxy downsizing
  - Environmental context

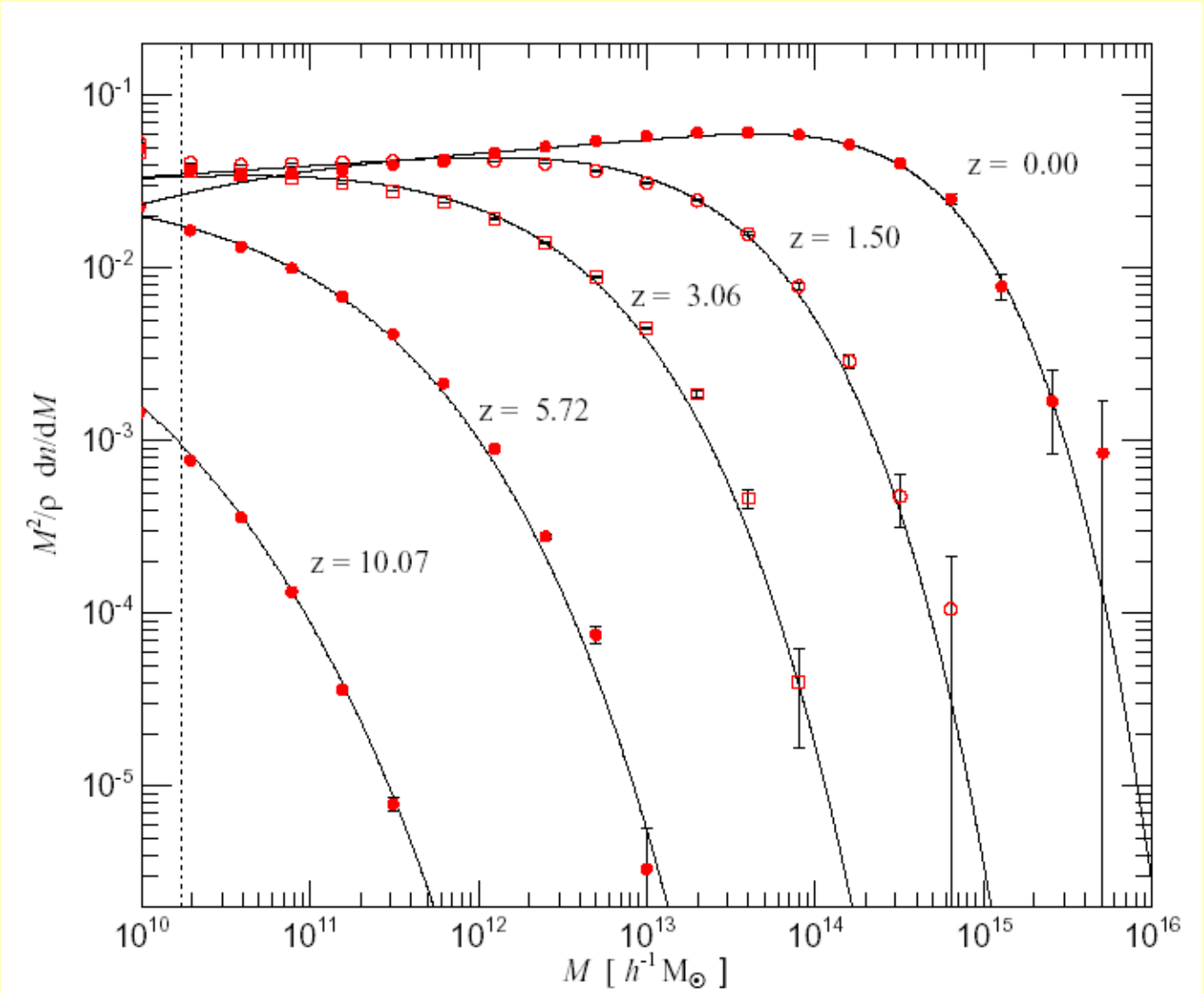
  - Require new deeper survey

Galaxy assembly: upside-downsizing

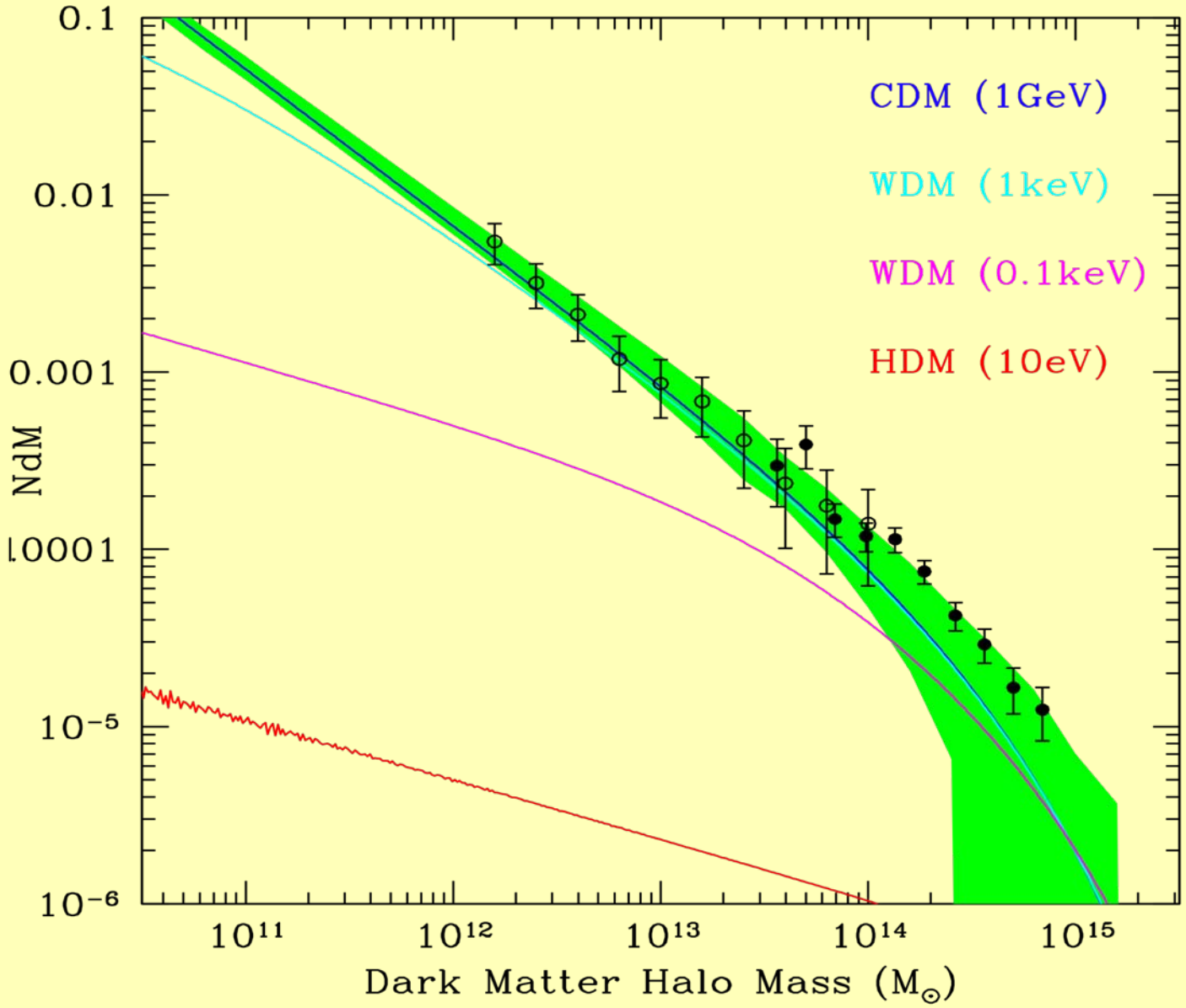


Pérez-González et al. (2007)

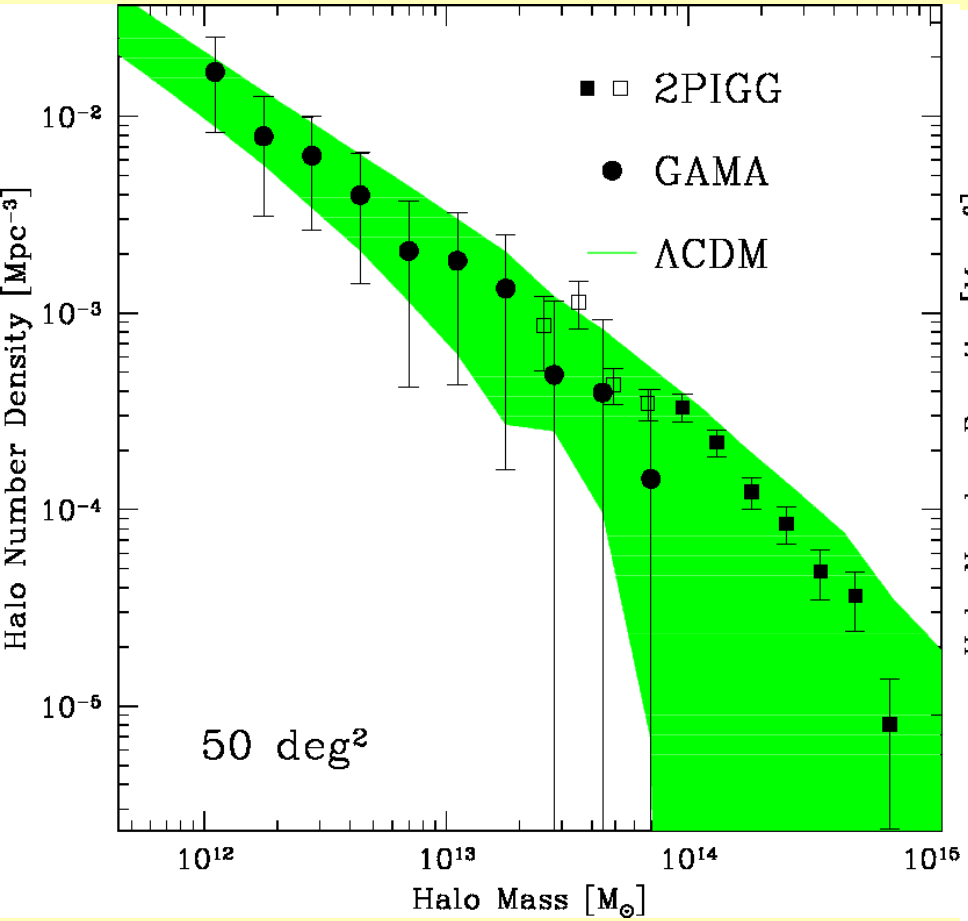
Opposite to buildup of virialized haloes ($\rho = 200 \langle\rho\rangle$)

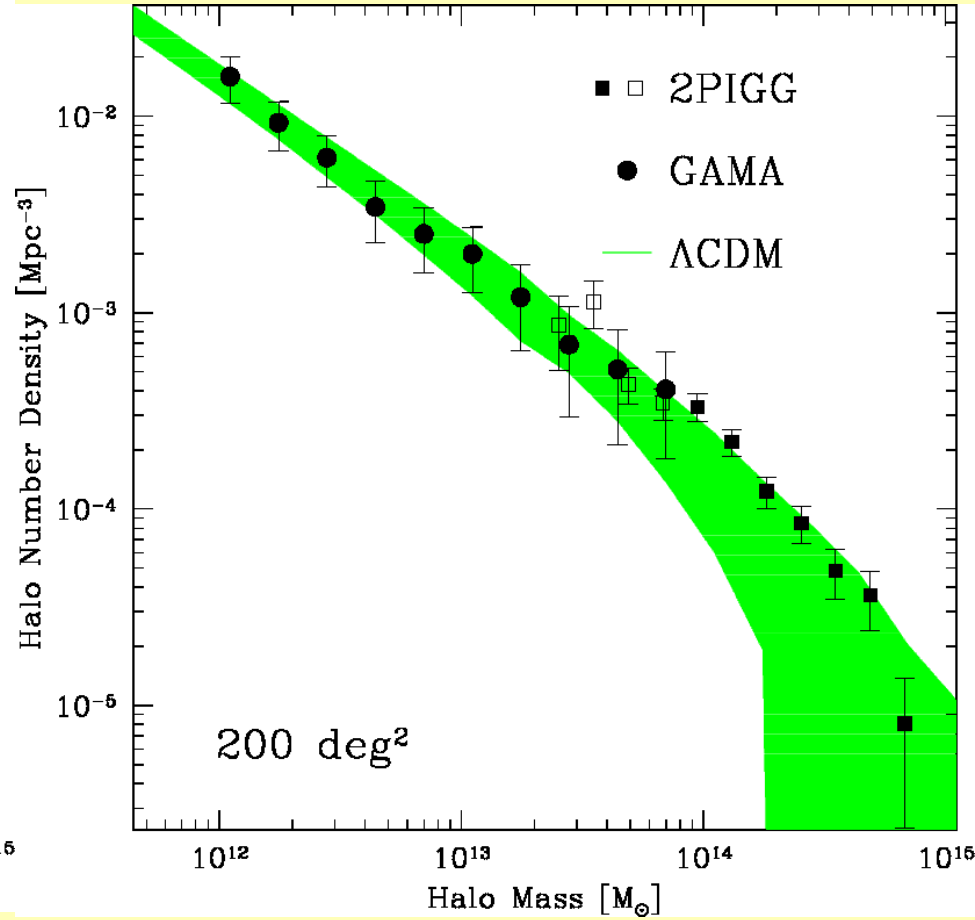


The halo mass function

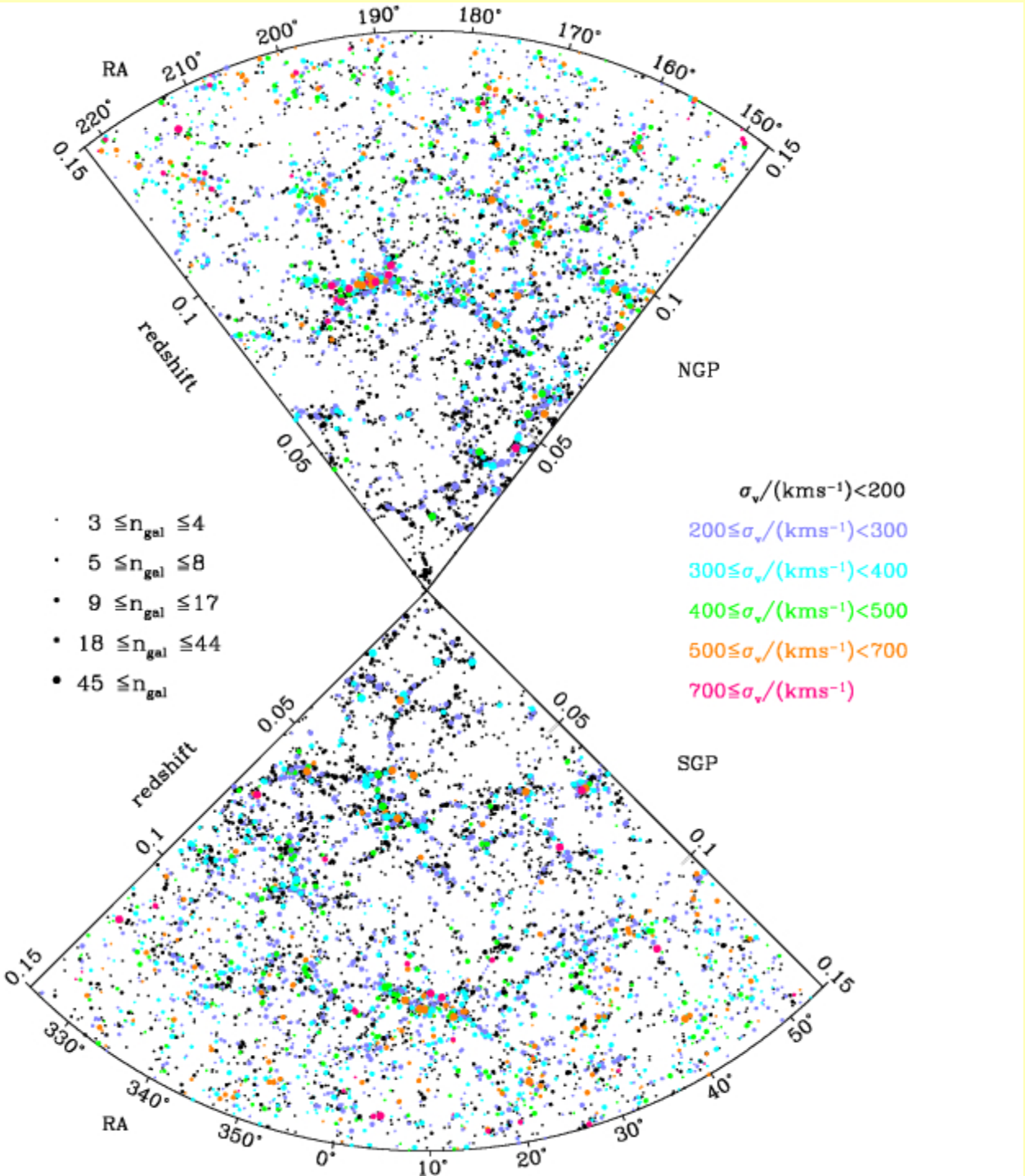


Measuring the Halo Mass Function: Area requirement





2PIGG: Groups in 2dFGRS



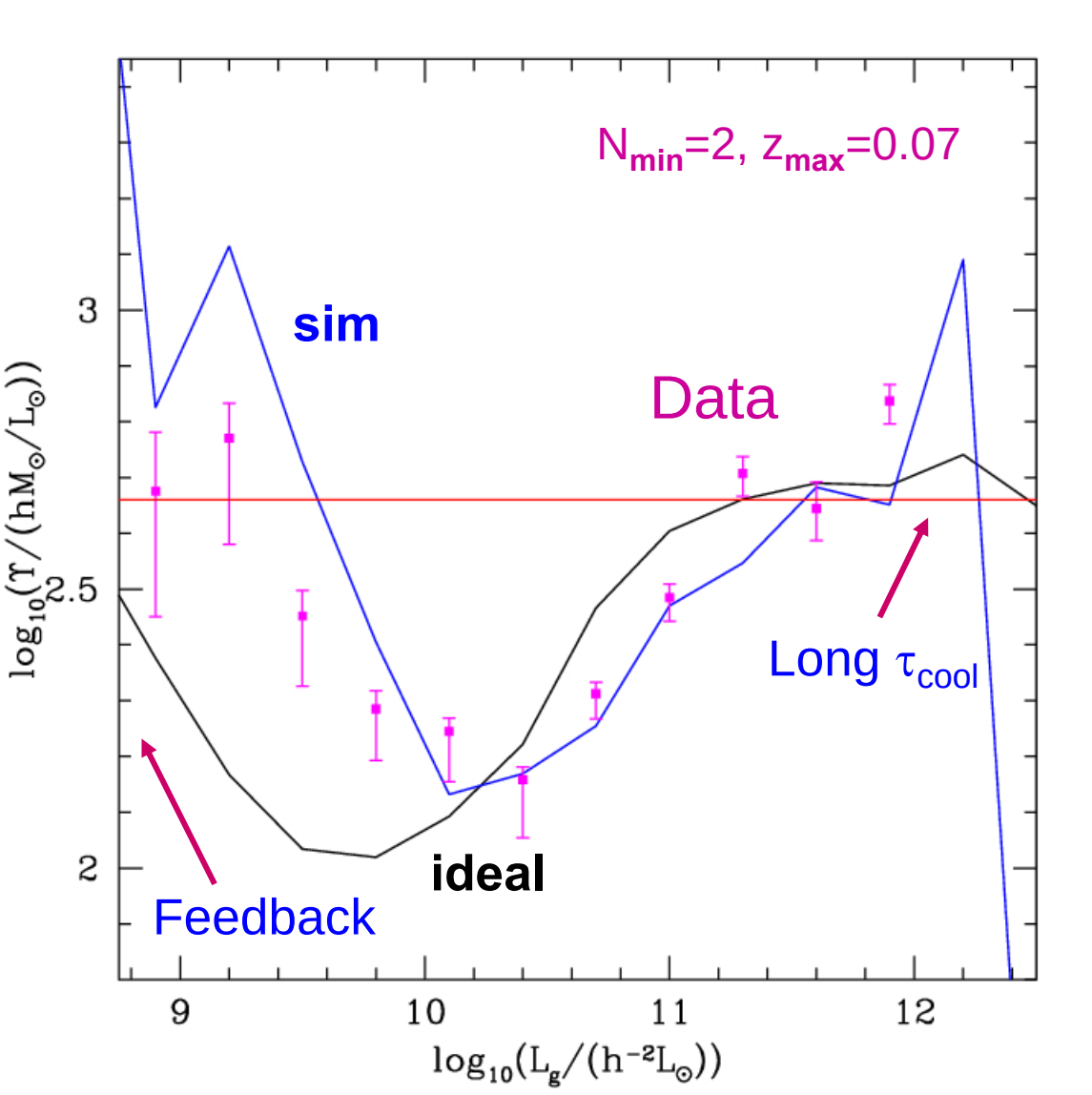
Eke, Frenk, Cole, Baugh + 2dFGRS 2003

2PIGG: empirical halo galaxy contents

Eke et al. 04:
Factor of 4 decrease in M/L from rich clusters to poor groups

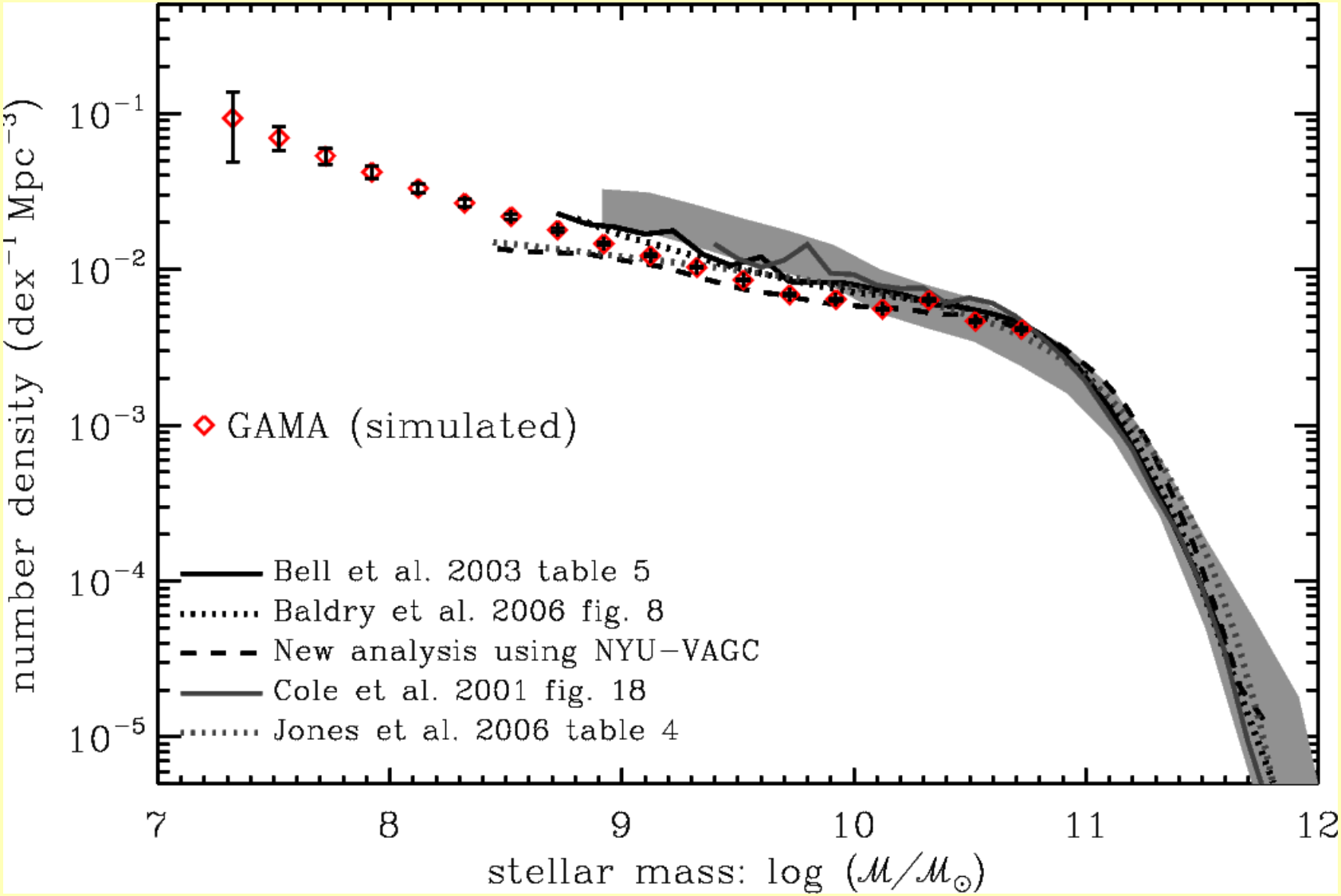
But really want to probe behaviour below total mass M = $10^{12.5}$ M_{sun}

– and evolution

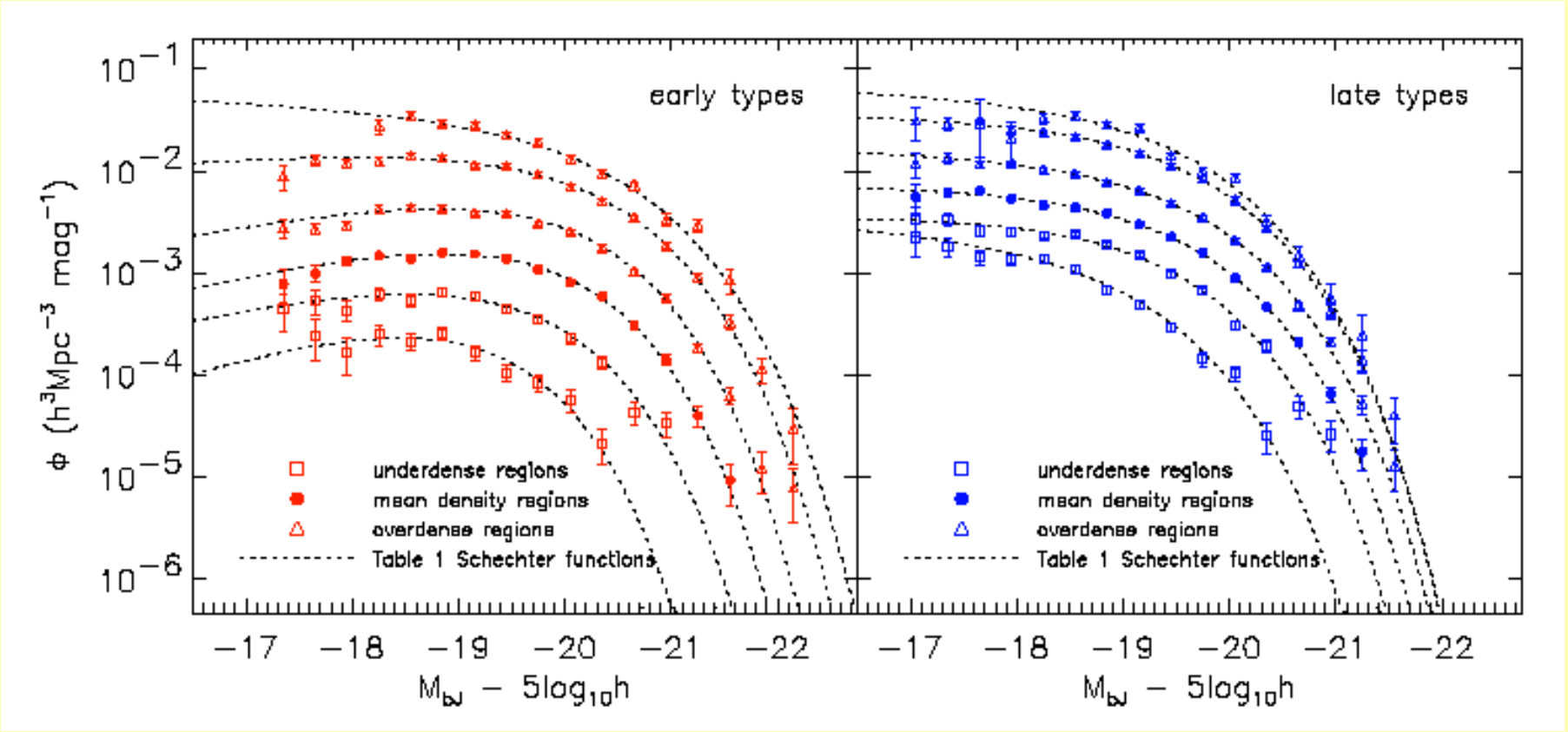


Group luminosity

Symptom 1: the Stellar Mass function



Symptom 2: environment and LFs

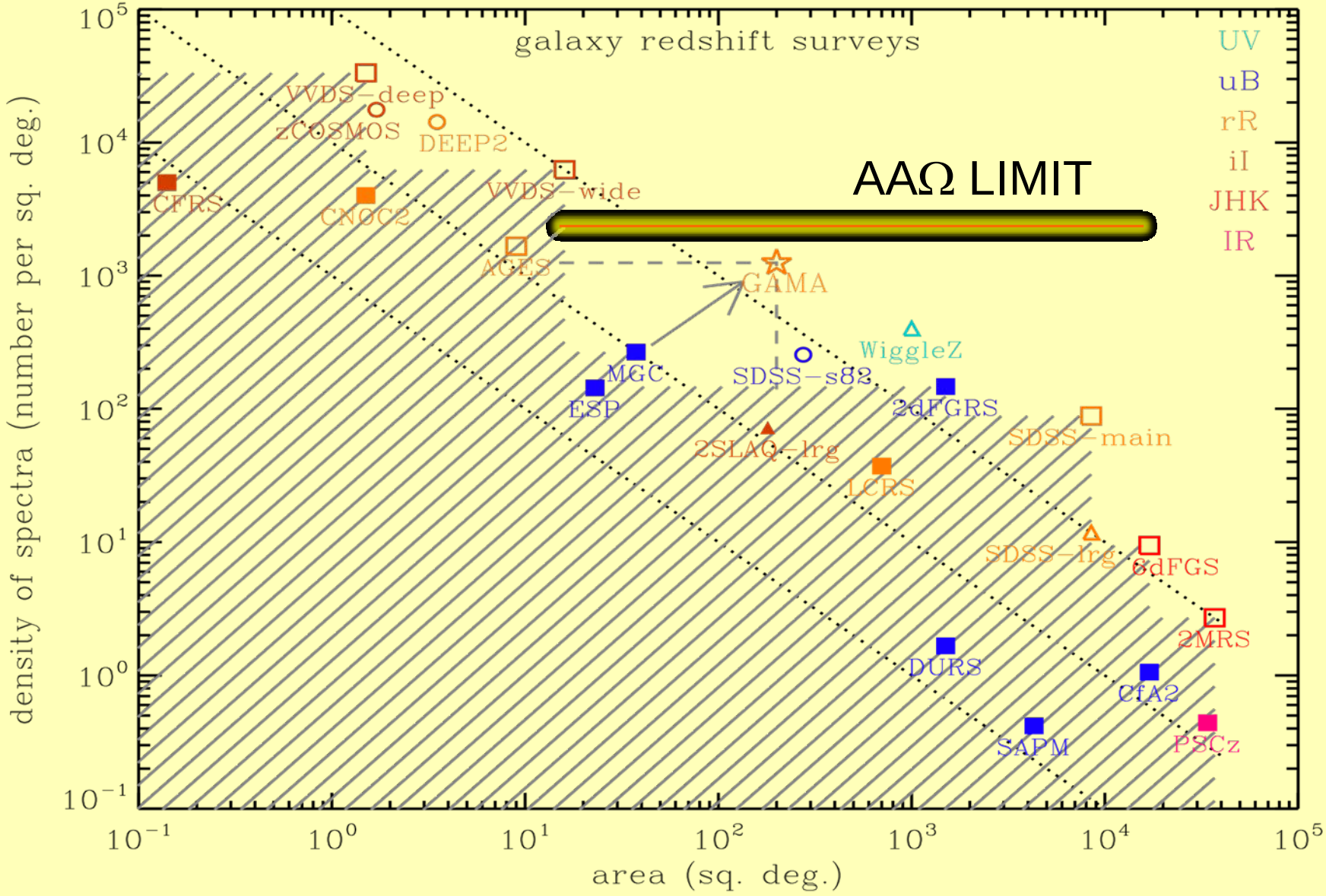


Croton et al. 2005: as f(density in 8 Mpc/h spheres)

GAMA science goals & strategy

- **COMPREHENSIVE**
  - 250 SQ DEGREES (5X50 SQ DEG. CHUNKS), 250K GALAXIES (25X MGC)
- **GENERAL SCIENCE:**
  - A STUDY OF STRUCTURE ON 1KPC-1MPC SCALES, WHERE BARYON PHYSICS CRUCIAL
- **SPECIFIC GOALS:**
  - THE CDM HALO MASS FUNCTION FROM GROUP VELOCITY DISPERSIONS
  - THE STELLAR MASS FUNCTION INTO THE INTERMEDIATE MASS REGIME
  - STELLAR CONTENT AS FUNCTION OF GROUP HALO MASS
  - BUILDING TOTAL SEDS FOR GALAXIES AND THEIR COMPONENTS AT $Z < 0.5$
- **MASSIVE MULTI-WAVELENGTH LEGACY:**
  - UV (GALEX)
  - OPTICAL: UGRI (VST, SDSS), SPECTRA (AAT)
  - NEAR-IR: ZYJHK (VISTA, UKIRT)
  - FAR-IR (HERSCHEL), SUB-MM SCUBA-II
  - RADIO: 21CM (ASKAP)

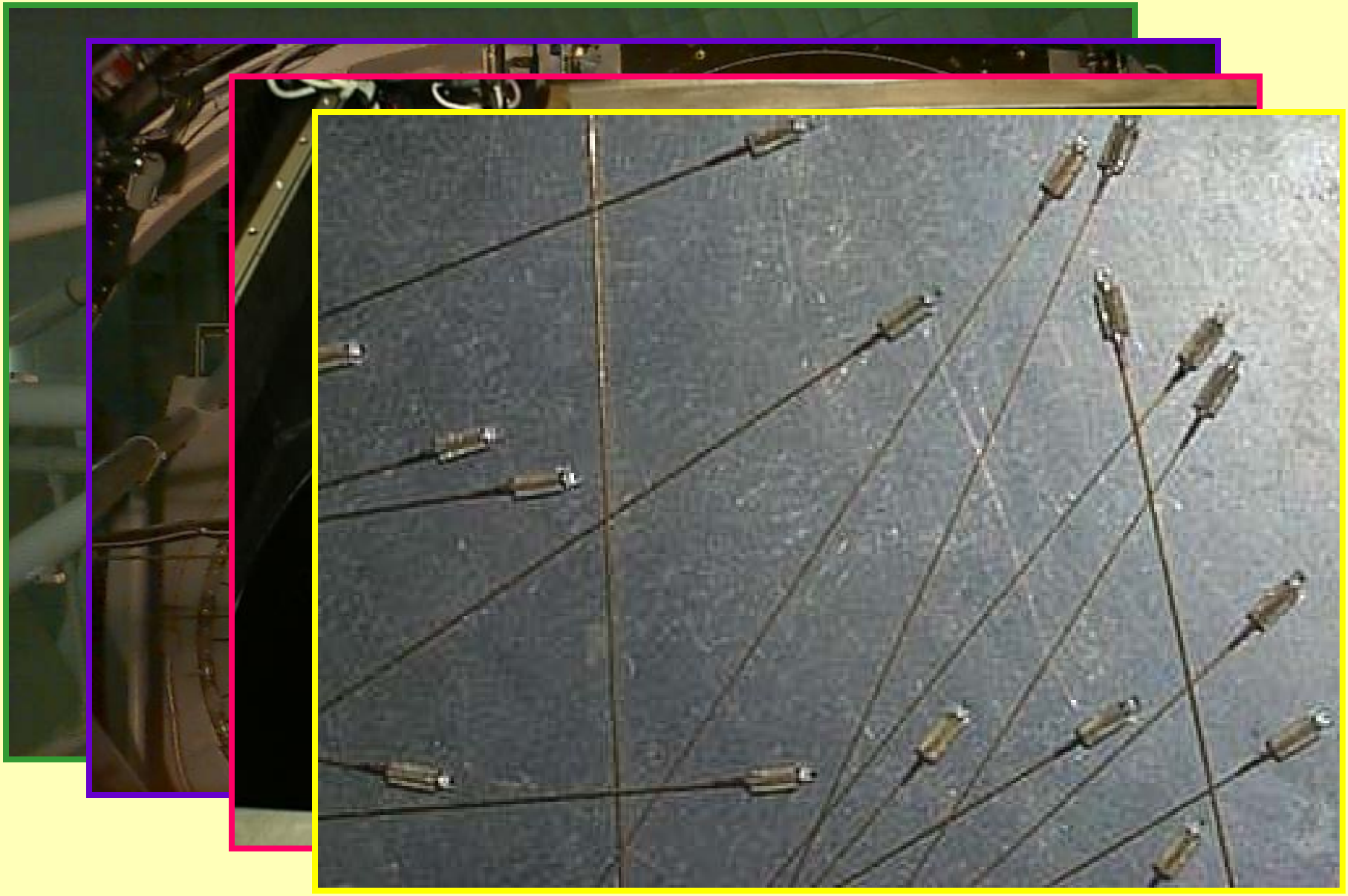
Survey strategy: wedding cakes


galaxy redshift surveys
AAΩ LIMIT
UV
uB
rR
iI
JHK
IR
VVDS−deep
zCOSMOS
DEEP2
CFRS
CNOC2
VVDS−wide
AGES
GAMA
WiggleZ
MGC
SDSS−s82
ESP
2dFGRS
2SLAQ−lrg
SDSS−main
LCRS
SDSS−lrg
6dFGS
2MRS
DURS
CfA2
SAPM
PSCz
density of spectra (number per sq. deg.)
area (sq. deg.)
10^{5}
10^{4}
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}

GAMA: key facts

- 250 deg^2 in 5 fields
- to r < 19.4 – cf. SDSS 17.8
- r < 19.8 (GAMA deep) in one field
- SDSS selection; deep field overlaps MGC
- Awarded 66 AAT nights 2008 – 2010
- First season:
  - 22 nights mar/apr 08 – 20 clear
  - 50746 z's out of 52557 spectra: 96.6% success
  - bright regions currently to r < 19.0

2dF/AAΩ on the AAT



AAΩ: new VPH spectrographs

GAMA Team

WORKING GROUPS/HEADS

SCIENCE	CATS	DATABASE	OBS	MOCKS	RADIO	SPEC. PIPE.	IMAGE. PIPE.
Peacock	Baldry	Liske	Driver	Norberg	Hopkins	Loveday	Bamford
(ROE)	(LJMU)	(ESO)	(PI, St And)	(ROE)	(USyd)	(Sussex)	(Nott.)

TEAM MEMBERS

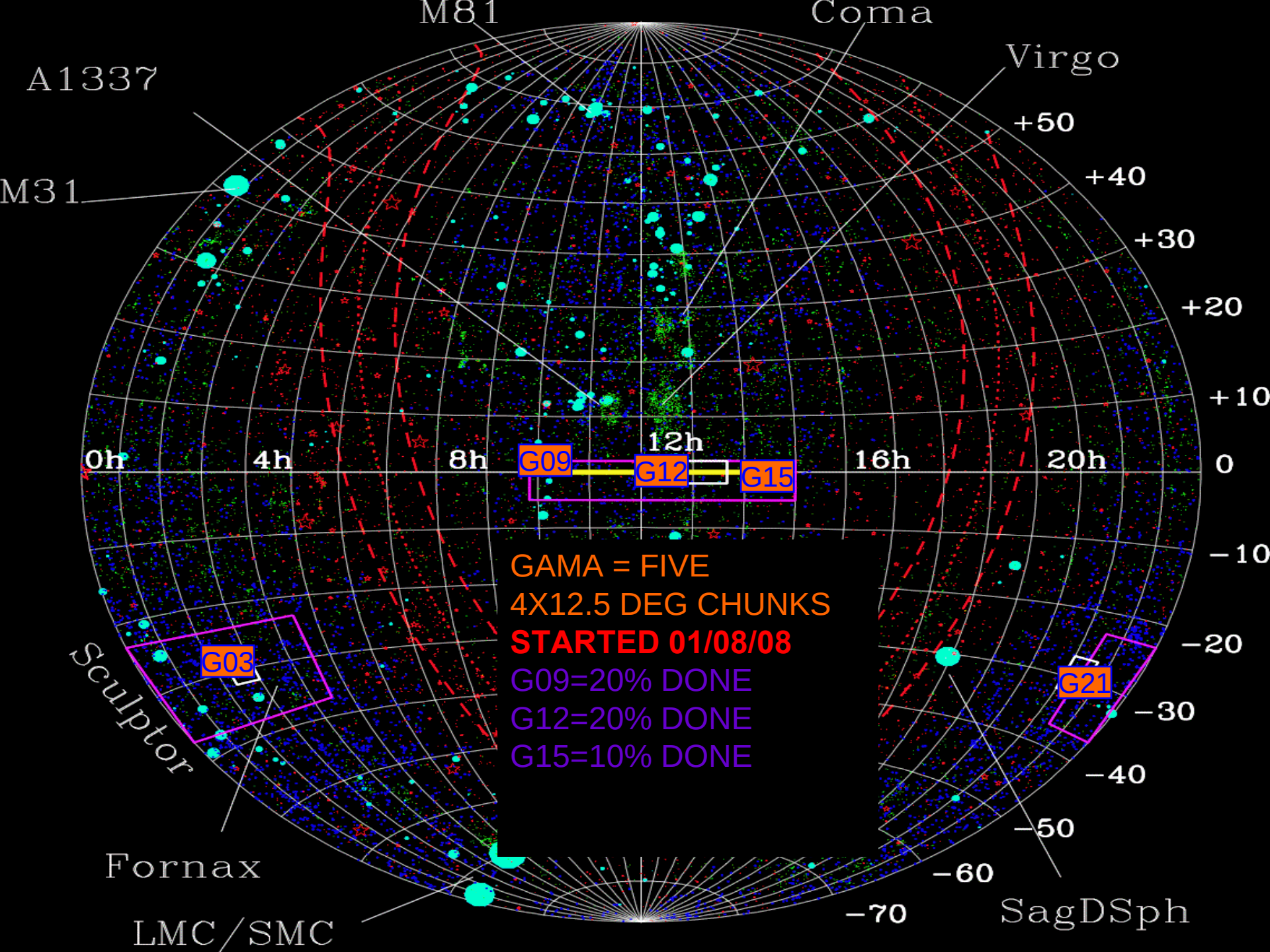
Bridges (AAO)
Bland-Haw'n (U.Syd)
Cameron (St And)
Conselice (Nott.)
Couch (Swin.)
Croom (U.Syd)
Cross (Edin.)
Frenk (Durham)
Graham (Swin)
Hill (StA)
Edmonson (Ports)
Jones (AAO)
Kuijken (Leiden)
Lahav (UCL)
Nichol (Ports.)
Oliver (Sussex)
Parkinson (Edin.)
Phillipps (Bristol)
Popescu (UCLan)
Eales (Cardiff)
Ellis (USyd)
Prescott (LJMU)
Proctor (Swin.)
Sharp (AAO)
Staveley-Smith (UWA)
Sutherland (Camb.)
Tuffs (MPIK)
van Kampen (Innsbruck)
Warren (Imperial)
Dunne (Nottingham)

TEAM AFFILIATIONS:

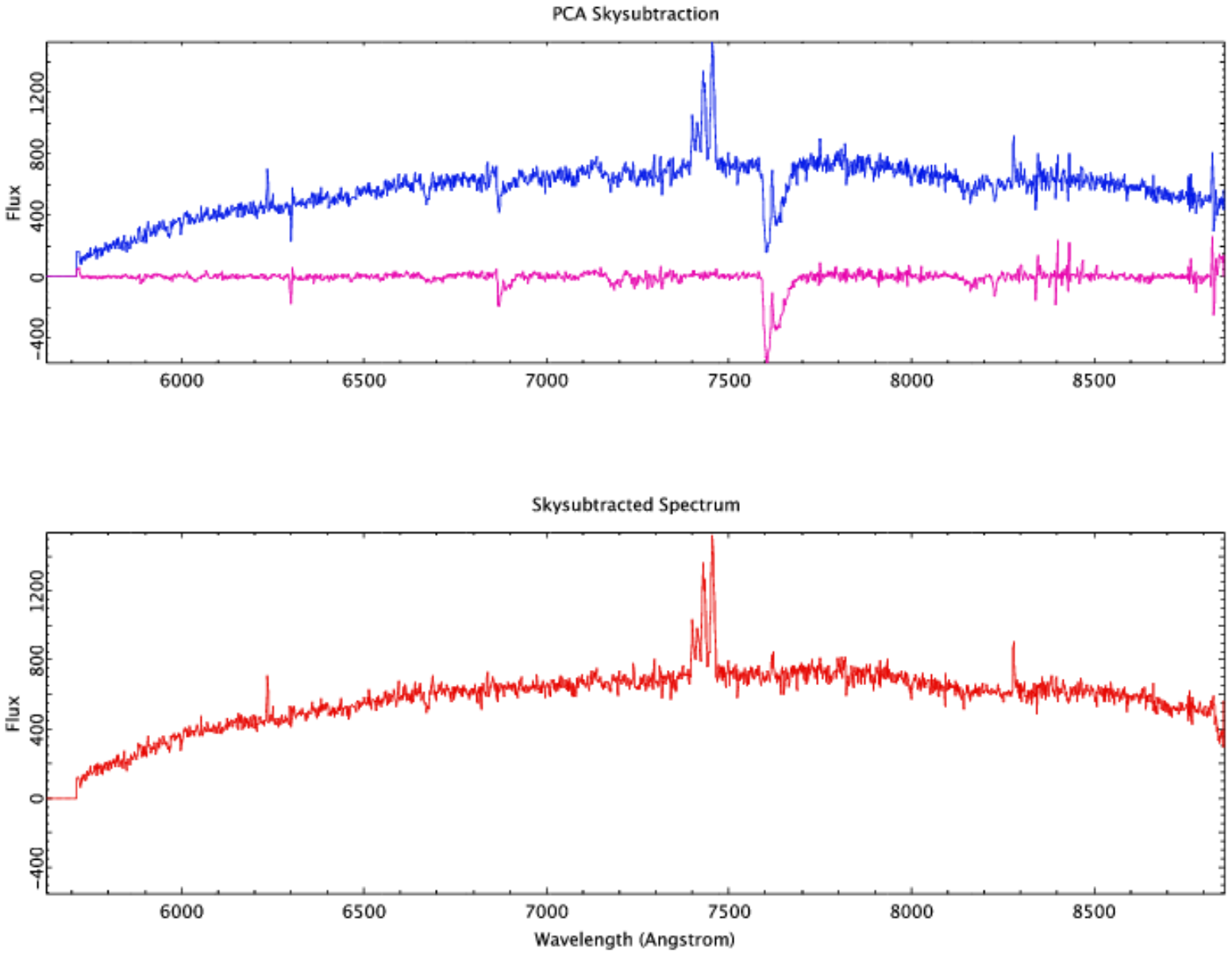
UKIRT/LAS, VST/KIDS, VISTA/VIKING, HERSCHEL-ATLAS, DURHAM ICC

WEBSITE:

http://www.eso.org/~jliske/gama/

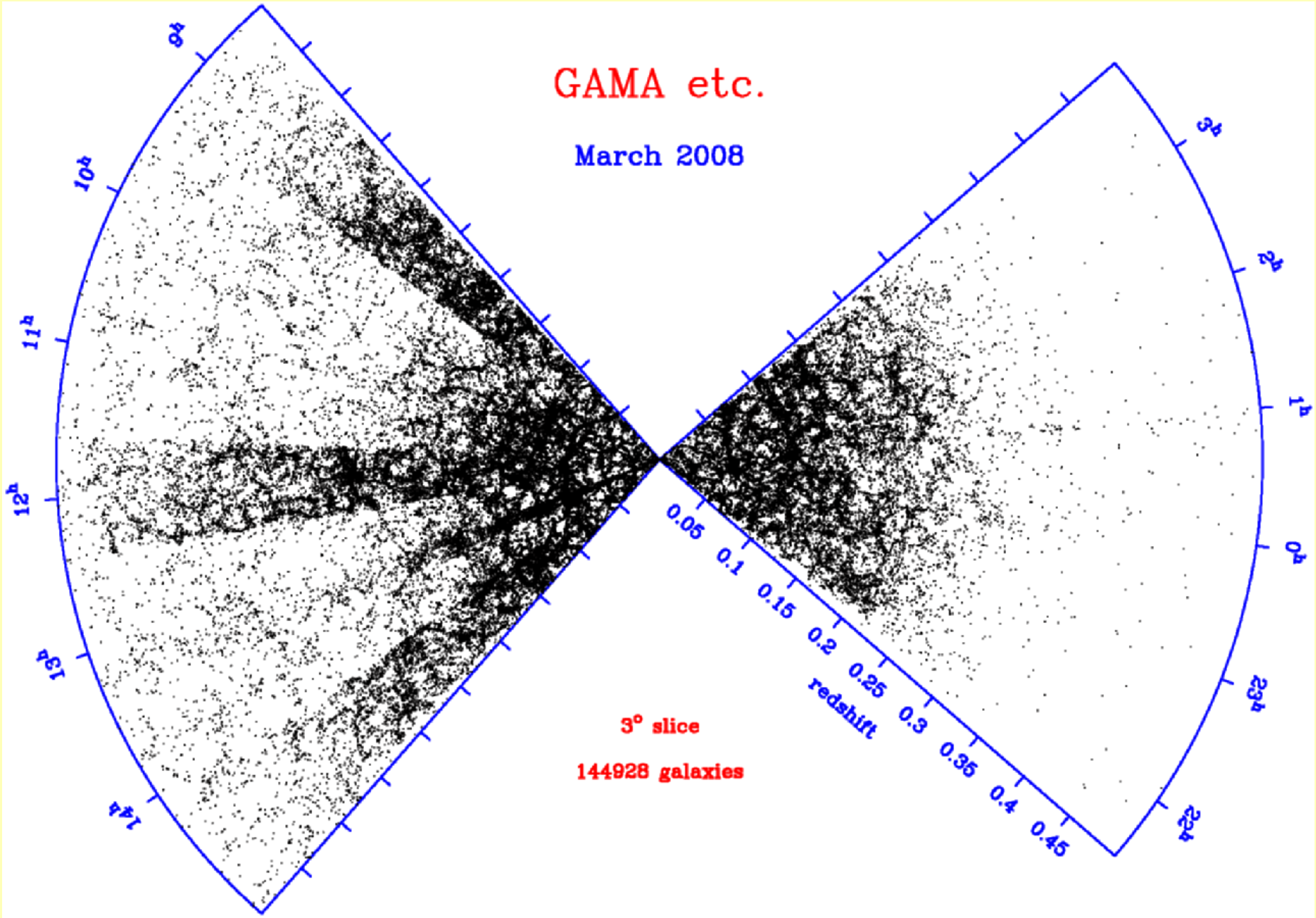

M81
Coma
Virgo
A1337
M31
+50
+40
+30
+20
+10
0
−10
−20
−30
−40
−50
−60
−70
0h
4h
8h
12h
16h
20h
G09
G12
G15
G03
G21
GAMA = FIVE
4X12.5 DEG CHUNKS
STARTED 01/08/08
G09=20% DONE
G12=20% DONE
G15=10% DONE
Sculptor
Fornax
LMC/SMC
SagDSph

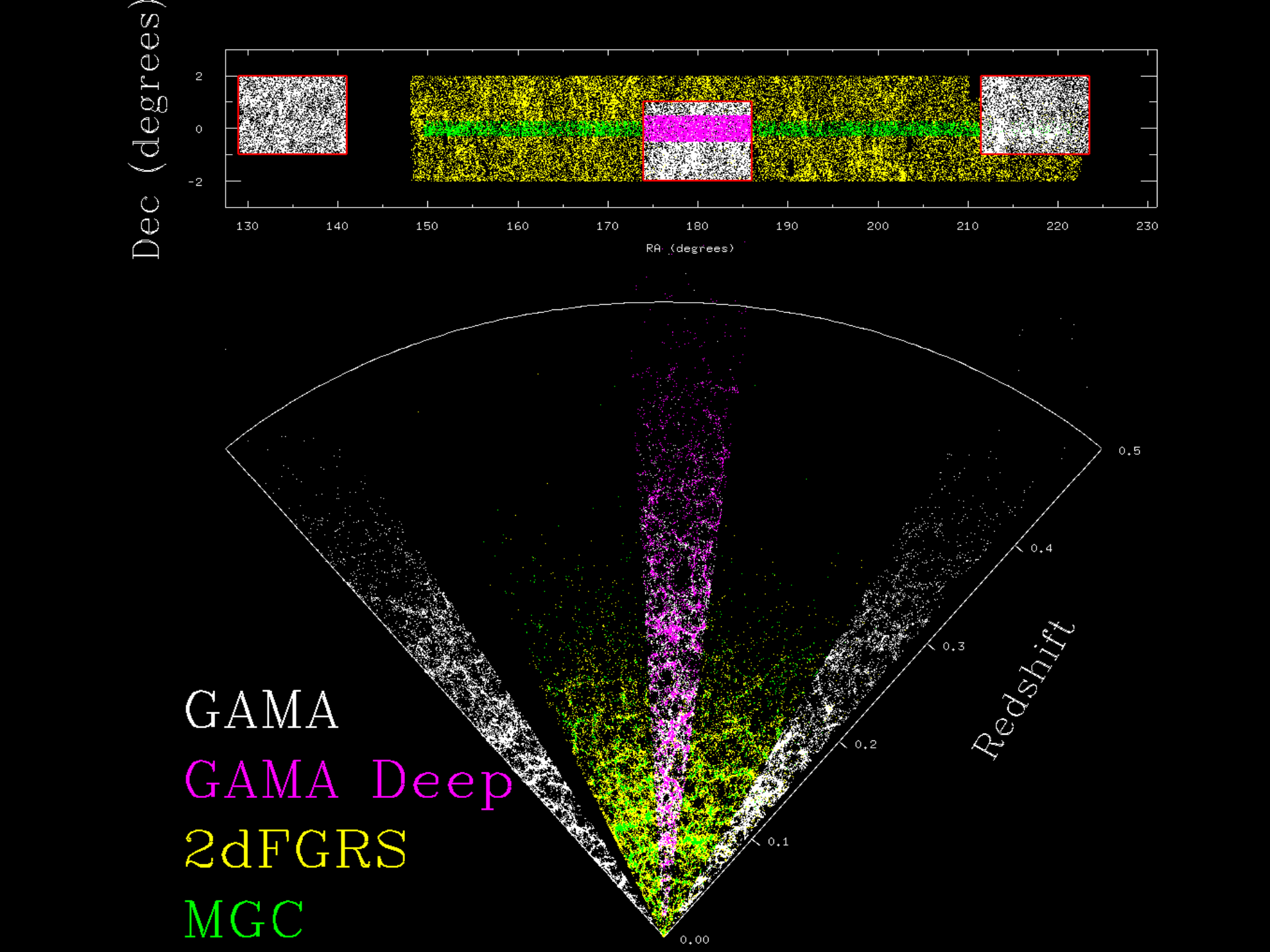
PCA sky subtraction



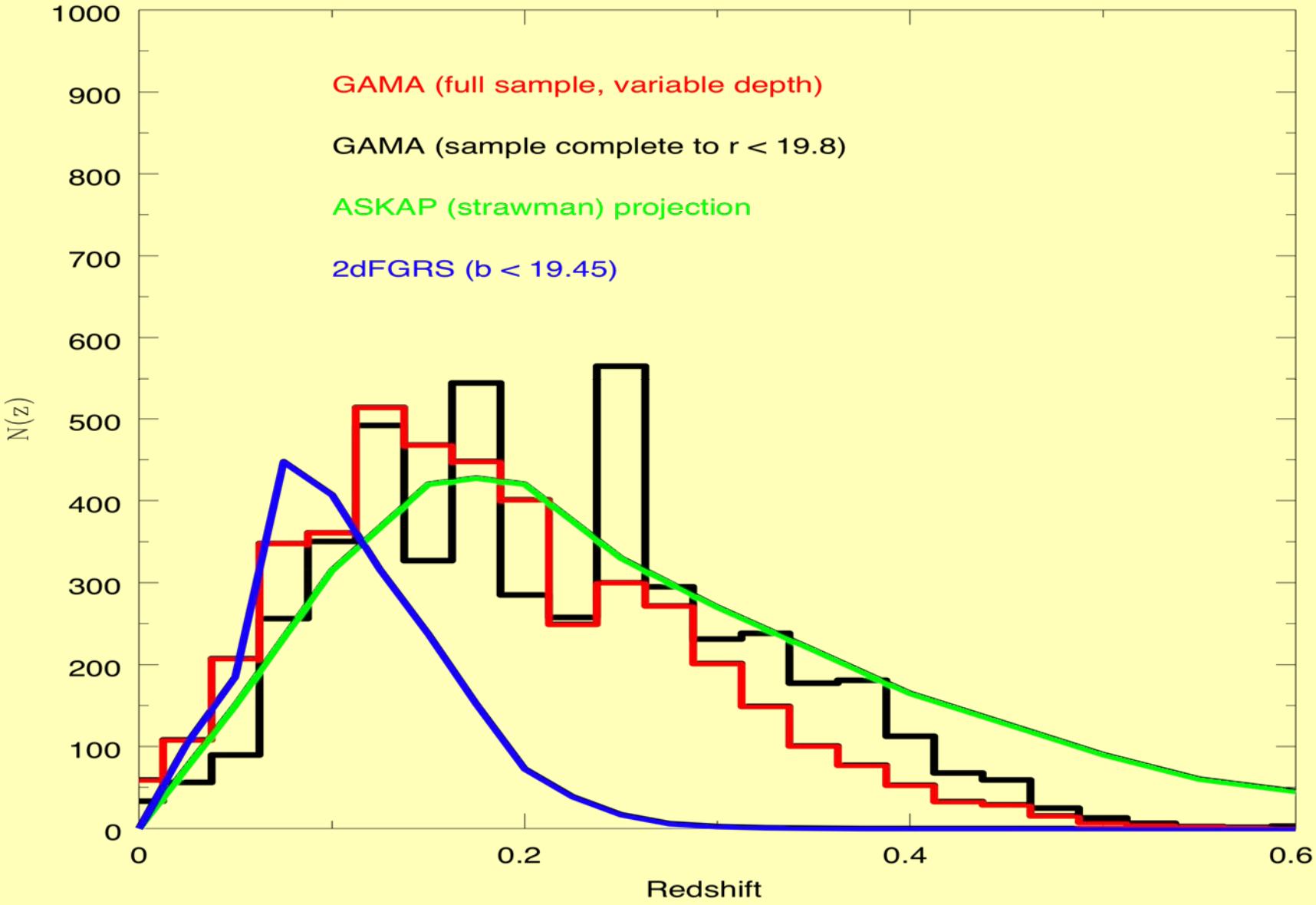
Hannah Parkinson

GAMA: year 1 cone diagram

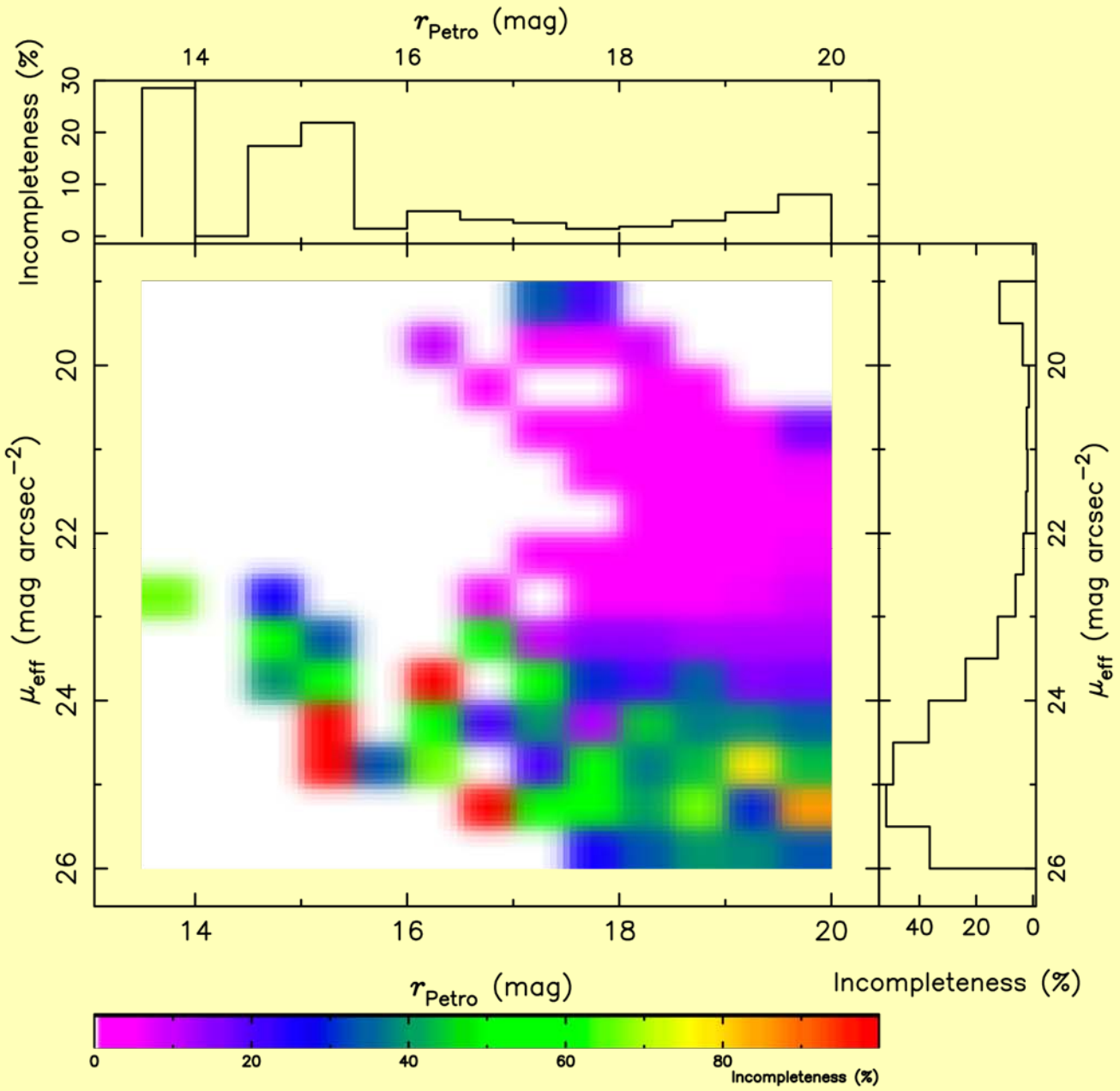



Dec (degrees)
2
0
-2
130
140
150
160
170
180
190
200
210
220
230
RA (degrees)
0.5
0.4
0.3
0.2
0.1
0.00
Redshift
GAMA
GAMA Deep
2dFGRS
MGC

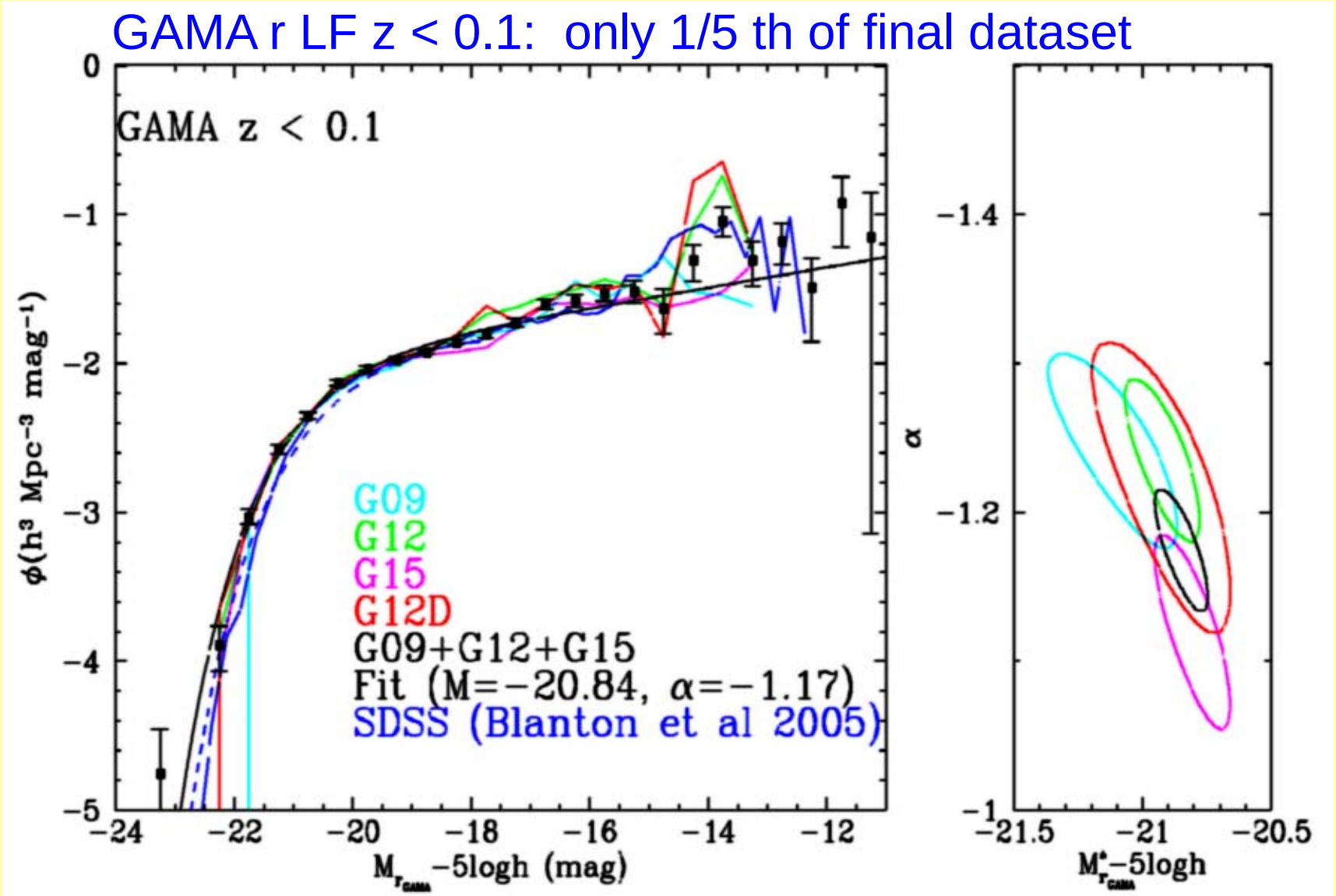
GAMA: year-1 N(z)



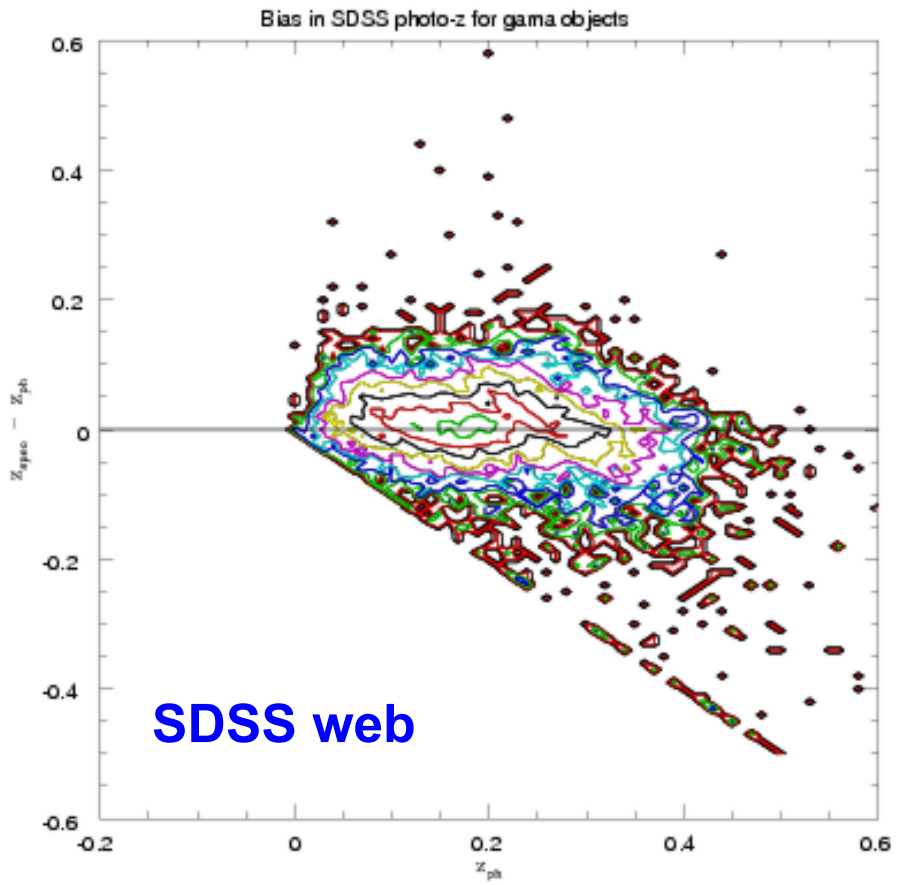
Completeness and surface brightness

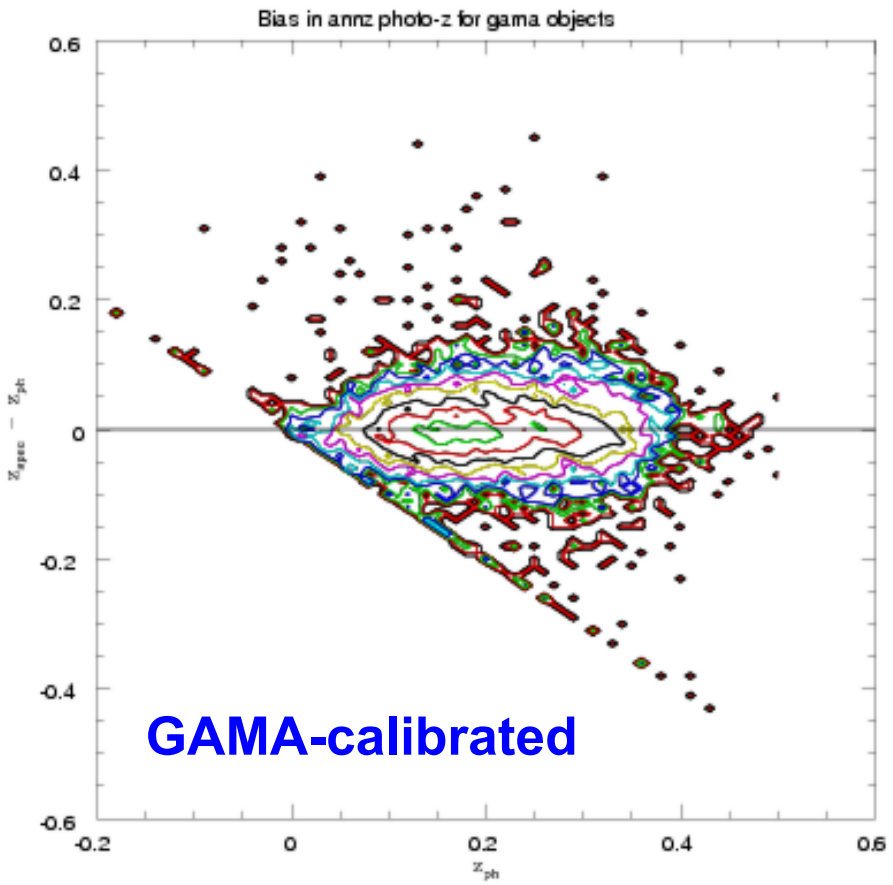


The GAMA luminosity function



Improved SDSS photo-z's





Hannah Parkinson

GAMA: multiwavelength legacy