Cosmic Evolution Survey (COSMOS)

HST image 2 deg.^{2} !

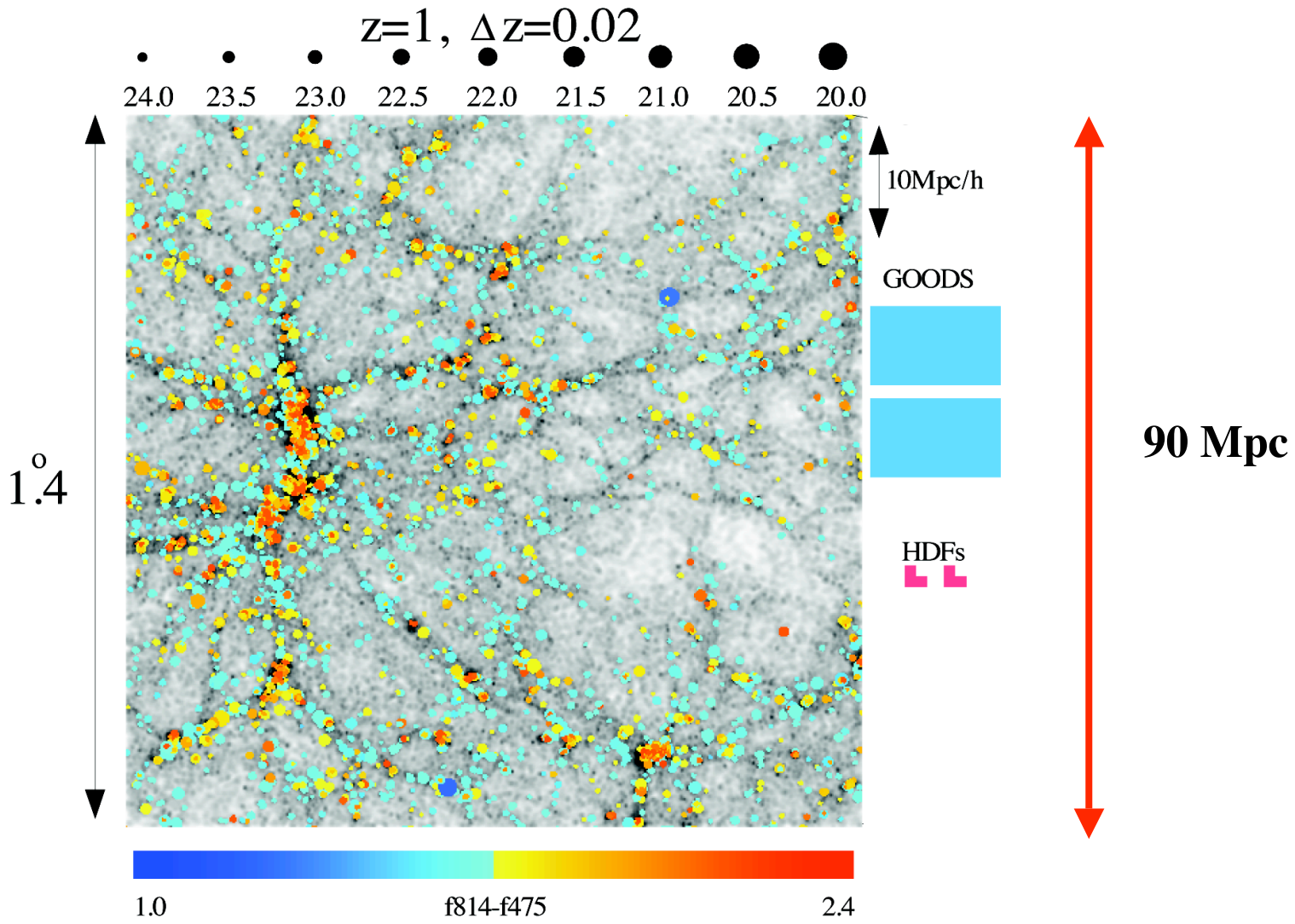
590 orbits in Cy 12-13

+ VLT-VIMOS, XMM, Subaru, VLA, Spitzer, Galex, …

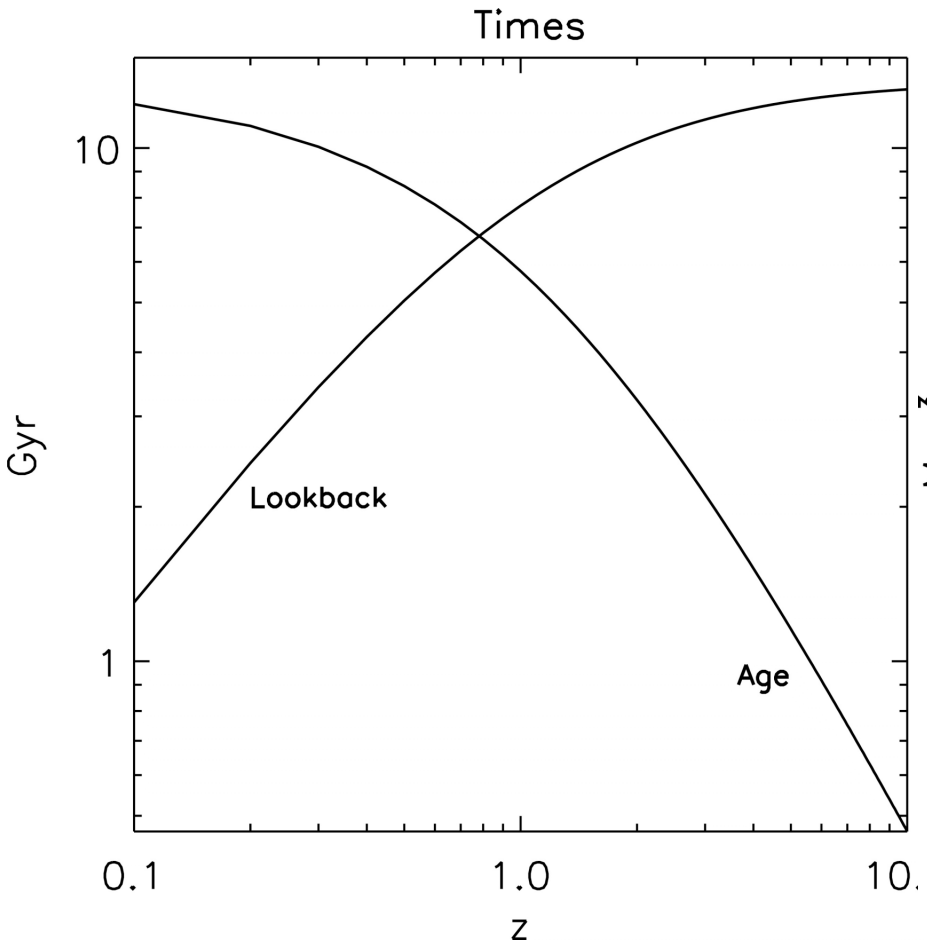
- **rational for survey**
- **major multi-wavelength components**
- **identification of structures**
- **galaxy evolution vs z and environment**

Coupled evolution of LSS, galaxies, star formation, AGN w/ Z

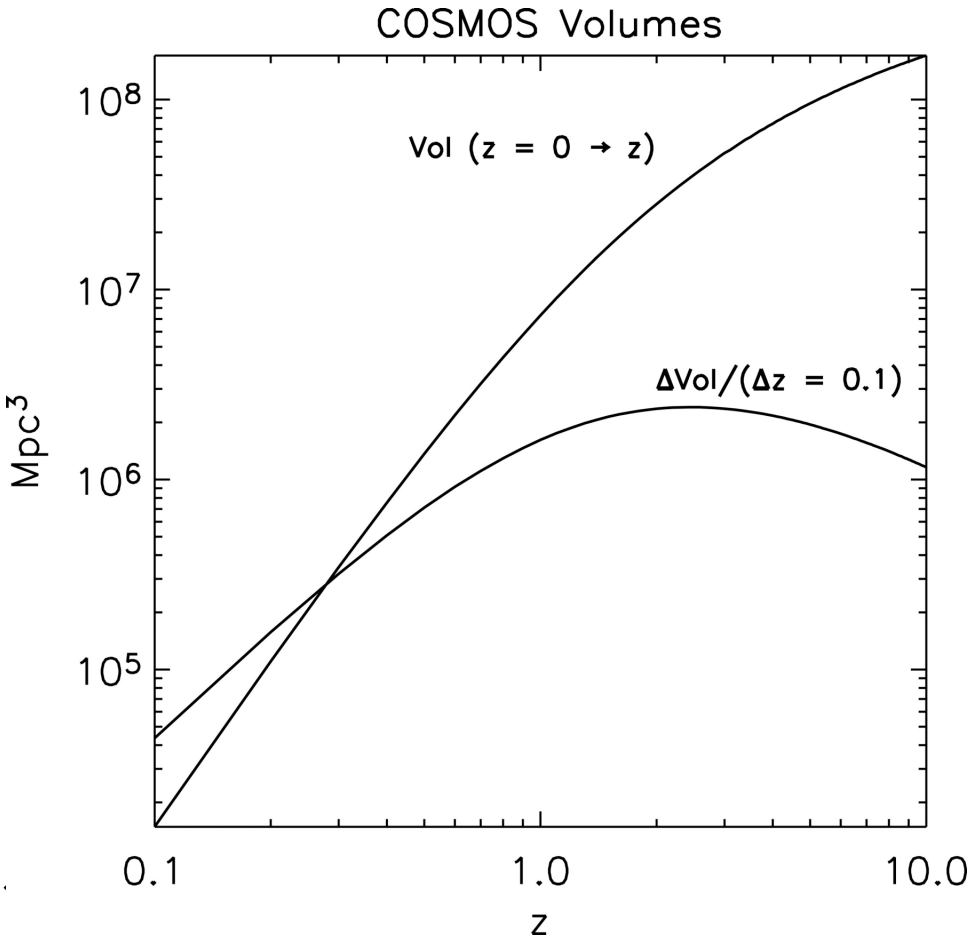
redshift slice from Λ CDM sim.



==> ~ 2 million galaxies !!



Lookback 8-10 Gyr



covers vol ~ SDSS at z ~1

COSMOS field : **1.4x1.4 deg near equator**

RA = 10:00:28.6 DEC = +02:12:21

(near but shifted from VVDS 10 hr field)

E_{B-V} = 0.02 mag ! and very uniform

!! most important : all instruments can see field

e.g. VLA, ALMA future TMT/OWL

Infrared Backgrounds and Sensitivities (1600 sec)

Field	8μm		24μm		100μm
	Background	$S_\nu(5\sigma)$)	Background	$S_\nu(5\sigma)$)	Background
COSMOS	6.9	12.7	32.3	0.080	0.90
Lockman, CDF-S	5.0-5.3	11.0	18.4-19.4	0.061	0.45
SWIRE-XMM	7.1	12.9	31.1	0.078	1.25

==> rel. sens. only ~20 - 25% worse than very best fields

COSMOS -- 38 ==> 80 team members --
US, Japan, Europe and Canada

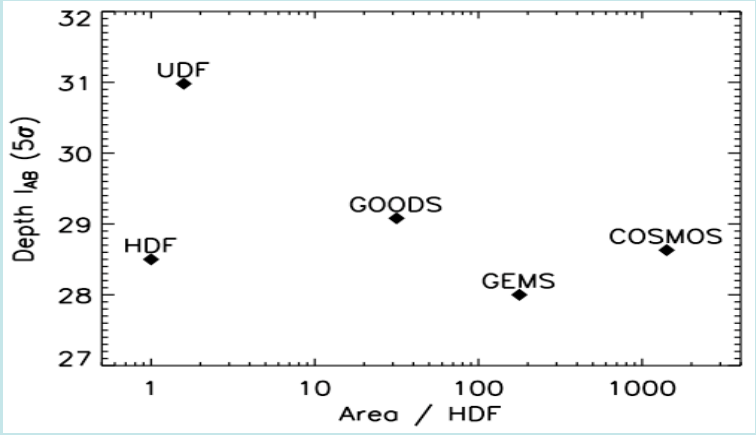
Telescopes :

Hubble -- very fine & sensitive optical images
XMM -- xray imaging
Galex -- ultraviolet imaging
Spitzer -- Mid IR w/ IRAC

Subaru -- multiple color imaging
VeryLargeArray -- radio imaging
ESO-VLT & Magellan-- opt. spec. ~ 45,000 gal.
NIR -- NOAO, UH88, UKIRT …

Submm : MAMBO, BOLOCAM, AZTEC, LABOCA

Cosmic Evolution Survey



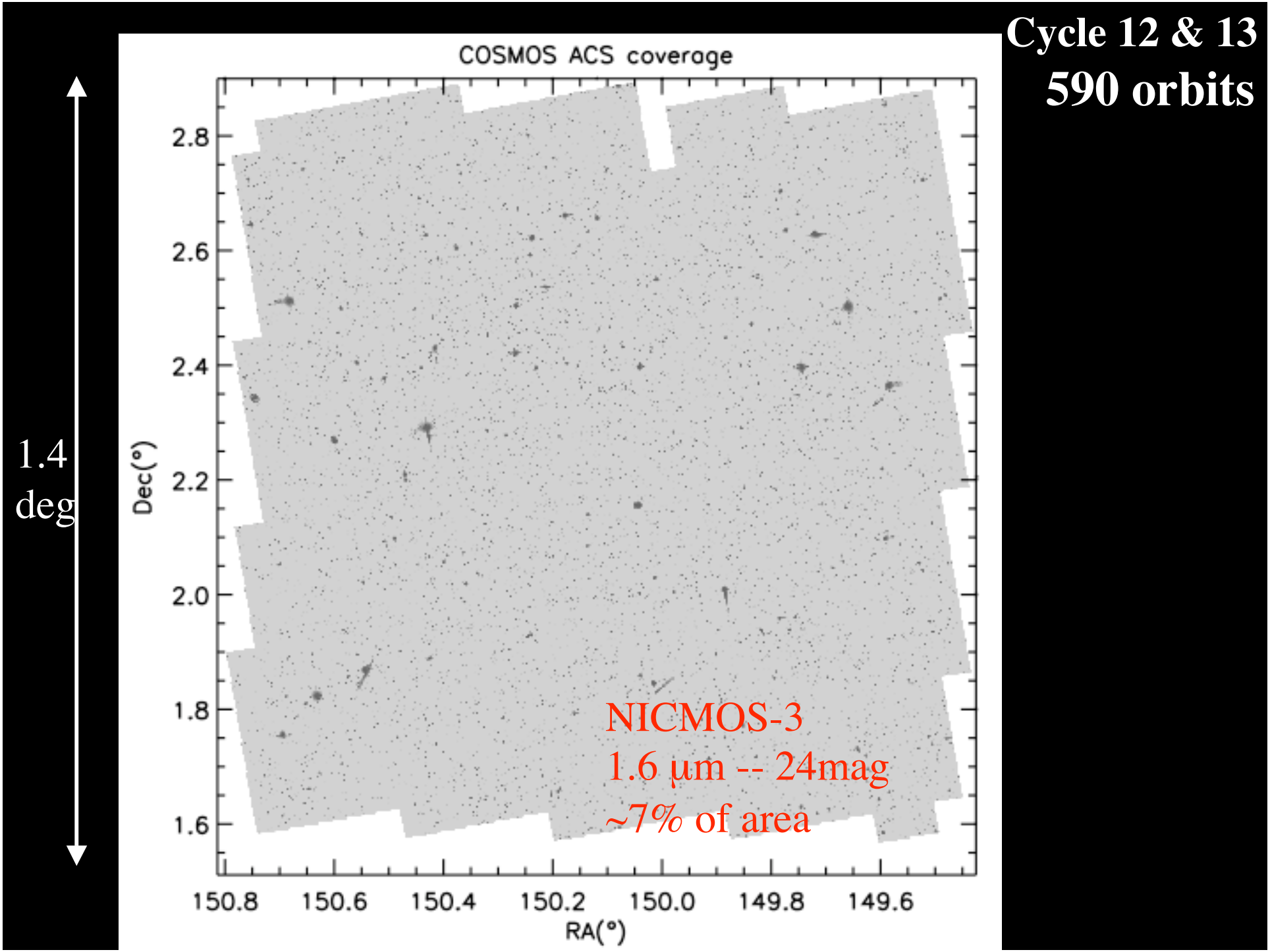
Major features :

- **large area -- 1.4 x 1.4 deg**
  => cover largest large scale structures

- **high sensitivity (I > 28.6 mag AB , 5σ)**
  => morphology of L_* galaxies at z < 2

- **sensitivity + area**
  => 2×10^6 galaxies , unusual objects at higher z

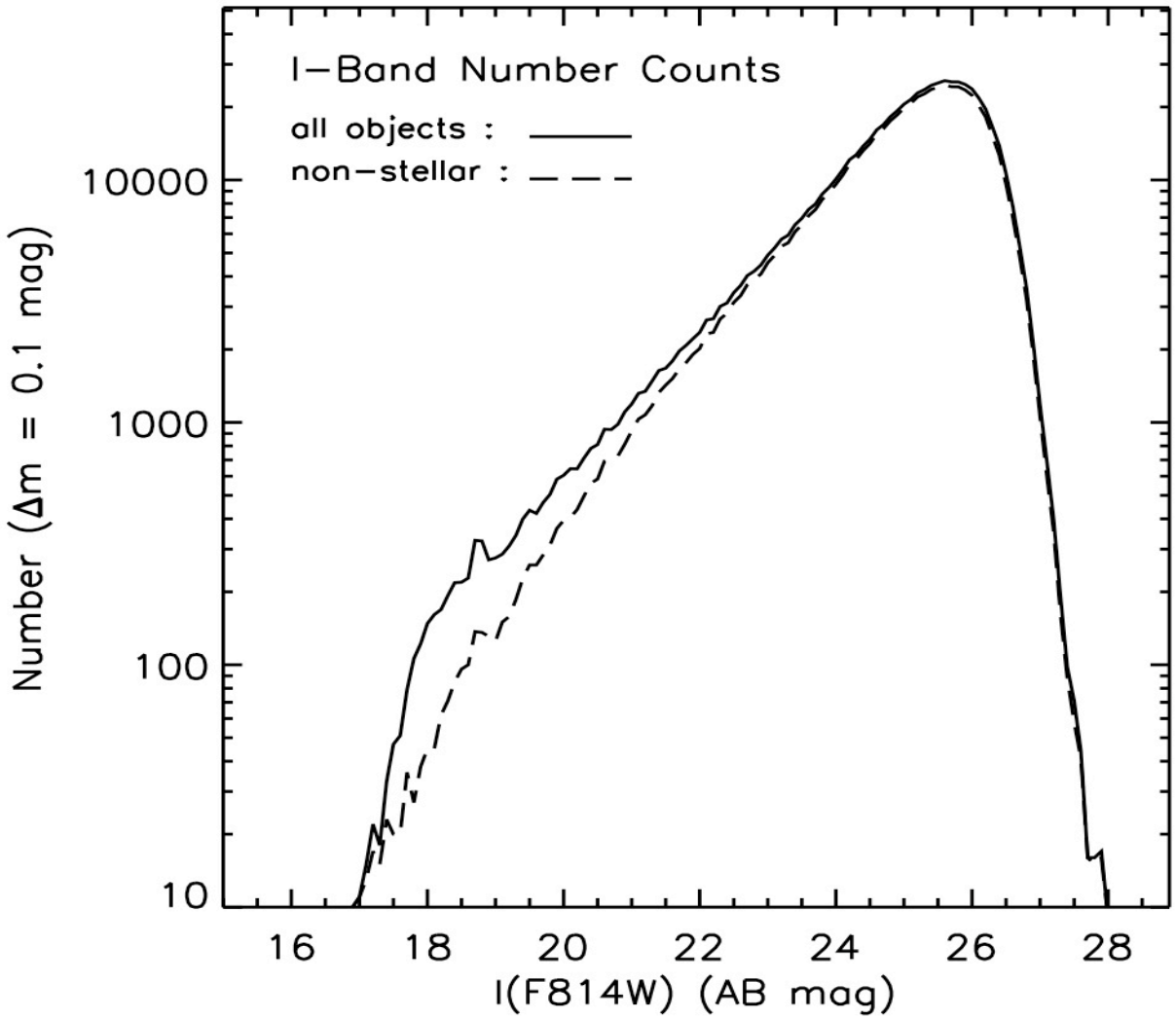
- **equatorial => multi-λ observations from all tel.**


Cycle 12 & 13
590 orbits
1.4
deg
COSMOS ACS coverage
Dec(°)
2.8
2.6
2.4
2.2
2.0
1.8
1.6
150.8
150.6
150.4
150.2
150.0
149.8
149.6
RA(°)
NICMOS-3
1.6 μm -- 24mag
~7% of area

ACS source counts

Enormous area and sensitivity

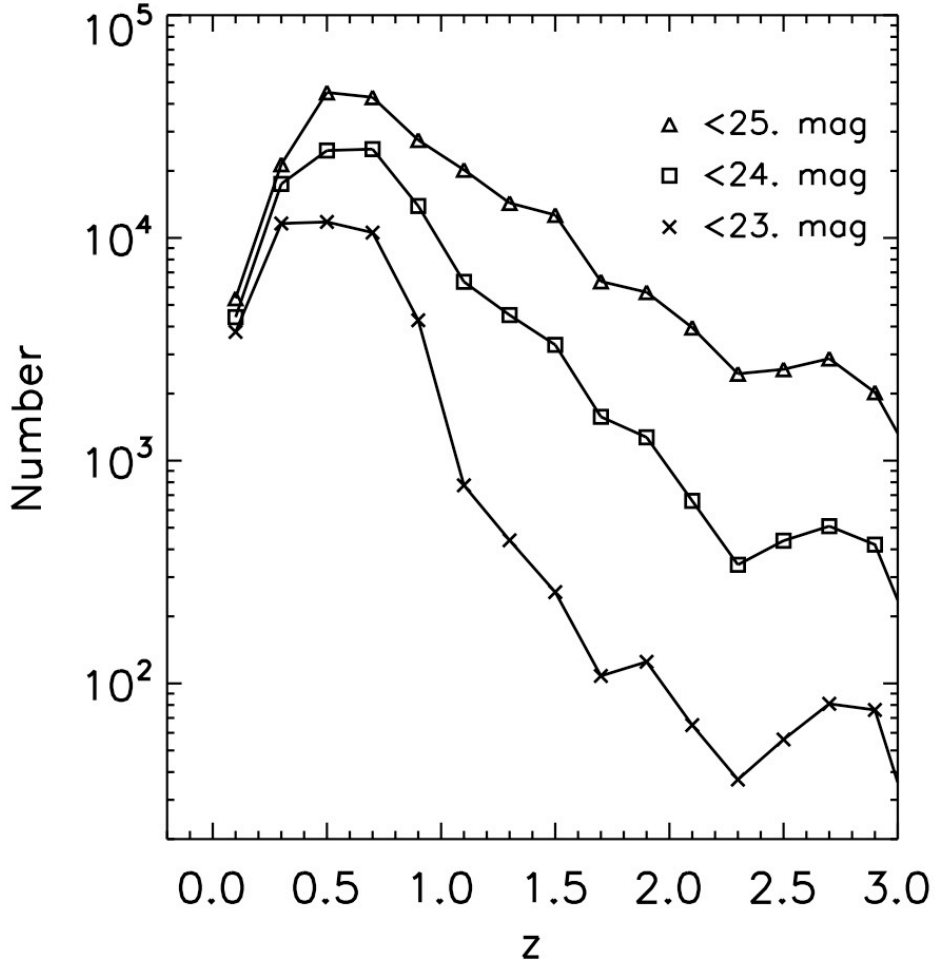
==> large samples of all objects :



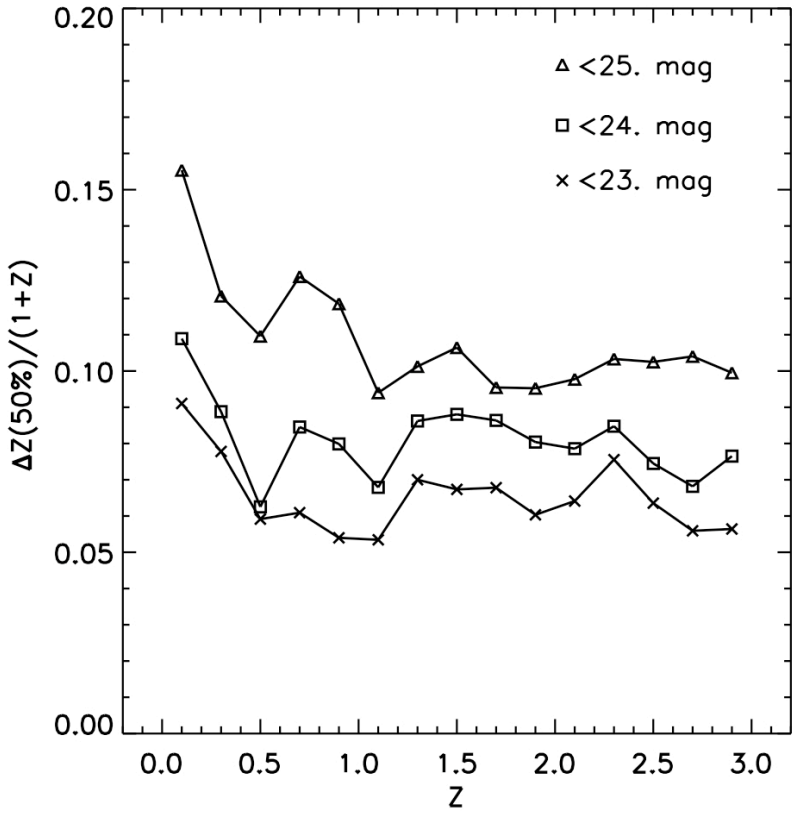
!!

COSMOS Photo-z catalog (Subaru, CFHT, NOAO)

Redshift distribution



Redshift uncertainties

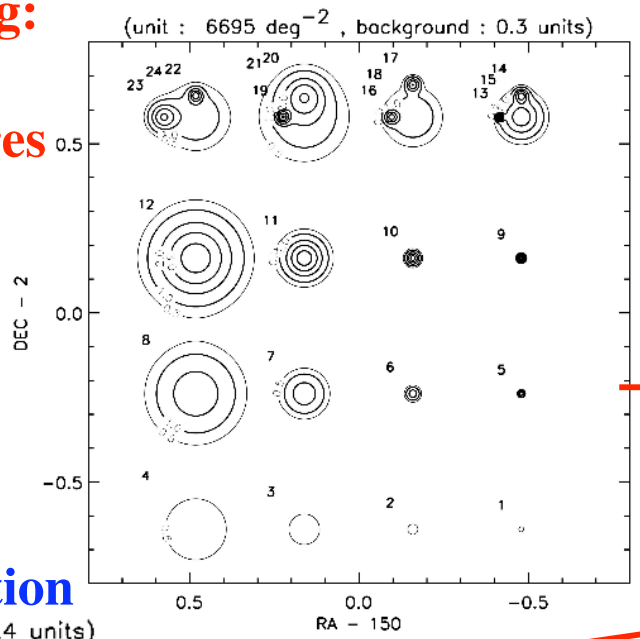


LSS from galaxy overdensities in redshift slices ==>

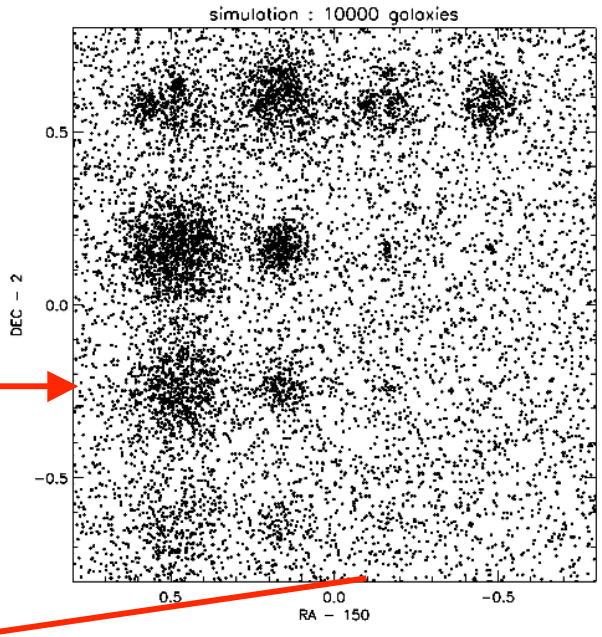
Test of adaptive smoothing:

~ 50% of gal. w/i structures
~ 50% in field

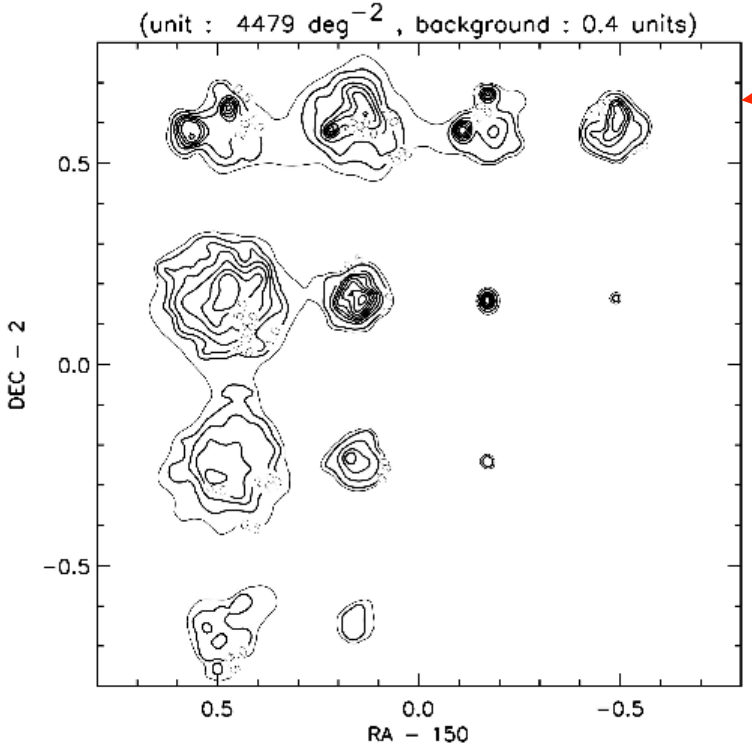
overdensity



galaxies



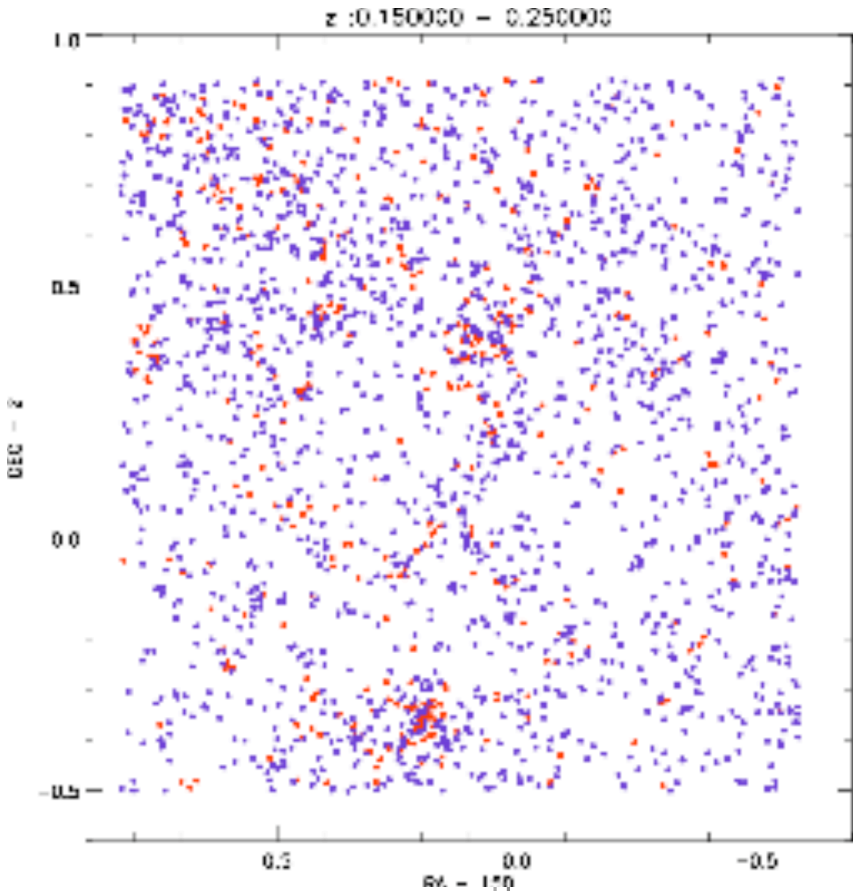
recovered distribution



- **recovers all significant structures**
- **retains power on all scales**
- **no spurious recoveries**
- **conserves number counts**

All SED types (not just early types)

redshift slices w/ $\Delta z = 0.1$



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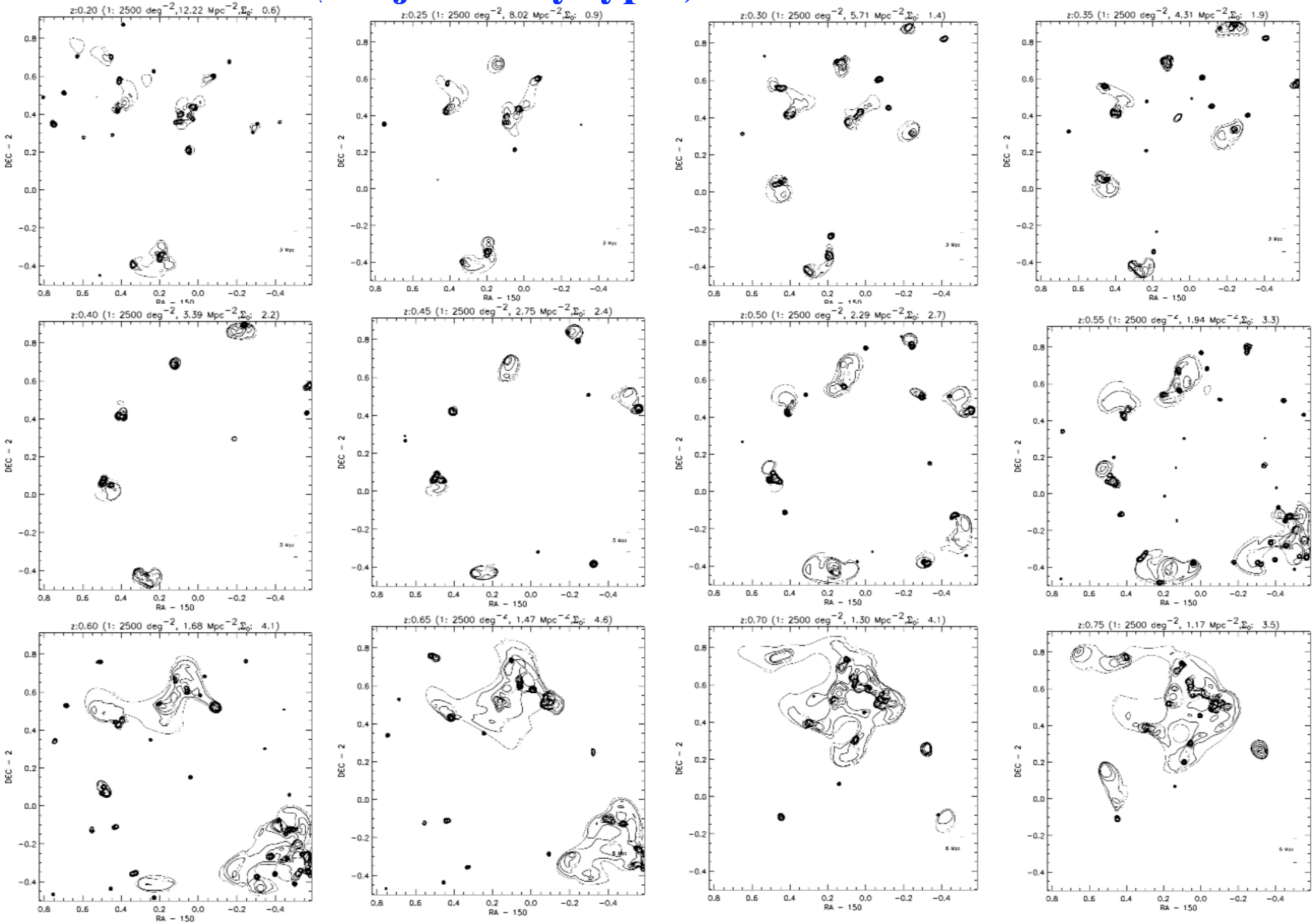
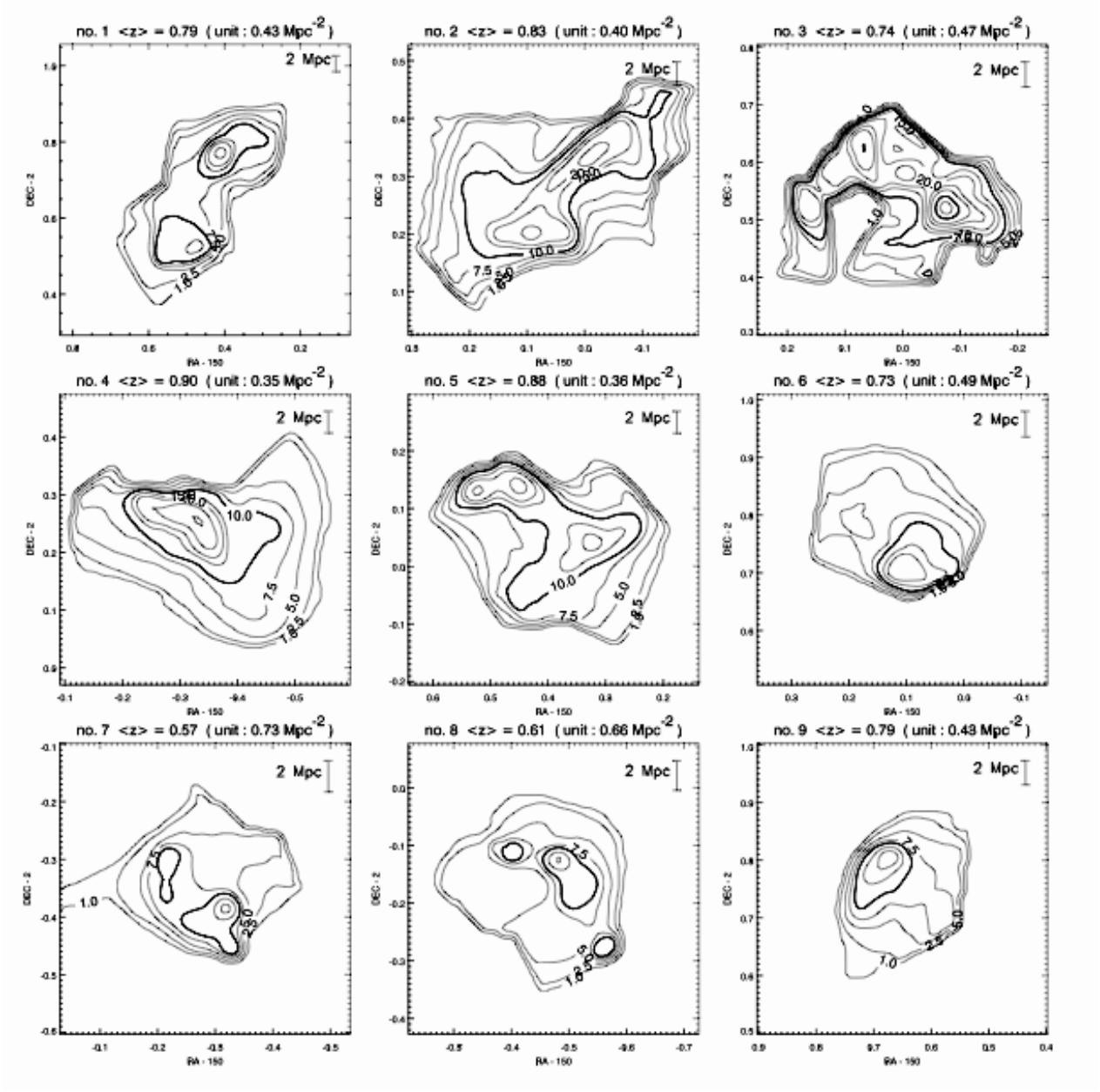


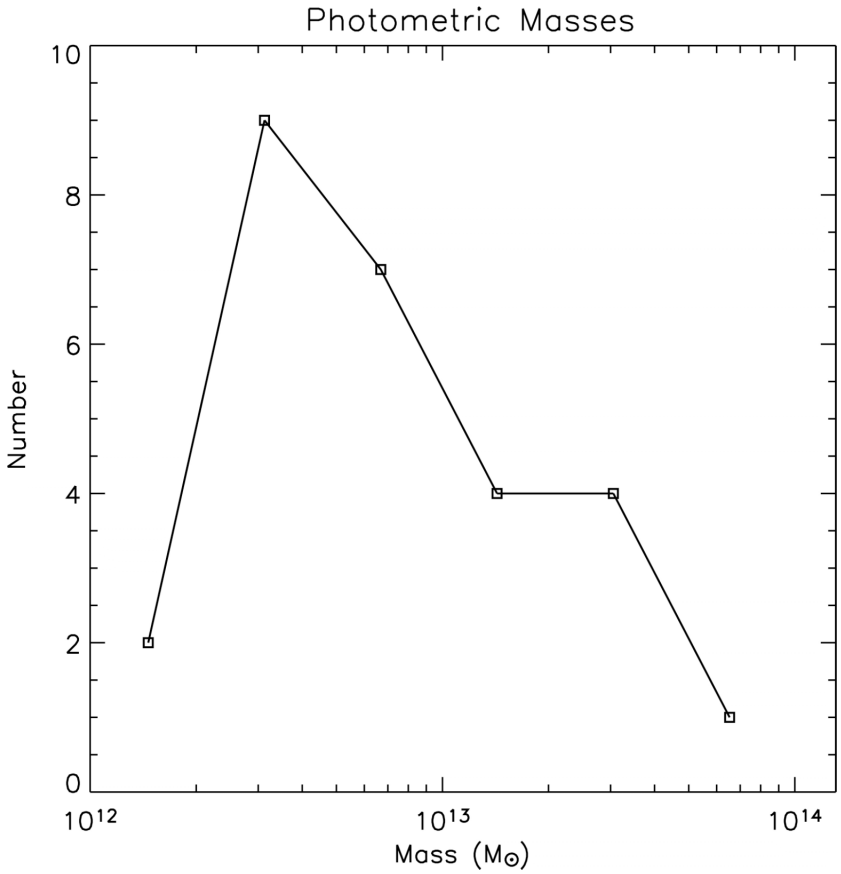
Σ_{gal}

w/i
each LSS

~ 40 major large-scalestructures at z < 1.2

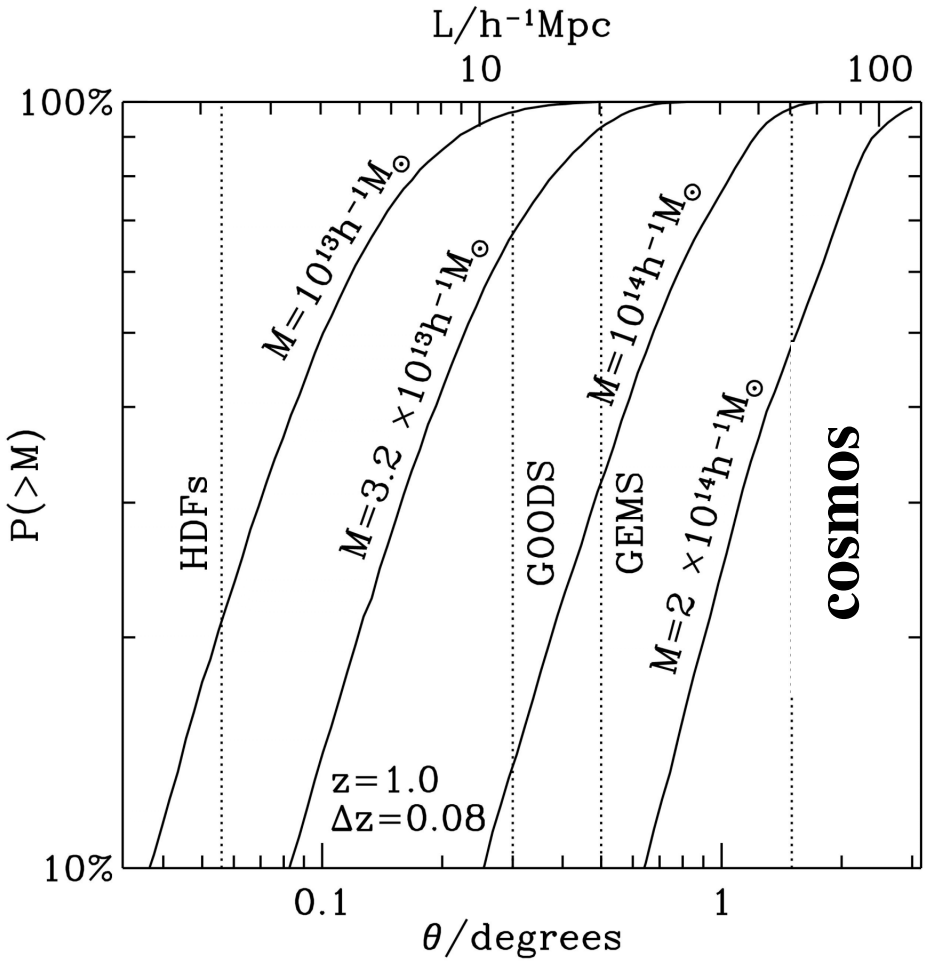


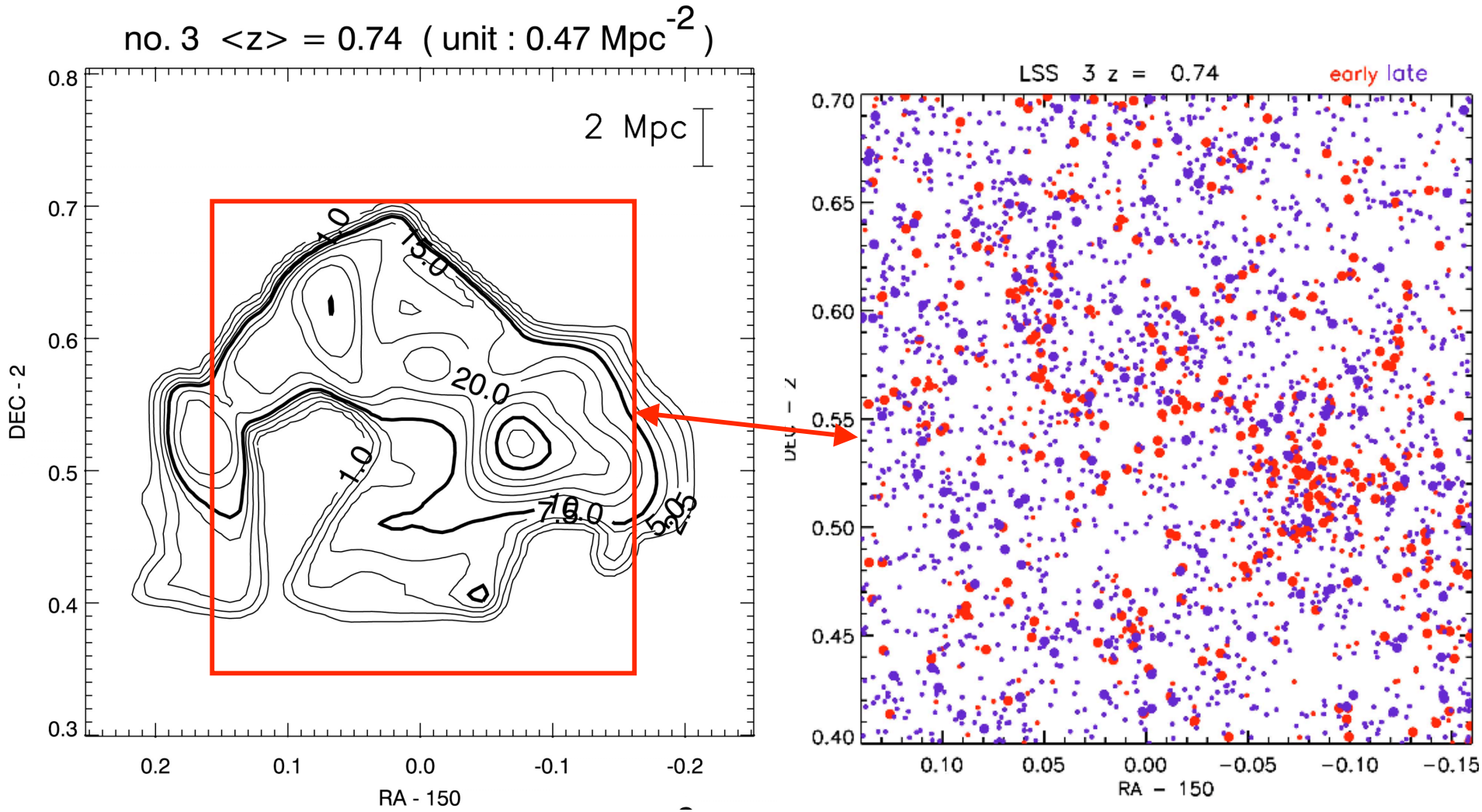
LSS mass : Σ galaxies w/i each LSS



Photometric/luminous mass
(DM halo ~ 10^{+} times larger)

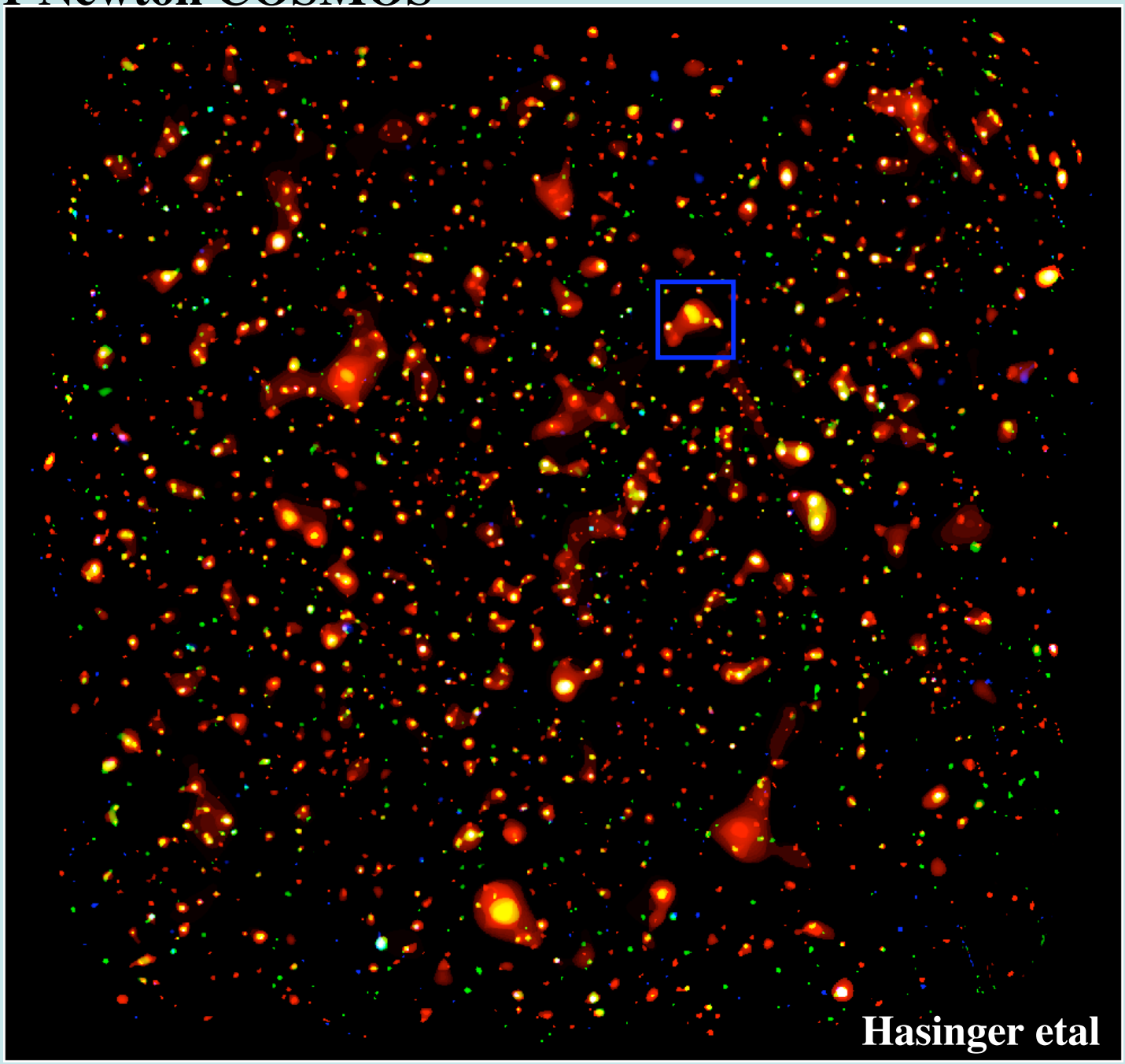
Prob. of halo mass structures

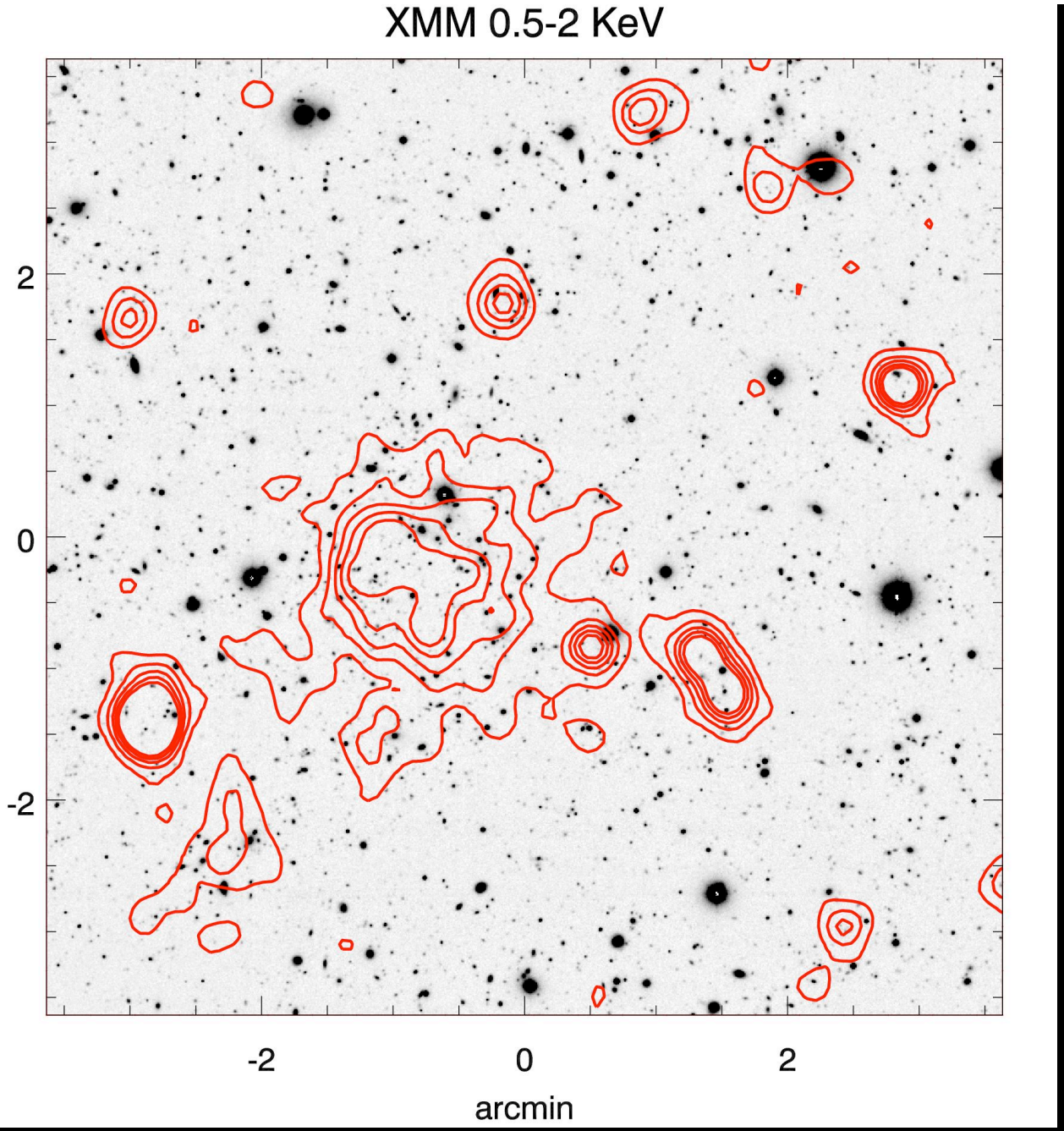




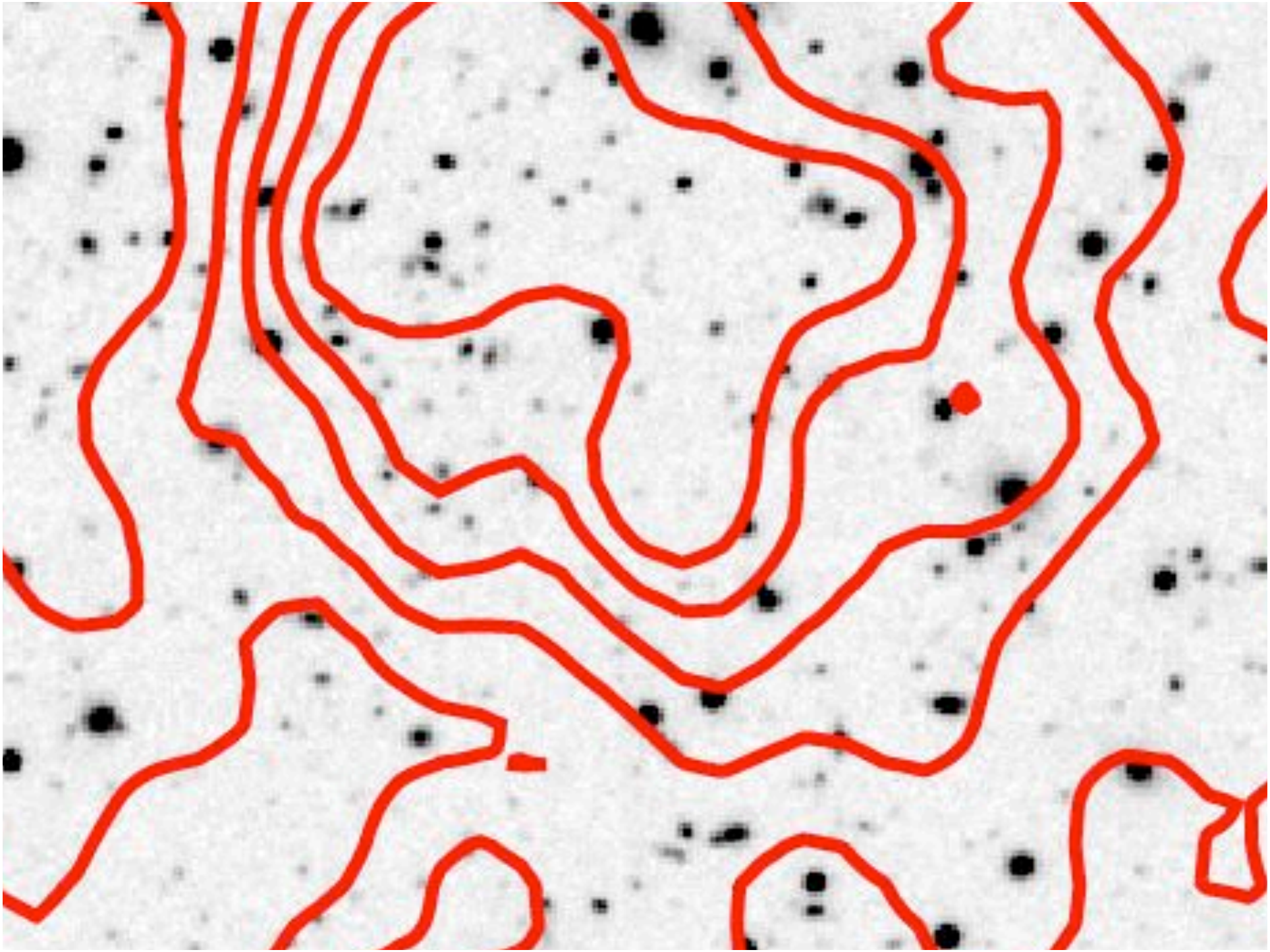
luminous early-type ==> dense core of LSS

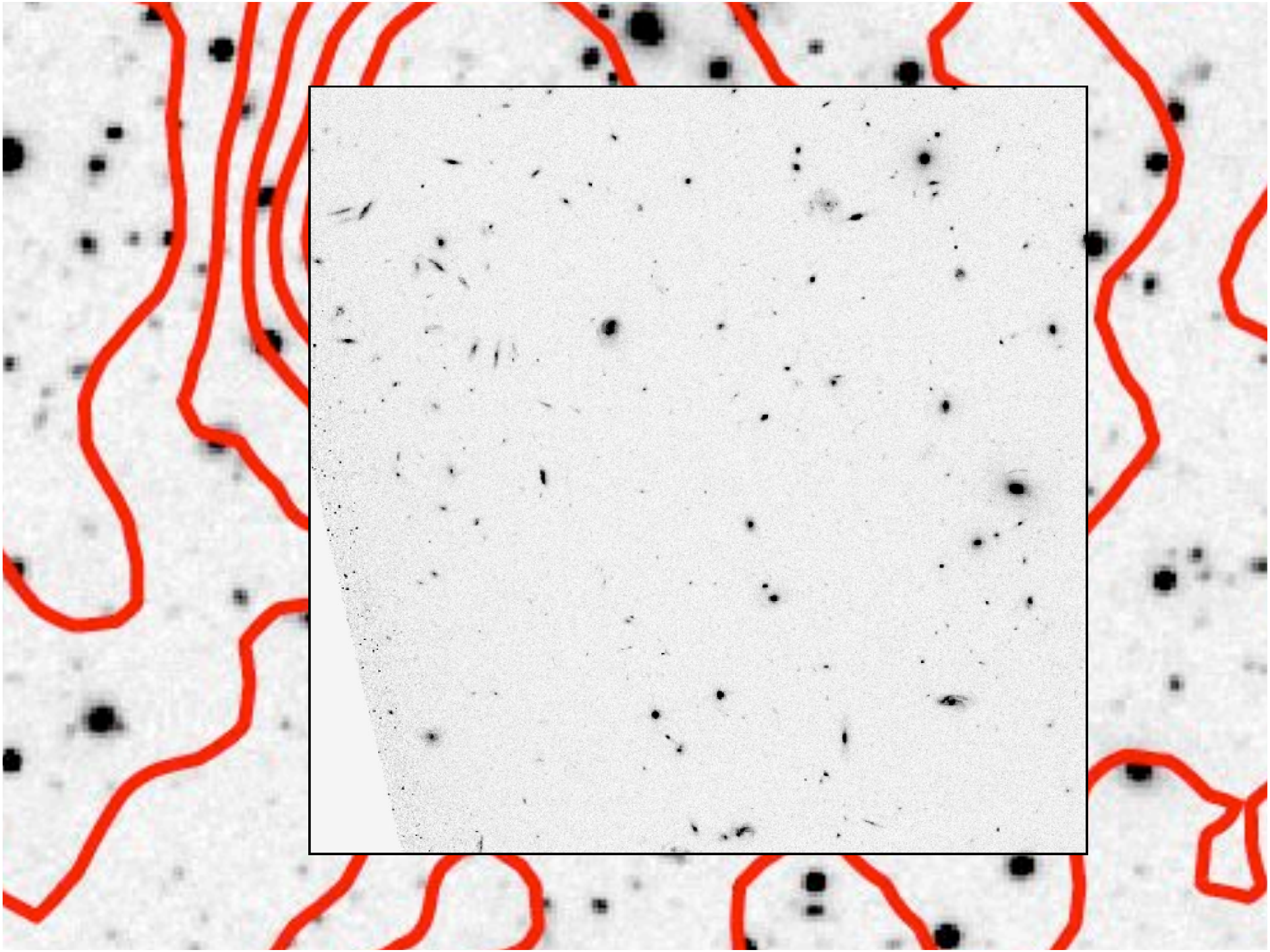
XMM-Newton COSMOS



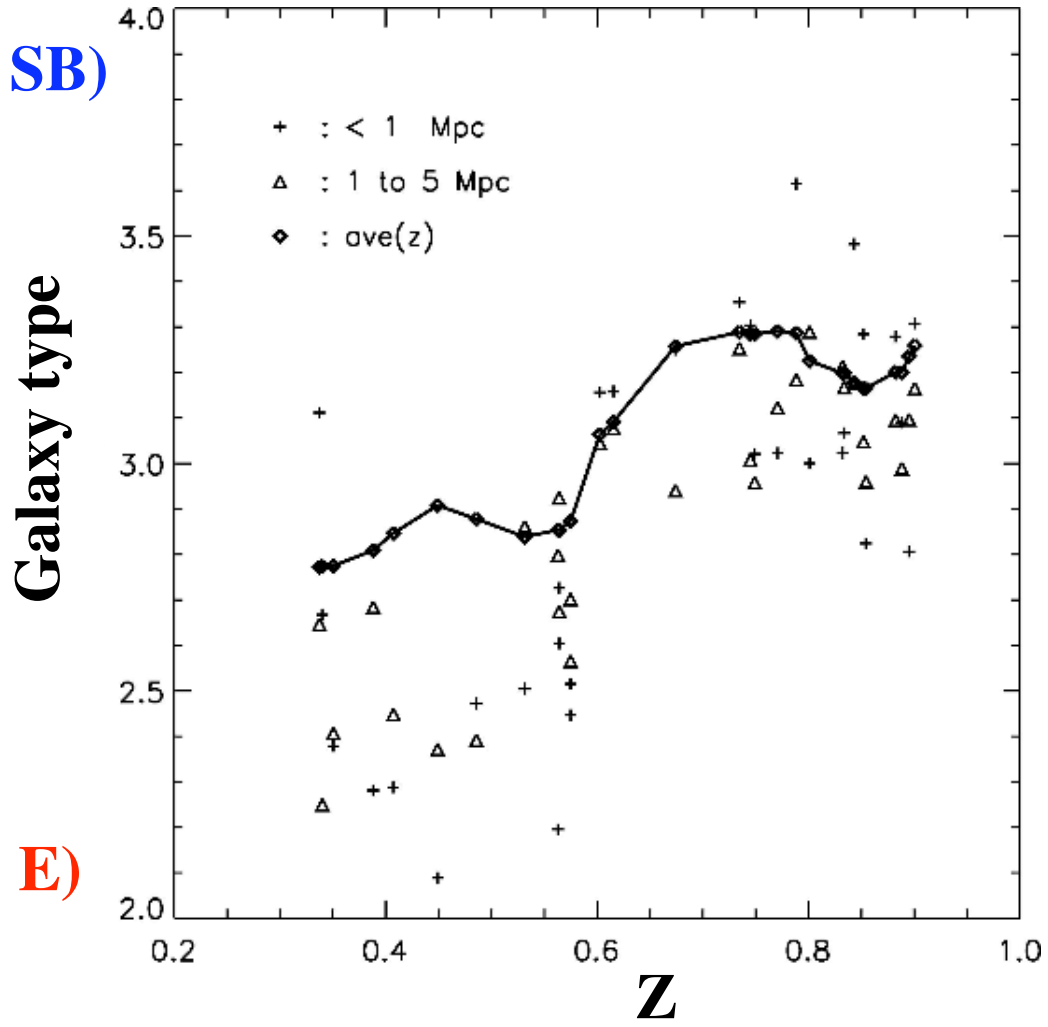


X-ray: COSMOS-XMM survey (Hasinger et al.)





Late (spirals and SB)



Early (S0 & E)

higher z ==> later type SED

cores of LSS/halos ==> earlier type SED

see LSS out to highest z !

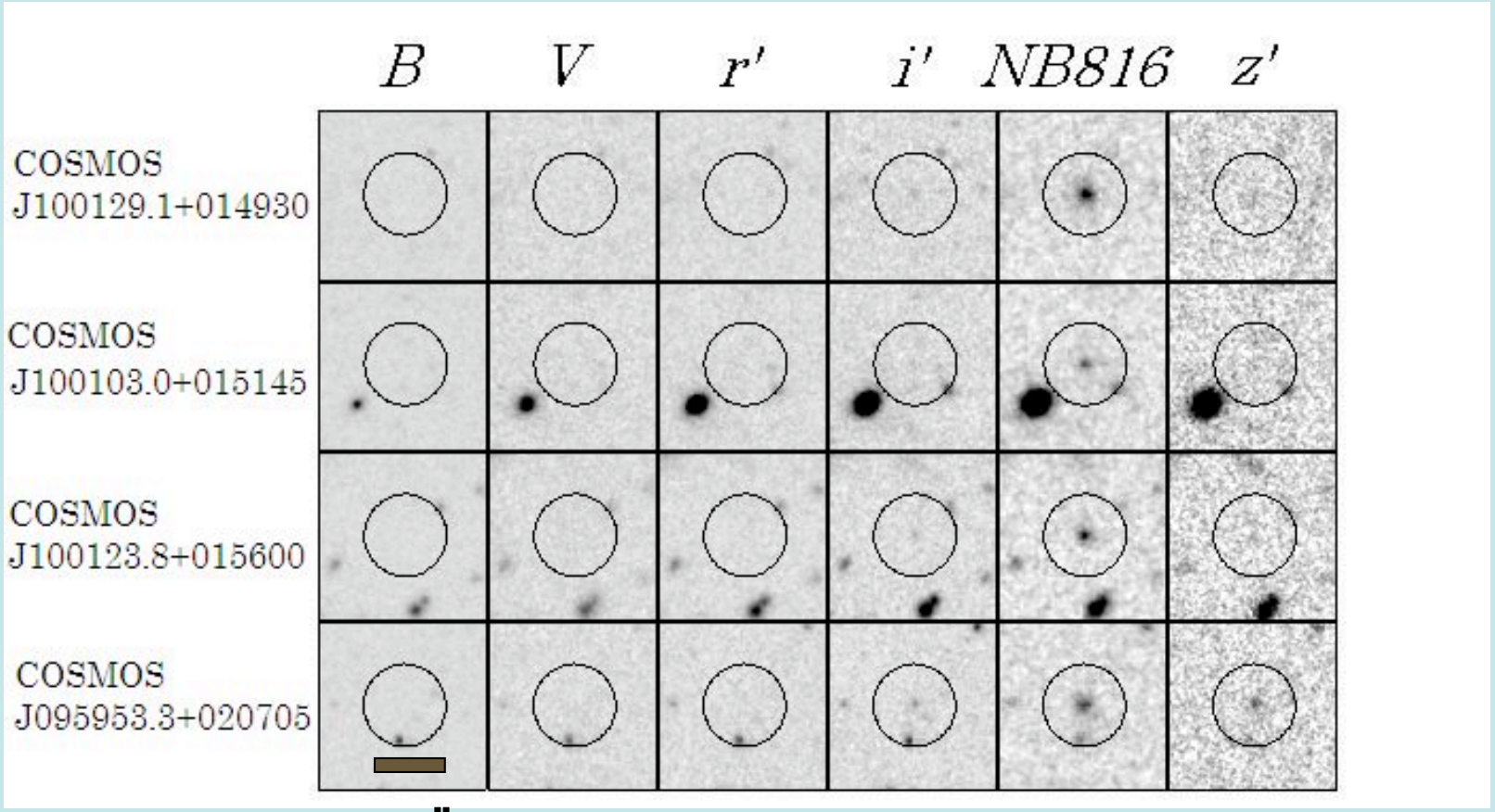
Ly Alpha emission @ z=5.7 in the COSMOS

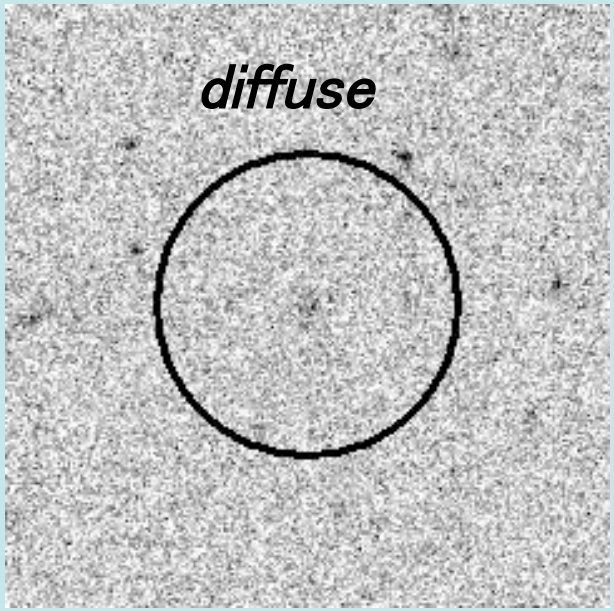
narrow band subaru imaging at 8150 Ang.
Taniguchi & Ajiki etal

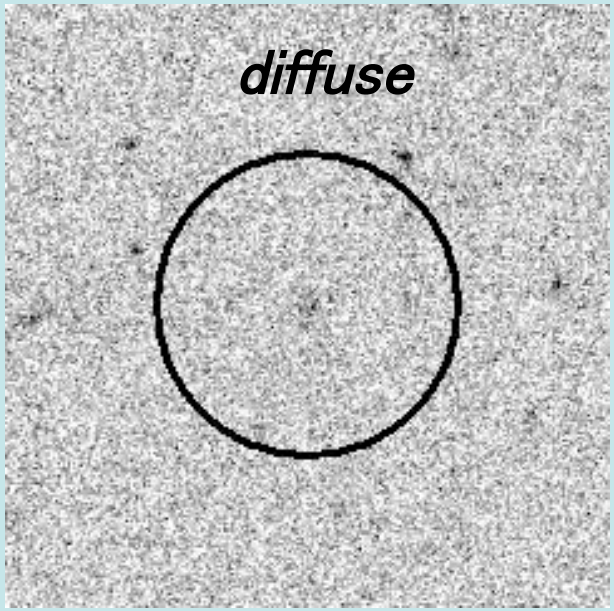
➔ 58 emission candidates

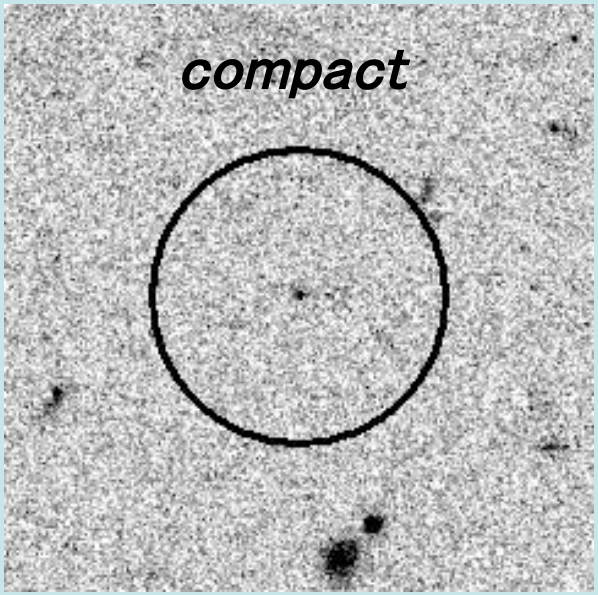
Survey Volume = 1.5×10^6 Mpc^3
n(LAE) = 3.8×10^{-5} Mpc^{-3}
$L_{ly\ alpha} > 10^{42.6}$ ergs/s

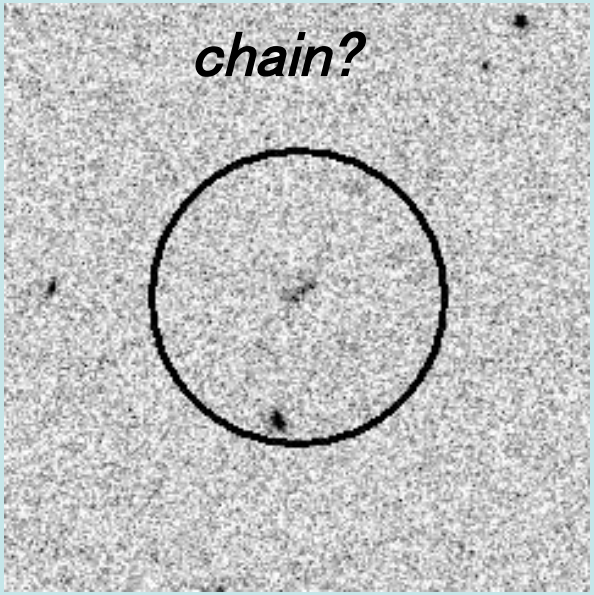
Examples of LAEs @ z=5.7



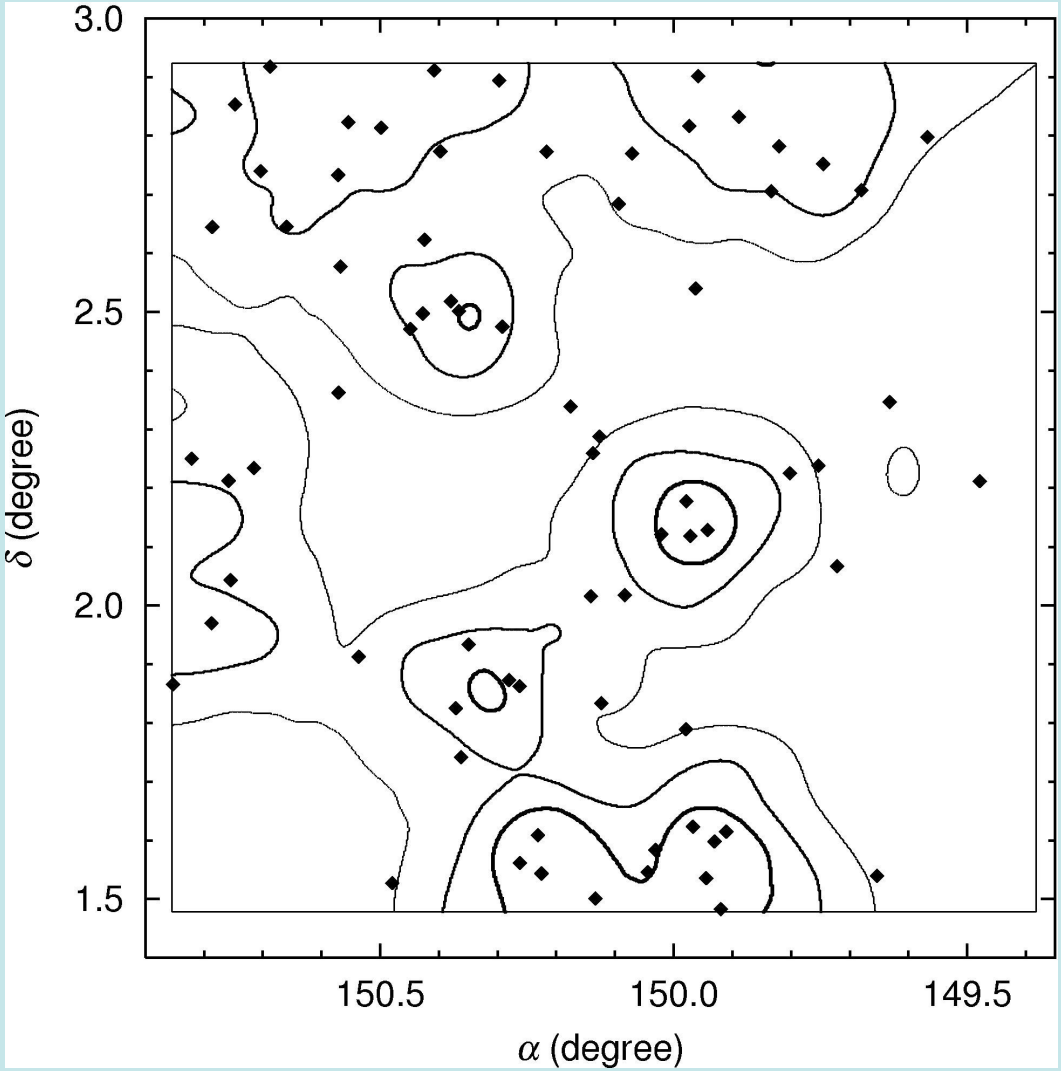

diffuse


diffuse


compact


chain?

LSS @ z=5.7 probed by LAEs



~200 Mpc

COSMOS has gotten to z=5.7 !!!

high Z ULIRG survey of COSMOS field

==> photz w/ 3% accuracy
==> pointed CO line search of sources
w/ known position and z
==> host gal. : M_dyn , M_H2

ALMA targetted to clusters / LSS ===> many sources per beam

Cosmos
IRAC coming in !!