An AGN census: the contribution of radio survey

Marco Bondi, INAF-IRA

AGN selected using different techniques/wavelengths represent separate populations, with differences in host galaxies, environments and accretion mode

Cons:

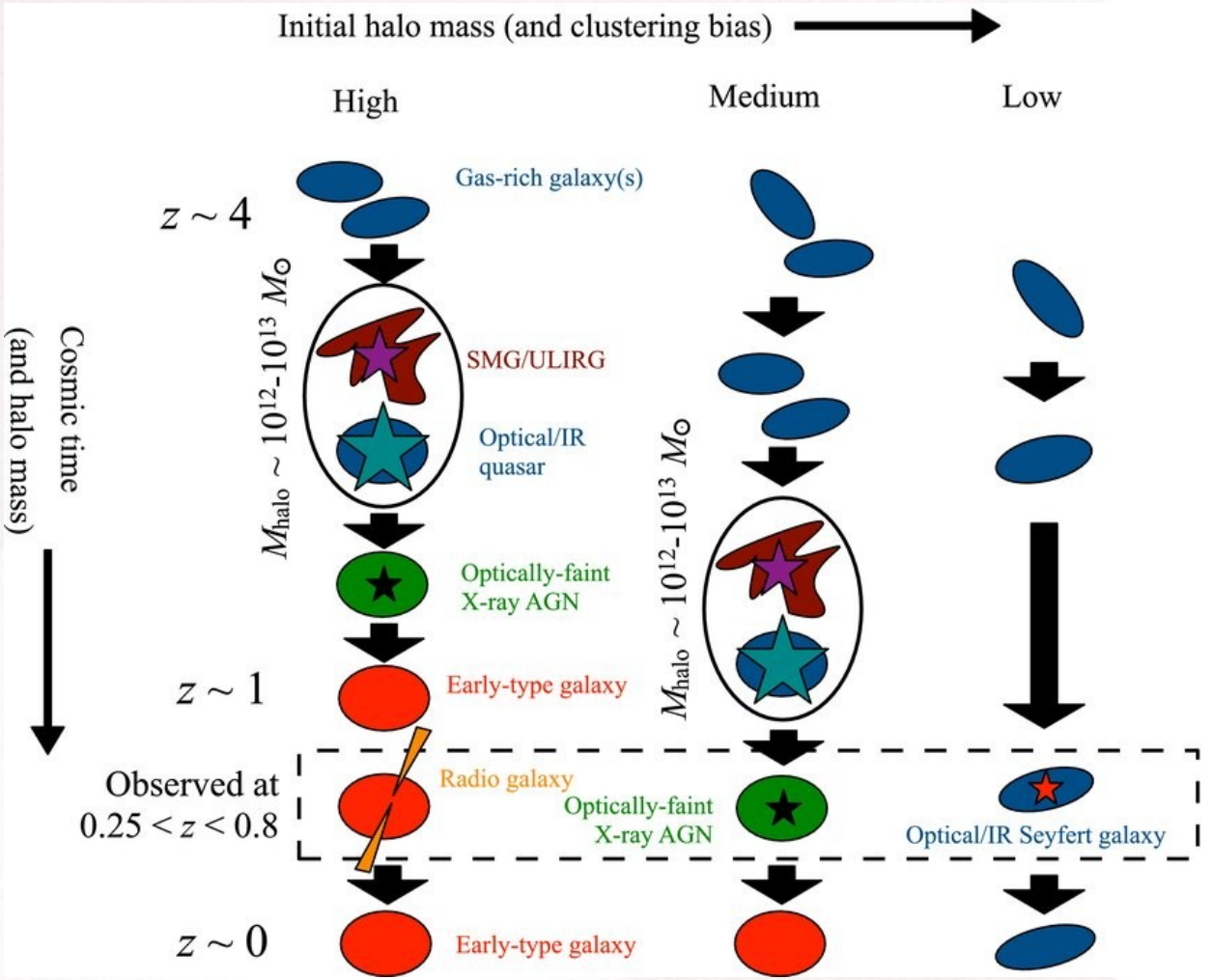
- Still low fraction of (quasar-mode) AGN is detected in radio surveys:
  - e.g 14% of X-ray AGN detected in the deepest radio survey (GOODS-N, 2Ms Chandra & JVLA-5.5GHz).

An AGN census: the contribution of radio survey

Pros:

- Major increase of sensitivity in the last years (JVLA) and still to come (SKA)
- High resolution
- Unaffected by dust absorption and obscuration
- Radio-mode AGN associated to red passive Es
  - direct link between radio AGN activity and massive galaxy formation (e.g. feedback)

Galaxy/AGN co-evolution



Hickox+09

Quasar/radio-mode dichotomy

Other names	HERG Cold-mode AGN Radiative-AGN Quasar-mode High SMBH accretors Thin-disk	LERG Hot-mode AGN Jet-mode AGN Radio-mode Low SMBH accretors Thick-disk, ADAF	
Radio luminosity	High (L20cm≥1026W/Hz)	Lower (L20cm≤1026W/Hz)	e.g., Kauffmann et al. 2008, Best & Heckman 2012
Source of radio emission	SF+AGN	AGN	e.g., Moric et al. 2010; Hardcastle et al. 2013; Gurkan et al. 2015
Optical color	Green	Red	e.g., Baum et al. 1992; Baldi & Capetti 2008; Smolčić et al. 2008; Smolčić 2009
Stellar mass	Lower than LERAGN	Highest (≥5×1010M□)	e.g., Kauffmann et al. 2008; Smolčić et al. 2008; Tasse et al. 2008; Smolčić 2009
Gas mass	Higher (3×108M□)	Low (<4.3×107M□)	e.g., Smolčić & Riechers 2011
BH mass	Lower than LERAGN	Highest (~109M□)	e.g., Baum et al. 1992; Chiaberge et al. 2005; Kauffmann et al. 2008; Smolčić et al. 2008; Smolčić 2009
BH accretion rate	~Eddington	sub-Eddington	e.g., Haas 2004; Evans et al. 2006; Hardcastle et al. 2006, 2007; Smolčić 2009
BH accretion mode	Radiatively efficient	Radiatively inefficient	e.g., Evans et al. 2006; Merloni & Heinz 2008; Fanidakis et al. 2012
Environment	Low-density	Wider range of densities	e.g., Gendre et al. 2013
Cosmic evolution	Steep	Mild	e.g., Sadler et al. 2007, Donoso et al. 2009; Best et al. 2014; Smolčić et al. 2009, 2015; Padovani et al. 2011, 2015

Courtesy V. Smolcic

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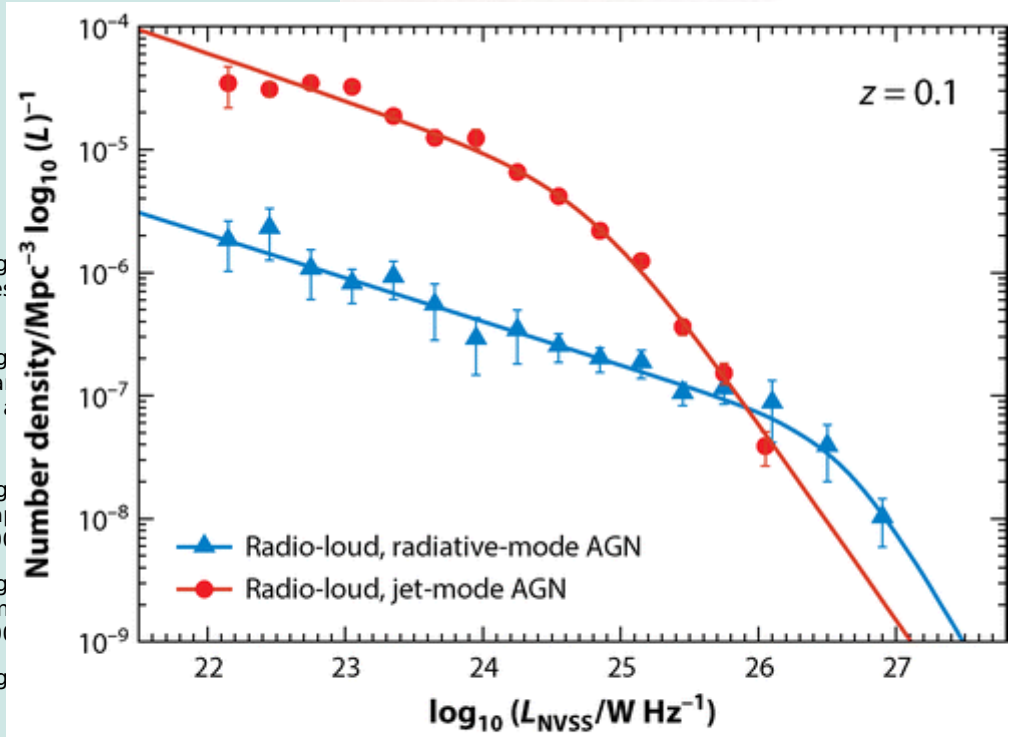

Heckman TM, Best PN. 2014.
Annu. Rev. Astron. Astrophys. 52:589–660

Still to improve faint and bright end at z>0.5

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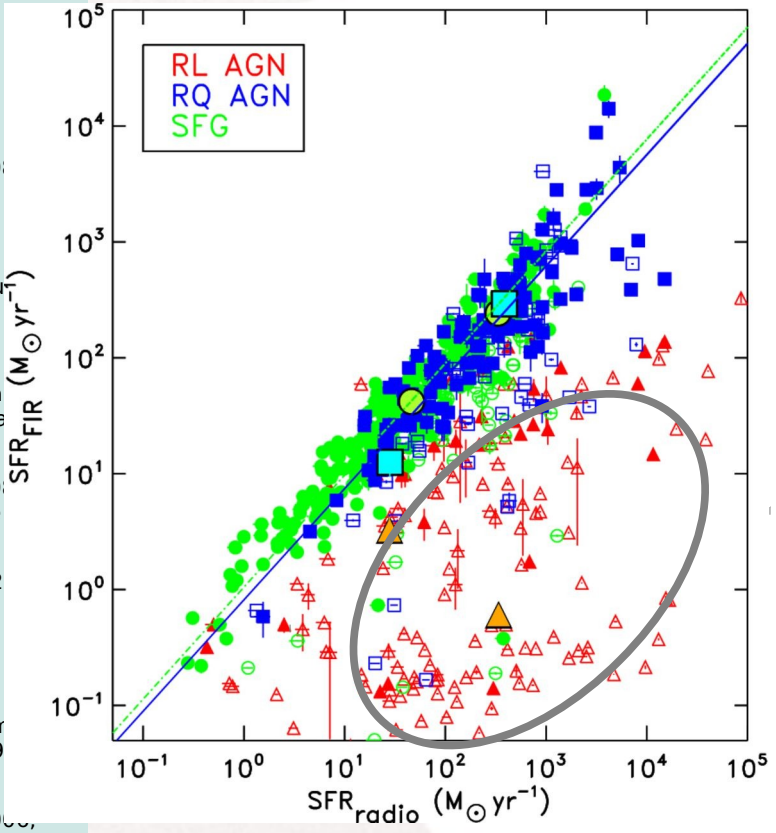
Bonzini+15



radio-excess (e.g. Del Moro+13)

Synergy between IR and radio

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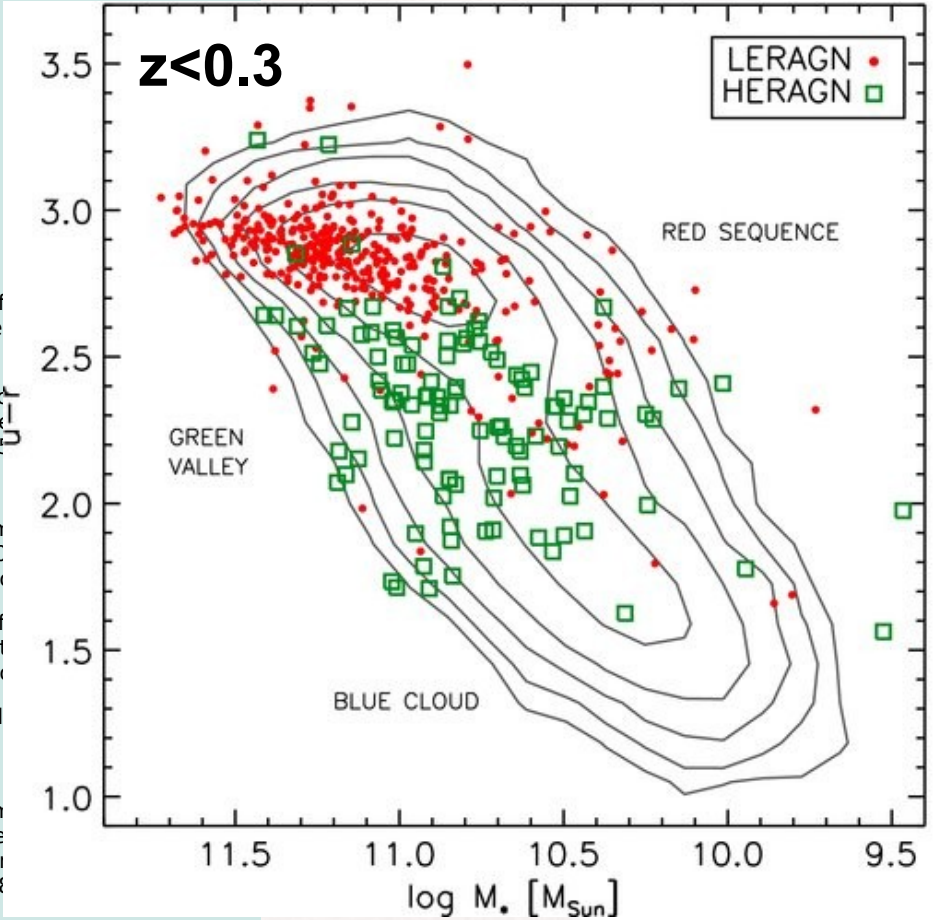

Smolcic09

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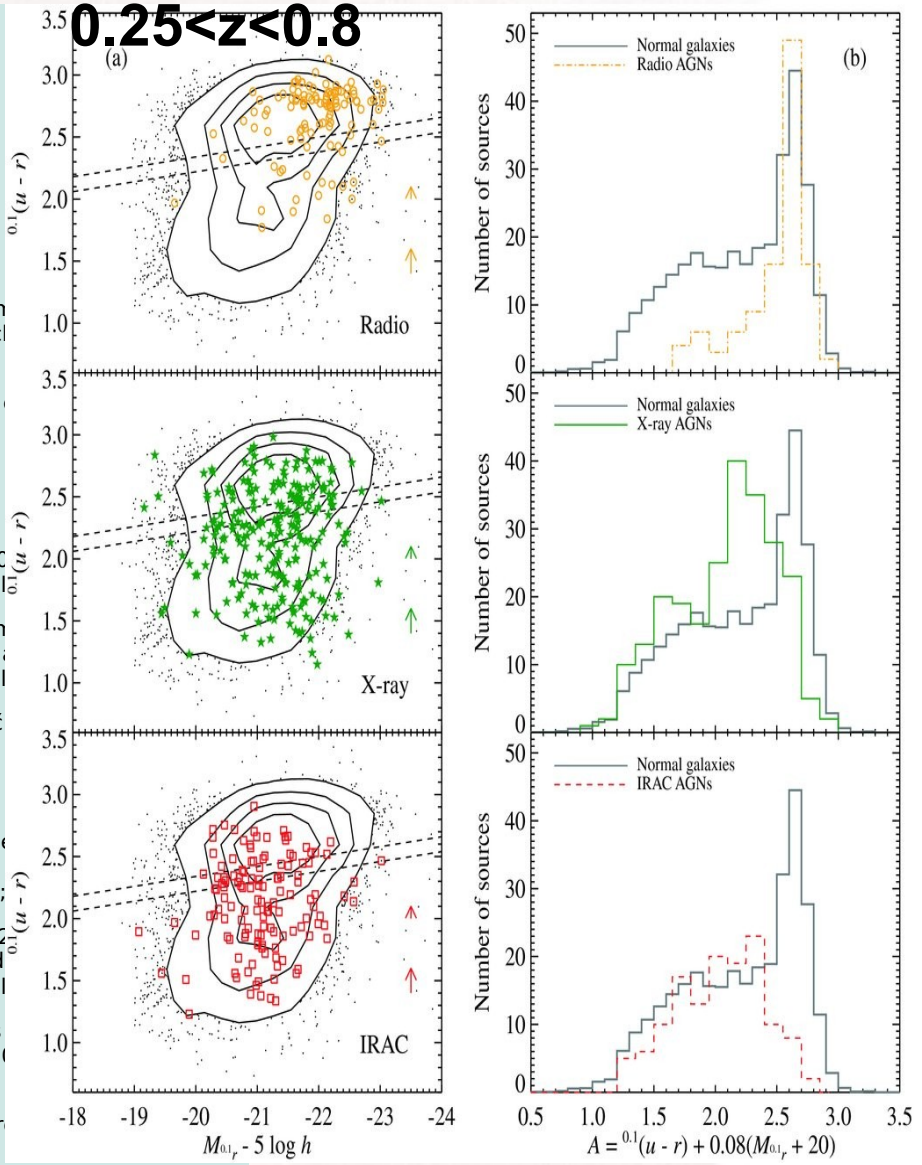

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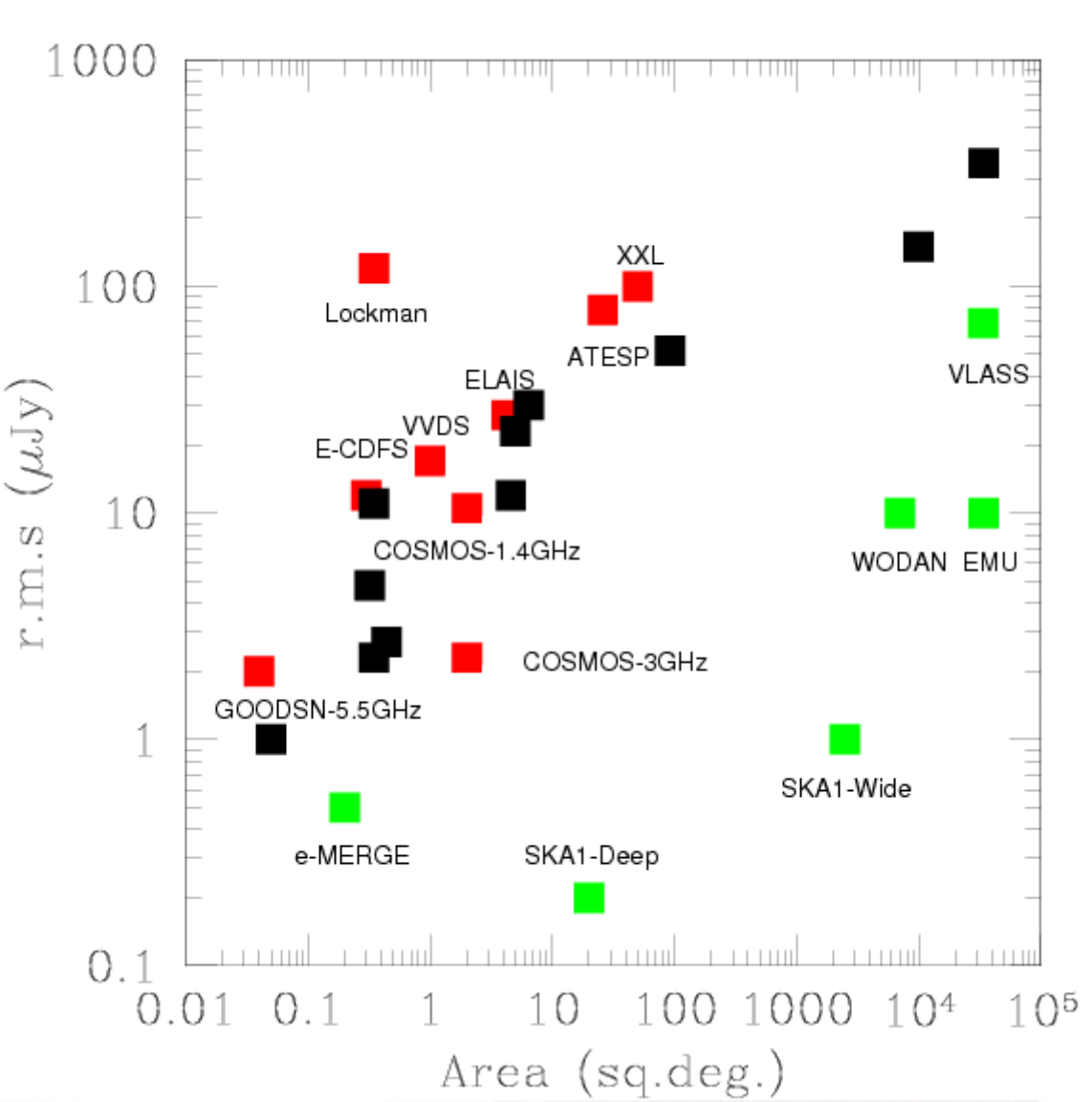
Where we are, what's next

Radio survey/follow-up with INAF participation

Future



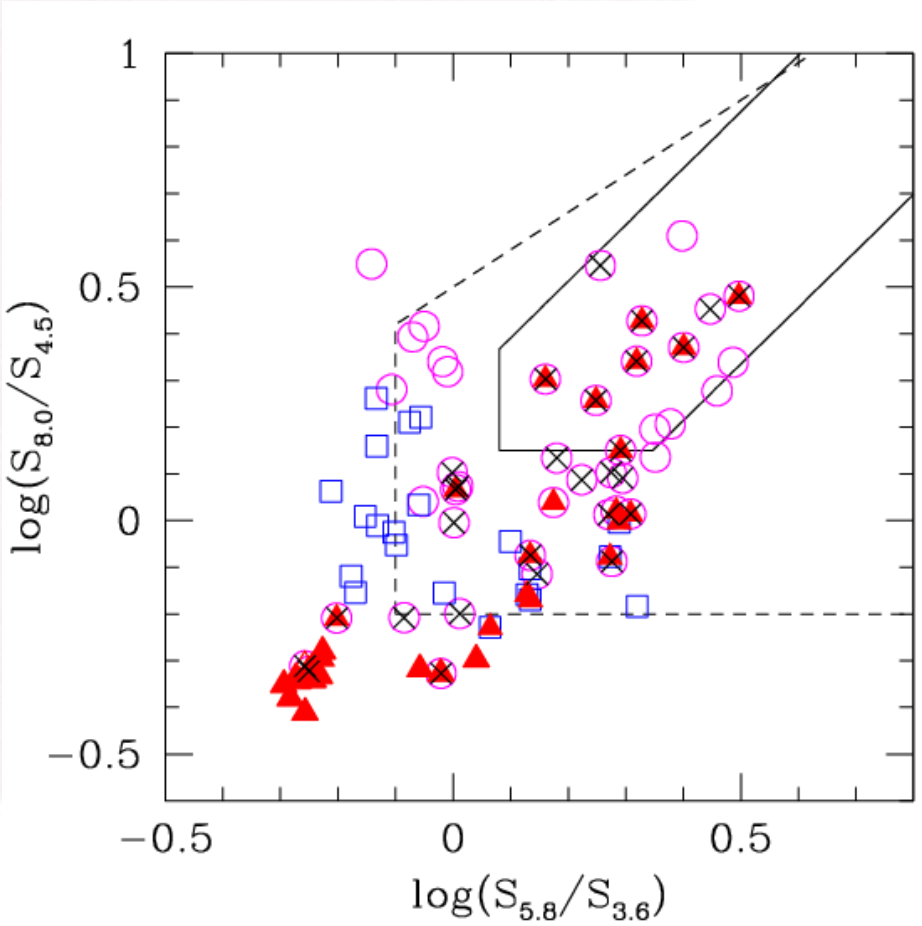
An efficient way to select AGN

GOODS-N JVLA 5.5 GHz
Low radio luminosity

IR-AGN based on Donley+12, Stern+05, Messiah+12, Kirkpatrick+13

- IR+X-ray AGN
- Red-passive E
- SF/Comp. objects
- cross: X-ray
- triangle: radio-excess

Radio band is an efficient AGN identifier: ~80% of radio sources are AGN dominated.



Guidetti+ in prep.

Conclusions:

Exploiting different expertise and increasing synergies among INAF institutes is mandatory in the era of the large international collaborations.

SKA will be a major breakthrough In the meantime, there is still a lot that can be done with the pathfinder (e.g. JVLA, e-MERLIN)