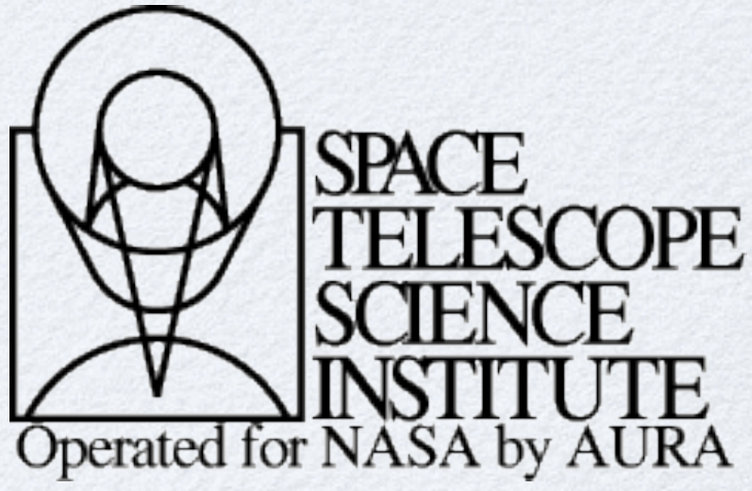
Baldi et al. 12, submitted to ApJ

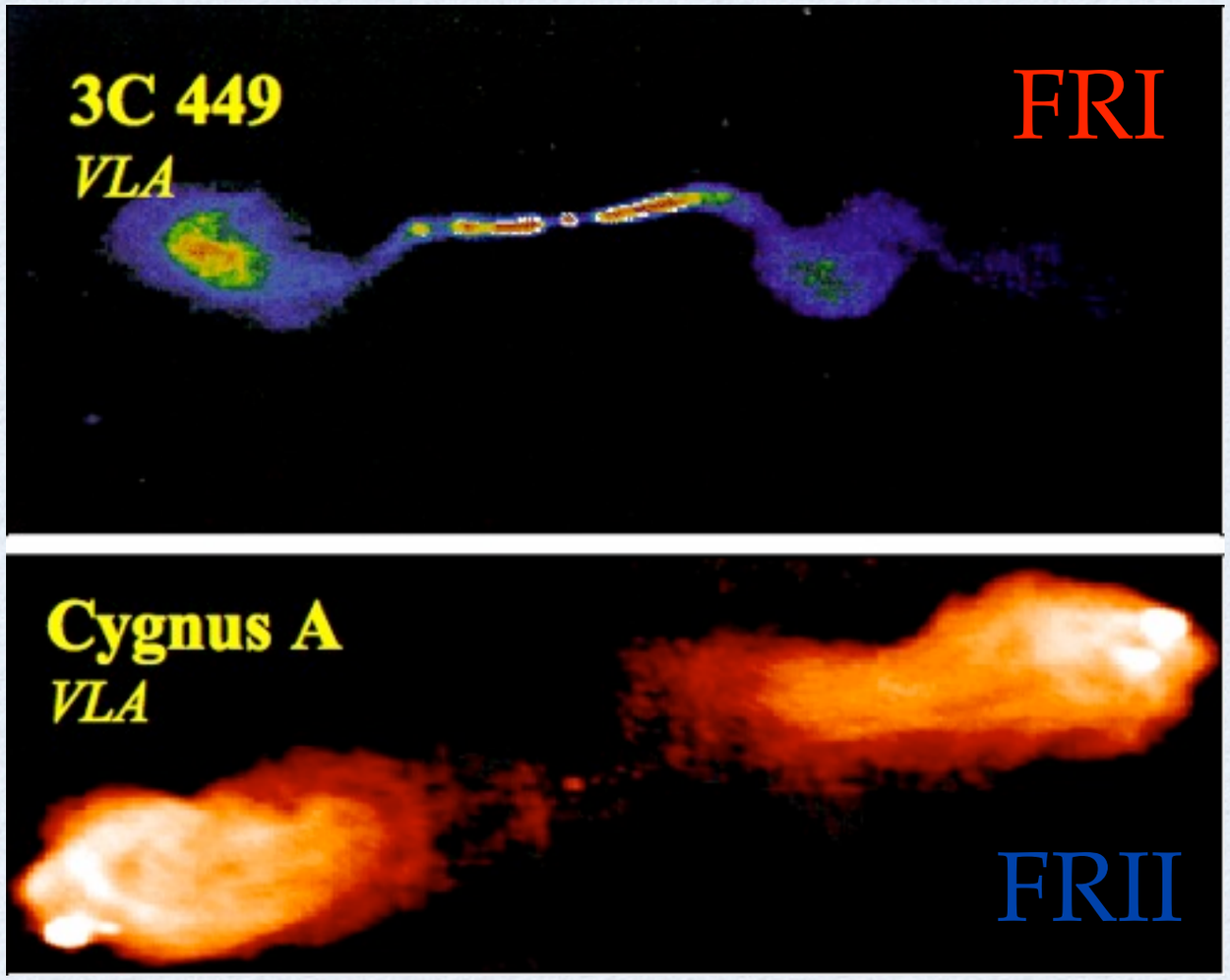
SPECTRAL ENERGY DISTRIBUTION OF LOW-LUMINOSITY RADIO GALAXIES AT z ~1-3: A HIGH-z VIEW OF THE AGN-HOST CONNECTION

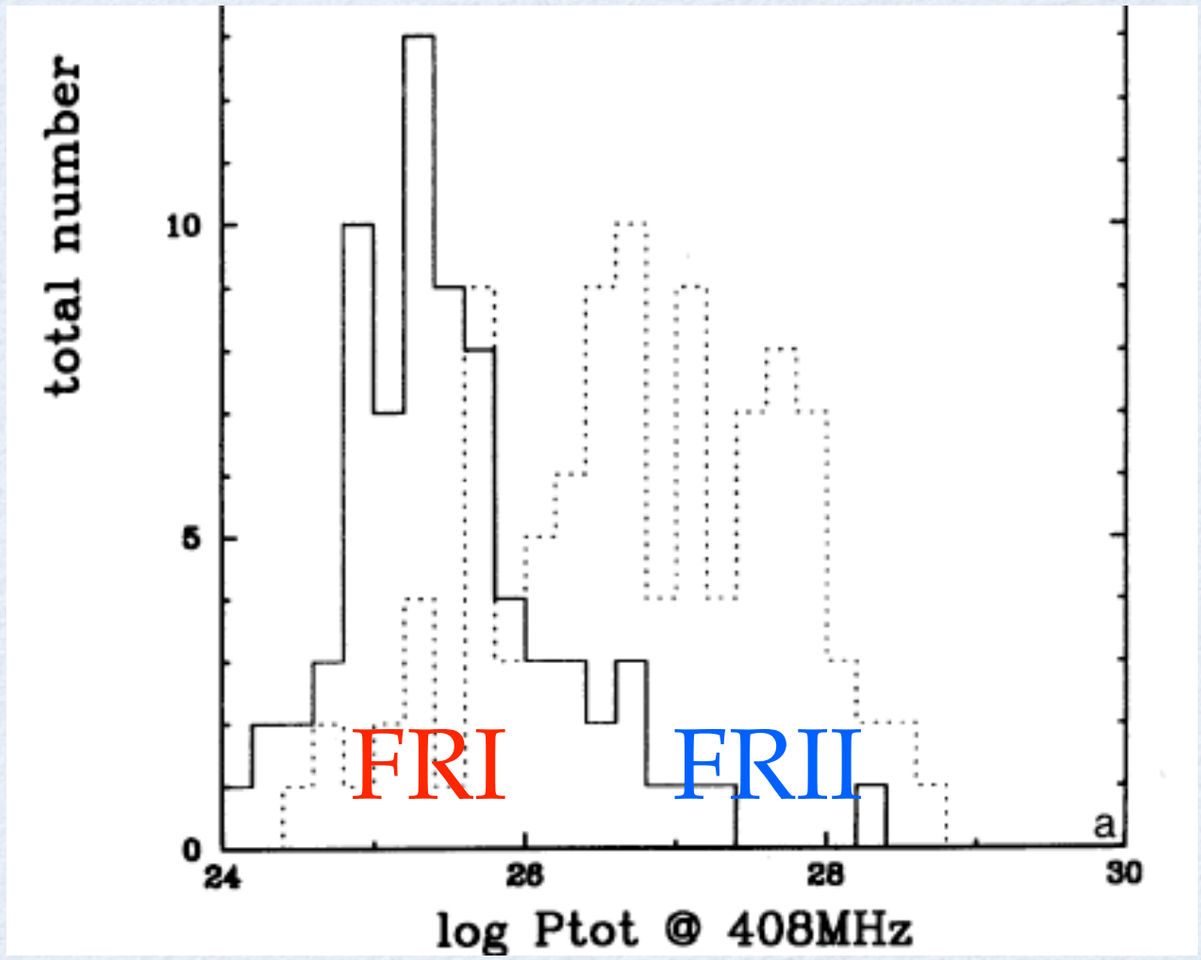
Ranieri D. Baldi

Marco Chiaberge, Alessandro Capetti



RADIO GALAXIES IN THE LOCAL UNIVERSE



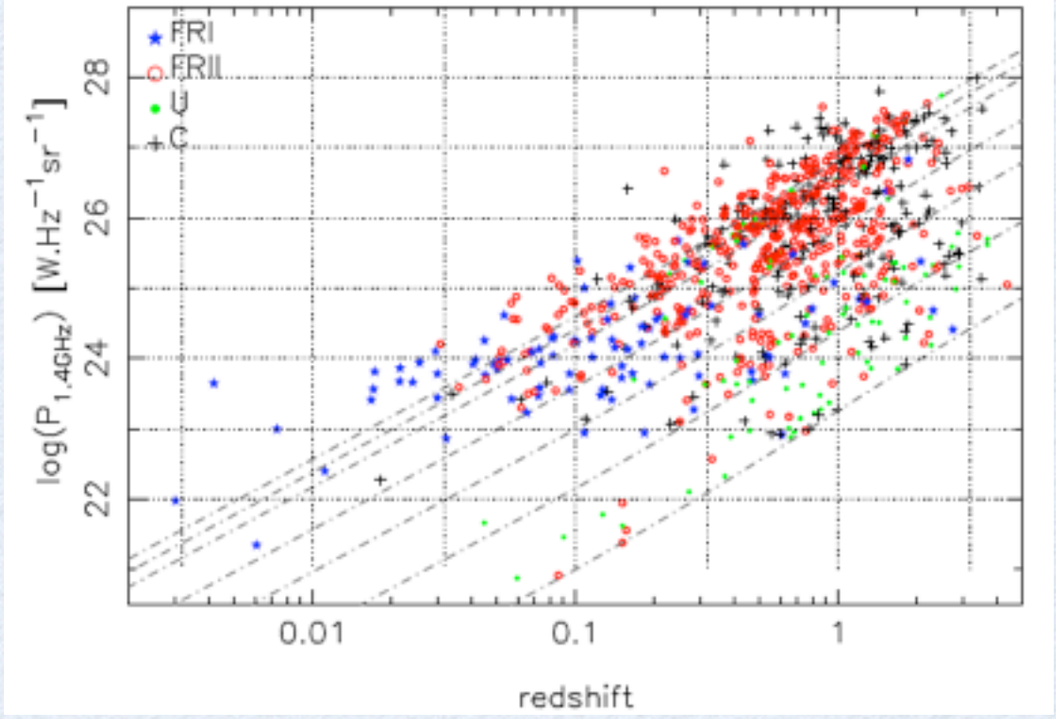


Zirbel & Baum 95

- Massive Early-type galaxies host RG
- FRI in rich environment, FRII in galaxy group

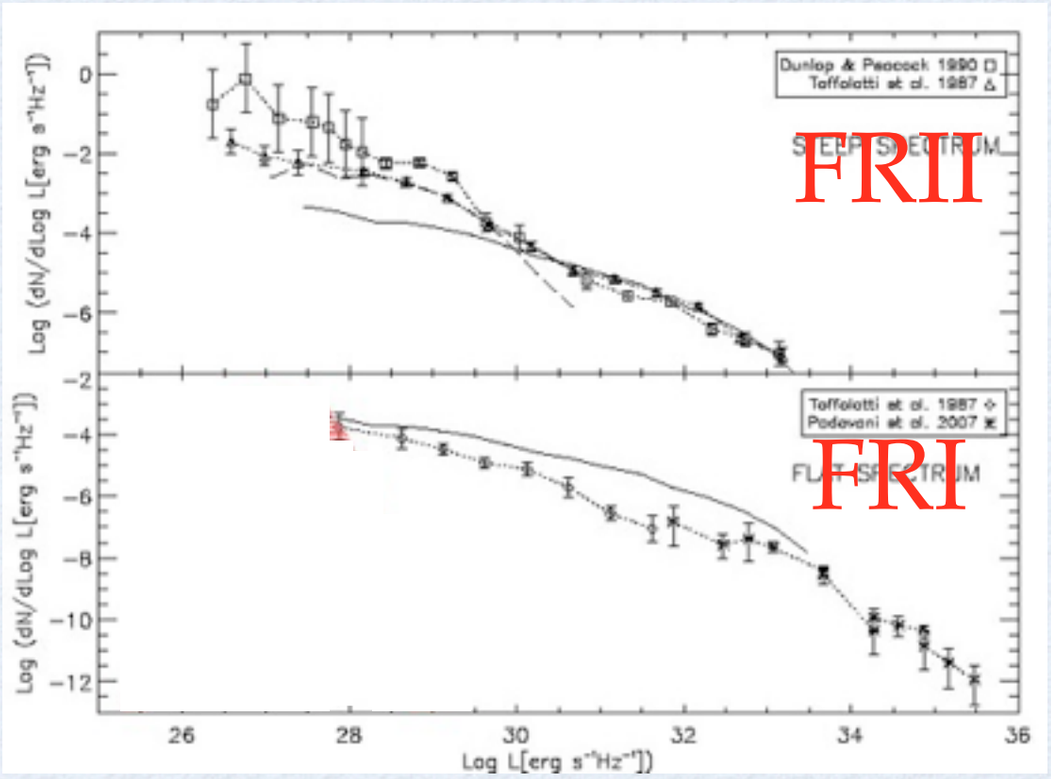
HIGH-Z RADIO GALAXIES

- Our knowledge of RG at high z is exclusively based on studies of FRII



Gendre, Best, Wall 10

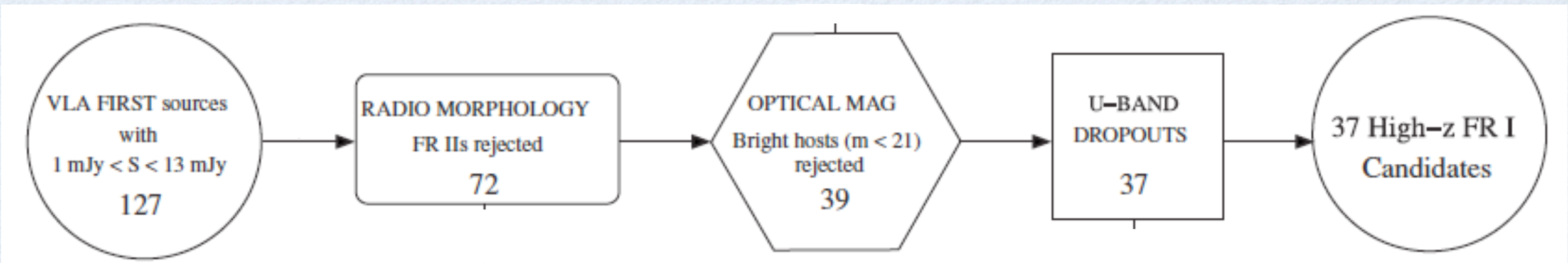
Dunlop & Peacock 90, Condon+ 02,



- The missing piece of the puzzle? study of FRI at high z.

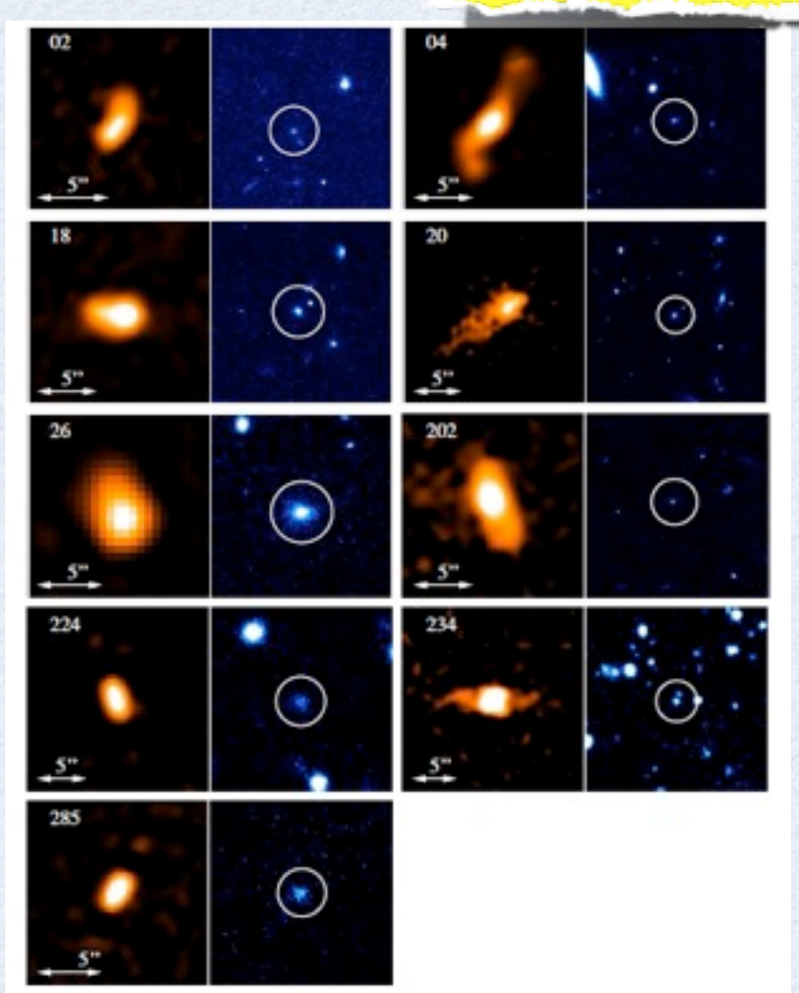
FRI AT HIGH Z

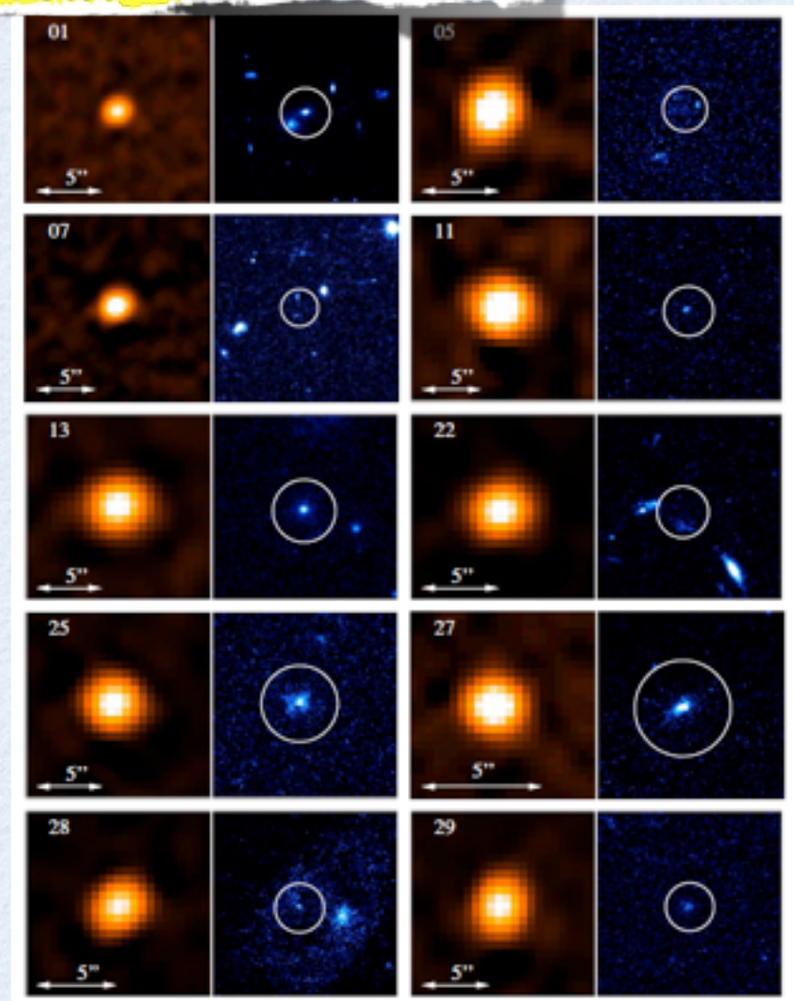
- a few FRI in 7C sample (Heywood + 07) and two possible FRI in HDF (Snellen & Best 01)
- Chiaberge + 09 selected the first sizeable sample of 37 FRI candidates at z≳1 in the COSMOS field.
- 4-steps selection criteria: radio/optical, independent of photo-z



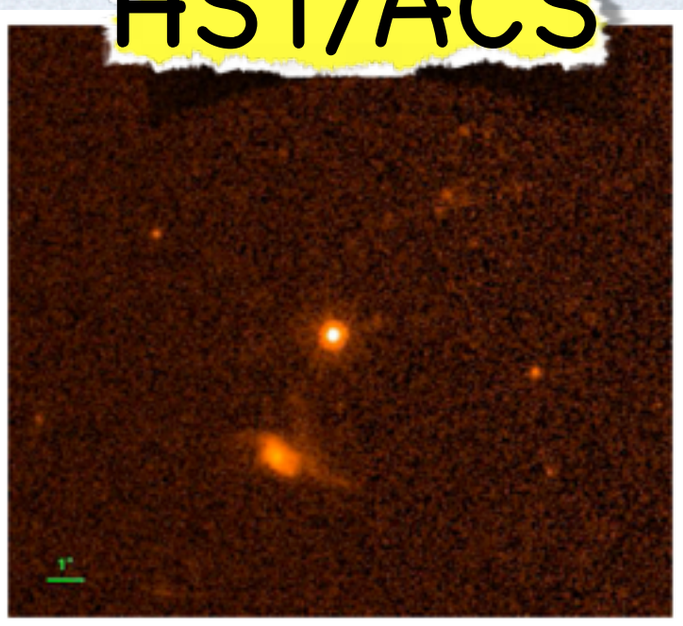
FRI CANDIDATES

VLA-COSMOS





HST/ACS



- Extended and compact radio sources
- $1 < z < 2$, Ilbert + 09, Mobasher + 07
- Host: no clear spirals and one QSO (Prescott + 06)

A BROAD PROJECT

- The AIM of the projet is to analyze the properties of this sample of low-luminosity radio galaxies located at high z: possible **progenitors** of local FRI population?

- METHOD: SED, host type, nuclear properties, dust in comparison with local and distant RGs
- SAMPLE: 34 FRI candidates (we exclude 3 obj)
- DATA: COSMOS survey, NVSS and FIRST catalog

COSMOS SURVEY

- COSMOS survey provides multi-wavelenth imaging and spectroscopy from radio to X-ray, covering a 2 deg^2.
- It includes HST, Subaru, GALEX, Spitzer data

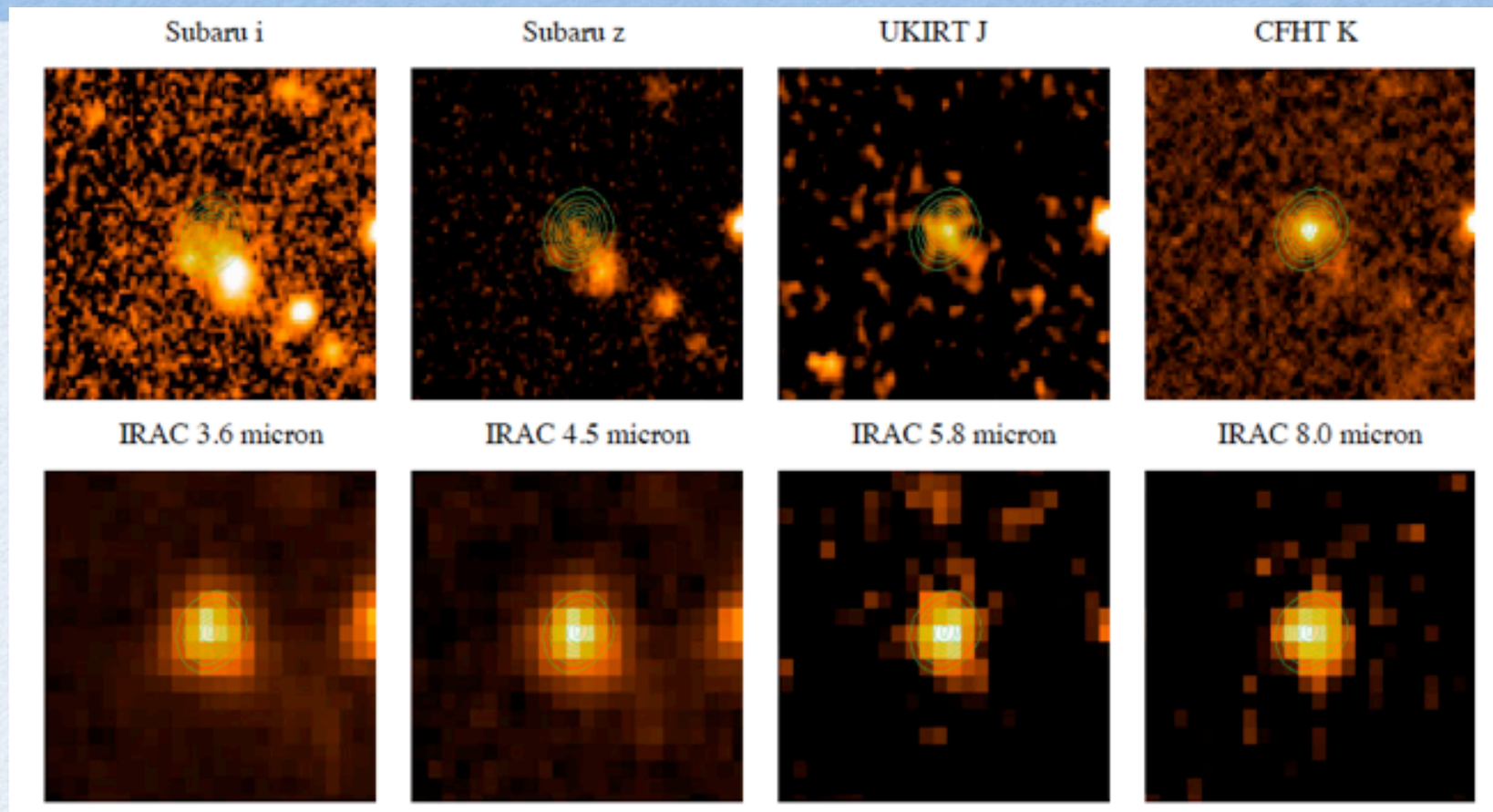
COSMOS catalog: i < 25

COSMOS BROAD BANDS AND THEIR PROPERTIES.

Filter	Telescope	λ_{eff}	FWHM	sensitivity
FUV	GALEX	1538.6Å	230.8Å	25.7
NUV	GALEX	2315.7Å	789.1Å	26.0
u^*	CFHT	3911.0Å	538.0Å	26.5
B_J	Subaru	4439.6Å	806.7Å	27.0
g^+	Subaru	4728.3Å	1162.9Å	27.0
V_J	Subaru	5448.9Å	934.8Å	26.6
r^+	Subaru	6231.8Å	1348.8Å	26.8
i^*	CFHT	7628.9Å	1460.0Å	24.0
i^+	Subaru	7629.1Å	1489.4Å	26.2
F814W	HST	8037.2Å	1539.0Å	27.2
z^+	Subaru	9021.6Å	9021.6Å	25.2
J	UKIRT	12444.1Å	1558.0Å	23.7
K_S	NOAO	21434.8Å	3115.0Å	21.6
K	CFHT	21480.2Å	3250.0Å	23.7
IRAC1	Spitzer	35262.5Å	7412.0Å	23.9
IRAC2	Spitzer	44606.7Å	10113.0Å	23.3
IRAC3	Spitzer	56764.4Å	13499.0Å	21.3
IRAC4	Spitzer	77030.1Å	28397.0Å	21.0
MIPS1	Spitzer	23.68μm	4.7μm	29.6

Capak+ 07, 08 and Taniguchi+ 08
Koekemoer + 07, Sanders + 07

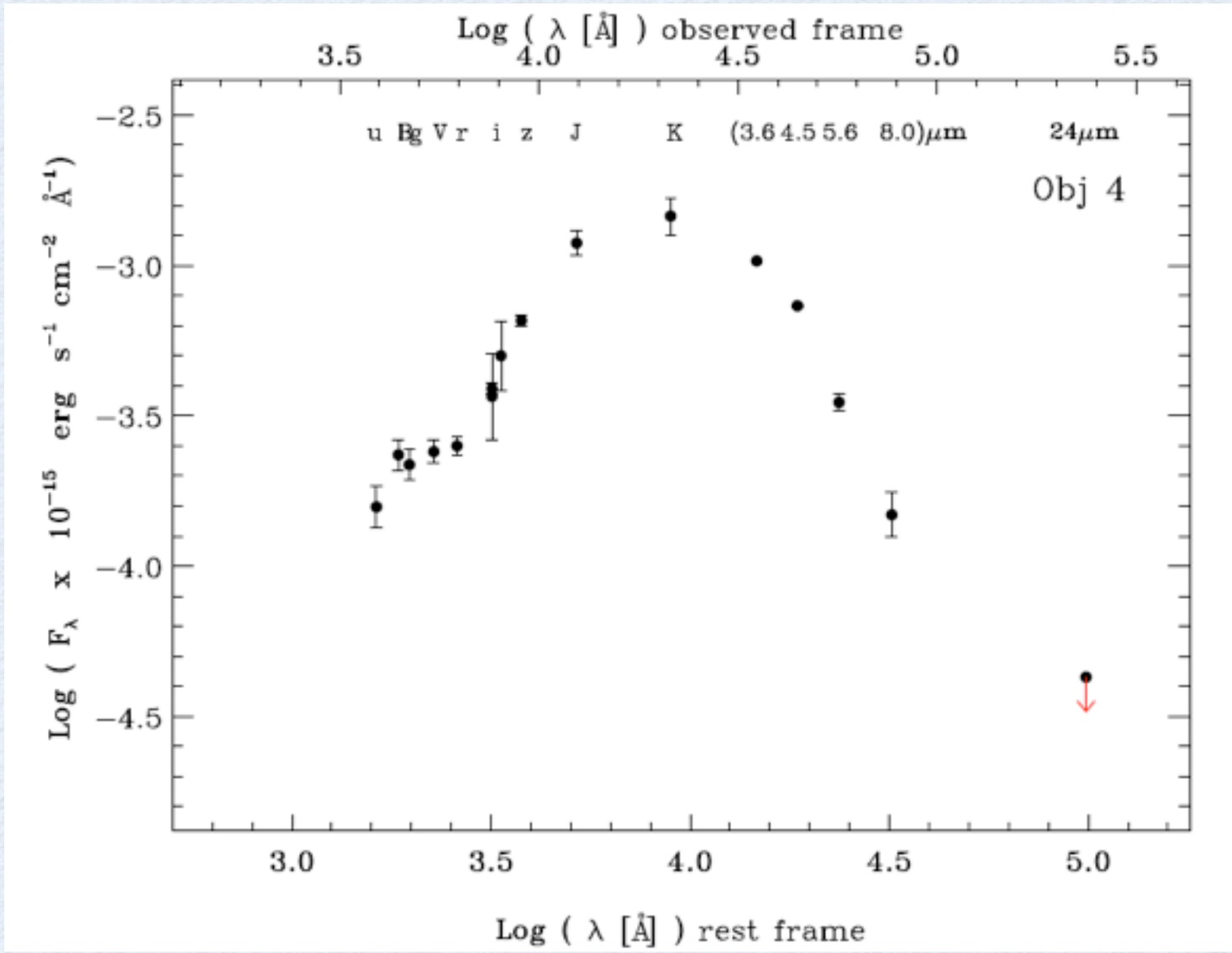
COUNTERPART IDENTIFICATION



- Counterpart identification: 29 correctly identified in i band.
- We perform our 3″-aperture photometry on the mis-identified counterparts.

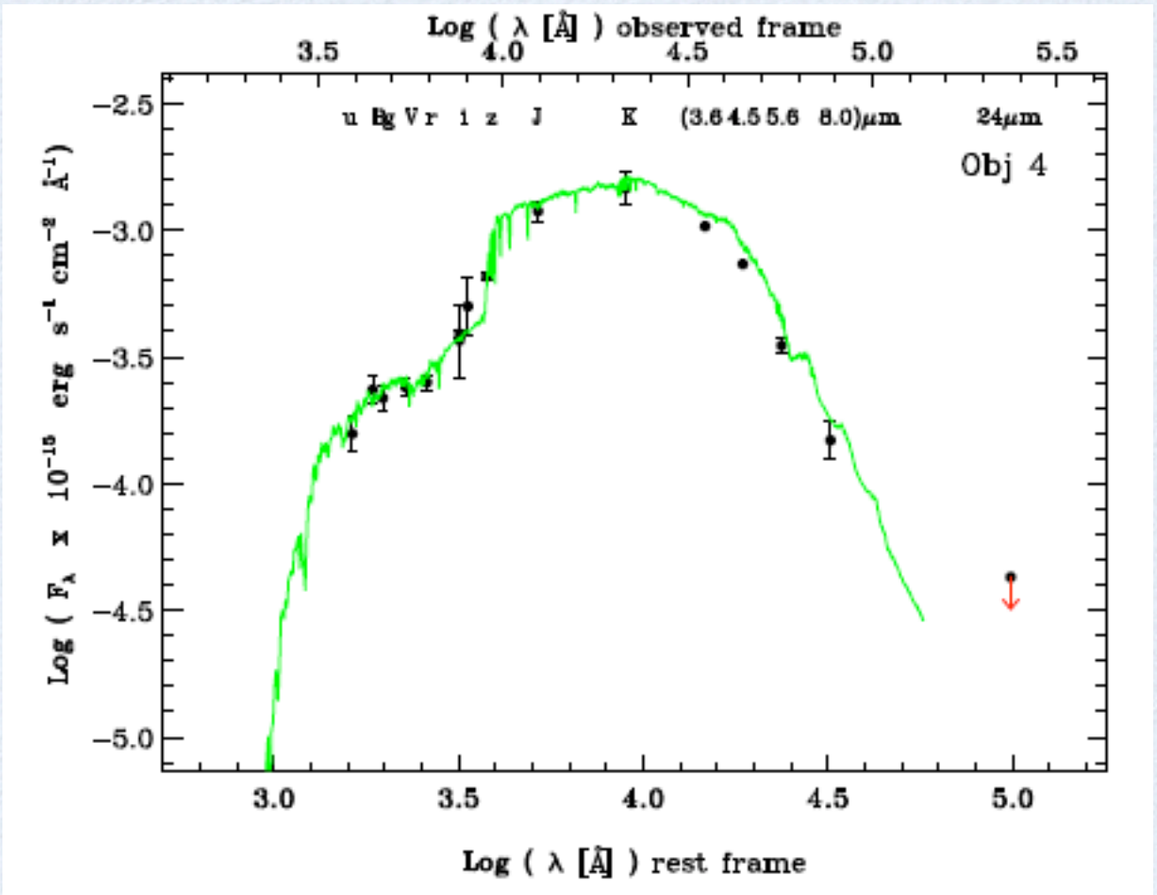
SPECTRAL ENERGY DISTRIBUTION

- SEDs from FUV to MIR bands.
- Stellar Templates: Bruzual & Charlot 03, 09 and Maraston+ 05
- E(B-V)=0-3



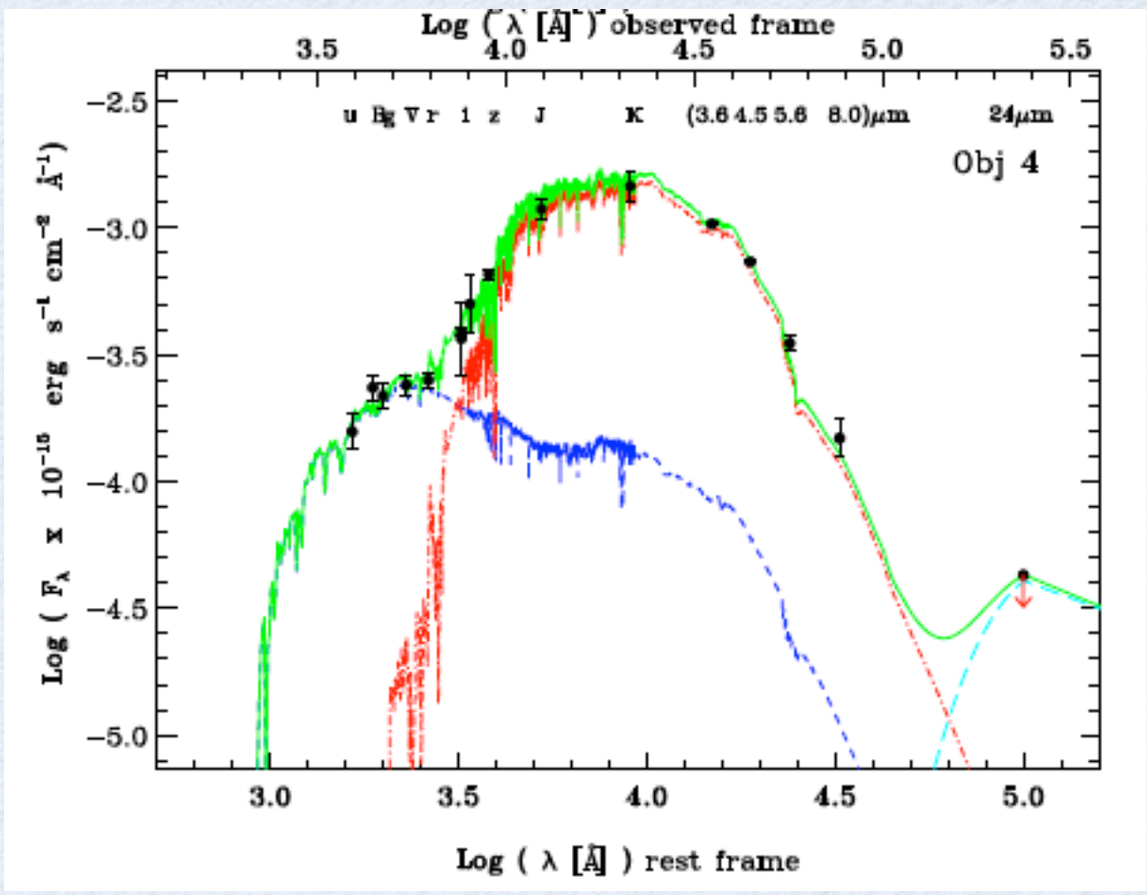
SED FITTING

Hyperz (Bolzonella+ 00)



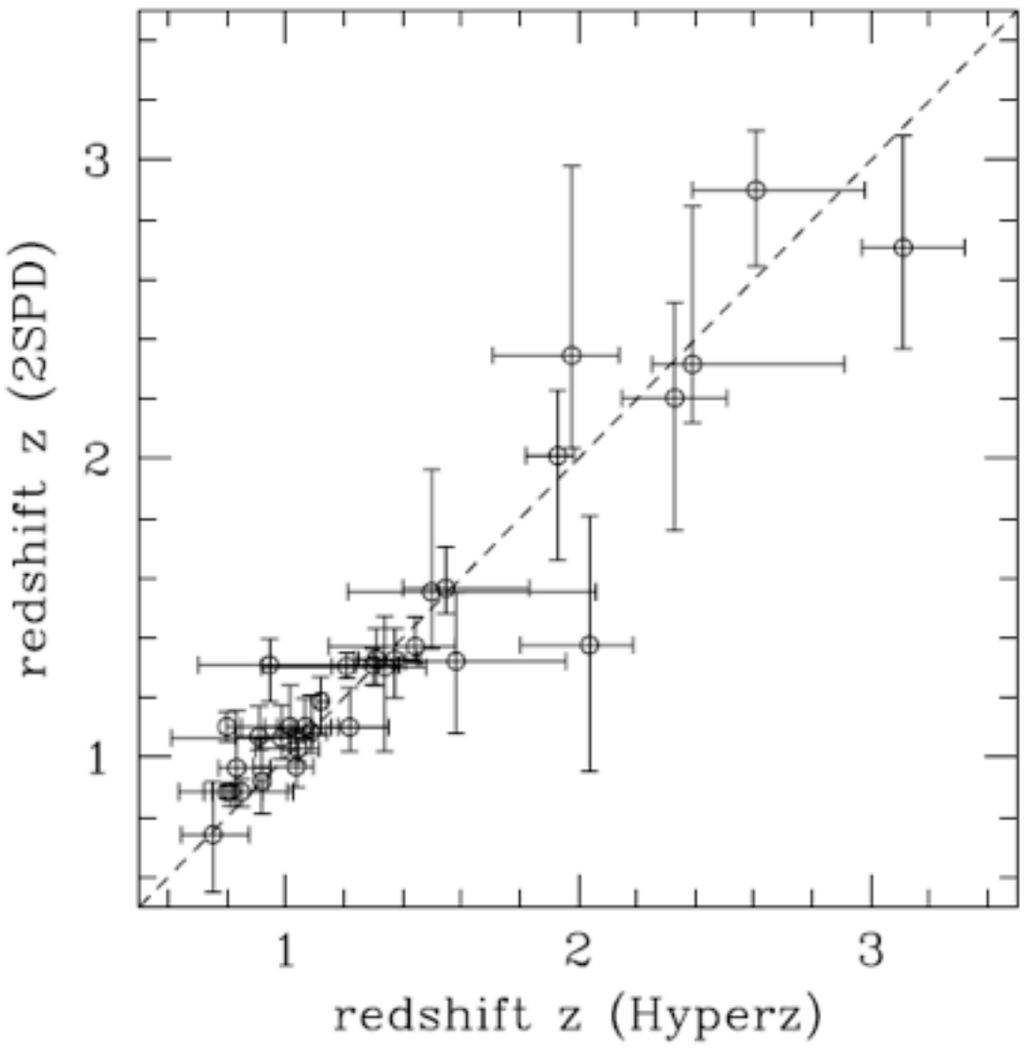
composite stellar population with single SF history

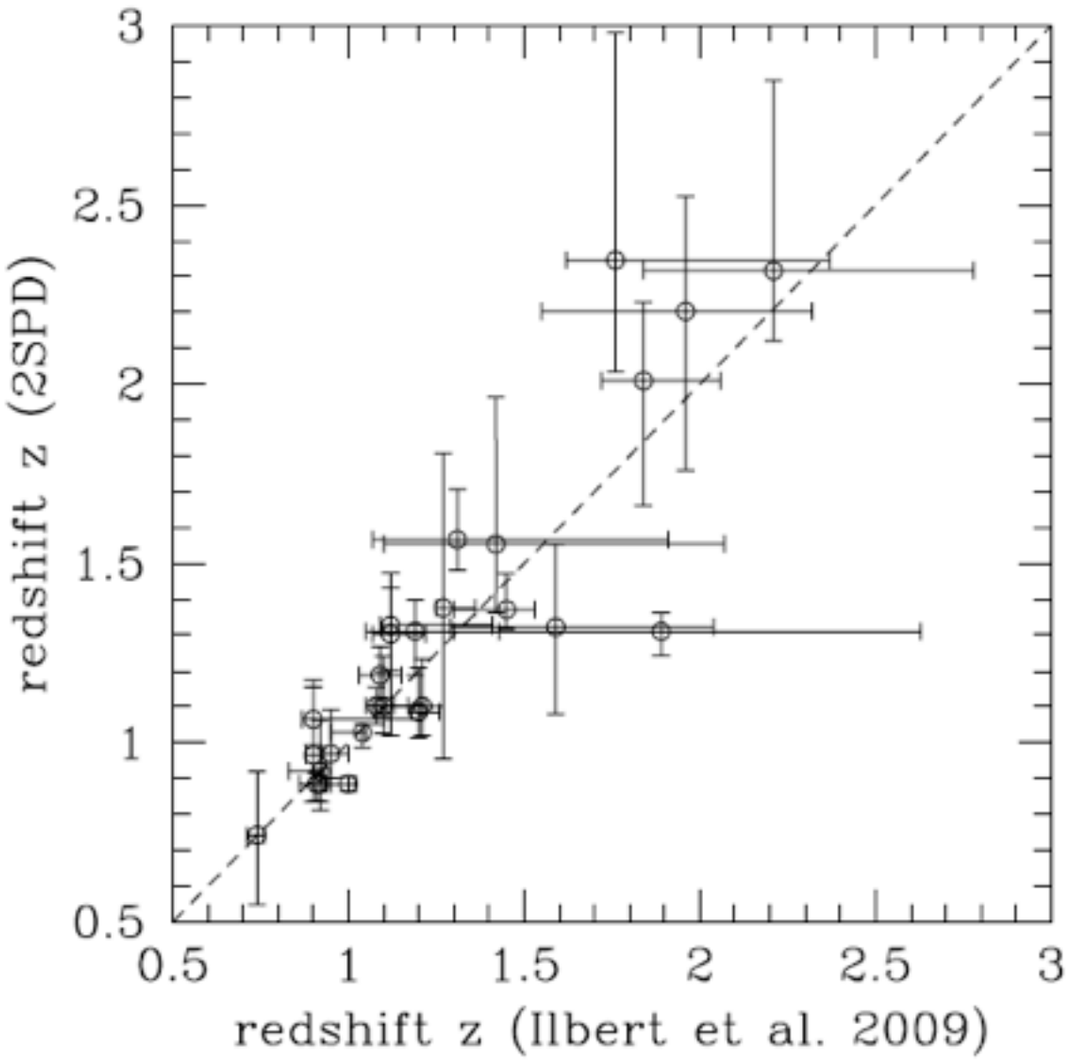
2SPD



Two stellar population (OSP and YSP) and dust component(s)

RESULTS: PHOTO-Z

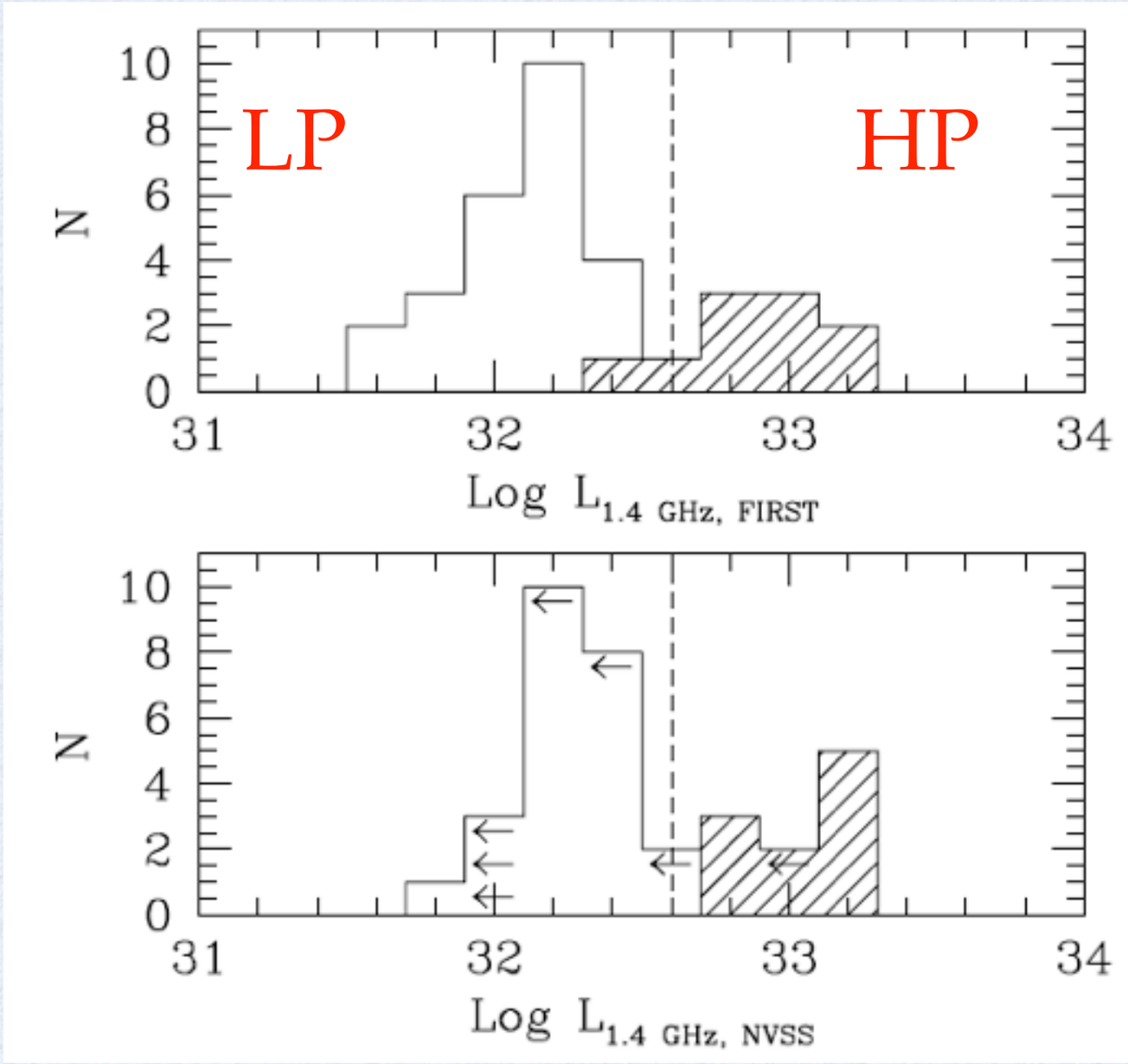




- The photo-z of the sample range from 0.7 to 3.
- Agreement with previous photo-z derivation and spectro-z (Ilbert+09, Lilly + 07, Trump + 07).

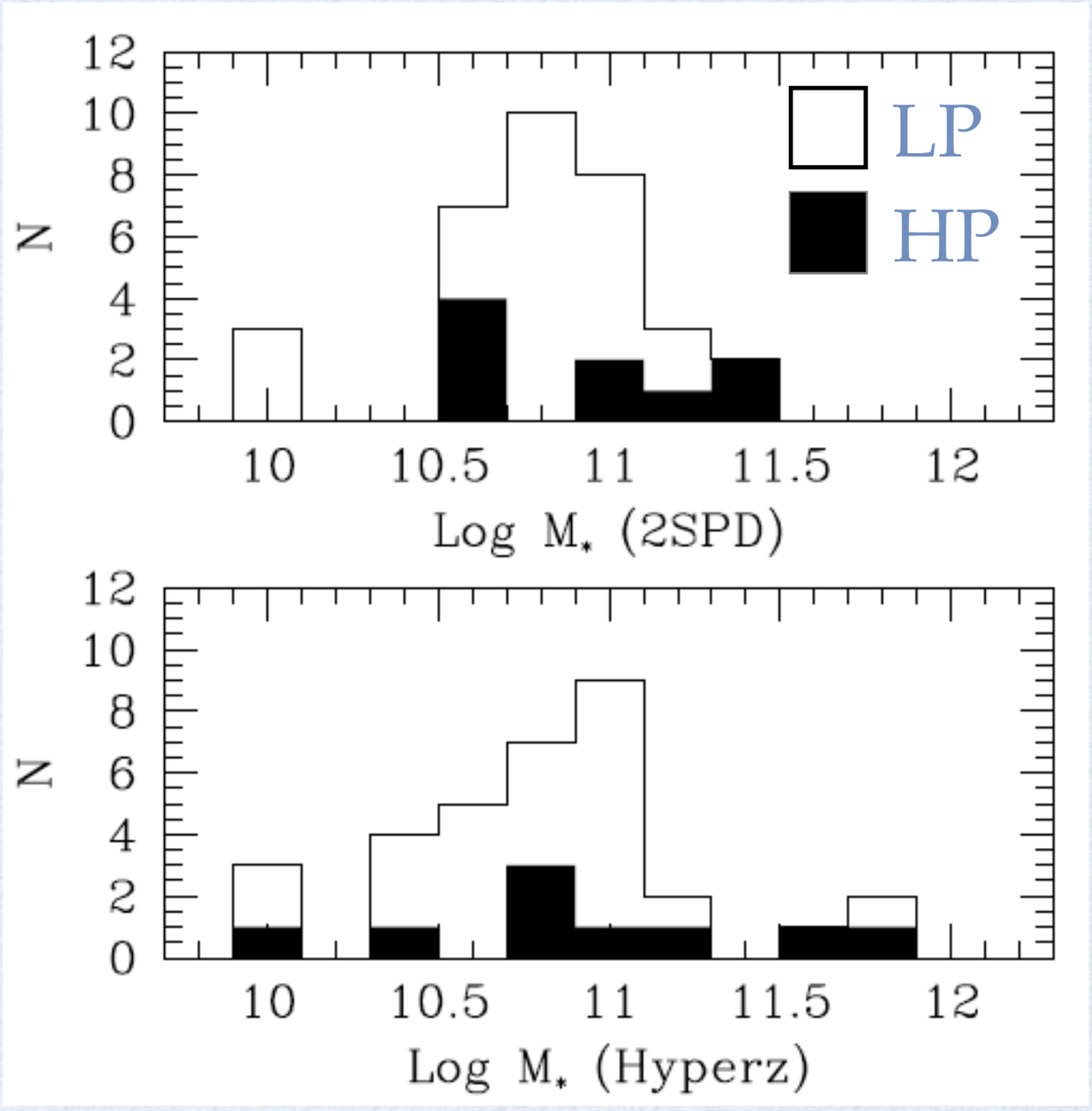
RESULTS: RADIO DISTRIBUTION

- K-corrected Radio distribution straddling the FRI/FRII break: LP and HP sources
- $L_{FIRST} \sim 10^{40.7\text{-}42.3}$ erg/s
- FRI-FRII? frequency?

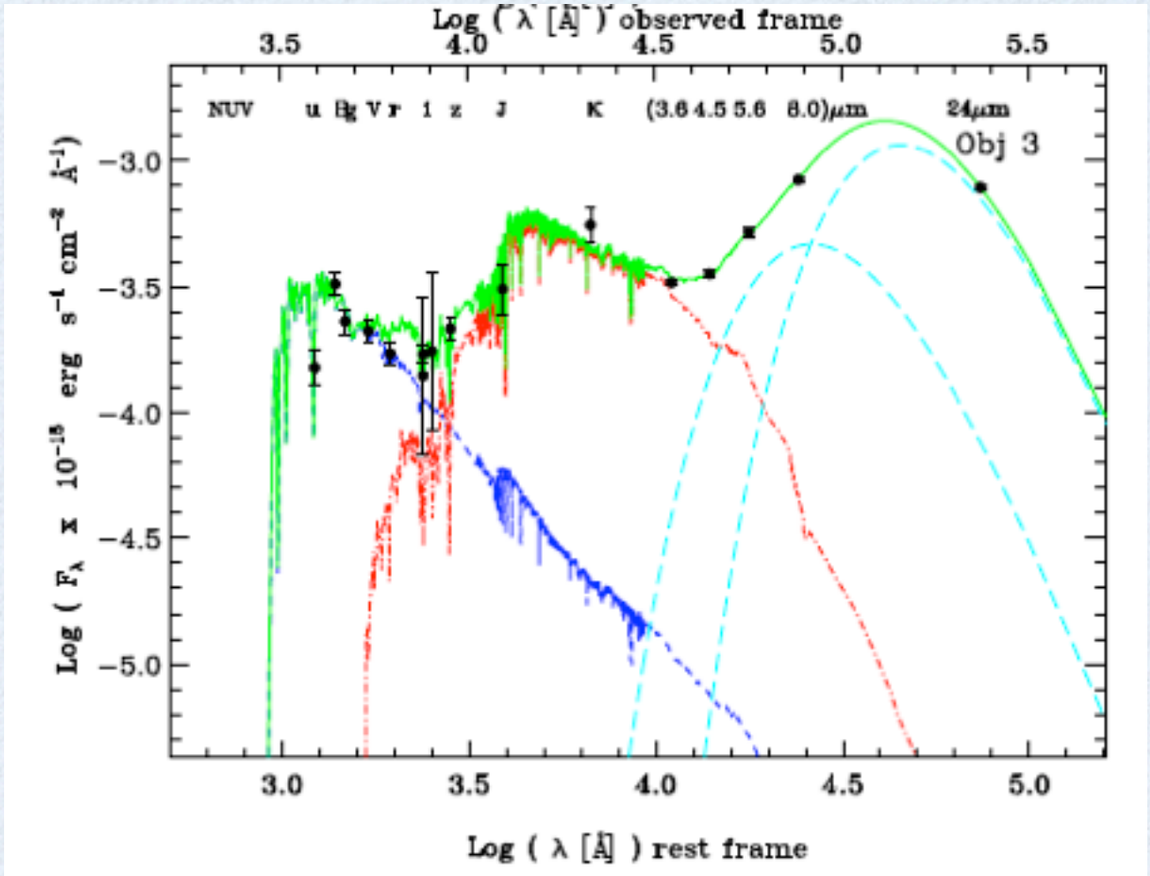


RESULTS: STELLAR POP

- Stellar masses: $10^{10.5\text{-}11.5}\ M_{\odot}$.
- SEDs are red and dominated by OSPs.
- OSP: 1-3 × 10^9 yr.
- YSP: 1-30 Myr and $\lesssim$1% mass contribution.

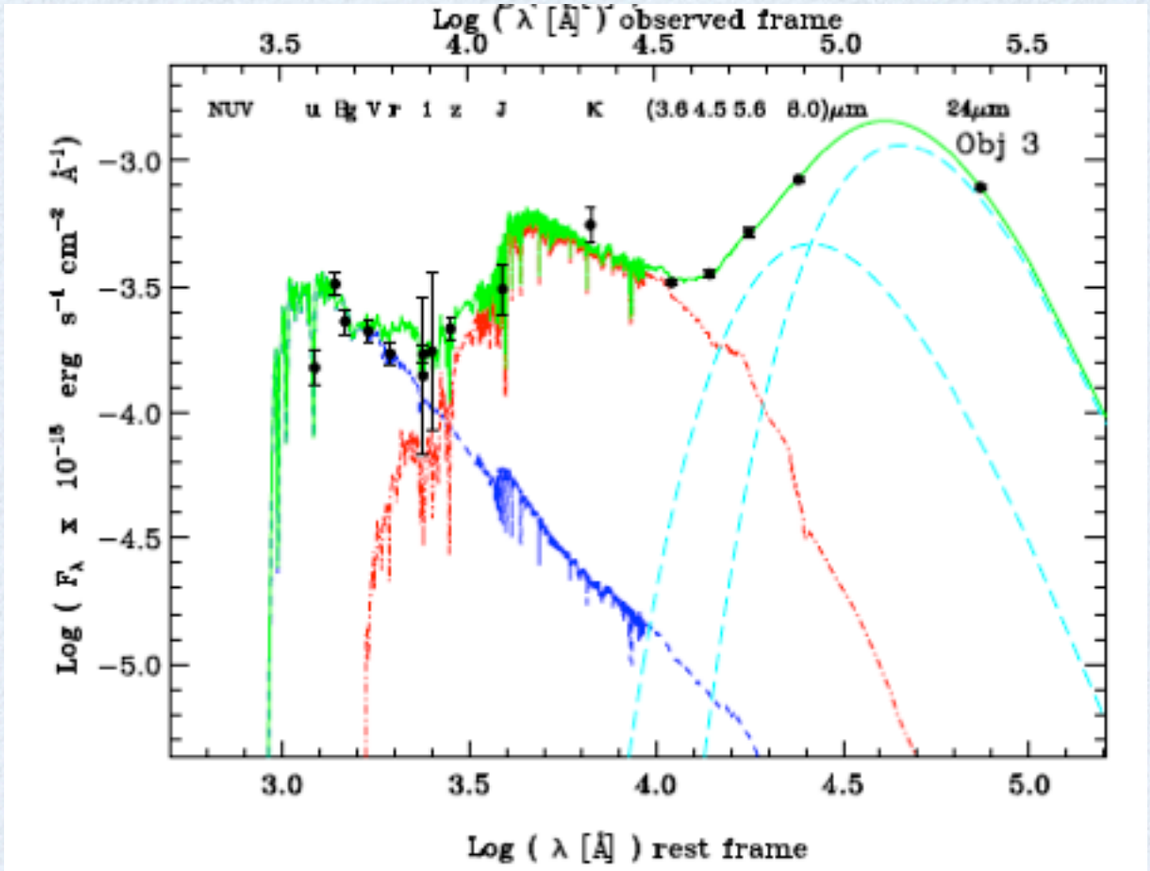


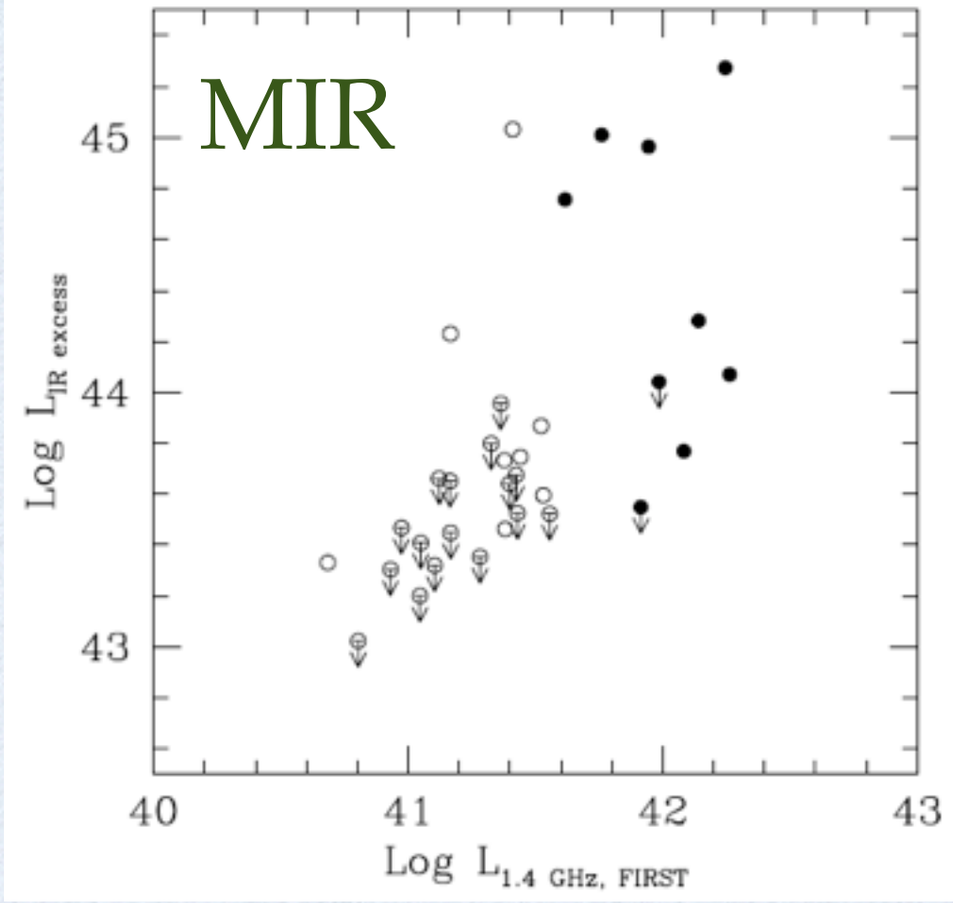
RESULTS: MIR & UV



MIR and UV excesses with respect to OSP

RESULTS: MIR & UV





- T range ~300-850 K; radio-IR relation: AGN origin
- L_{dust} ~$10^{43.5\text{-}45.5}$ erg s^{-1}

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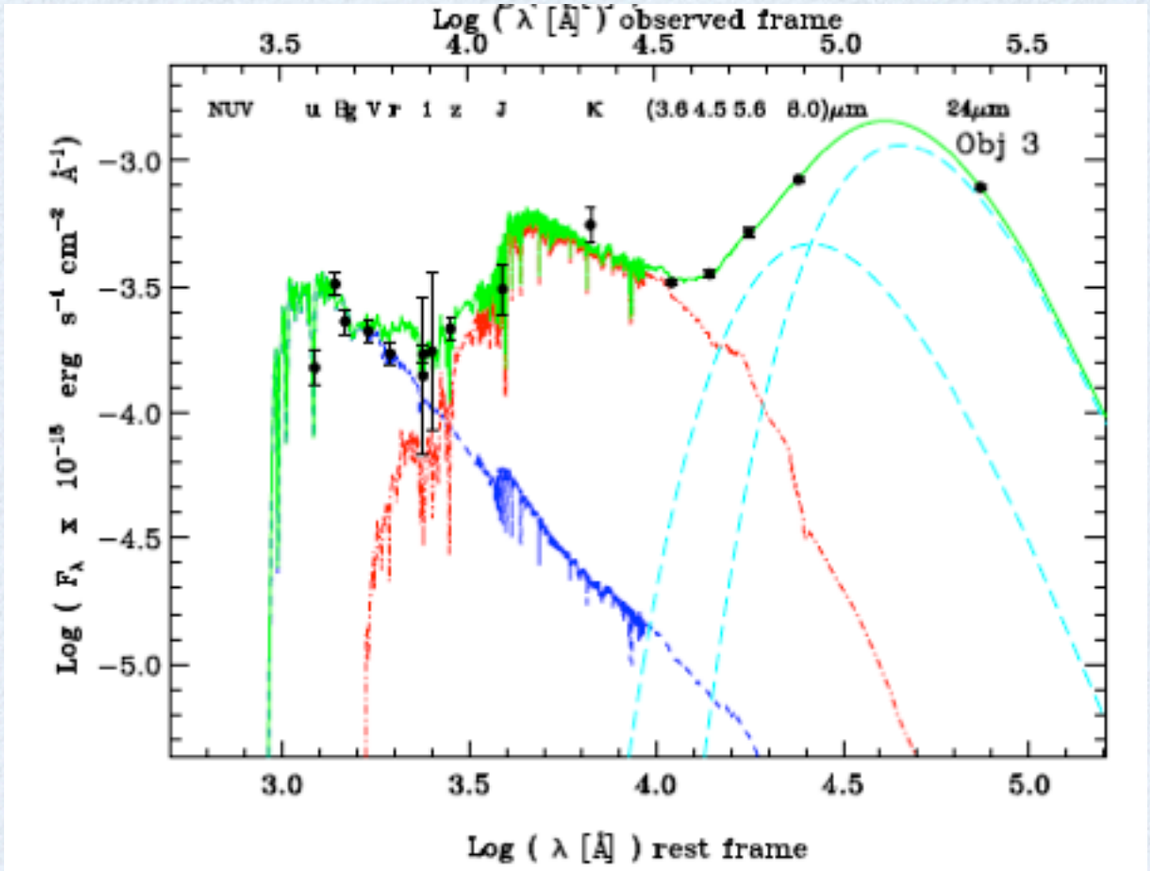

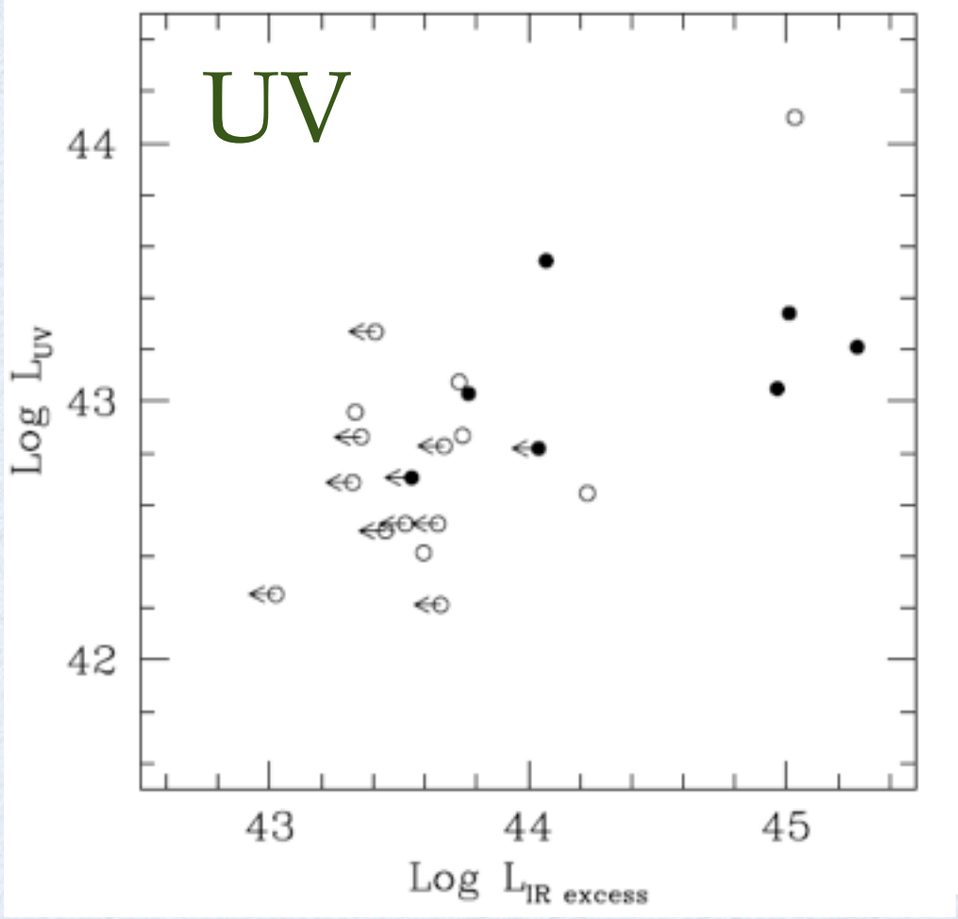

- T range ~300-850 K; radio-IR relation: AGN origin
- L_{dust} ~$10^{43.5-45.5}$ erg s^{-1}
- L_{UV} ~ 10^{42-44} erg s^{-1}
- radio-UV no relation, IR-UV relation: SF or AGN?

COMPARISON WITH LOCAL RG

- Radio distribution: similar FRI, but broad
- host: red massive galaxies
- environment (see Castignani's talk)
- MIR: L_{MIR} larger than local FRI
- UV: L_{UV} larger than local FRI

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LP/HP = FRI/FRII?
Possible progenitors?

CONCLUSIONS

- Redshift range: $0.7 < z < 3$
- low radio power, red massive host: FRI
- UV and MIR excesses in several sources: FRII?
- Future: host (color, type) and nuclear (radio and X-ray) properties