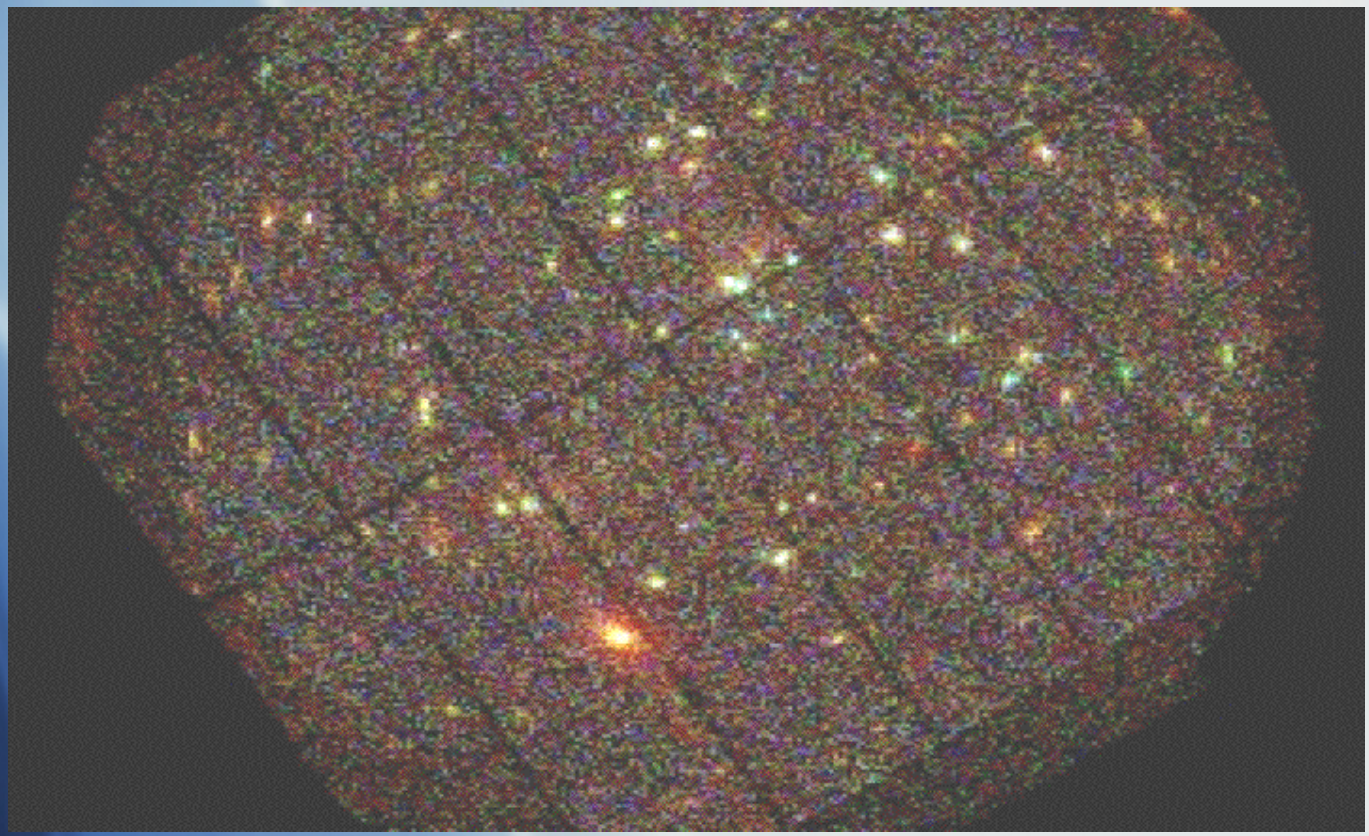
AGN from the 13H *XMM/Chandra* deep radio/X-ray survey



Nick Seymour (SSC) NRAO 17th May

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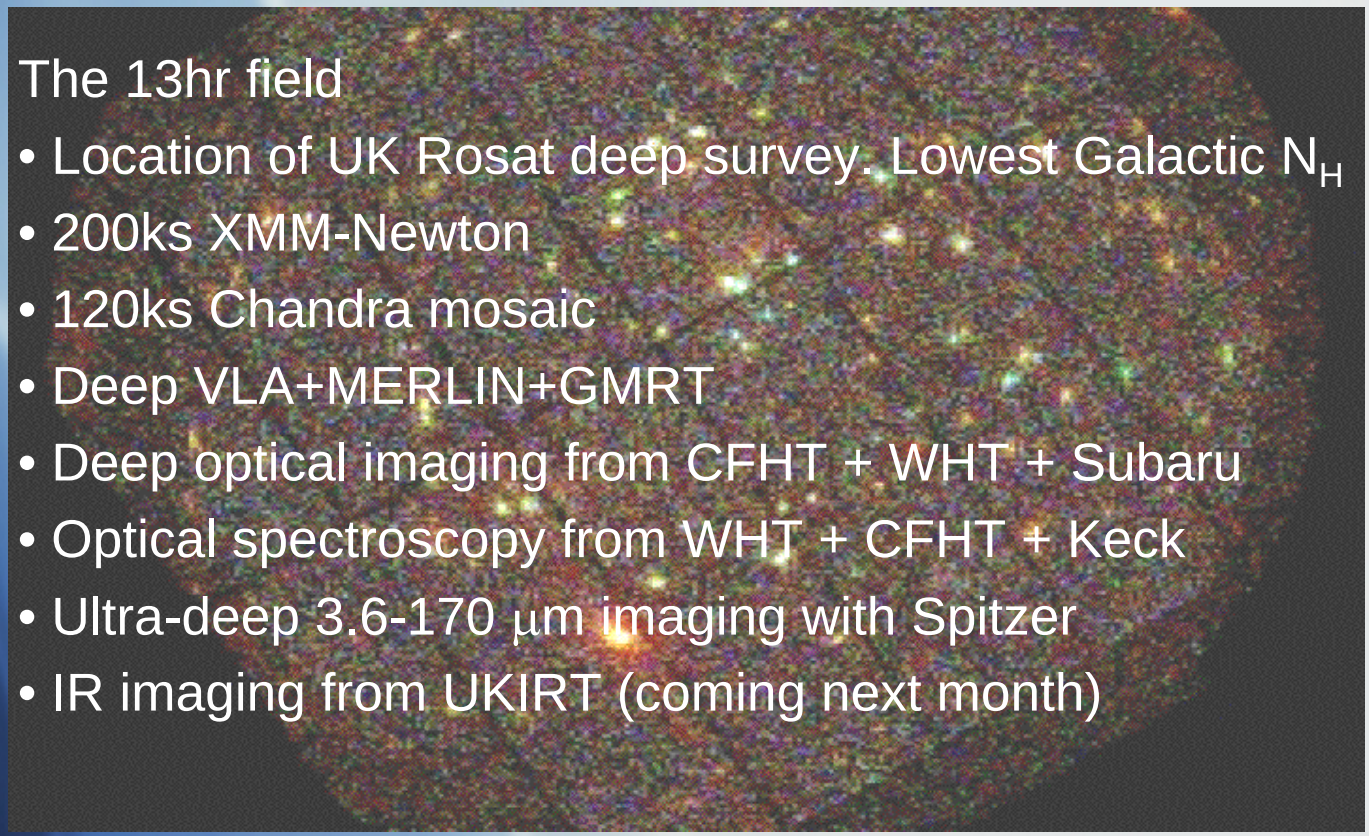
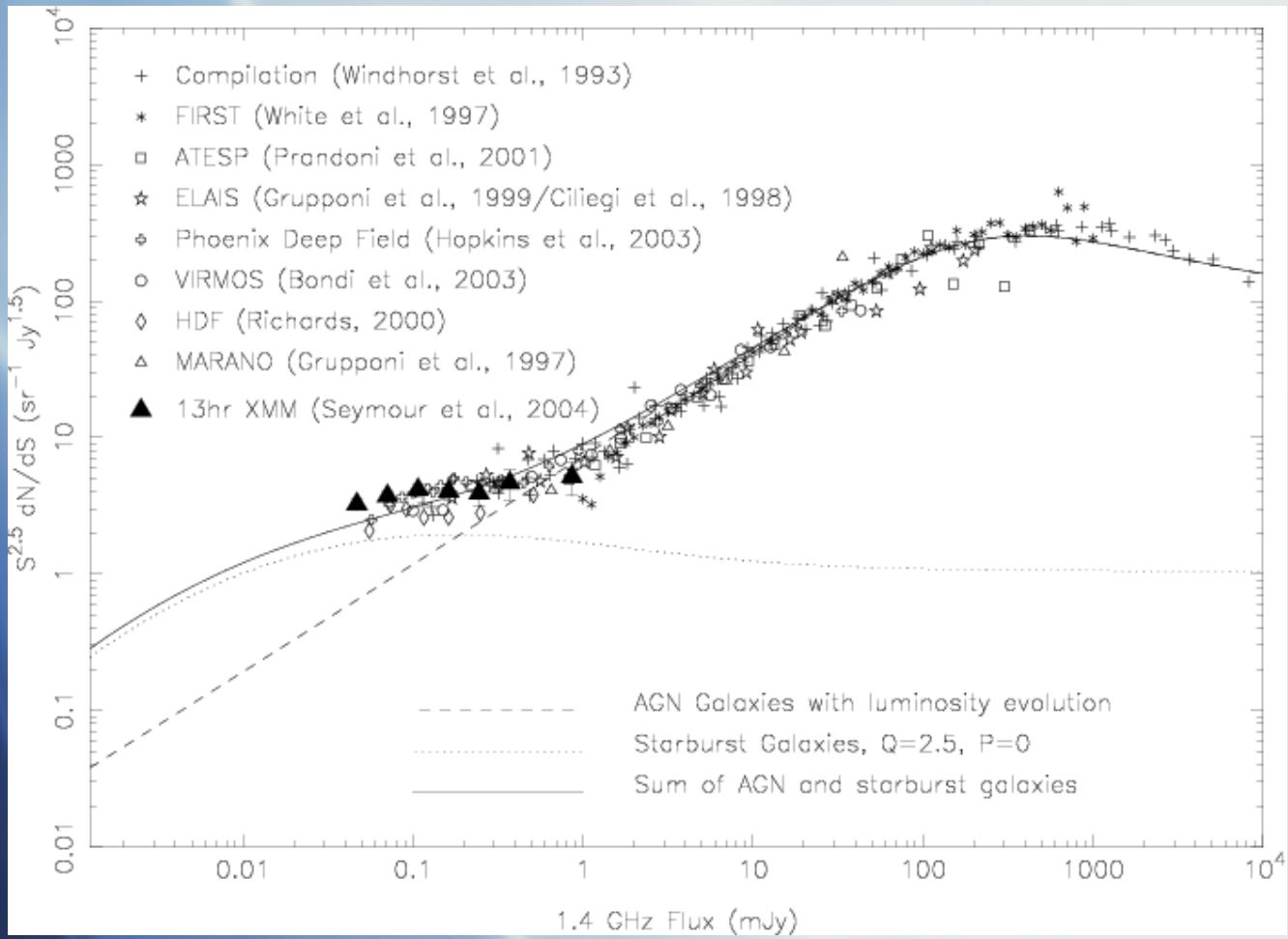


The 13hr field

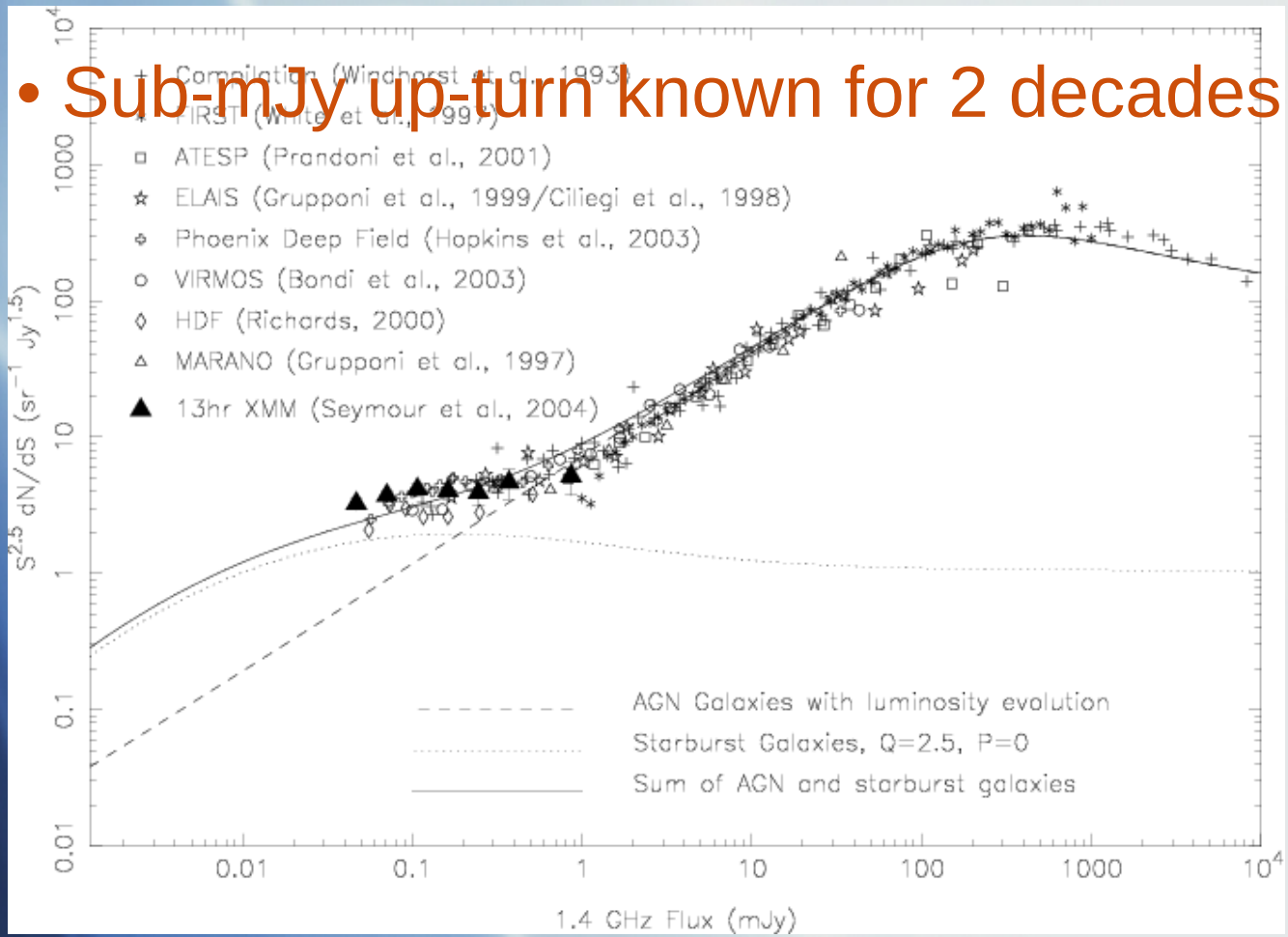
- Location of UK Rosat deep survey. Lowest Galactic N_H
- 200ks XMM-Newton
- 120ks Chandra mosaic
- Deep VLA+MERLIN+GMRT
- Deep optical imaging from CFHT + WHT + Subaru
- Optical spectroscopy from WHT + CFHT + Keck
- Ultra-deep 3.6-170 μm imaging with Spitzer
- IR imaging from UKIRT (coming next month)

The 20cm deep radio counts



The 20cm deep radio counts

- Sub-mJy up-turn known for 2 decades



The 20cm deep radio counts

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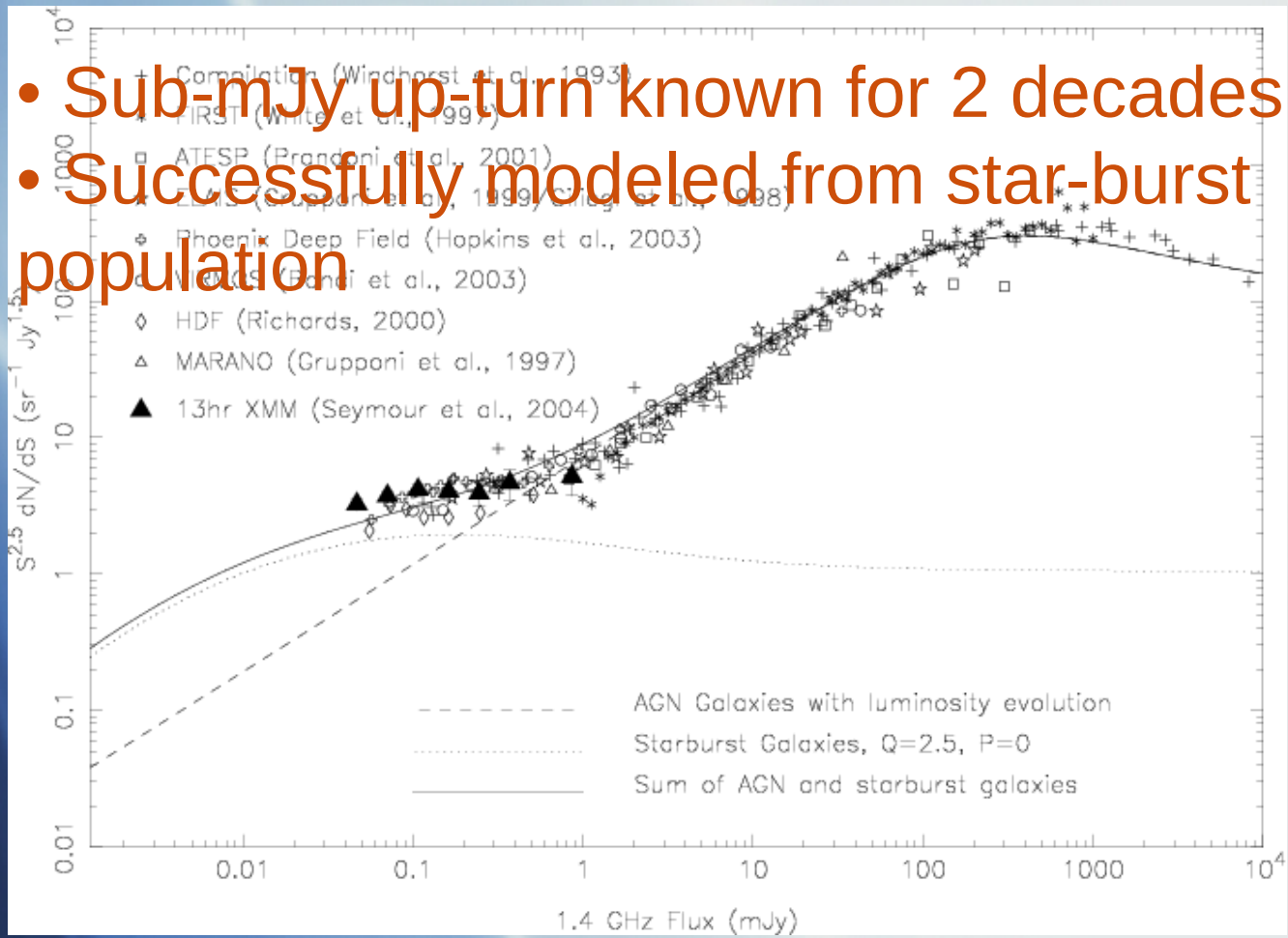

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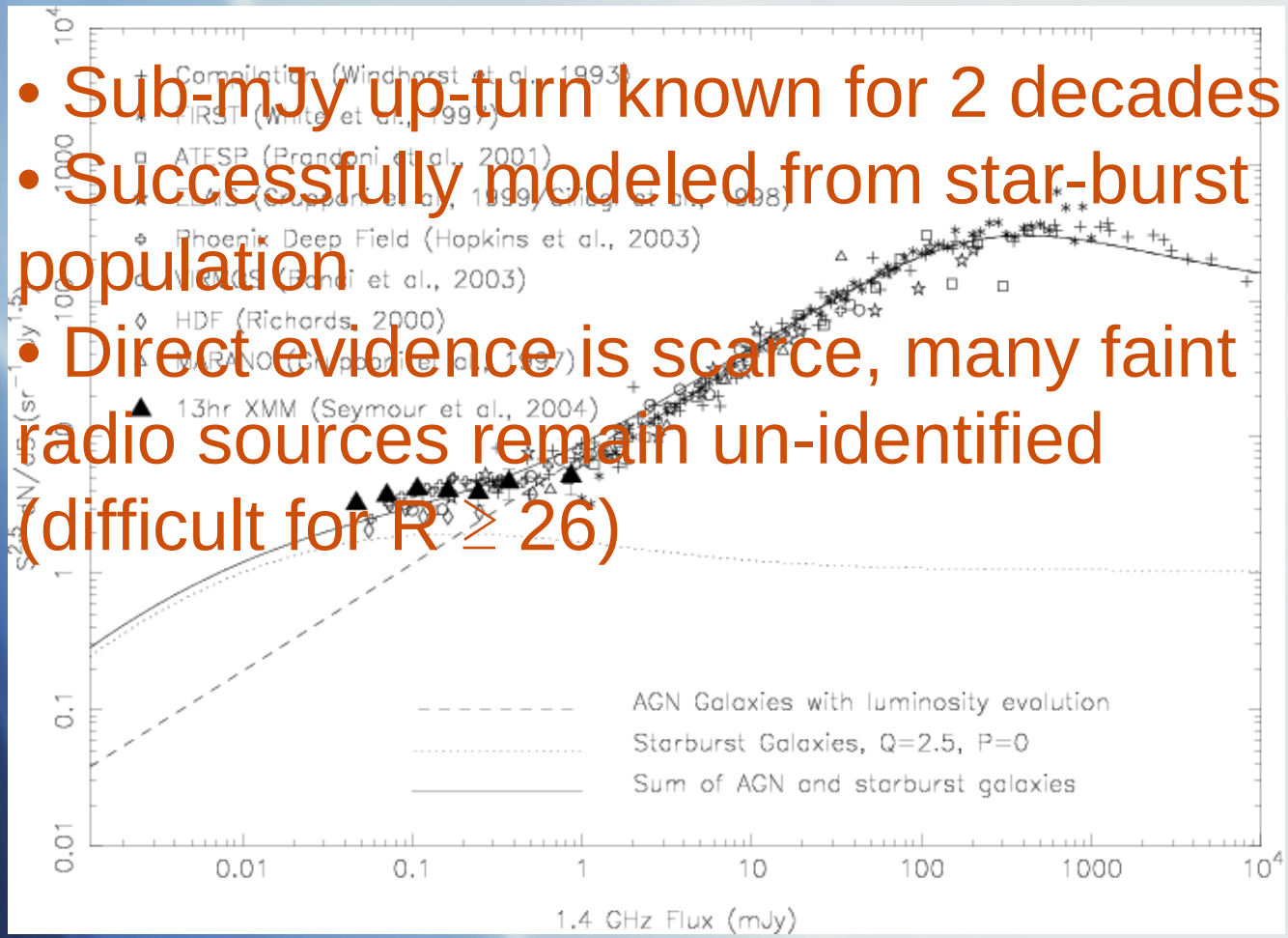

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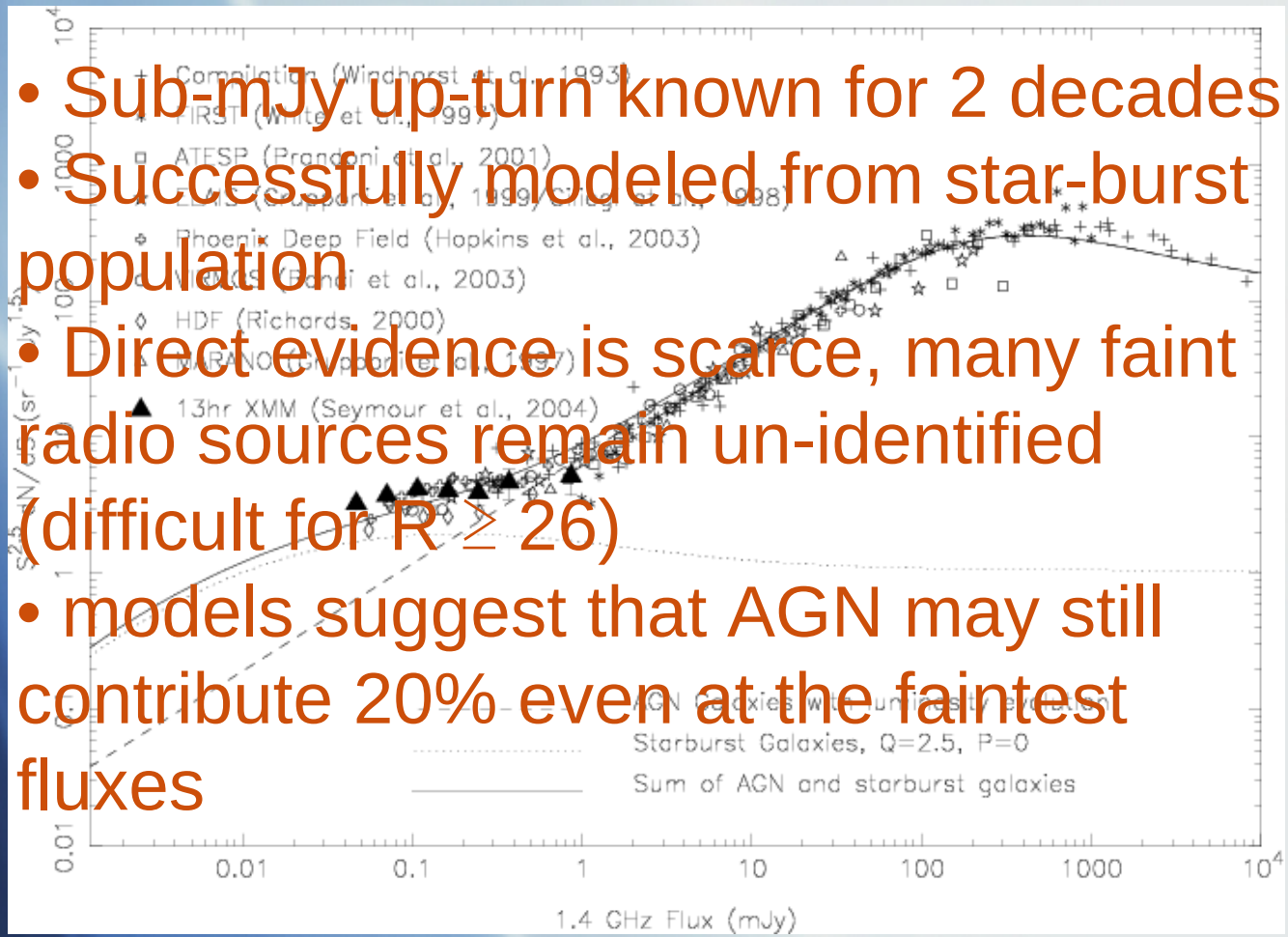

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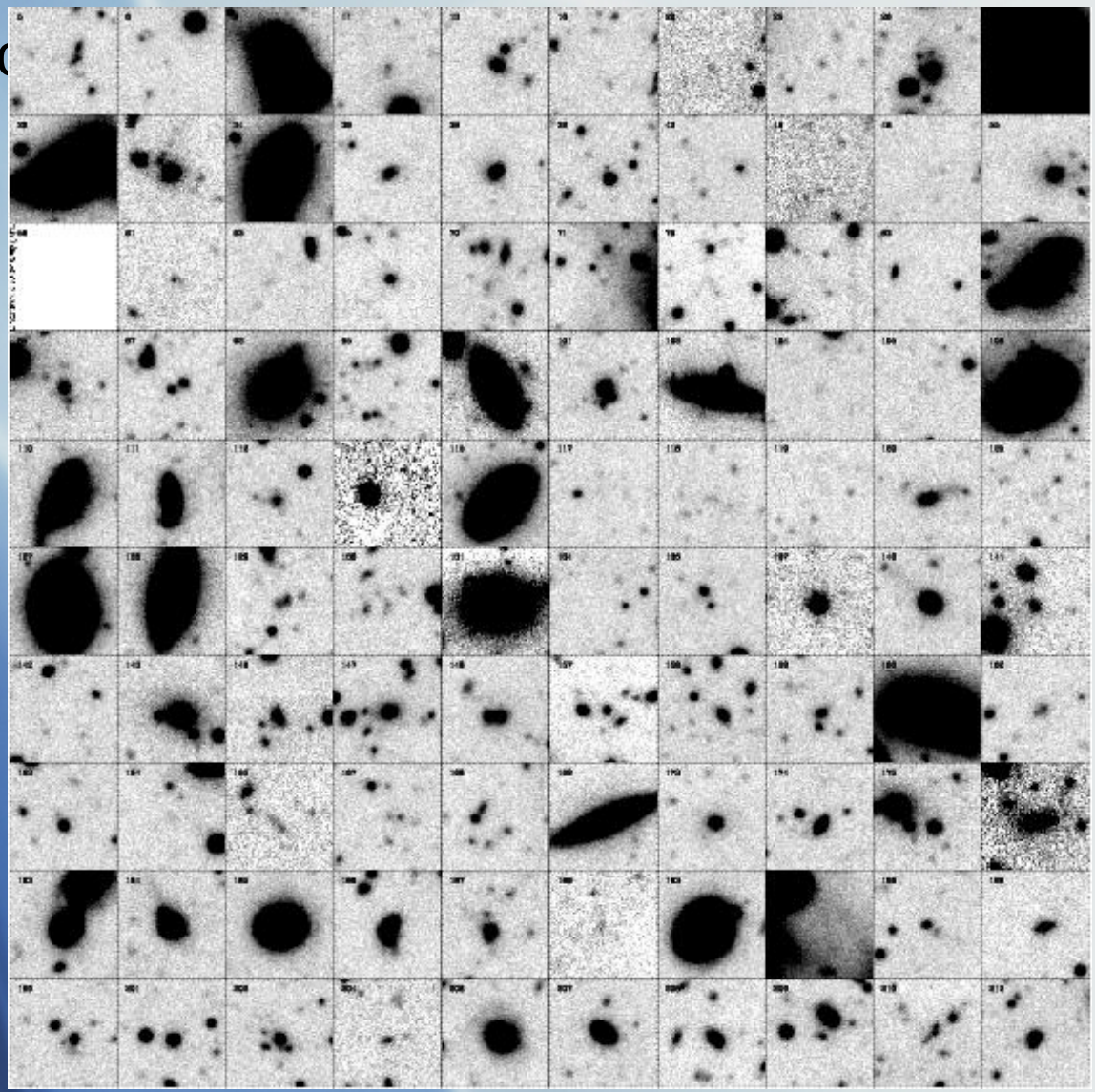
- Direct evidence is scarce, many faint radio sources remain un-identified (difficult for $R \geq 26$)
- models suggest that AGN may still contribute 20% even at the faintest fluxes

AGN/SFG Discrimination

- optical morphology/colours

AGN/SFG Discrimination

- optic



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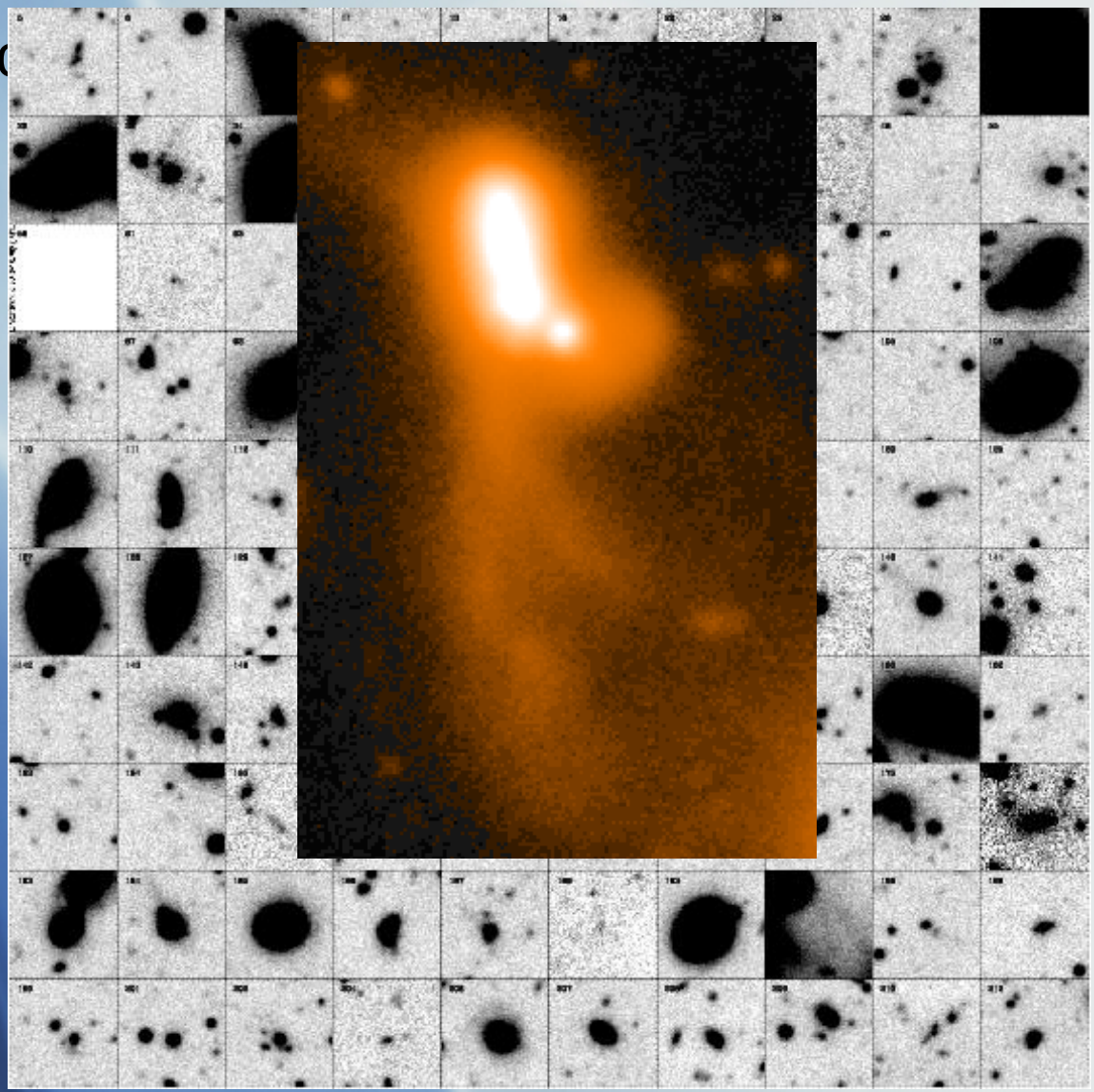

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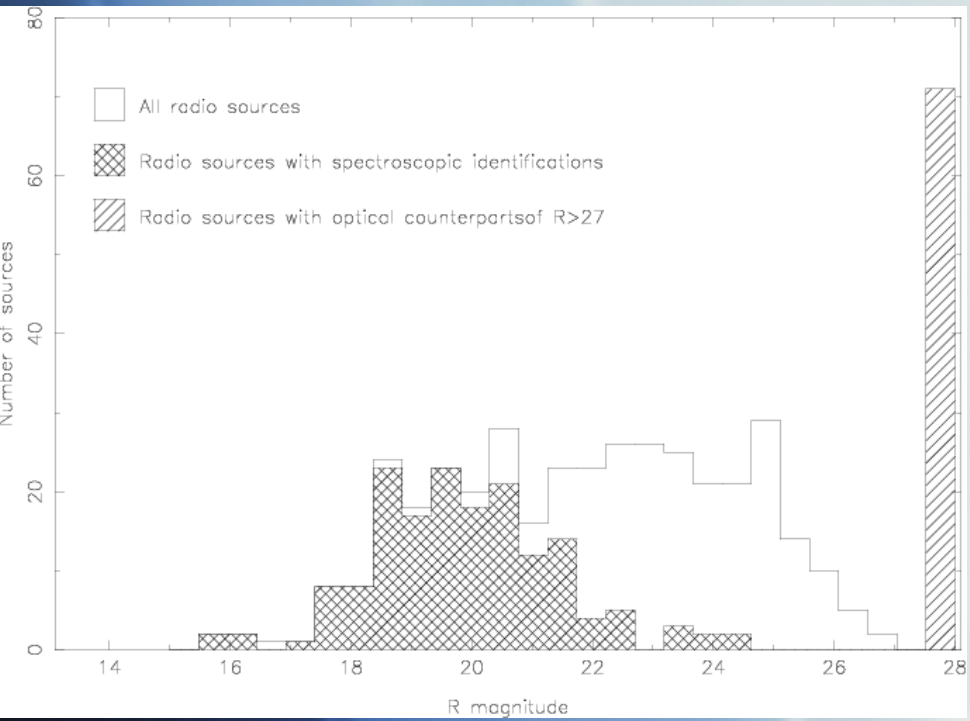

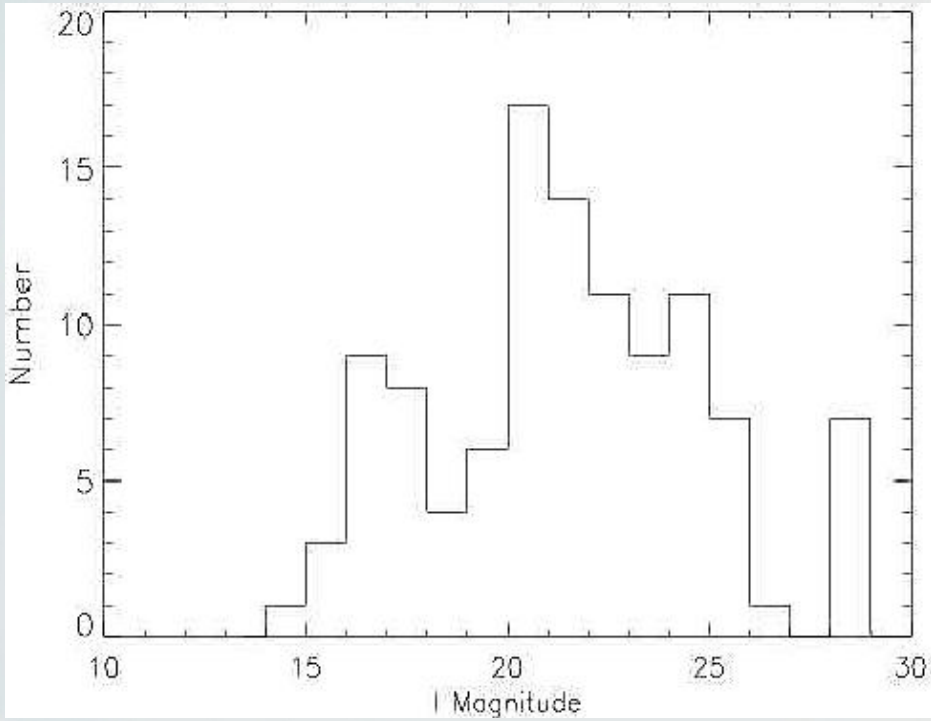

1.4GHz *R*-band

635MHz *i* ´-band

AGN/SFG Discrimination

- optical morphology/colours
- optical spectra - need high S/N for line diagnostics

AGN/SFG Discrimination

- optical morphology/colours
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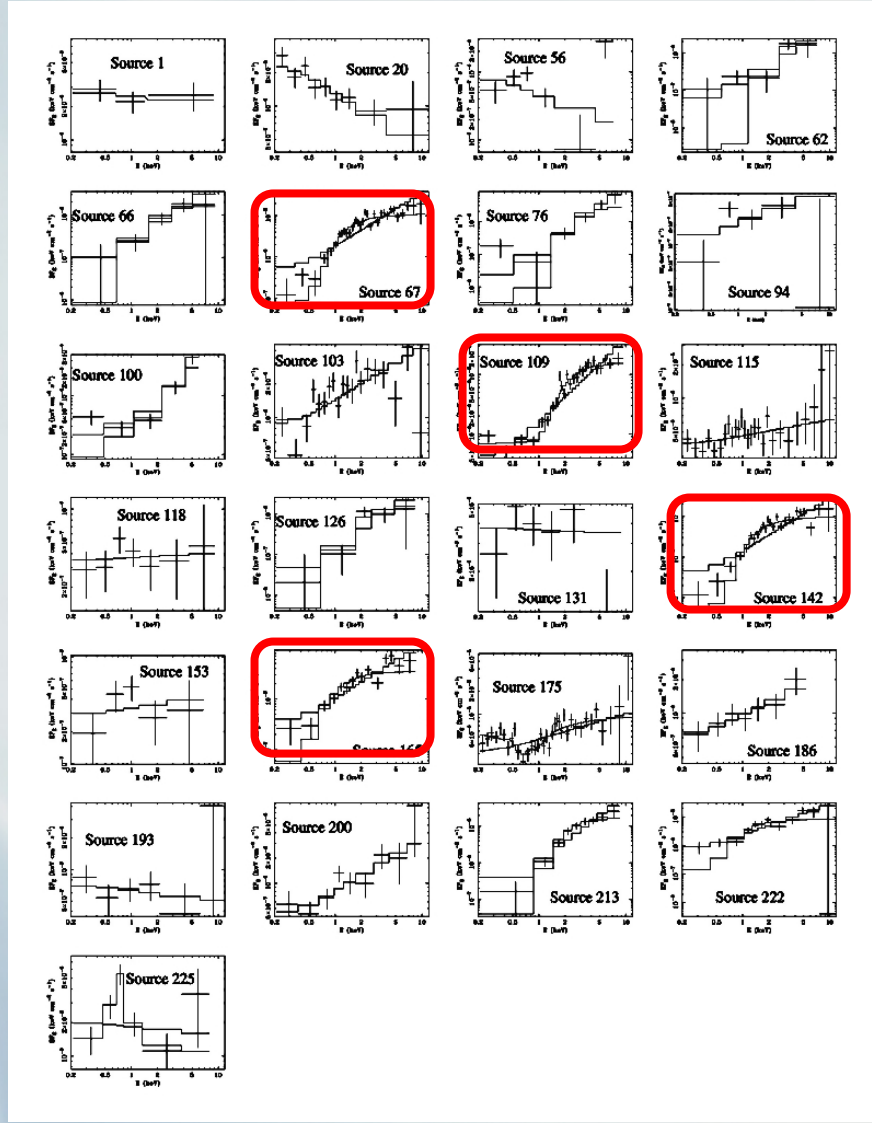
- X-ray spectra

Spectra of NELGs

- Lots of them are absorbed.
- Some are not.
- Some absorbed and with reprocessed soft component.



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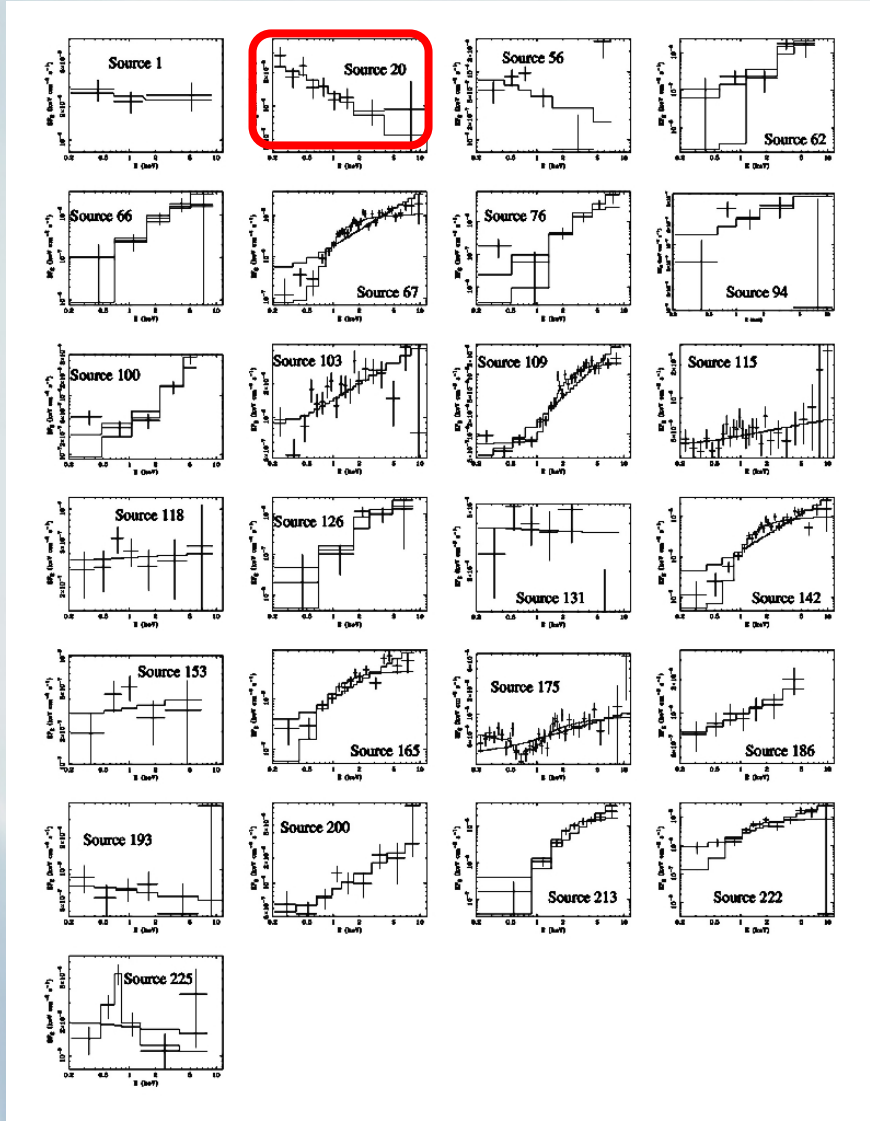

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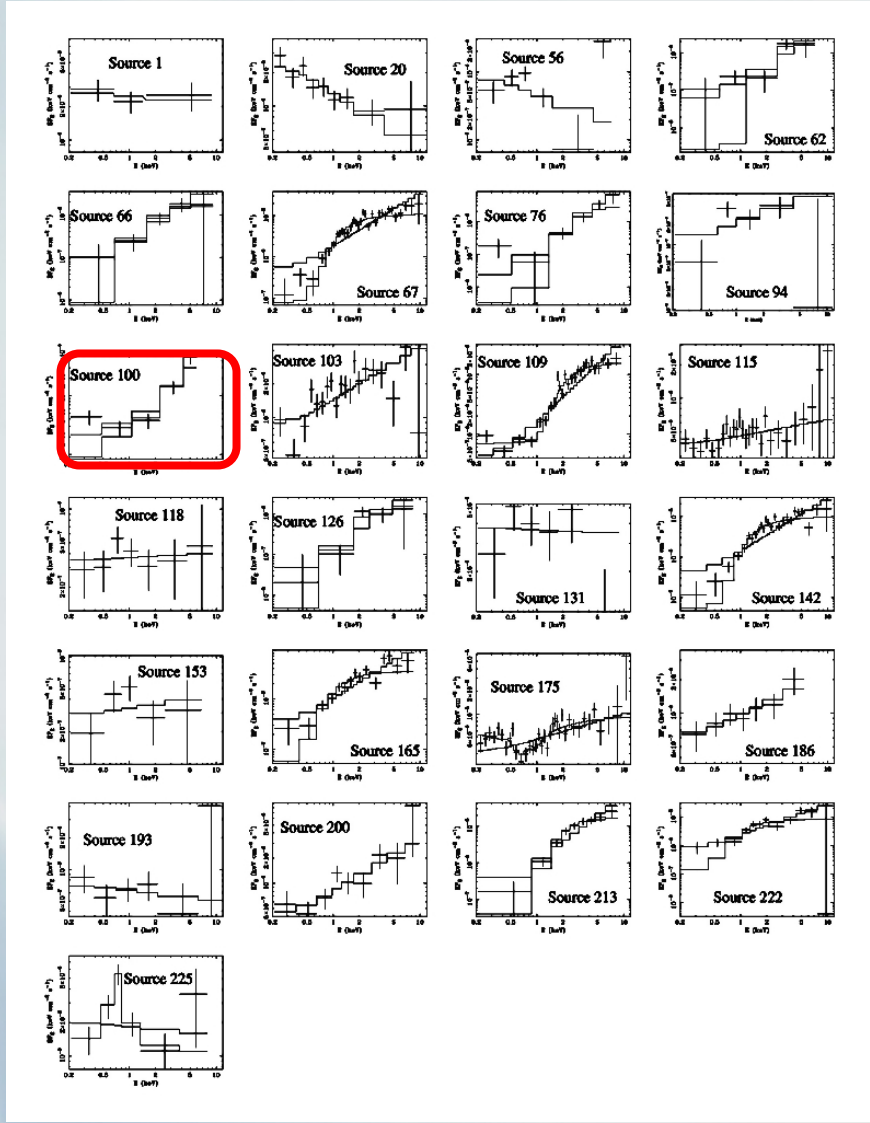
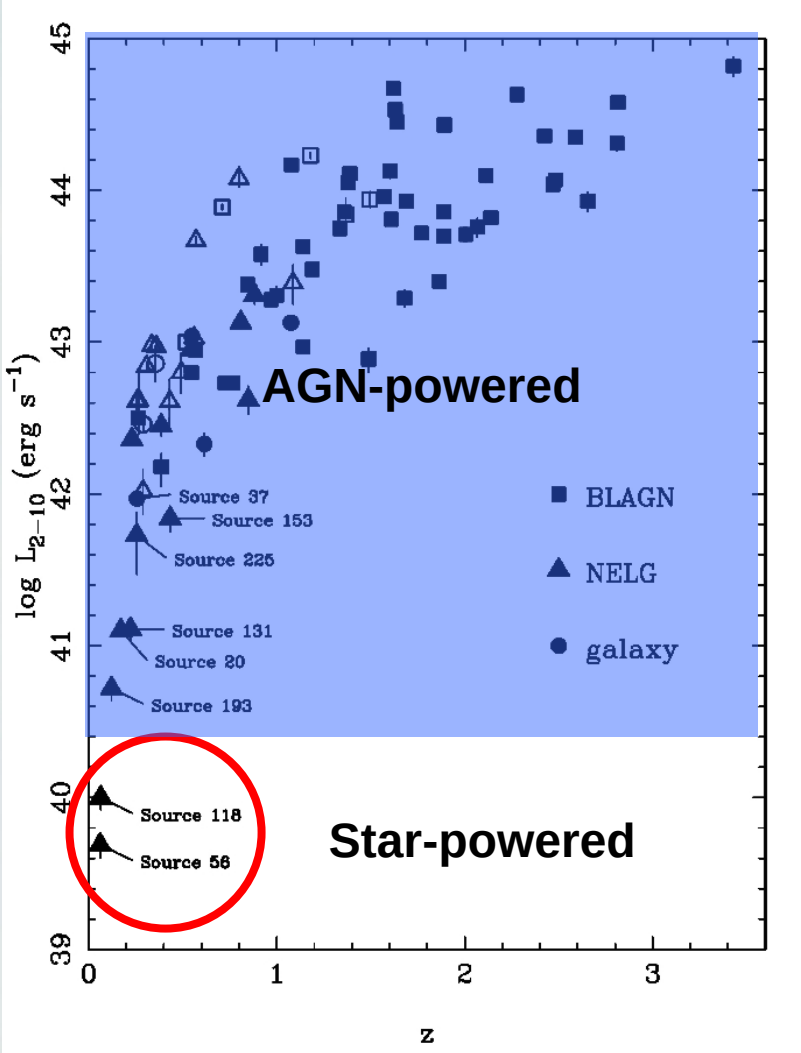


Star-forming galaxies?

- You can tell the AGN by a combination of properties.
- Variable
- Power law spectra
- Point-like sources
- How many sources with $L_{2\text{-}10} < 10^{42}$ are powered by star formation rather than AGN?



- Answer is 2.
- Both have $L_{2\text{-}10} <= 10^{40}$
- The ambiguous region of $10^{40}<L_X<10^{42}$ is almost entirely AGN.

Page et al. 2006

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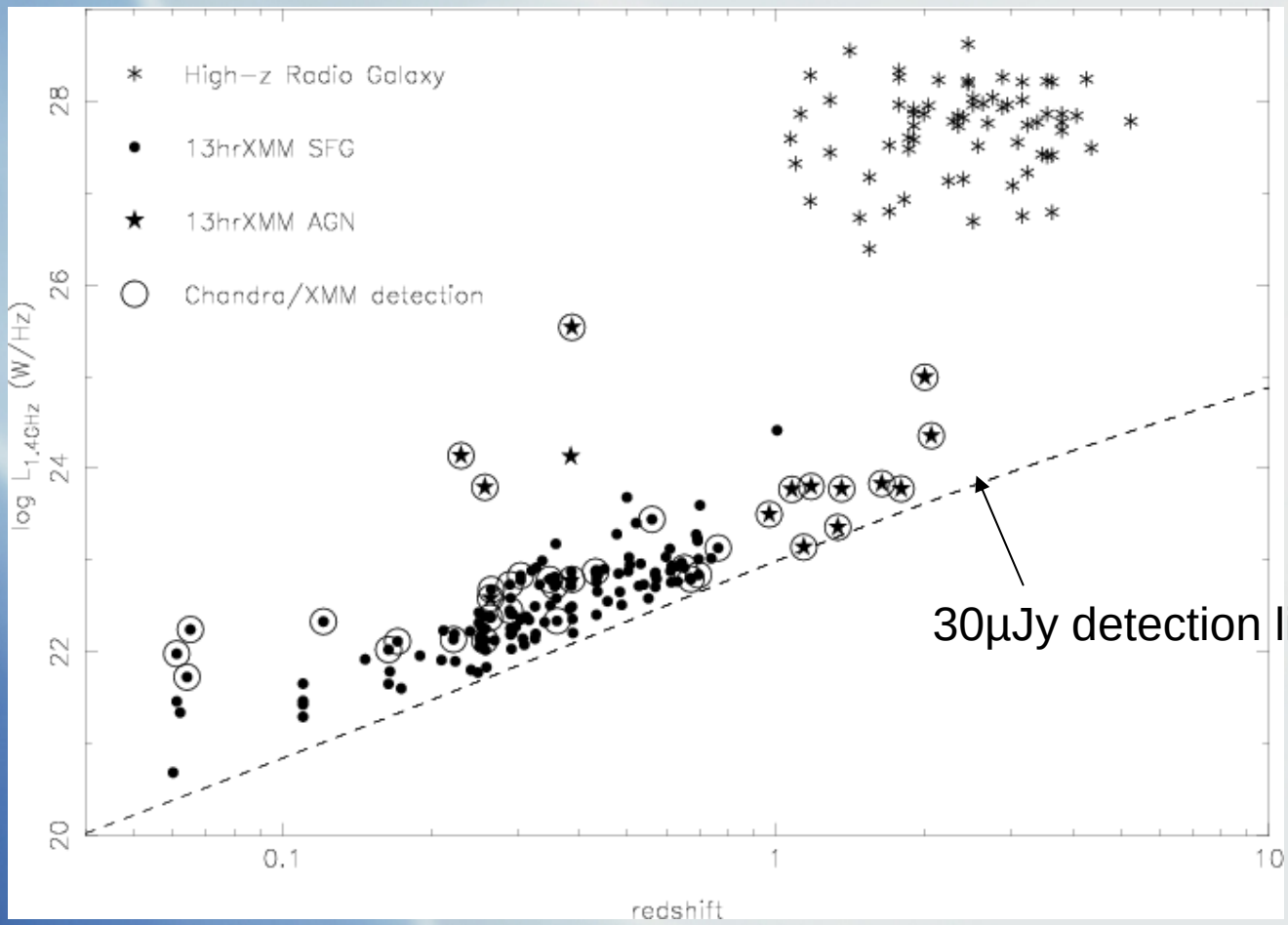
- radio morphology (AGN=compact/lobes, SFGs=galaxy sized)
- X-ray spectra
- radio spectra/morphology (AGN=flat compact cores/ultra-steep lobes, SFGs=galaxy sized, moderately steep)

HzRGs compared to other radio sources

Log($L_{1.4GHz}$) [W/Hz]



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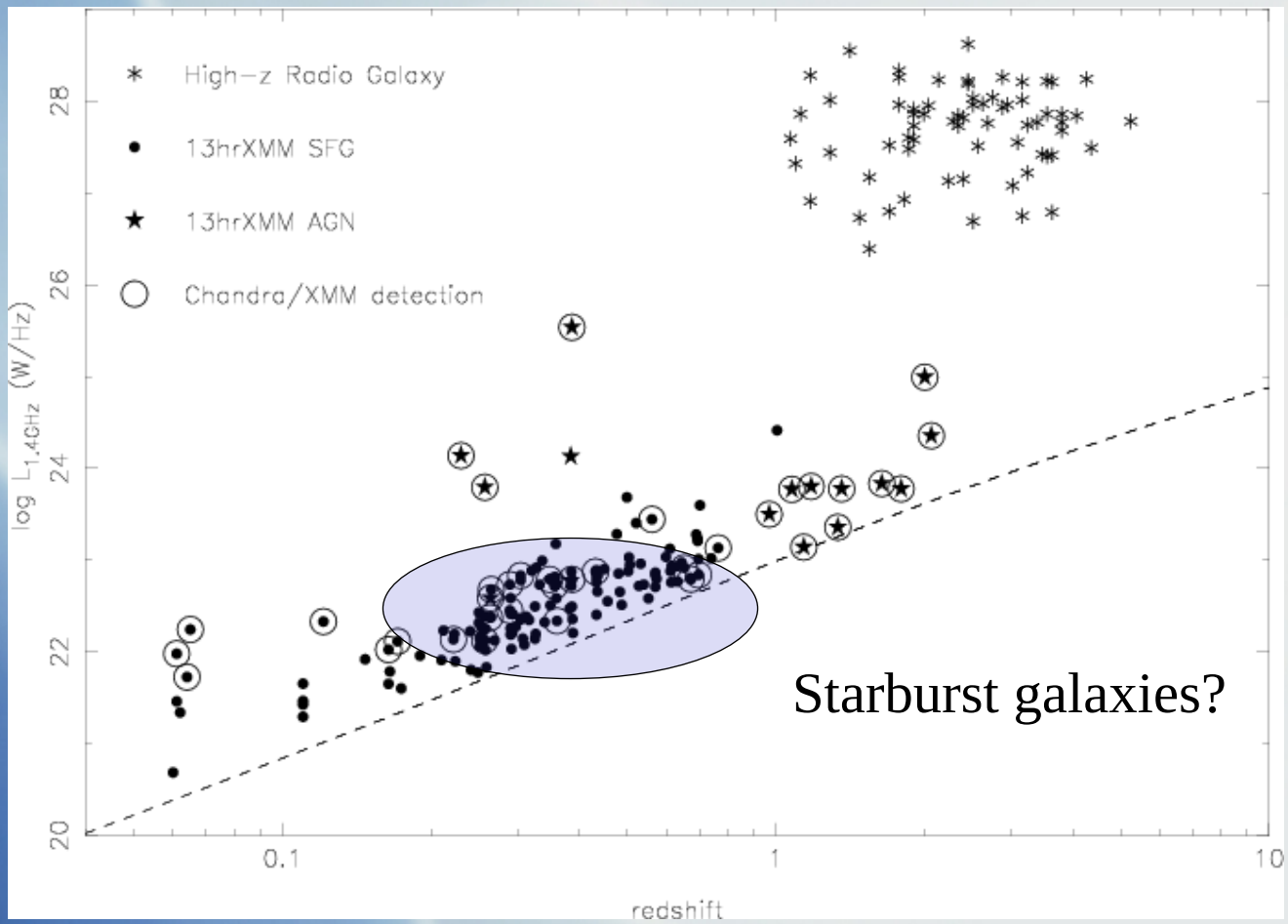

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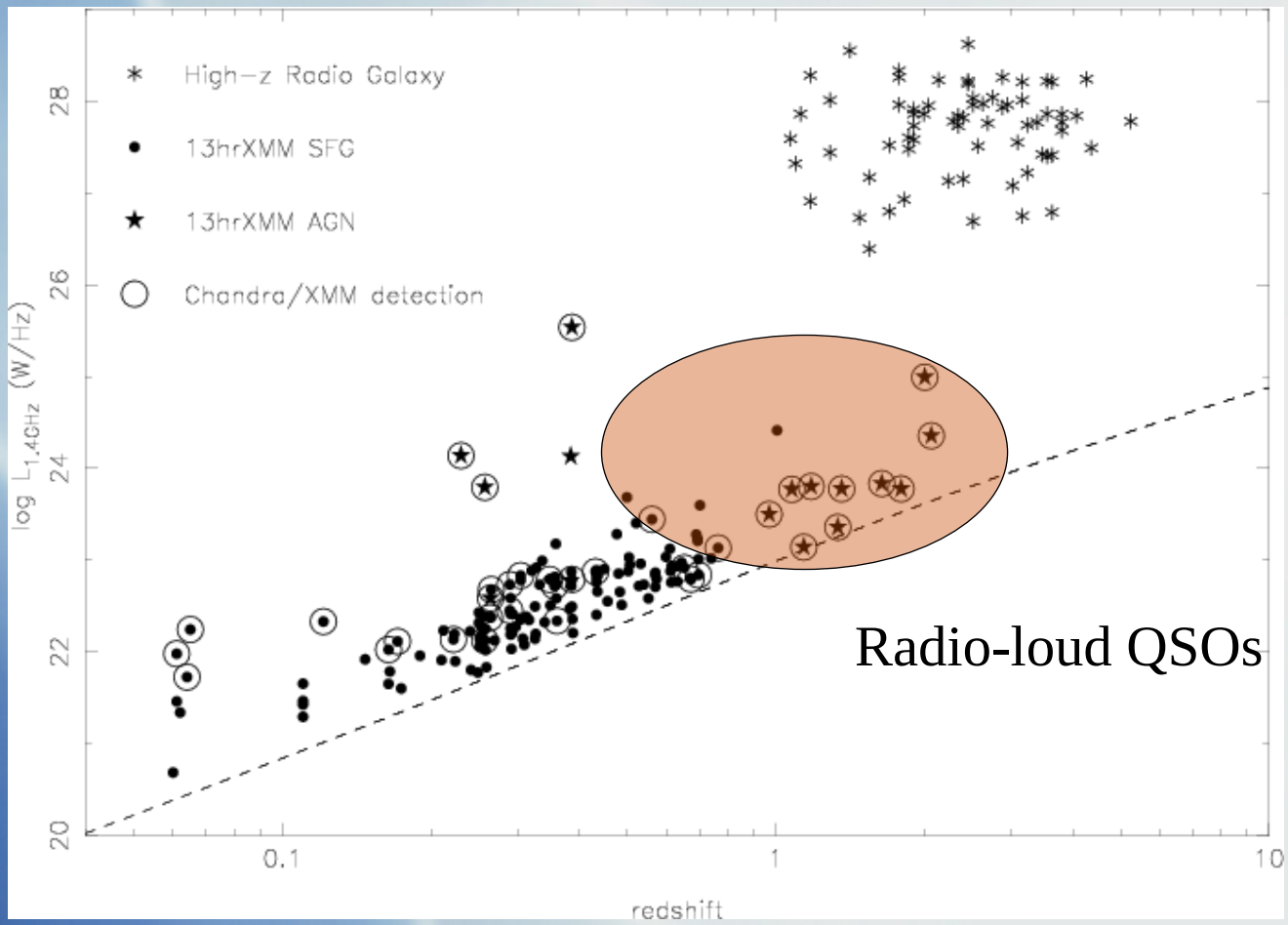

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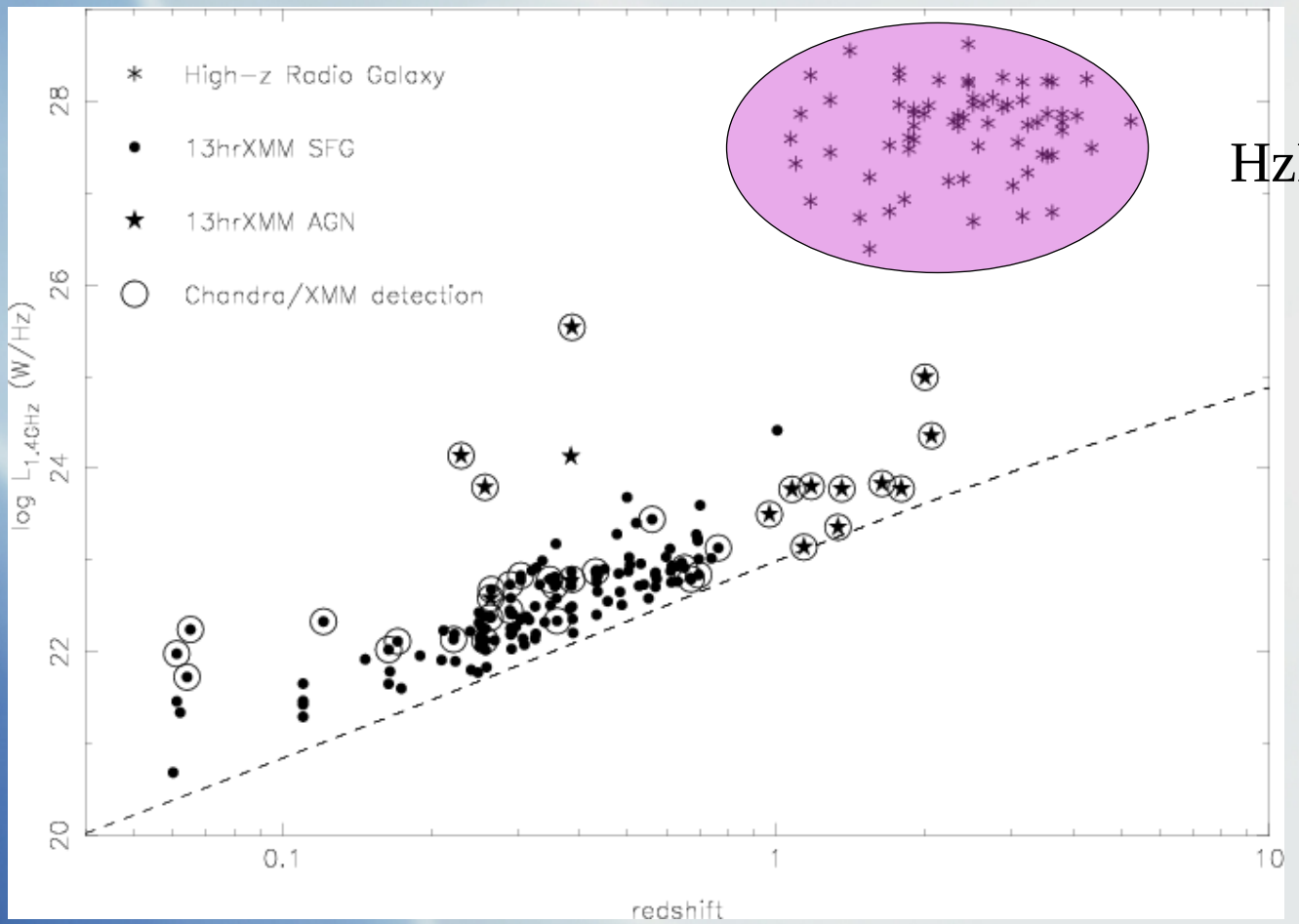

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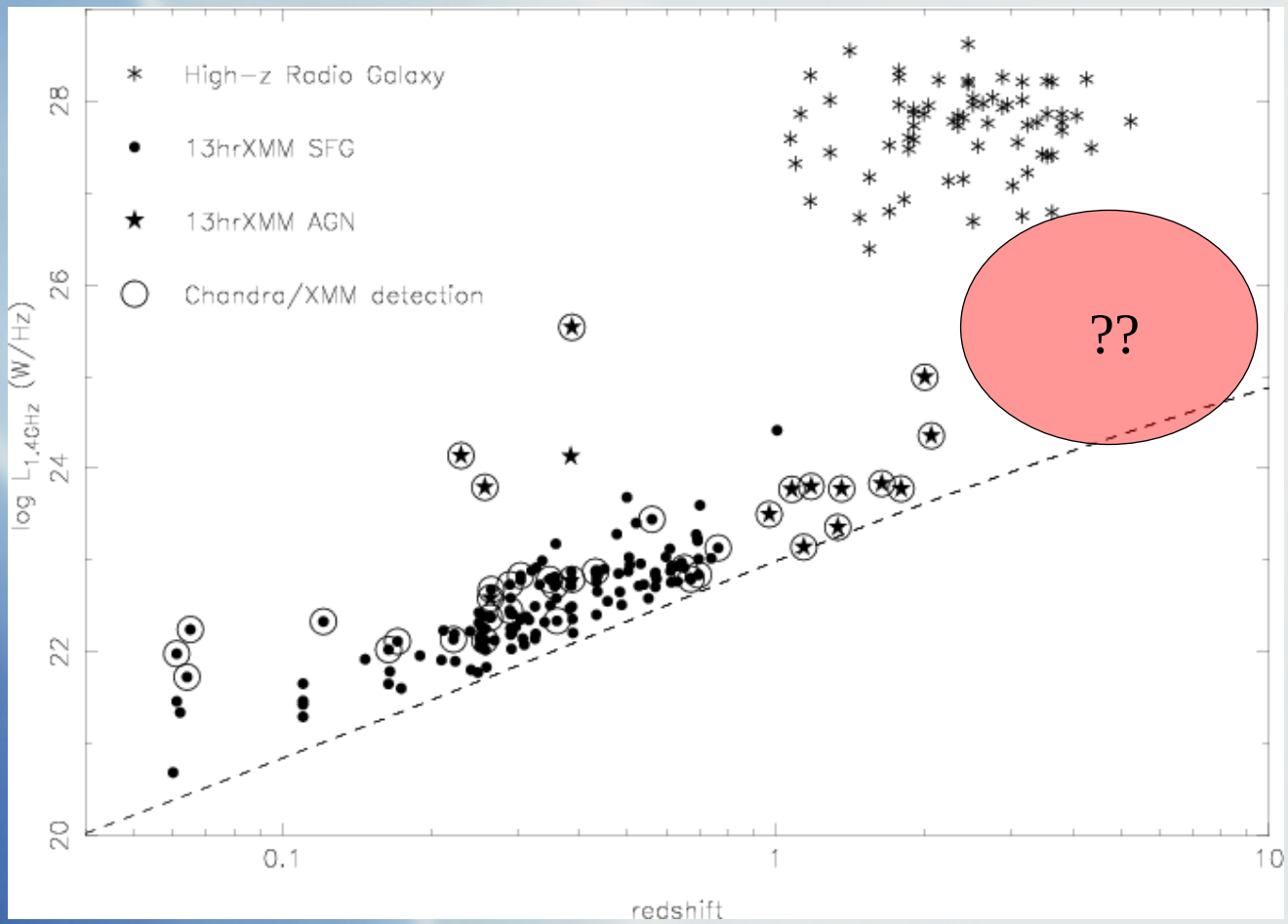

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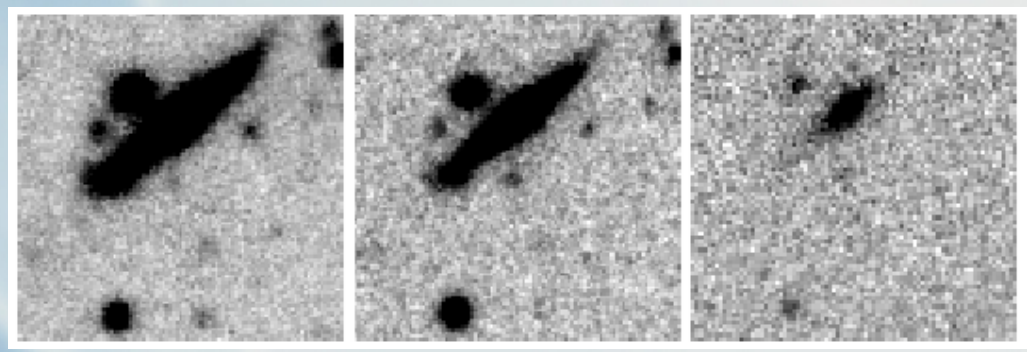
Photometric redshifts

One faint source with S_ν=120μJy at 20cm

R z' K_s



Over an order of magnitude break between *R* and z'

Photometric redshifts

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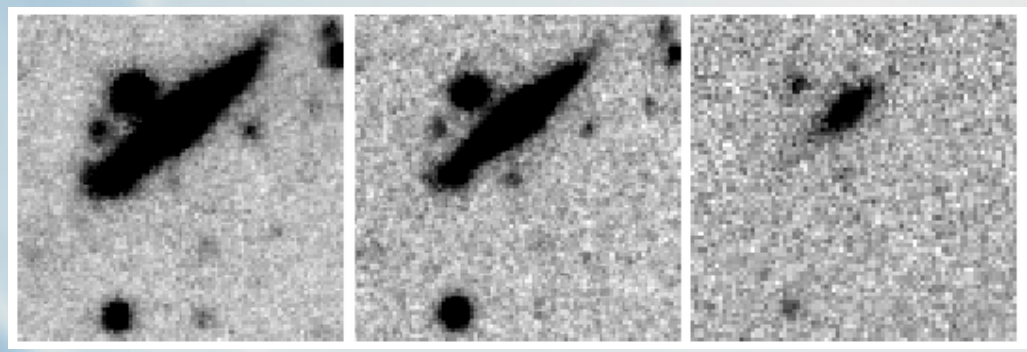

Over an order of magnitude break between *R* and z´, hence either

z~1.1 L~$10^{23.5}$ ⇒ SFG (v dusty)
z~6.4 L~$10^{24.9}$ ⇒ AGN (lensed?)

Deep(er) *J, H, K* and IRAC data is in hand

Conclusions

- some AGN are radio loud QSOs at z~1-2
- some are hidden in SFGs with $L_{1.4GHz} \sim 10^{22\text{-}23}$ W/Hz
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- as are wider/deeper radio observations