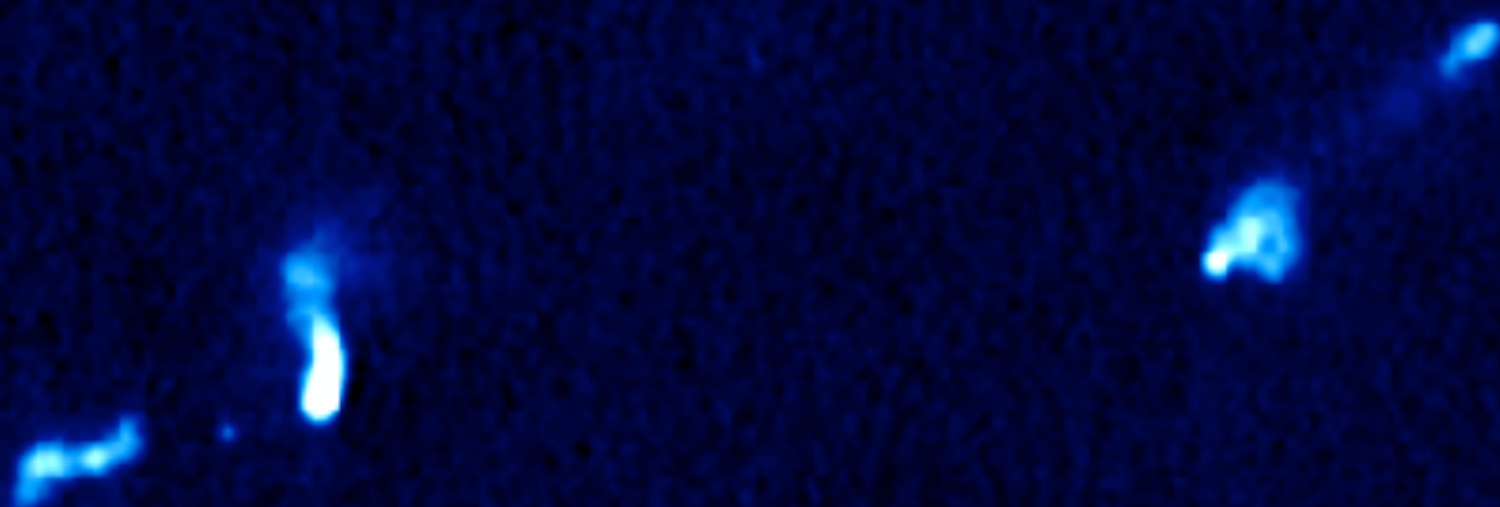


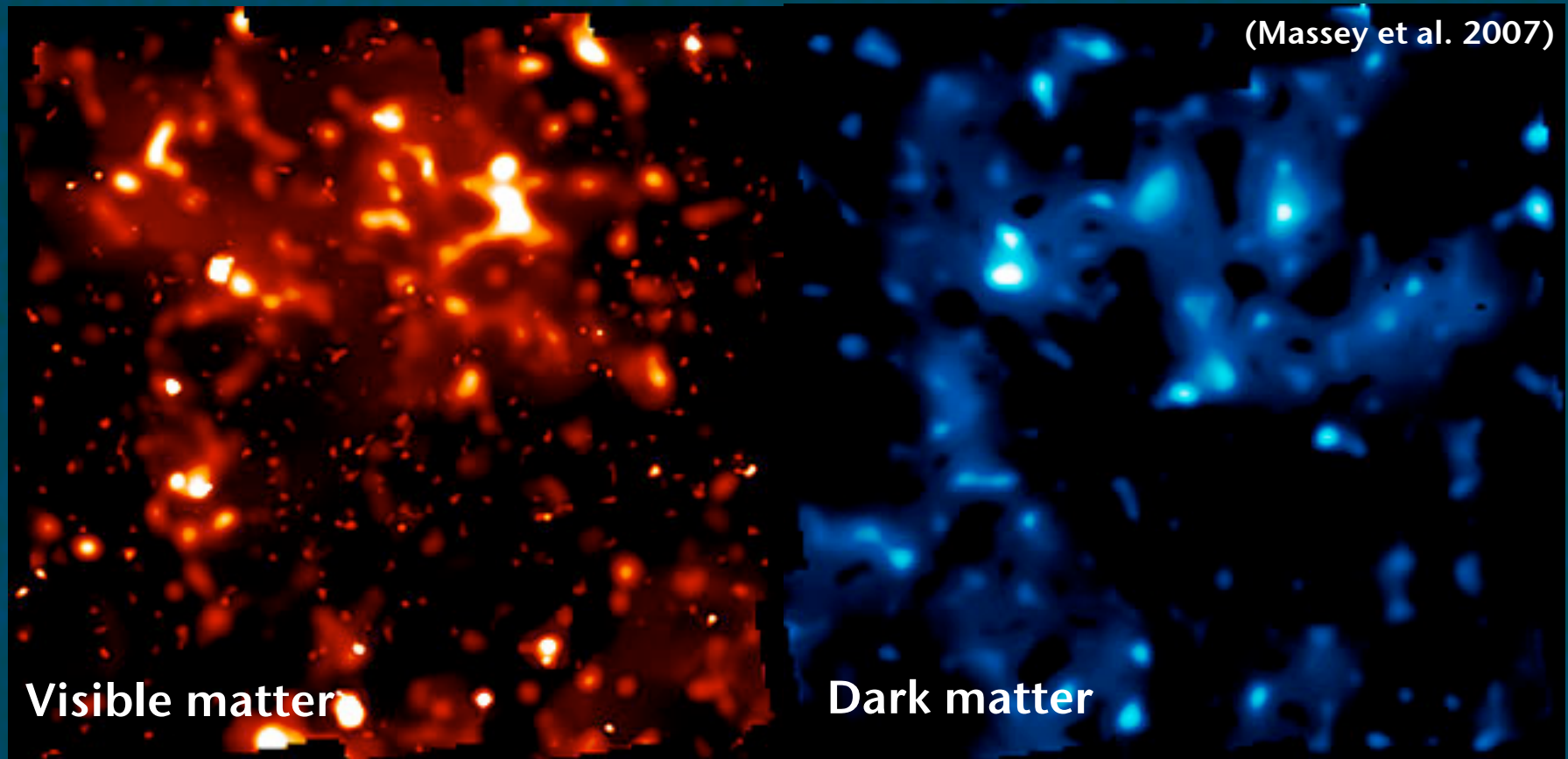
The Millimeter & Radio Surveys in the COSMOS Field



Eva Schinnerer (MPIA)
COSMOS collaboration

COSMOS Field

1.4 deg x 1.4 deg field @ 10:00:28.6 +02:12:21
equatorial



- Assembly of galaxies, clusters & dark matter
- Evolution of galaxies and black holes as a function of environment & redshift (I.e. Large Scale Structure - LSS)

COSMOS Datasets

COSMOS - Cosmic Evolution Survey (PI: Nick Scoville)

Panchromatic dataset includes

Imaging:

X-ray (XMM, Chandra)

UV (Galex)

Optical space-based (HST: ACS)

Optical/NIR ground-based (CFHT, Subaru, UKIRT, UH88; VISTA)

Infrared (Spitzer: IRAC, MIPS; Herschel: PACS, SPIRE)

Millimeter (Bolocam, AzTEC, MAMBO; LABOCA)

Radio (VLA)

Spectroscopy:

Optical surveys (VLT/VIMOS, Magellan/IMACS)

Optical follow-up (VLT/FORS, Keck/DEIMOS)

NIR follow-up (Subaru/MOIRCS)

NRAO Very Large Array

VLA-COSMOS team: Schinnerer (PI)

Smolcic, Carilli, Bondi, Ciliegi, Scoville, Bertoldi,
Blain, Impey, Jahnke, Koekemoer, Le Fevre, Urry,
Martinez Sansigre, Wang, Datta

Pilot project (10hr): A array (Schinnerer et al. 2004)

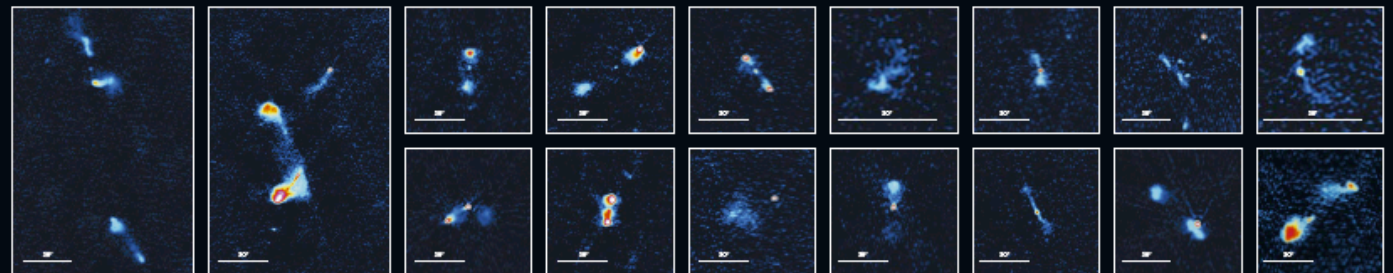
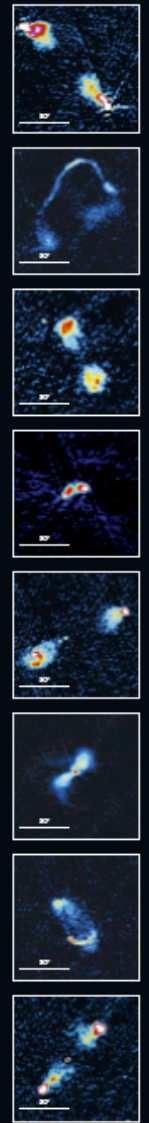
- ~ 250 sources (catalog - public)
- ~ 1 sqrdeg; rms ~ 30 μ Jy/beam

Large project (275hr): A+C array (Schinnerer et al. 2007)

- ~ 3,642 sources (catalog - public)
- ~ 2(1) sqrdeg; mean rms ~ 15(10) μ Jy/beam;

Deep project (62hr): A array

- ~ 1 sqrdeg; rms ~ 7-8 μ Jy/beam (central 30')



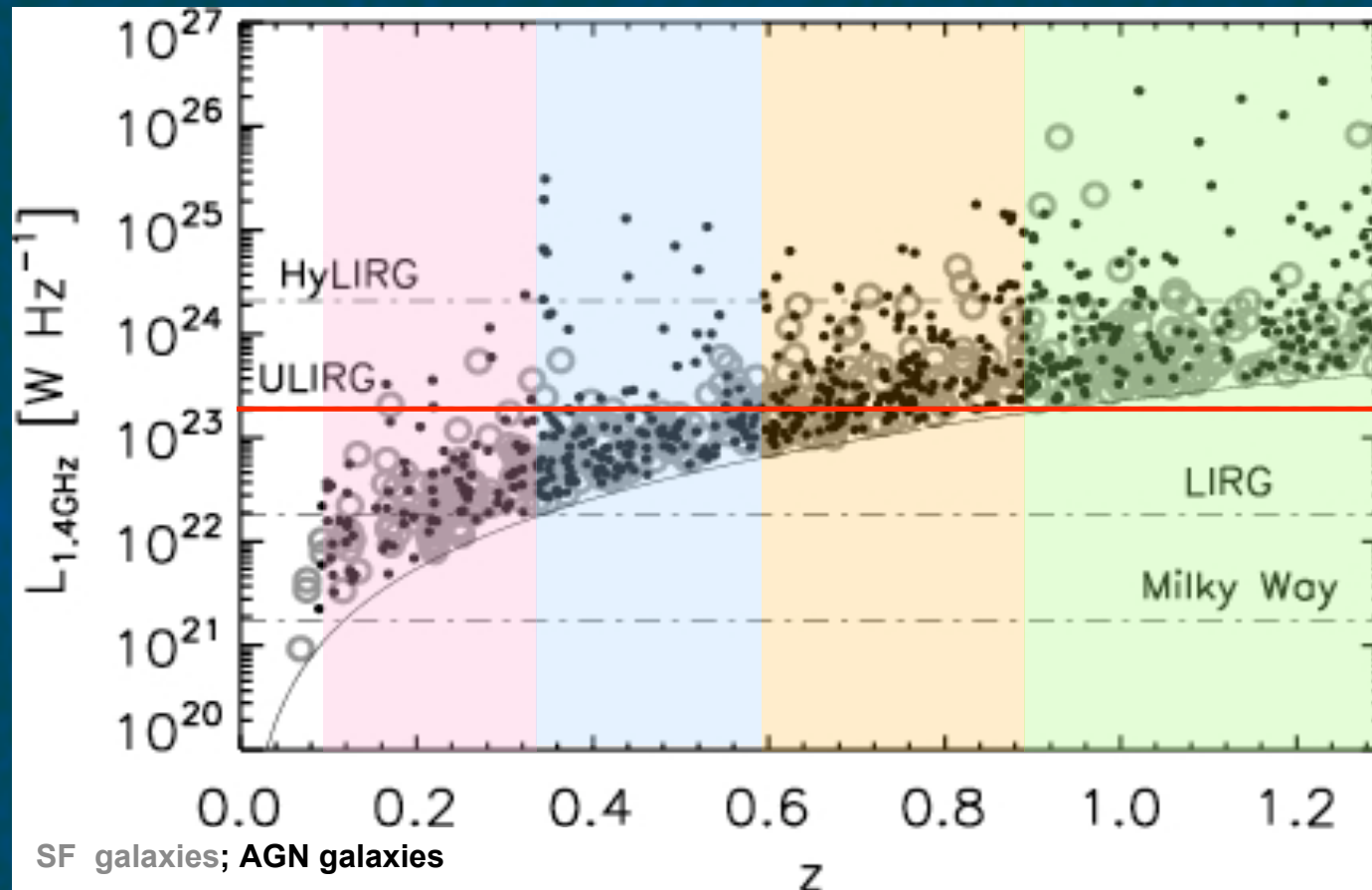
VLA-COSMOS: The faint radio population

Classified as star forming (SF) and AGN galaxies (via panchromatic data)

==> for $z < 1.3$: ~ 60% AGN

~ 40% SF

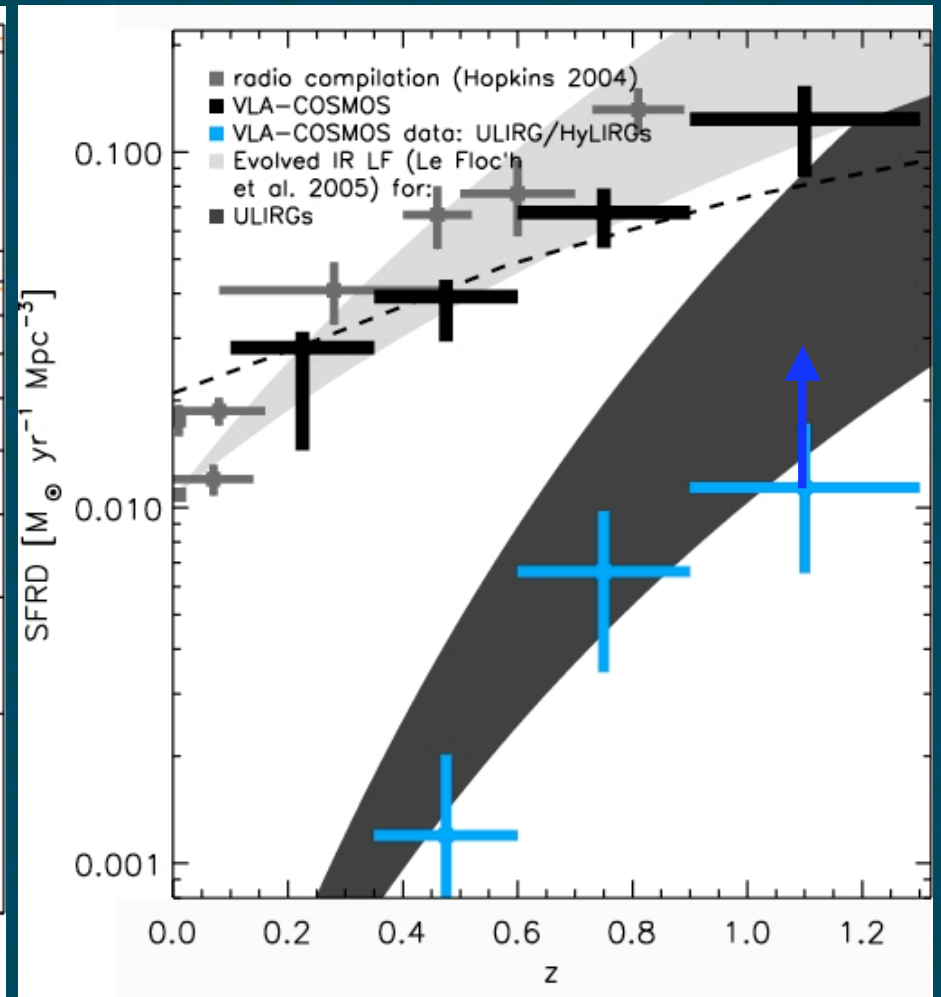
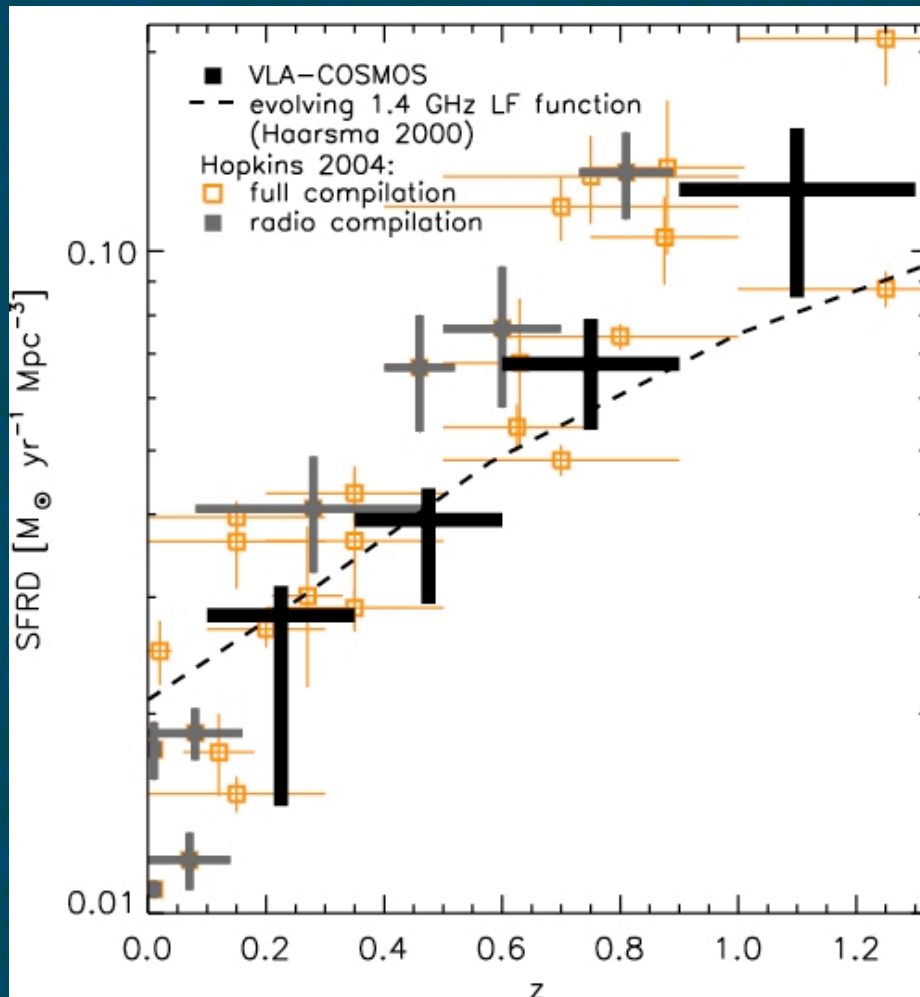
similar fraction for sources w/ $z > 1.3$



VLA-COSMOS: Dust-unbiased cosmic SFH

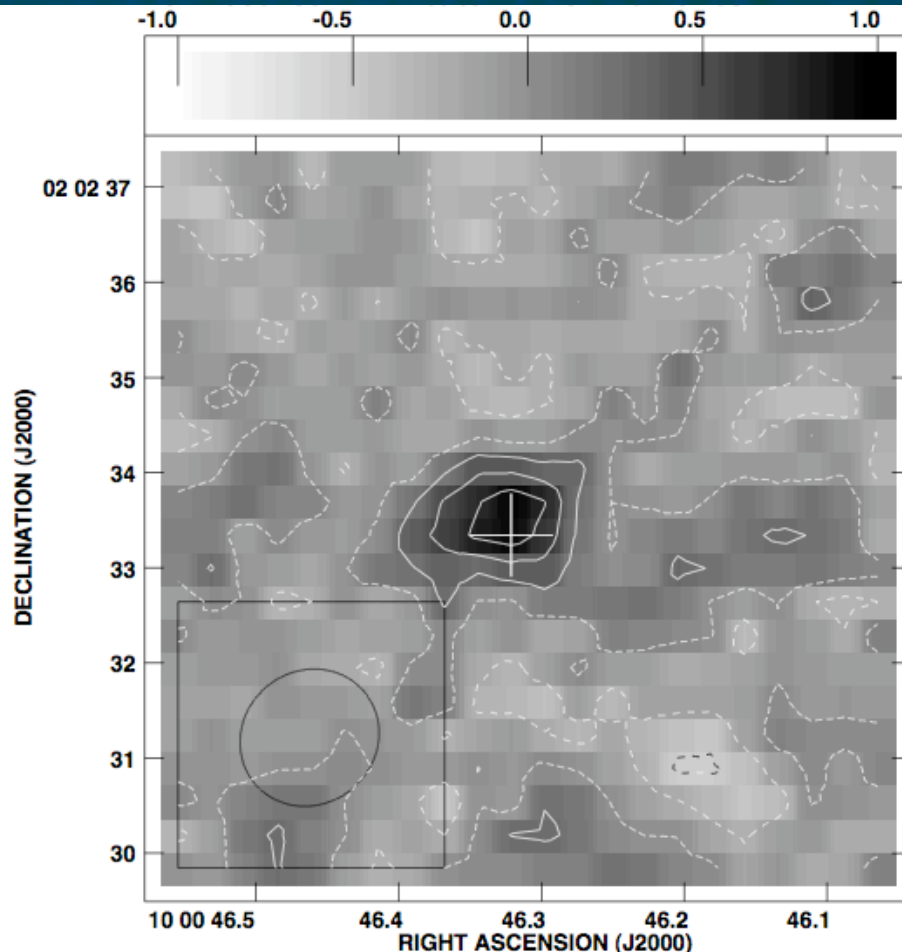
New radio-derived SFH (1 order of magnitude more sources):

- good agreement w/ other SFH (which use dust correction)
- stronger evolution for SF ULIRGs (consistent w/ 24 μ m)



VLA-COSMOS: Lyman Break Galaxies (LBGs)

COSMOS LBG samples of Lee, Capak et al.



Stacking detection:

U-Band Drop-outs ($2.5 < z < 3.5$)

Median Flux: $0.90 \pm 0.21 \mu\text{Jy}$

$\Rightarrow \langle \text{SFR}_{\text{radio}} \rangle \sim 50 M_{\text{sun}}/\text{yr}$

$\langle \text{SFR}_{\text{uv}} \rangle \sim 10 M_{\text{sun}}/\text{yr}$

\Rightarrow extinction: \sim factor 5

Upper limits:

B & V-band drop-outs

Carilli, Lee et al. (in prep.)

$r z 3.6\mu\text{m} + \text{VLA (contours)}$

Millimeter surveys in COSMOS:

- CSO/Bolocam (Aguerre et al., sub.): central 25' x 25'
15 sources $> 3.5\sigma$, rms ~ 1.9 mJy/beam
- JCMT/AzTEC (Scott et al., in prep.): $z \sim 0.7$ cluster in NW
10 sources $> 5\sigma$, 44 sources $> 3.5\sigma$, rms ~ 1.3 mJy/beam
- IRAM/MAMBO (Bertoldi et al., 2007): central 20' x 20'
- SHARCII 350 μm follow-up of 16 mm-detected sources
5-10 detections (PI: Aguerre)
- APEX/LABOCA (PI: Bertoldi): 44hrs this fall

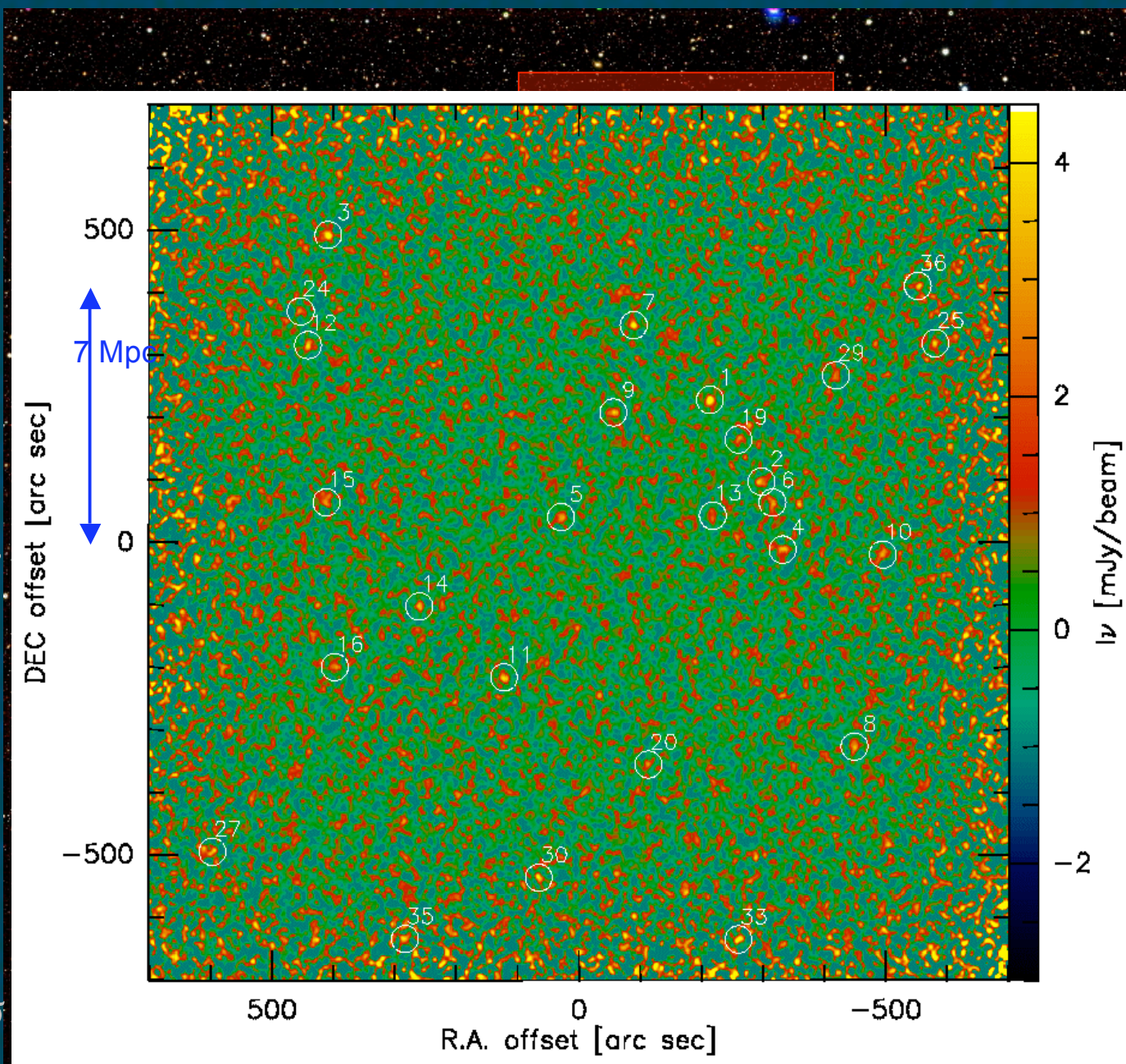
COSBO MAMBO 1.2mm survey

Team:

Bertoldi (PI),
Aravana, Menten,
Carilli, Schinnerer,
Blain, Hasinger,
Lutz, Omont,
Smolcic

250arcmin²:
Rms < 1 mJy
15 sources > 4 σ

Bertoldi et al. (2007)

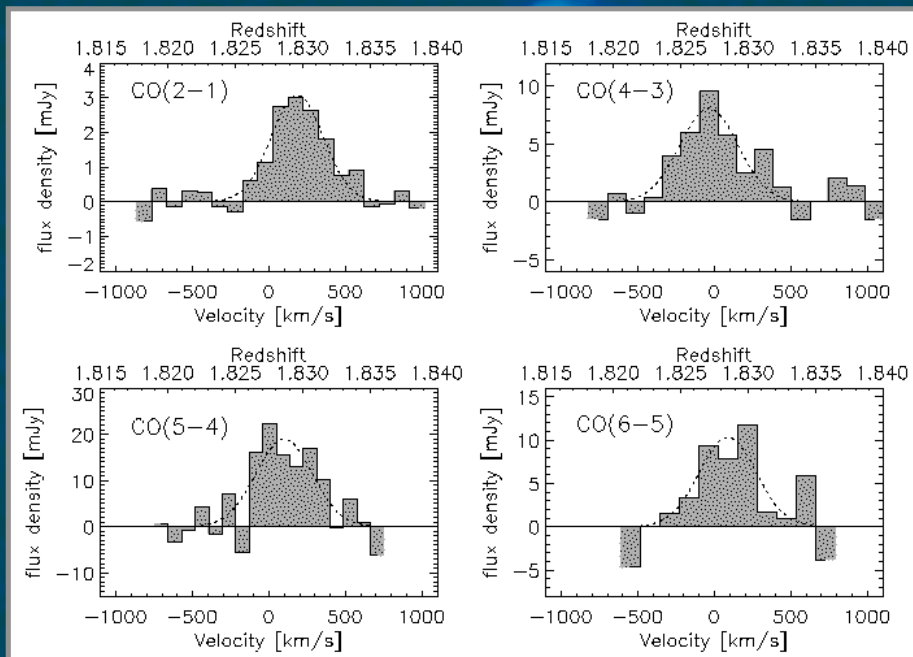
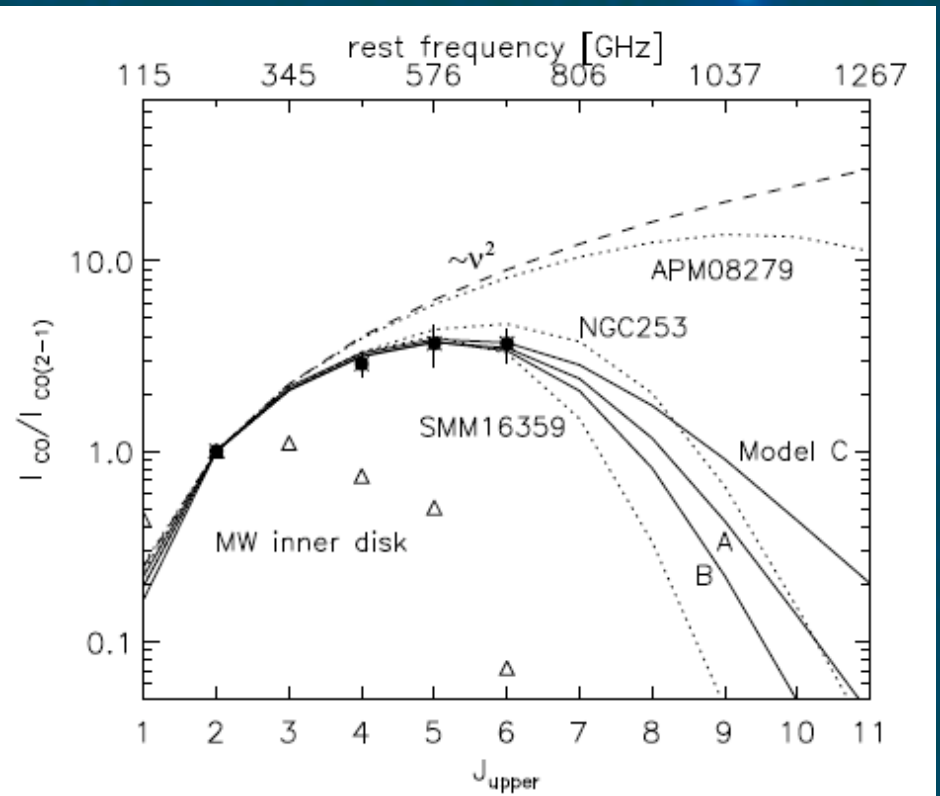
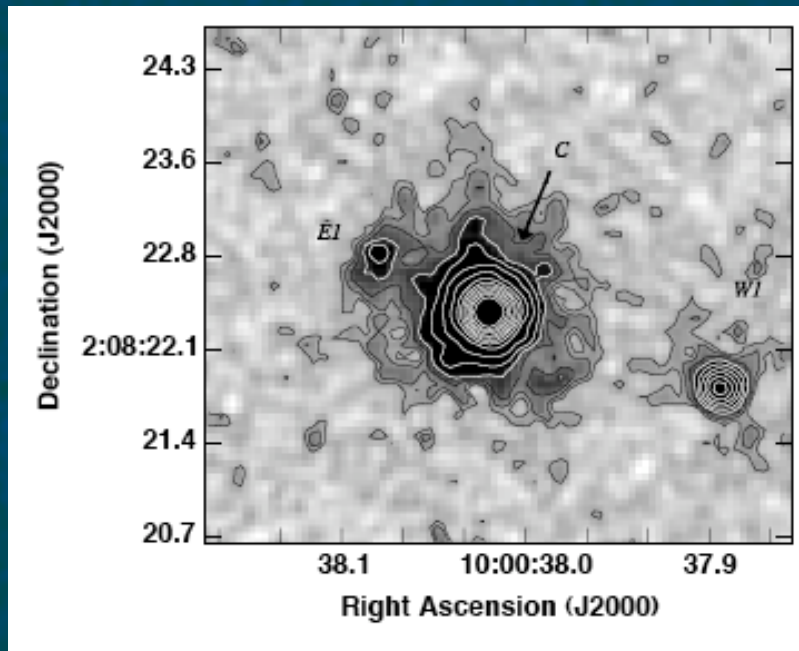


COSBO - SMG w/ AGN

@ $z=1.8$ using IRAM 30m

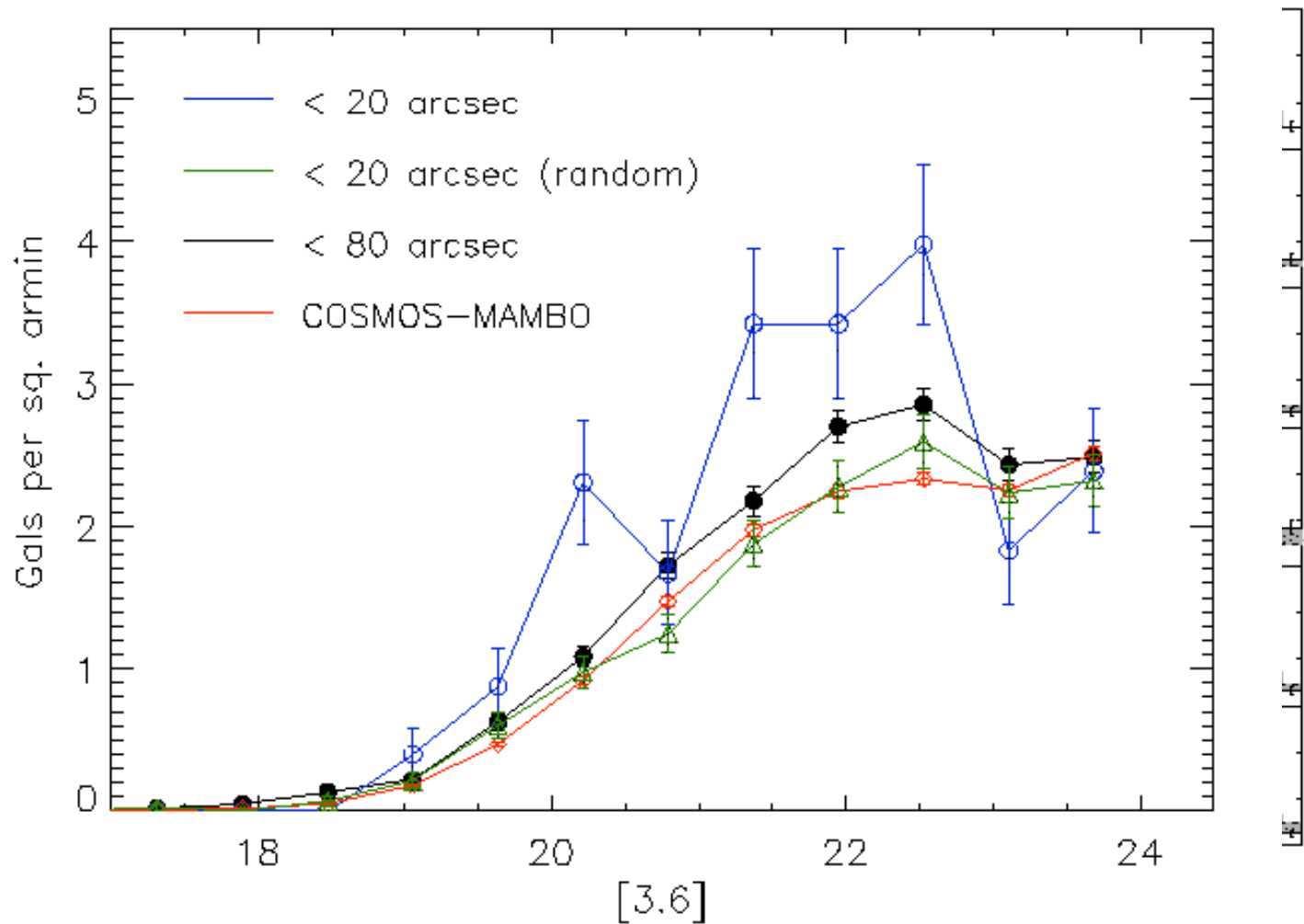


FWHM(v) \sim 420 km/s
 $L'_{CO} = 5 \times 10^{10} L_{sun}$



Aravena et al. (in prep.)

COSBO - Clustering around SMGs



Overabundance of red ($r - 3.6 > 2$) galaxies w/i $\sim 10''$
Overdensity of $3.6 \mu\text{m}$ sources w/i $\sim 20''$

COSMOS radio & (sub-)millimeter surveys

- Early Science w/ ALMA --
highly dust-obscured star forming galaxies
in dense environment (ULIRGs out to $z \sim 1.3$, SMGs):
 - characteristics of the FIR luminosity
 - molecular gas content, kinematics, dynamical mass
target & clustered sources
- Science w/ the full ALMA --
dust & gas properties of selected galaxy types
as function of Large Scale Structure:
 - deep field
 - targeted follow-up: ISM, dust, full SEDs

