

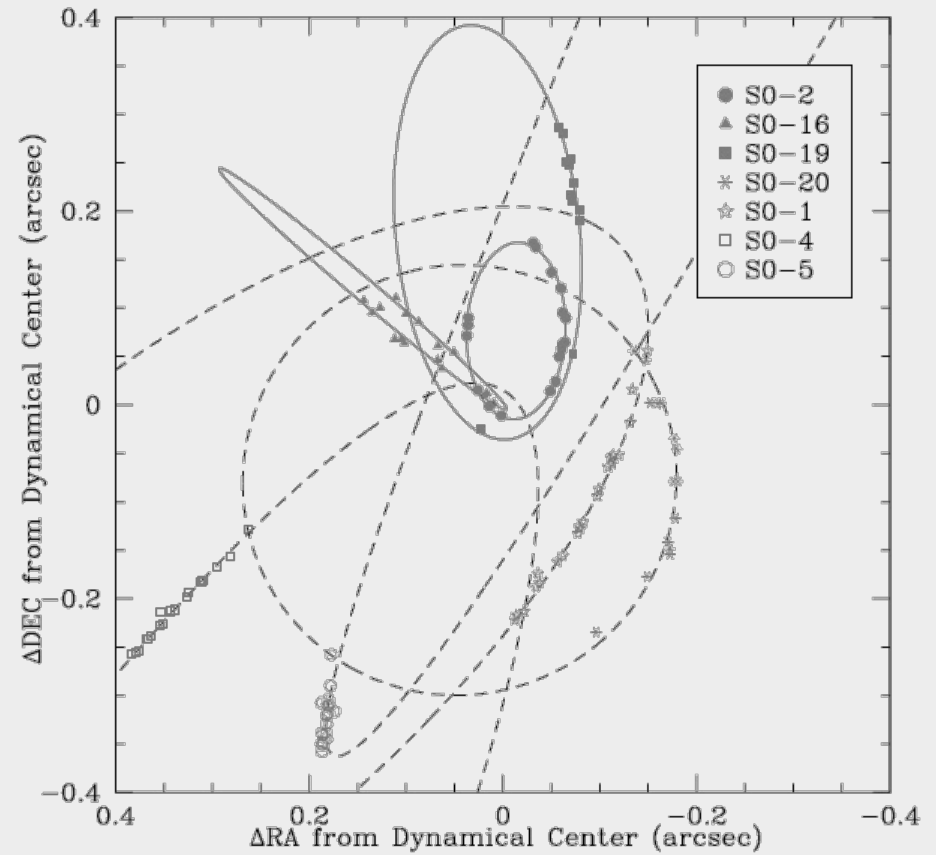
A multi-wavelength study of the impact of AGN on their host galaxies

Michael Cowley

MQAAAstro Seminar, December 2014

ASTRONOMY 101: AGN

Supermassive black hole Sagittarius A*



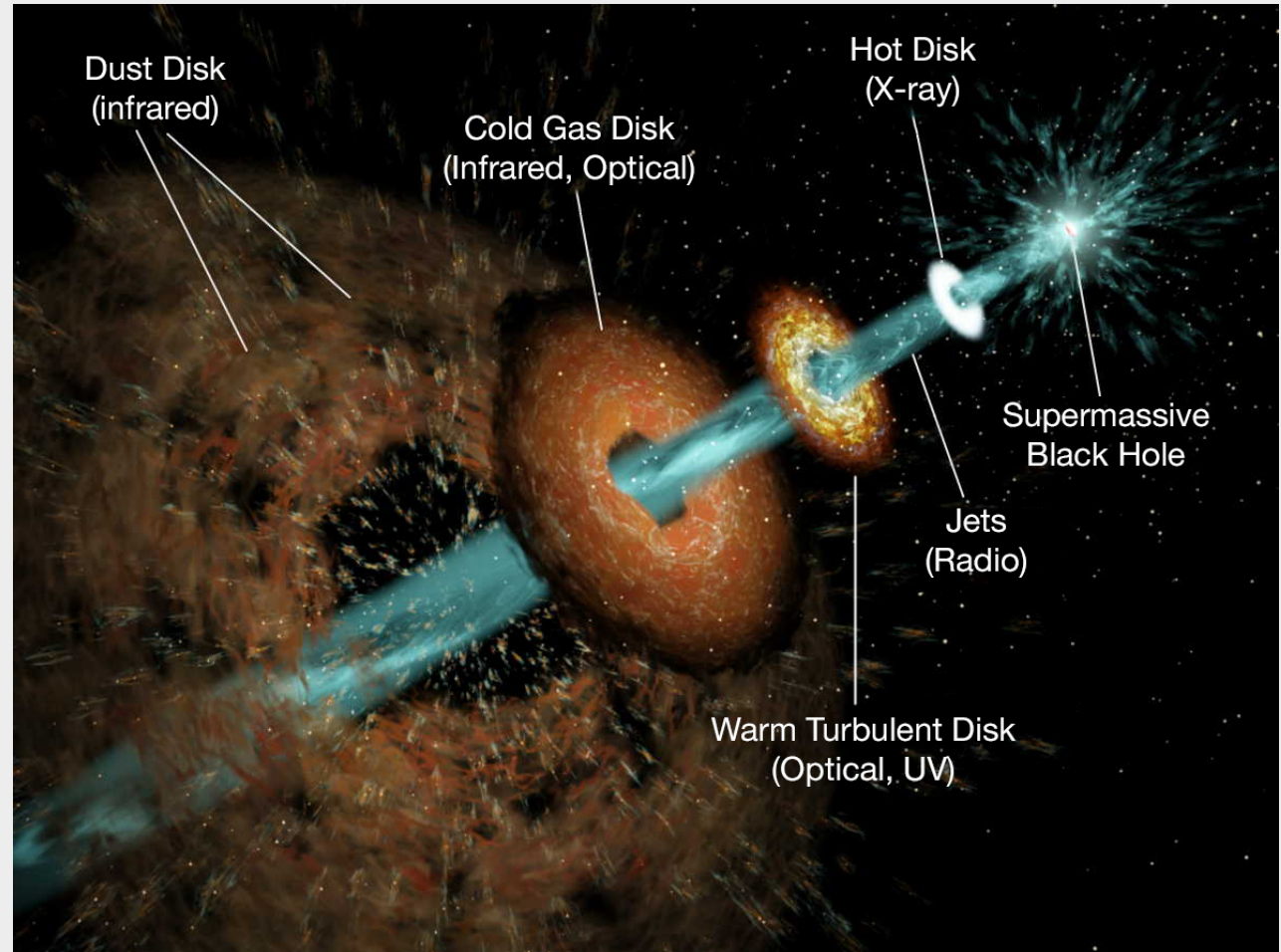
ASTRONOMY 101: AGN

A "feeding" or active, supermassive black hole



A MULTI-WAVELENGTH APPROACH

- Cold material close to SMBH forms an accretion disc
- Dissipative processes transport matter inwards and angular momentum outwards
- Accretion disc heats up and can inverse-Compton scatter photons up to X-ray energies
- Radiation may be obscured by dust and re-radiate at other wavelengths

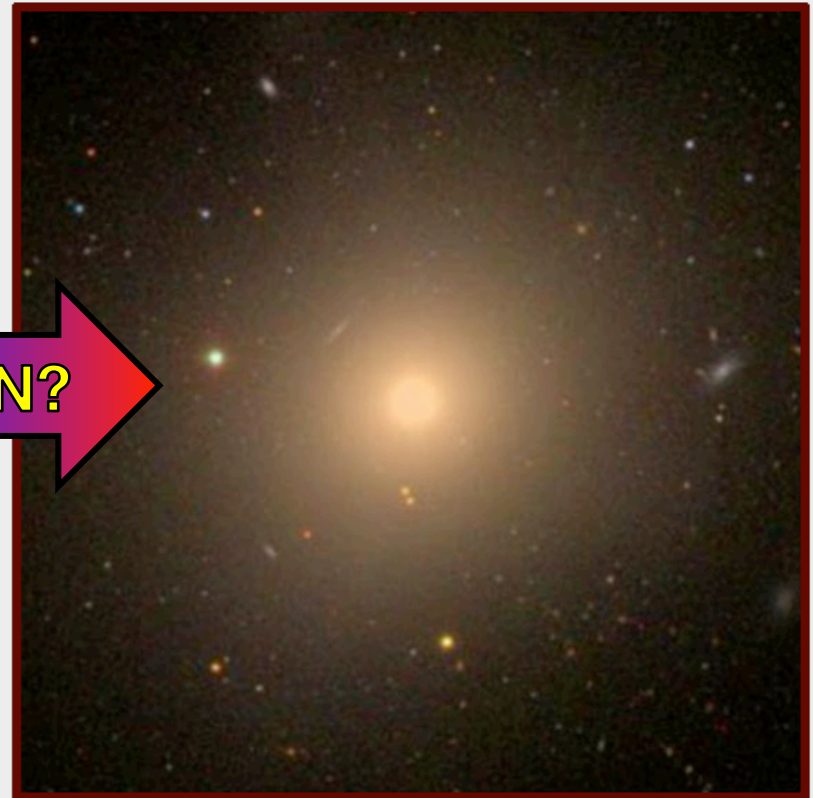


DO AGN QUENCH STAR-FORMATION?

Blue spiral w/ ongoing star-formation

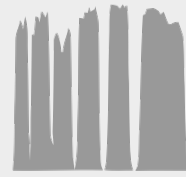


Red-dead elliptical galaxy



AGN?

DATA



ZFOURGE
FourStar Galaxy Evolution Survey

Survey

- ~50 nights
- Magellan Telescope
- FourStar Imager

Data

- 5 medium-band filters (J1, J2, J3, Hs, Hl, Ks)
- 3 legacy fields (UDS, GOOD-S, COSMOS)

Primary Science:

- Accurate photometric redshifts: 1-2%
- ~30,000 galaxies
- Out to redshift of $z \sim 7$ (lookback time of ~12.7 billion years)



DATA



Survey

- ~50 nights
- Magellan Telescope
- FourStar Imager

Data

- 5 medium-band filters (J1, J2, J3, Hs, Hl, Ks)
- 3 legacy fields (UDS, GOOD-S, COSMOS)

Primary Science:

- Accurate photometric redshifts: 1-2%
- ~30,000 galaxies
- Out to redshift of $z \sim 7$ (lookback time of ~12.7 billion years)



MULTI-WAVELENGTH DATA

X-RAY: CHANDRA



RADIO: VLA

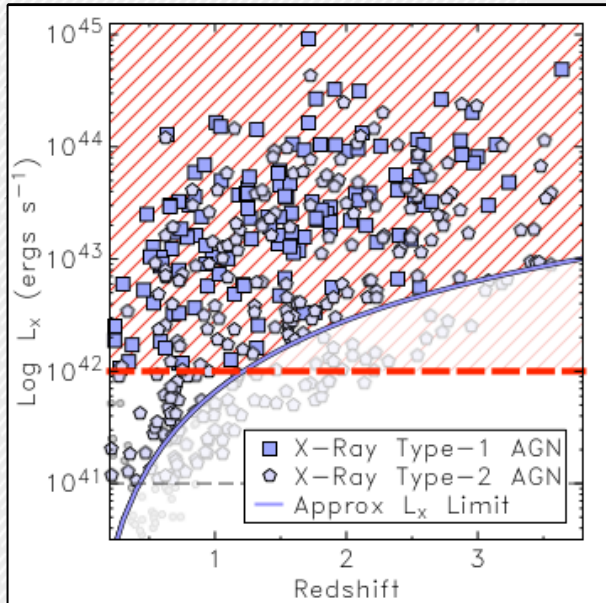


INFRARED: SPITZER

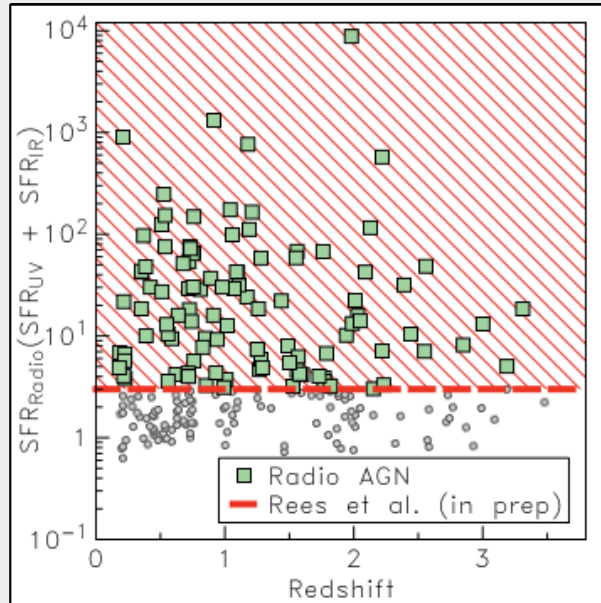


AGN DETECTION

X-RAY: CHANDRA



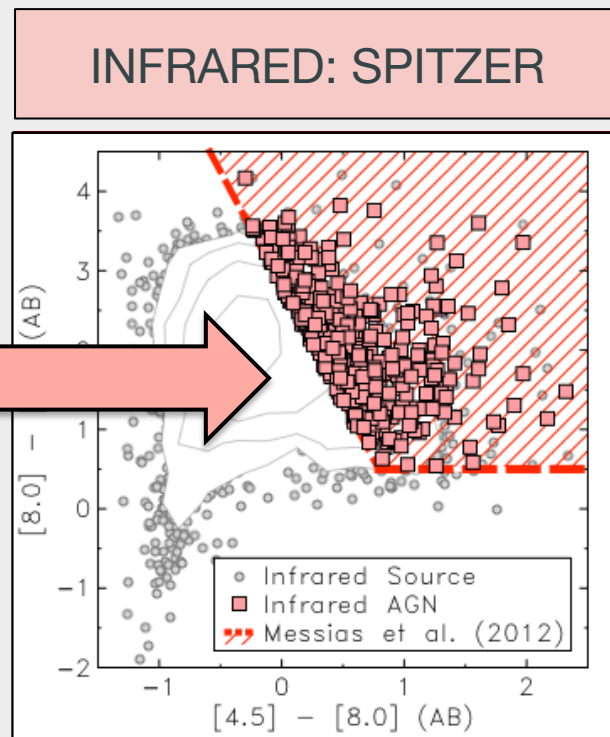
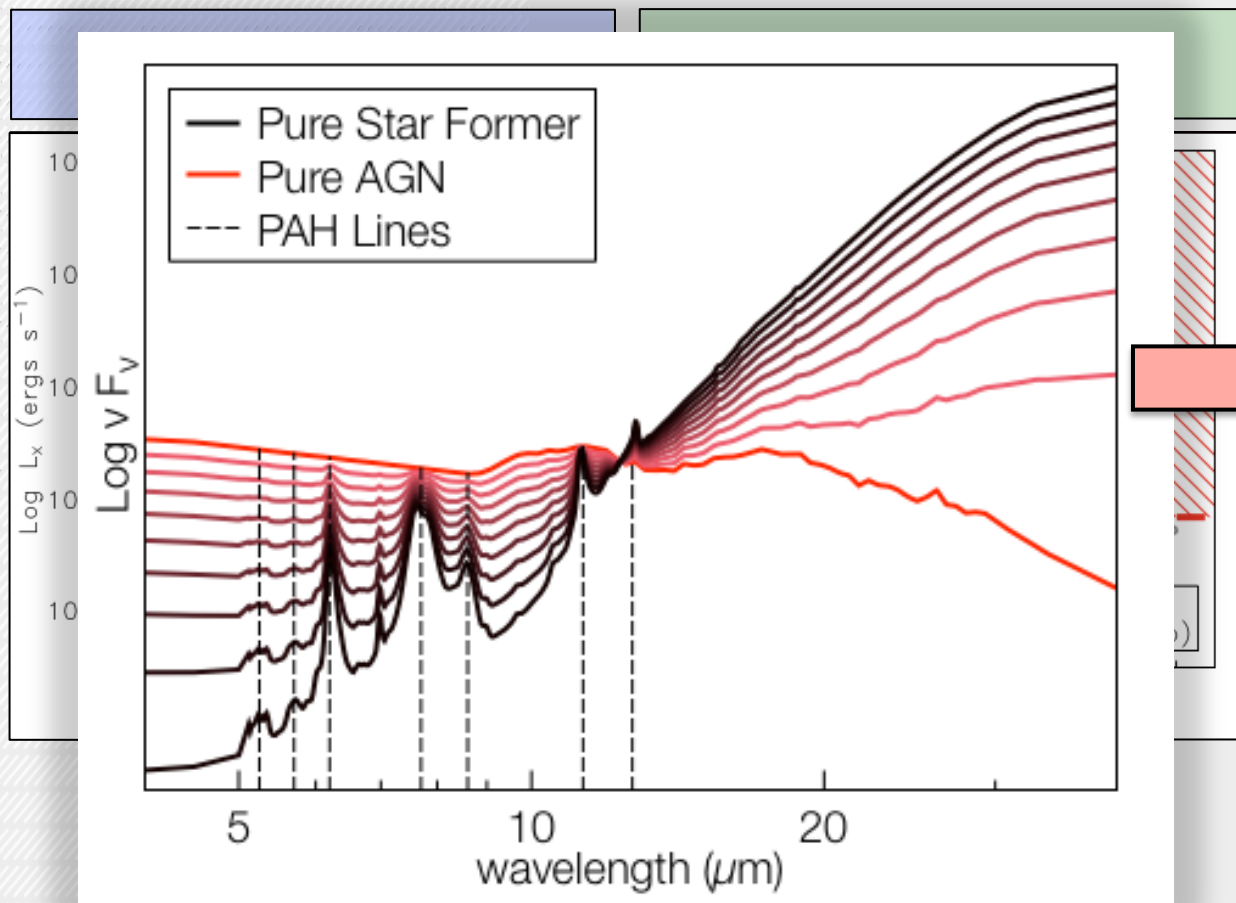
RADIO: VLA



INFRARED: SPITZER

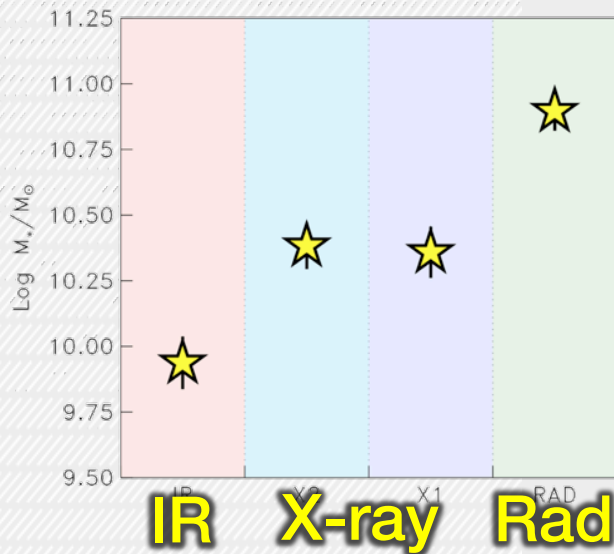


AGN DETECTION

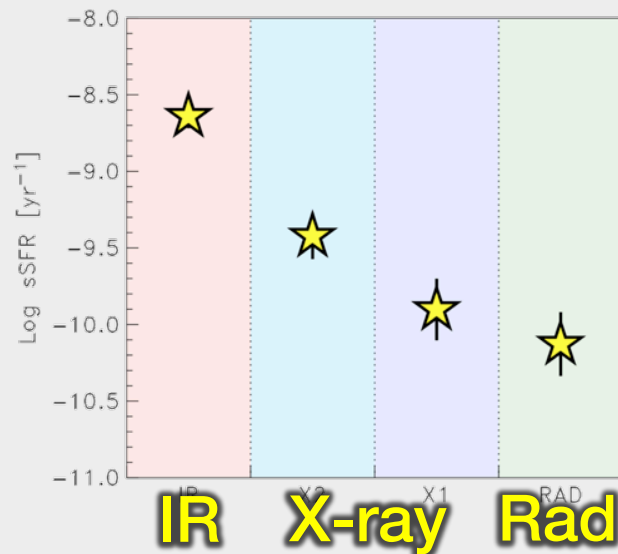


HOST GALAXY PROPERTIES

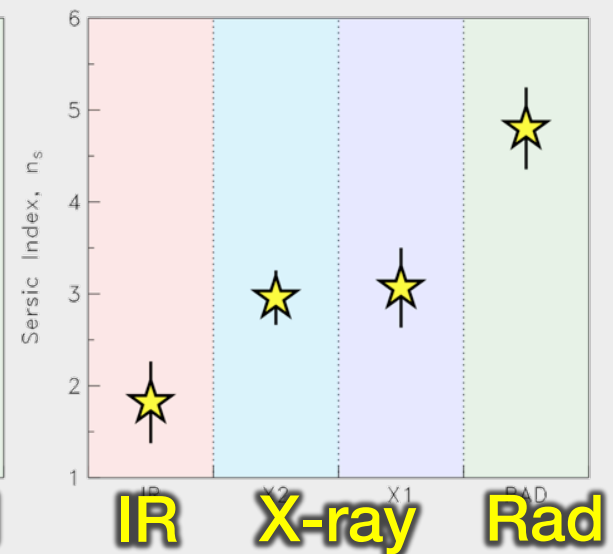
Host Mass



Star-Formation

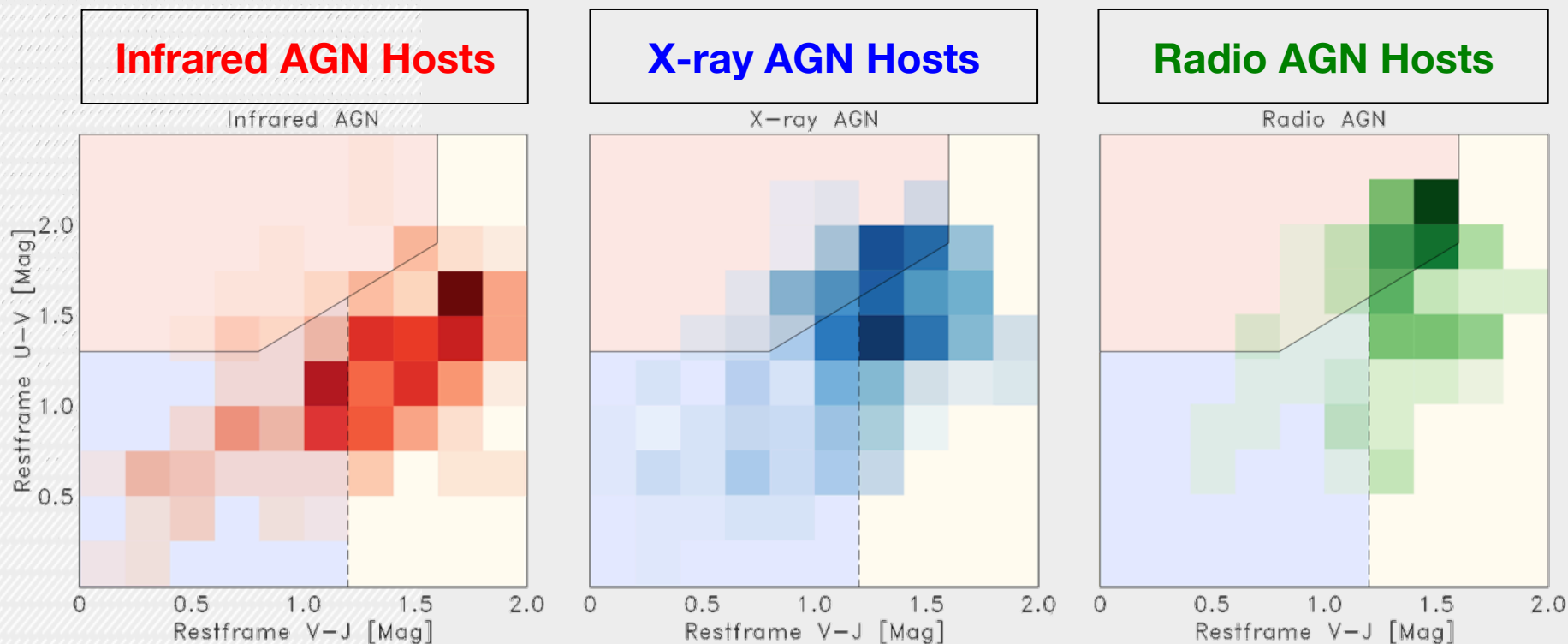


Morphology



INFRARED AGN HOSTS: Low mass, star-forming, disk-like galaxies
RADIO AGN HOSTS: High mass, quiescent, elliptical-type galaxies
X-RAY AGN HOSTS: Straddle between the two

U-V vs. V-J COLOUR DIAGRAM



INFRARED AGN HOSTS: Low mass, star-forming, disk-like galaxies

RADIO AGN HOSTS: High mass, quiescent, elliptical-type galaxies

X-RAY AGN HOSTS: Straddle between the two

HOST GALAXY PROPERTIES

Younger



INFARED AGN HOSTS

Transitional



X-RAY AGN HOSTS

Older



RADIO AGN HOSTS

HOST GALAXY PROPERTIES

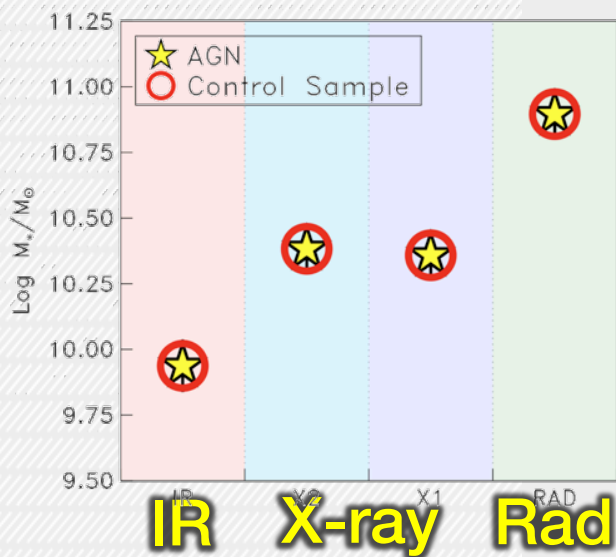


AGN host galaxies

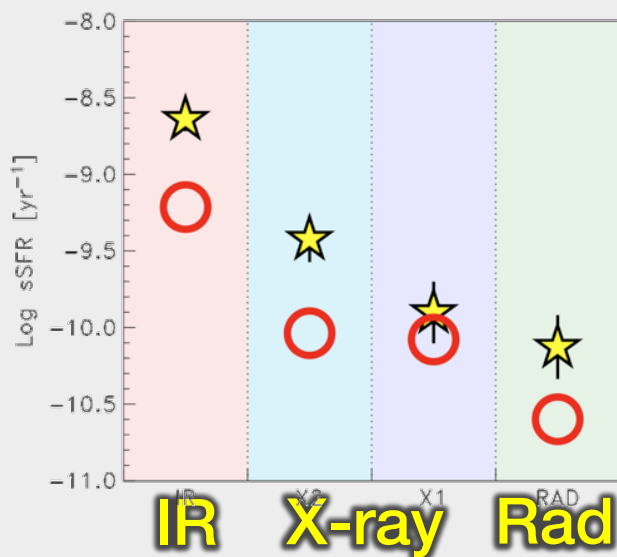


Non-active mass-matched galaxies

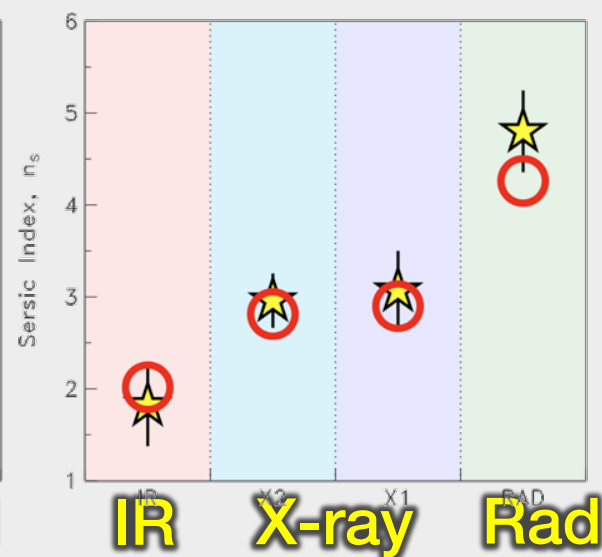
Host Mass



Star-Formation



Morphology

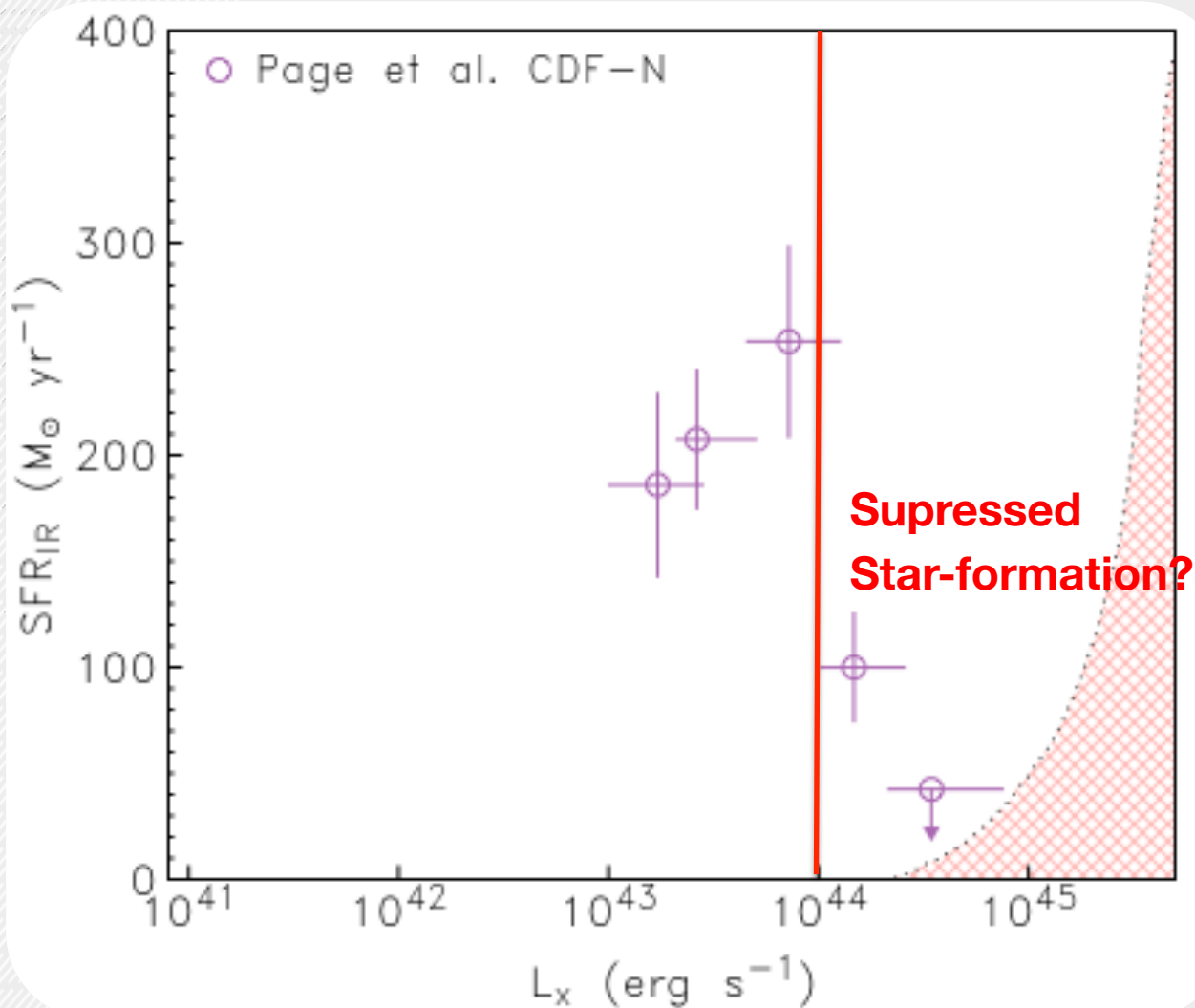


AGN vs. NON-ACTIVE: AGNs tend to be in more star-forming galaxies!

SUMMARY

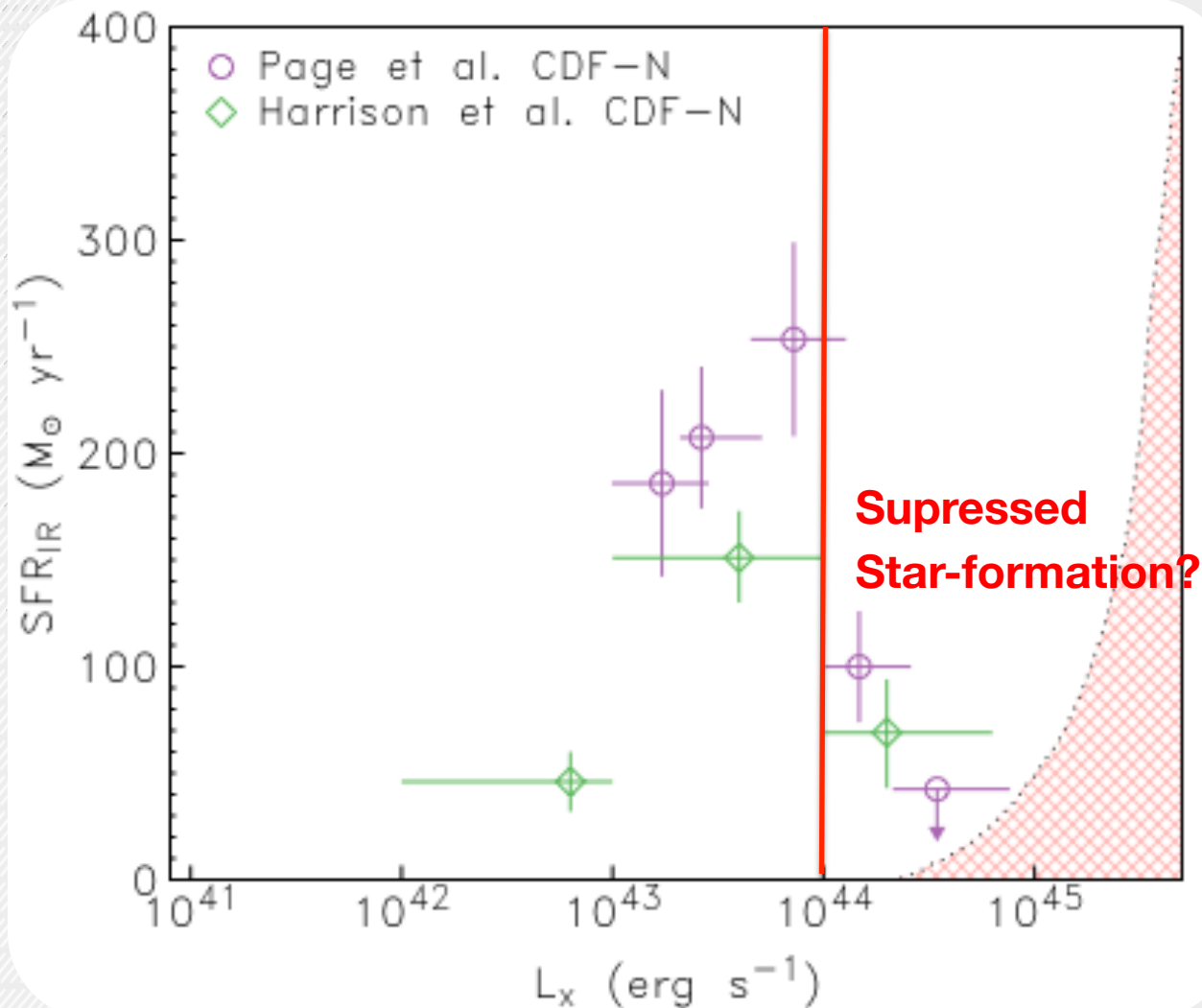
- AGN are identified in ZFOURGE using a multi-wavelength approach
- The mere presence of an AGN is not the dominant mechanism responsible for star-formation quenching
- AGN are less likely to be hosted by weak star-forming or quenched galaxies
- AGN are preferentially found in hosts with higher star-formation than non-active galaxies
- Future work will investigate the effect AGN luminosity has on a host

LUMINOUS AGN QUENCHING STAR-FORMATION?



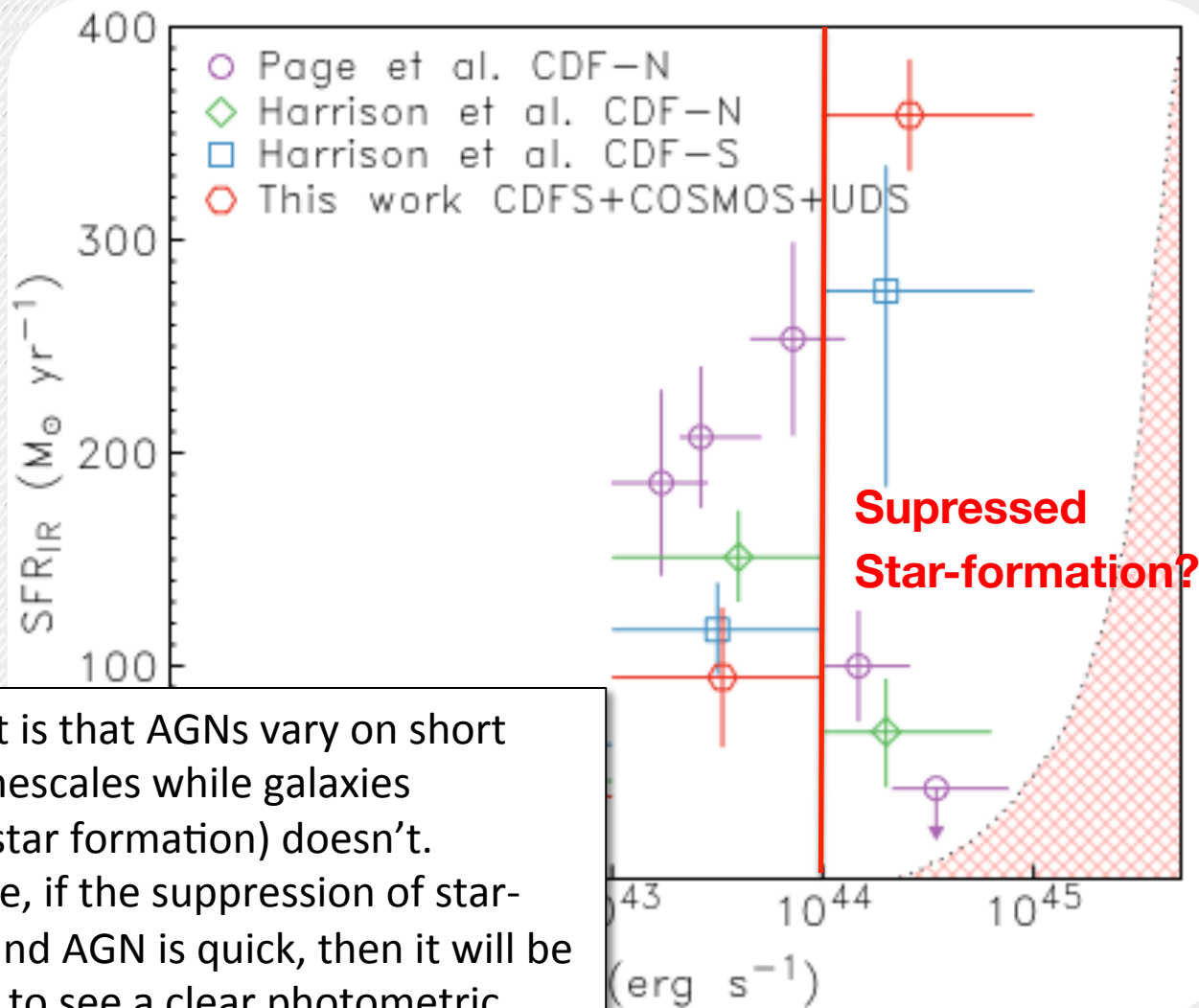
LUMINOUS AGN QUENCHING STAR-FORMATION?

These results were from a small field and with low source statistics - what about another field?



LUMINOUS AGN QUENCHING STAR-FORMATION?

These results were from a small field and with low source statistics - what about another field?

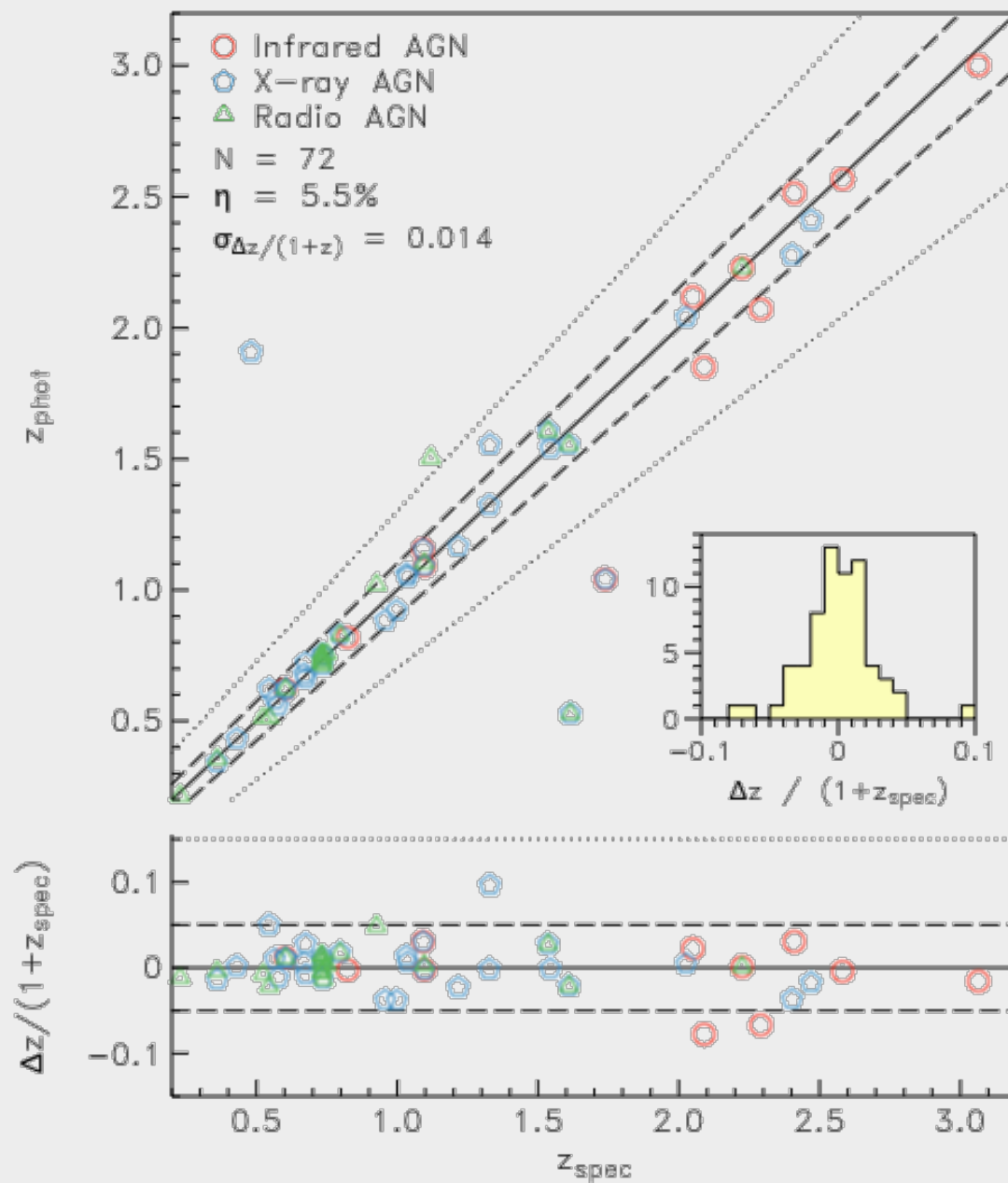


A caveat is that AGNs vary on short timescales while galaxies (or star formation) doesn't. Therefore, if the suppression of star-formation and AGN is quick, then it will be difficult to see a clear photometric signature

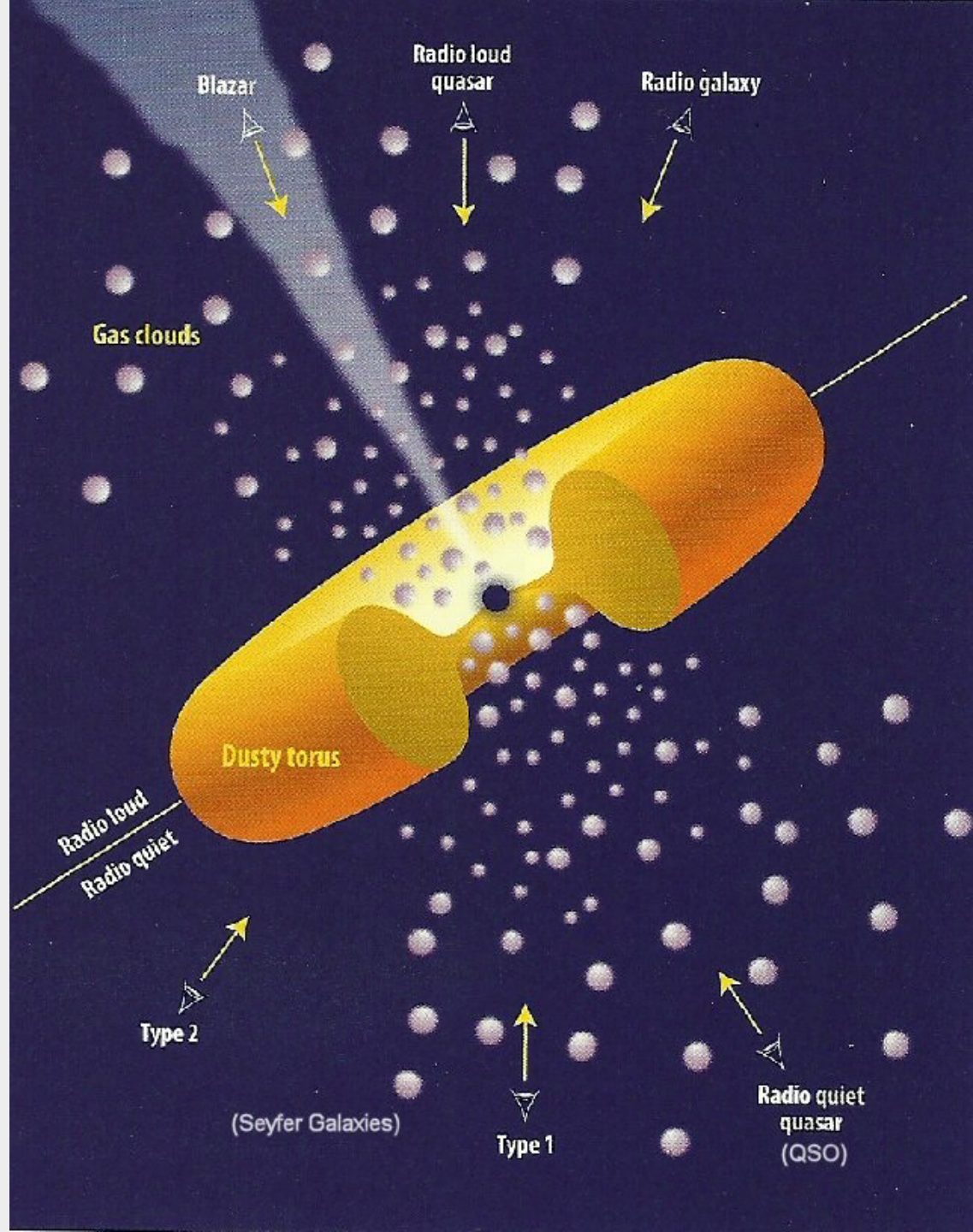
SUMMARY

- AGN are identified in ZFOURGE using a multi-wavelength approach
- The mere presence of an AGN is not the dominant mechanism responsible for star-formation quenching
- AGN are less likely to be hosted by weak star-forming or quenched galaxies
- AGN are preferentially found in hosts with higher star-formation than non-active galaxies
- Future work will investigate the effect AGN luminosity has on a host

z_{SPEC} VS. z_{PHOT}



AGN UNIFIED MODEL



sSFR BINS OF MASS

