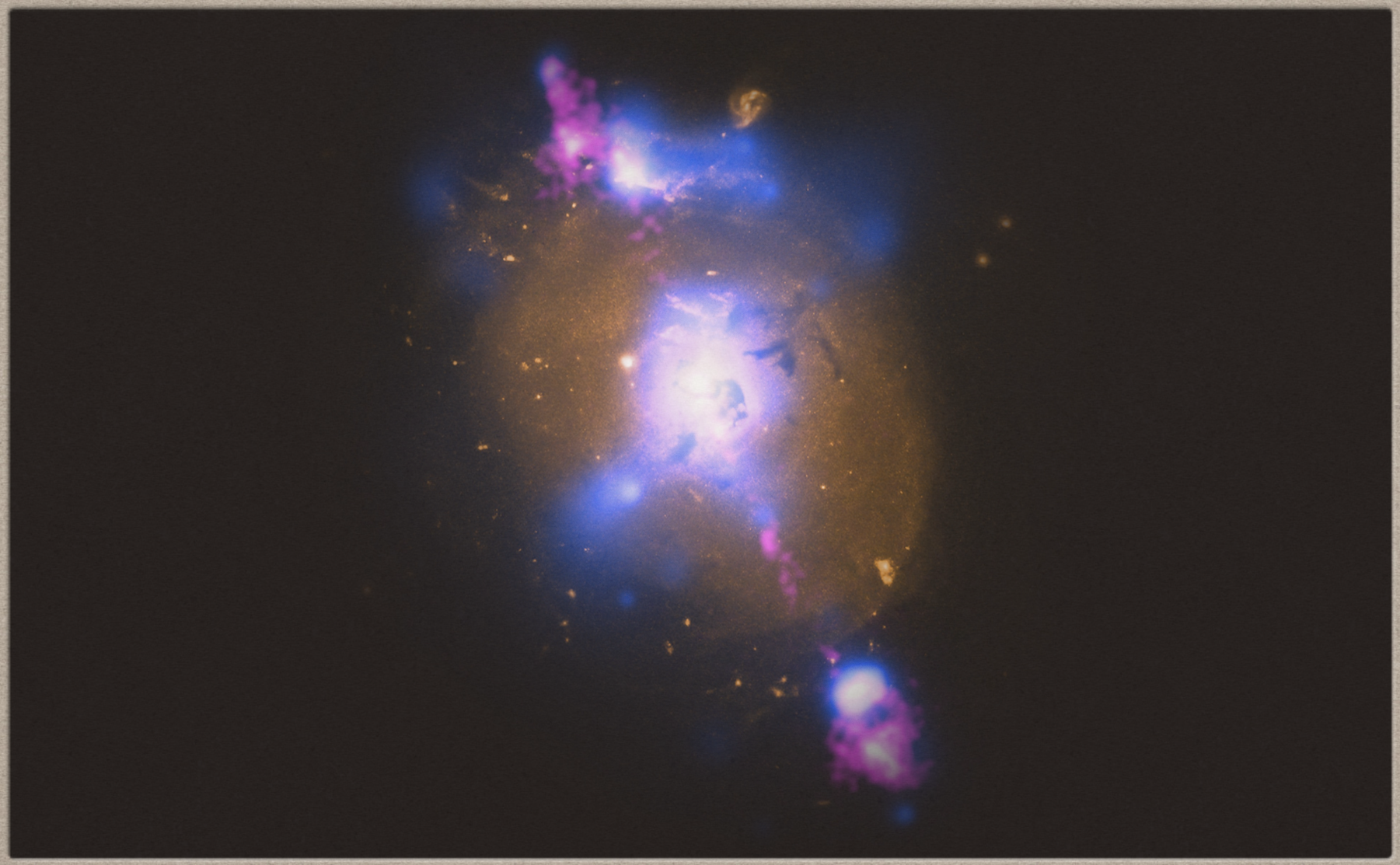
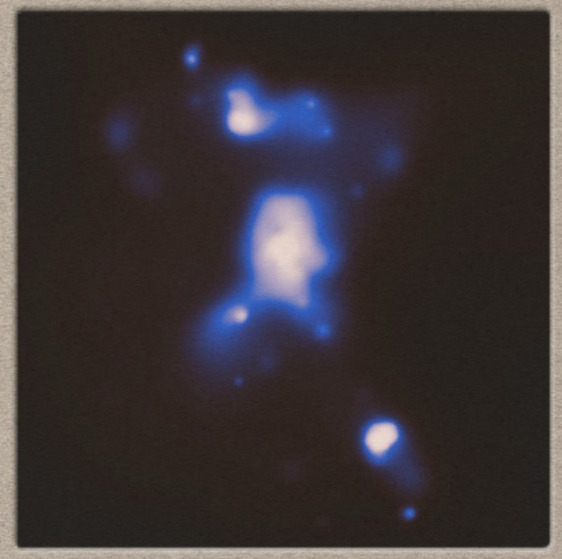
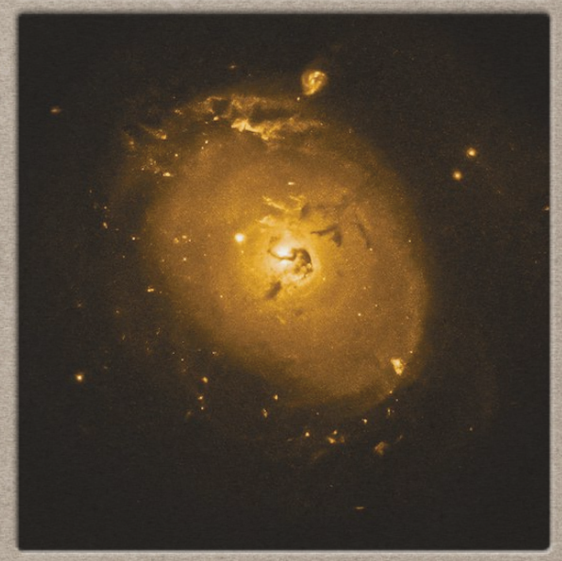






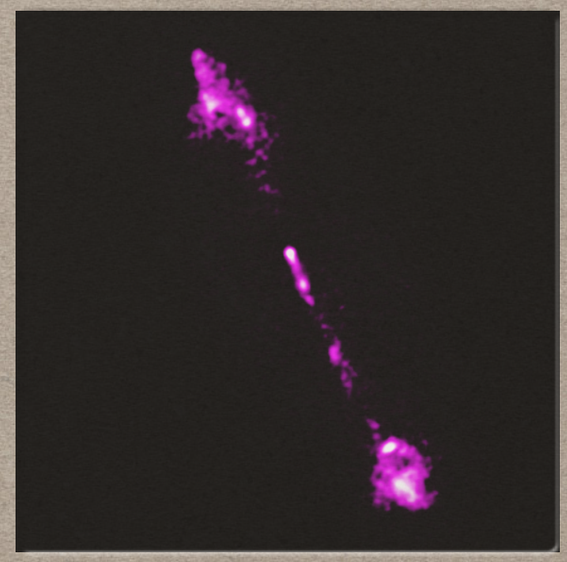
THE PROPERTIES OF X-RAY, IR AND RADIO AGN HOSTS TO $z = 3.2$ IN ZFOURGE

MICHAEL COWLEY

MACQUARIE University
SYDNEY·AUSTRALIA

Australian Government
Department of Industry and Science

AAO



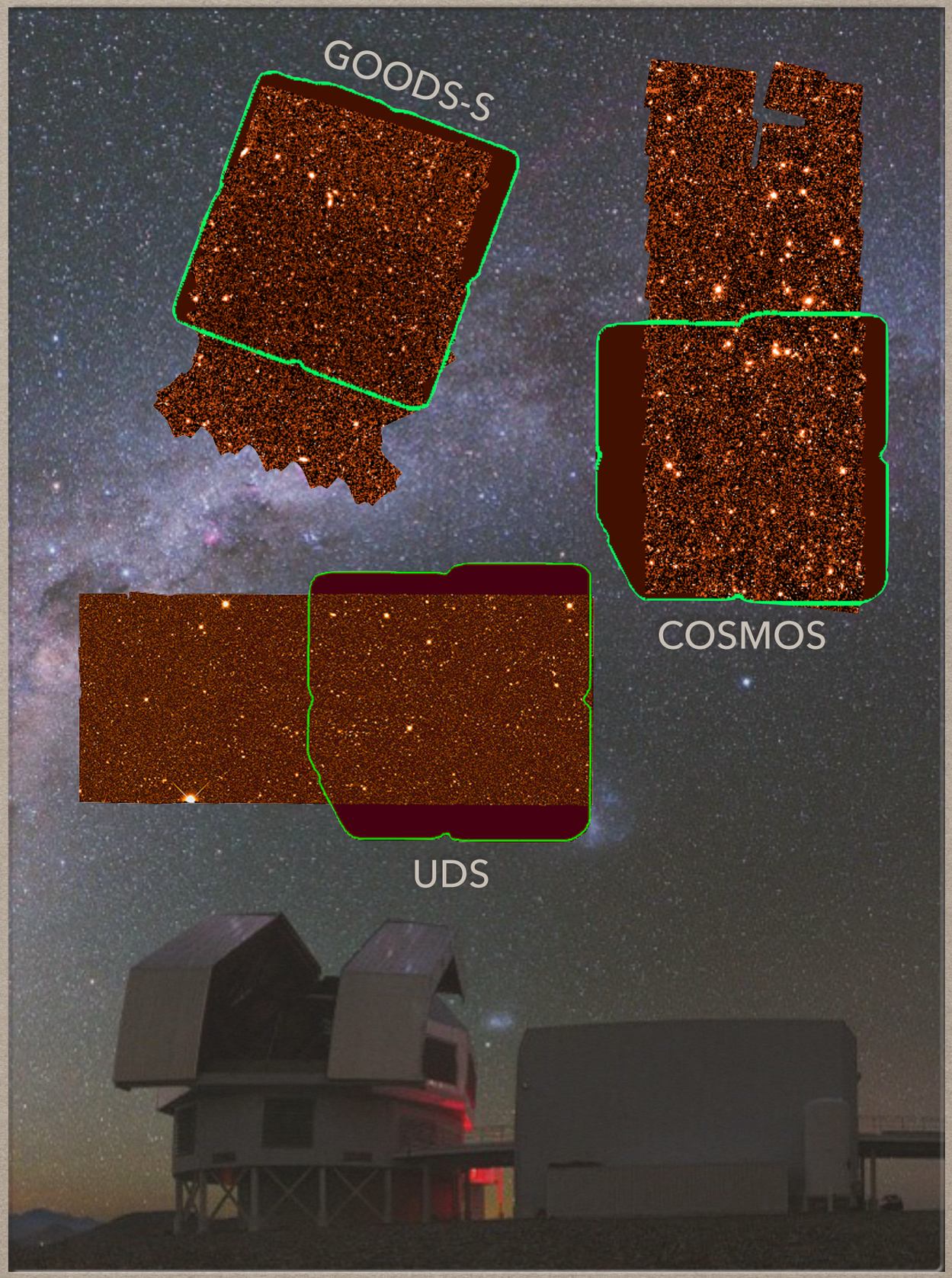
ATLAS MEETING, 12 OCTOBER 2015

ZFOURGE

FourStar Galaxy Evolution Survey

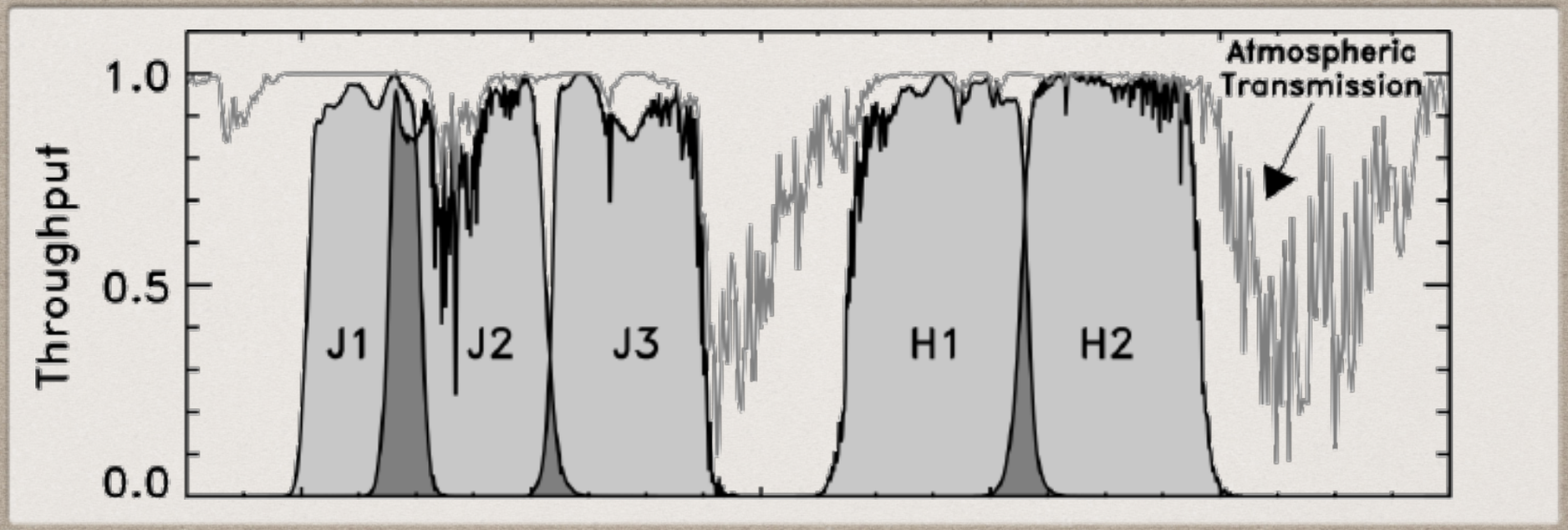
OVERVIEW

- ~50 nights on Magellan/ FourStar near-IR camera
- 5 medium-band filters & Ks broadband
- 3 legacy fields (COSMOS, GOODS-S and UDS)
- Accurate photo-z of ~30,000 galaxies to z = 4
- Primary science to study galaxy formation and evolution at z > 1



ZFOURGE
FourStar Galaxy Evolution Survey

Medium Band Filters

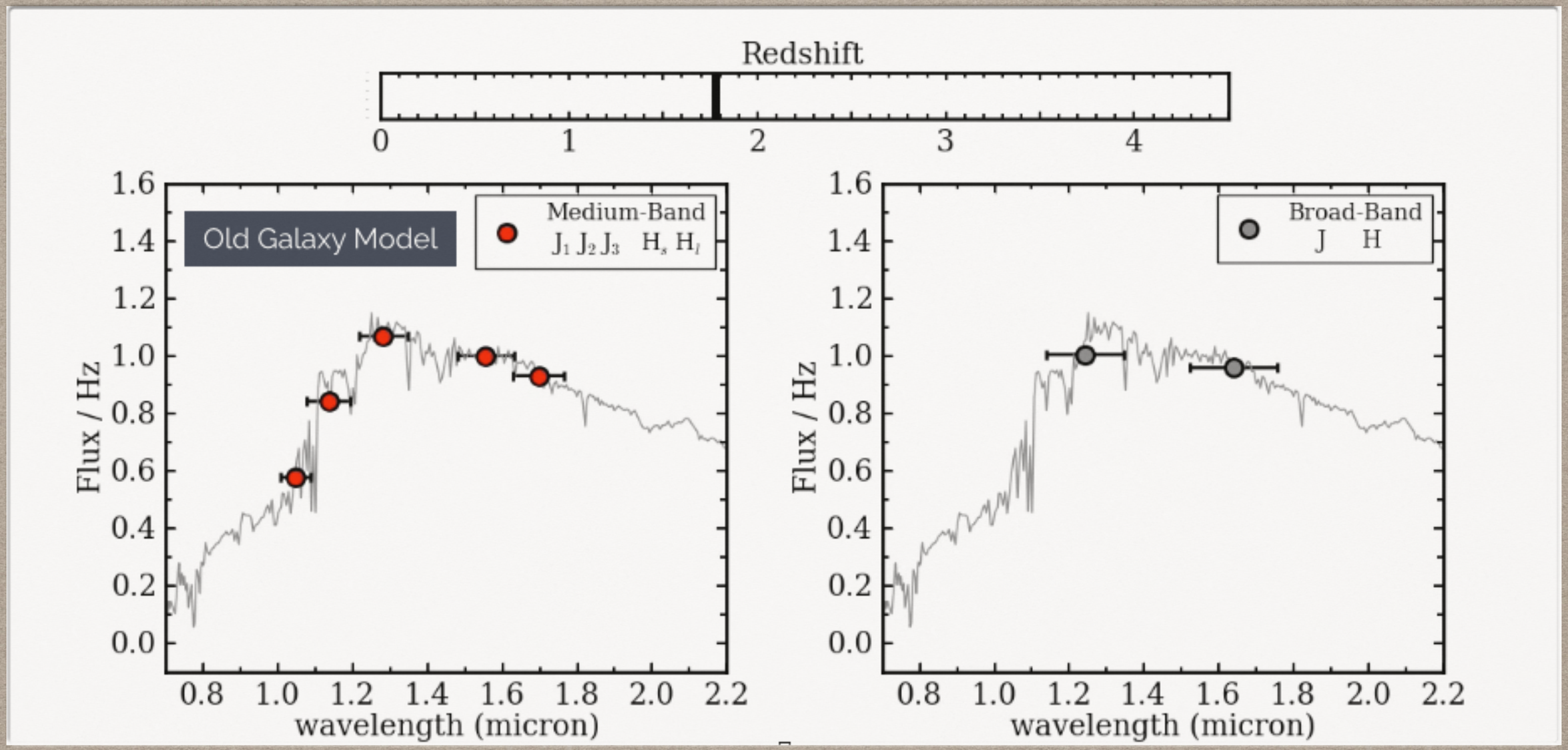


5-sigma: J_1 J_2 J_3 to 26 AB, H_l H_s to 25 AB, K_s to 25 AB

1-2% redshift uncertainties, $\sigma/(z+1)$, at $1.5 < z < 3.5$

ZFOURGE

FourStar Galaxy Evolution Survey



ZFOURGE Filters

Traditional Filters

ZFOURGE
FourStar Galaxy Evolution Survey

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MICHAEL COWLEY
BEN FORREST
KARL GLAZEBROOK
GLENN KACPRZAK
NANCY KAWINWANICHAKIJ
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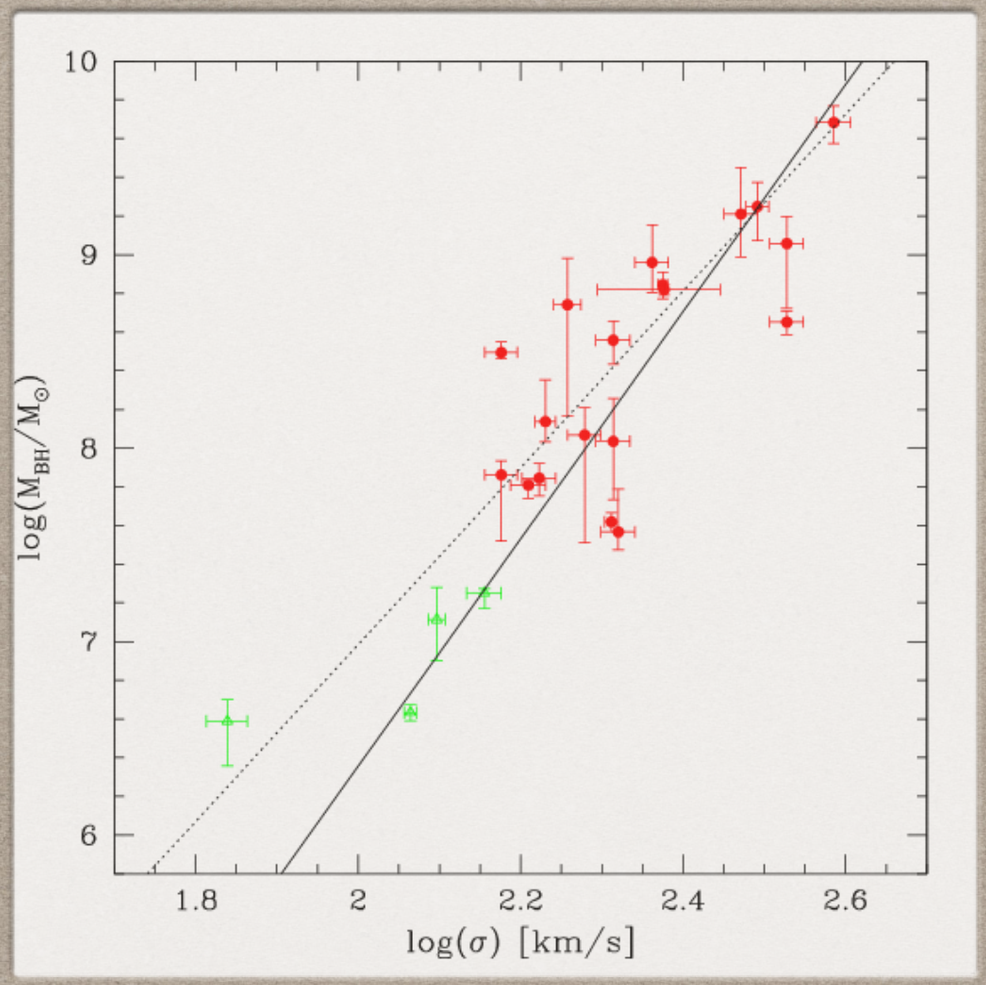
ATLAS MEETING, 12 OCTOBER 2015

WHY DO WE CARE ABOUT ACTIVE GALACTIC NUCLEI (AGN)?

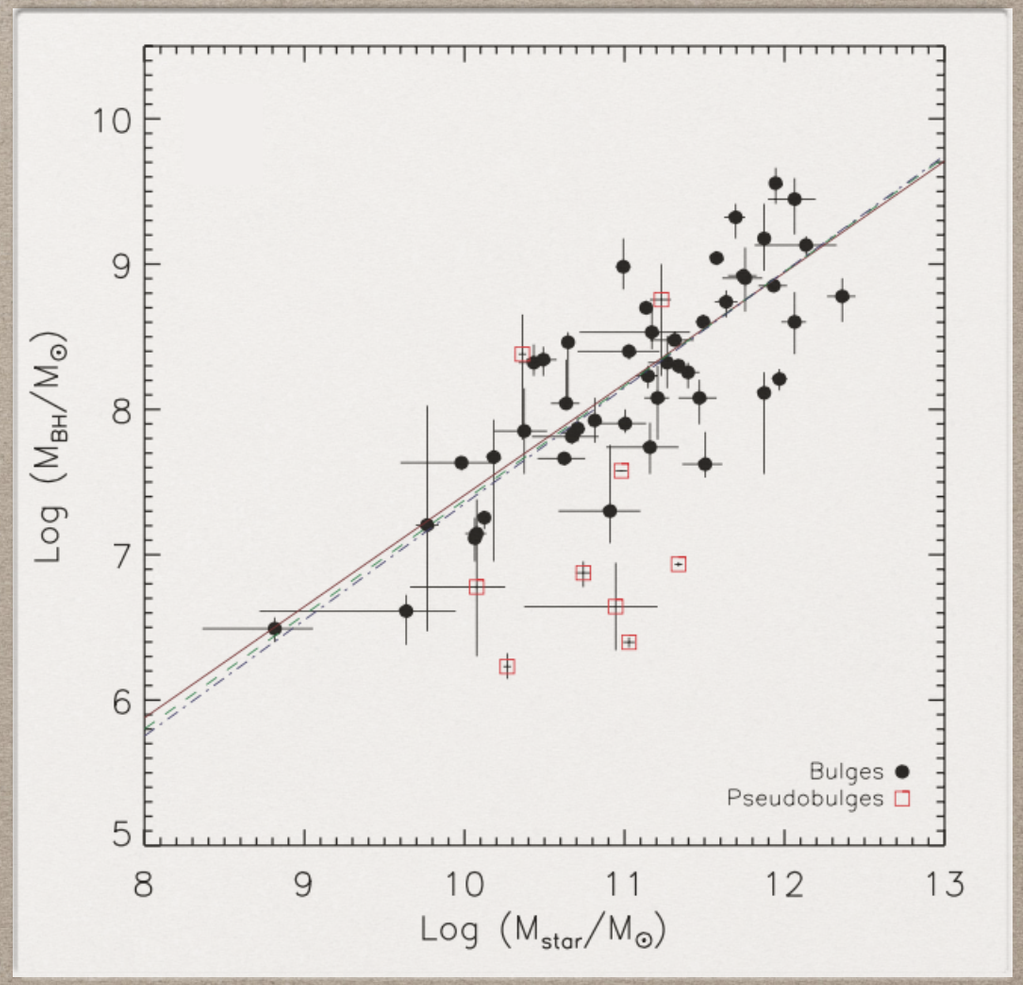
There's a **close connection** between AGN and their hosts

Rhode 2012



Velocity Dispersion

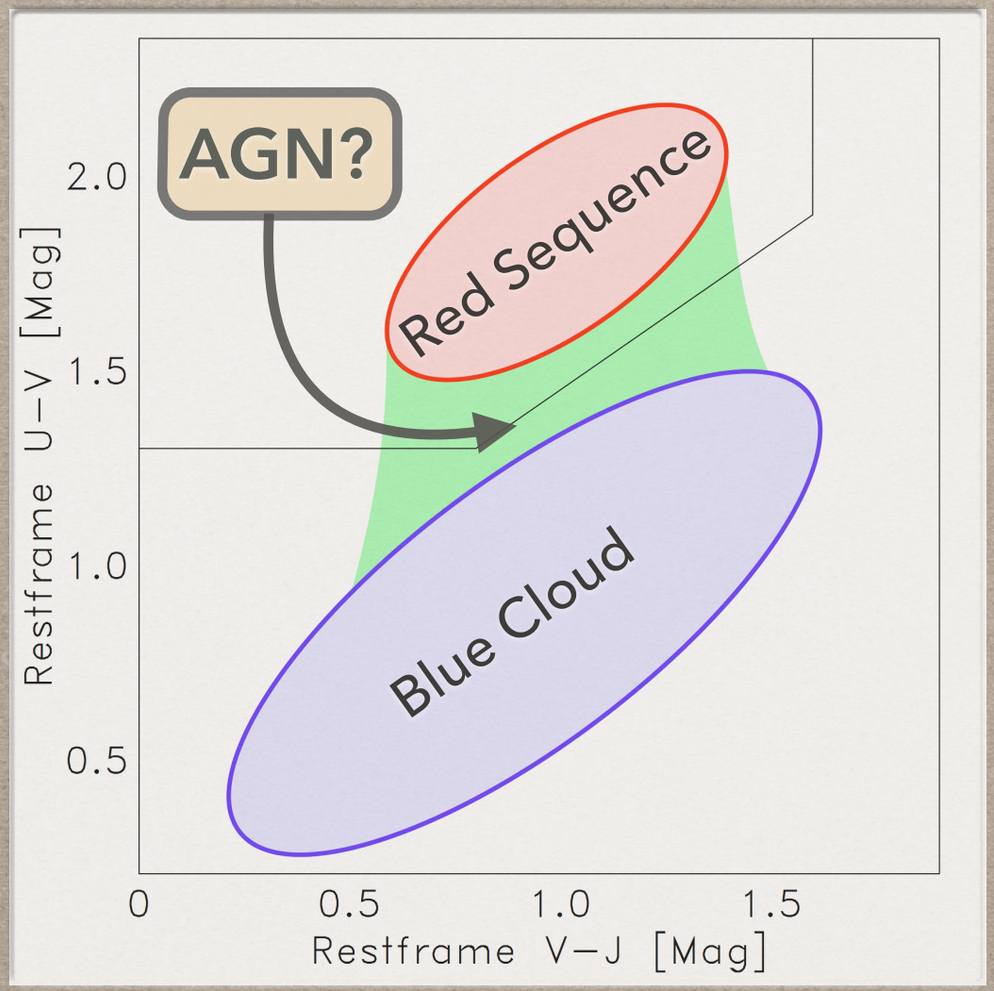
Sani+ 2011

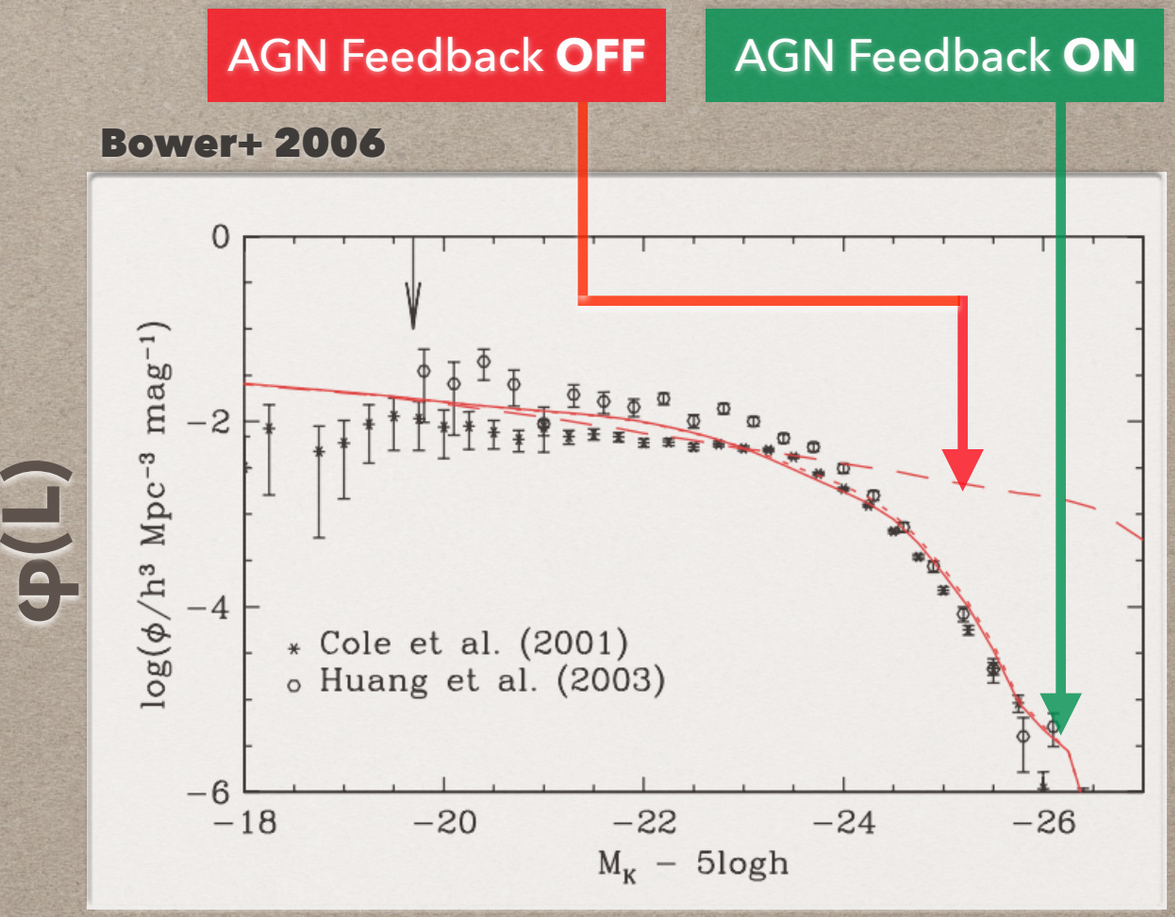


Host Galaxy Mass

WHY DO WE CARE ABOUT ACTIVE GALACTIC NUCLEI (AGN)?

Negative feedback from AGN helps **suppress ongoing star formation** and **reduce the number of massive galaxies**

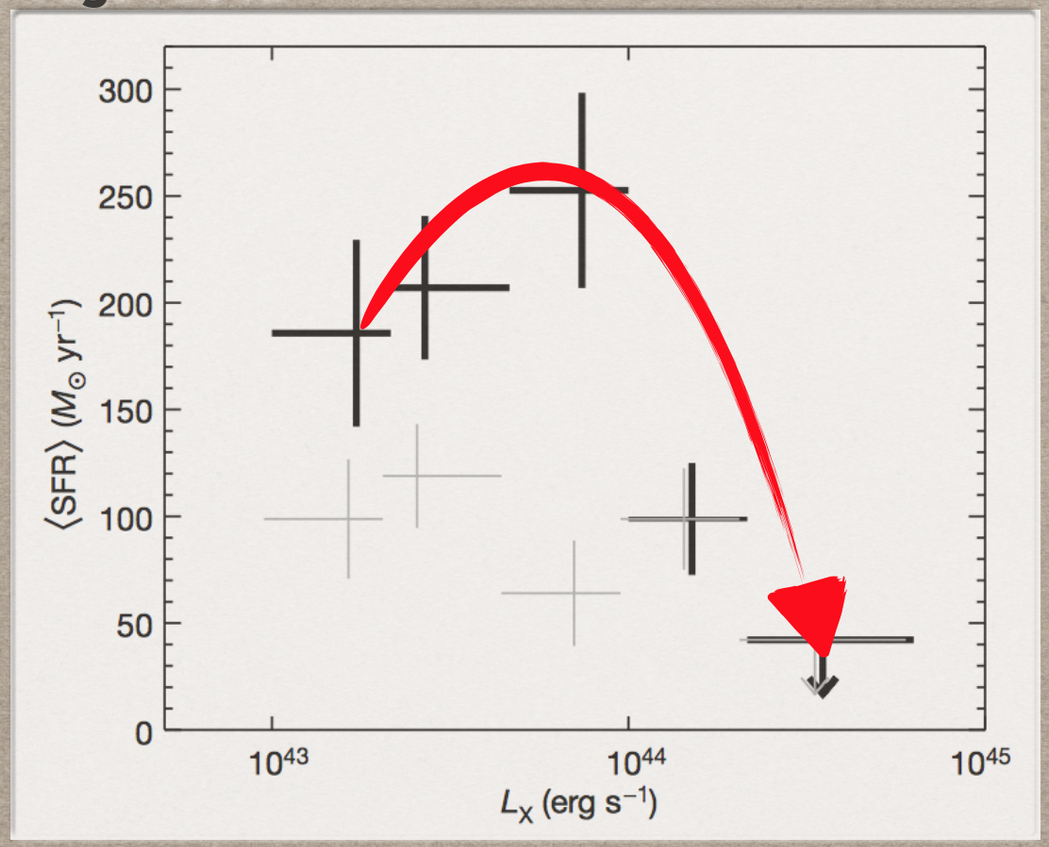




NEGATIVE FEEDBACK

Direct evidence for star formation quenching by AGN negative feedback?

Page+ 2012

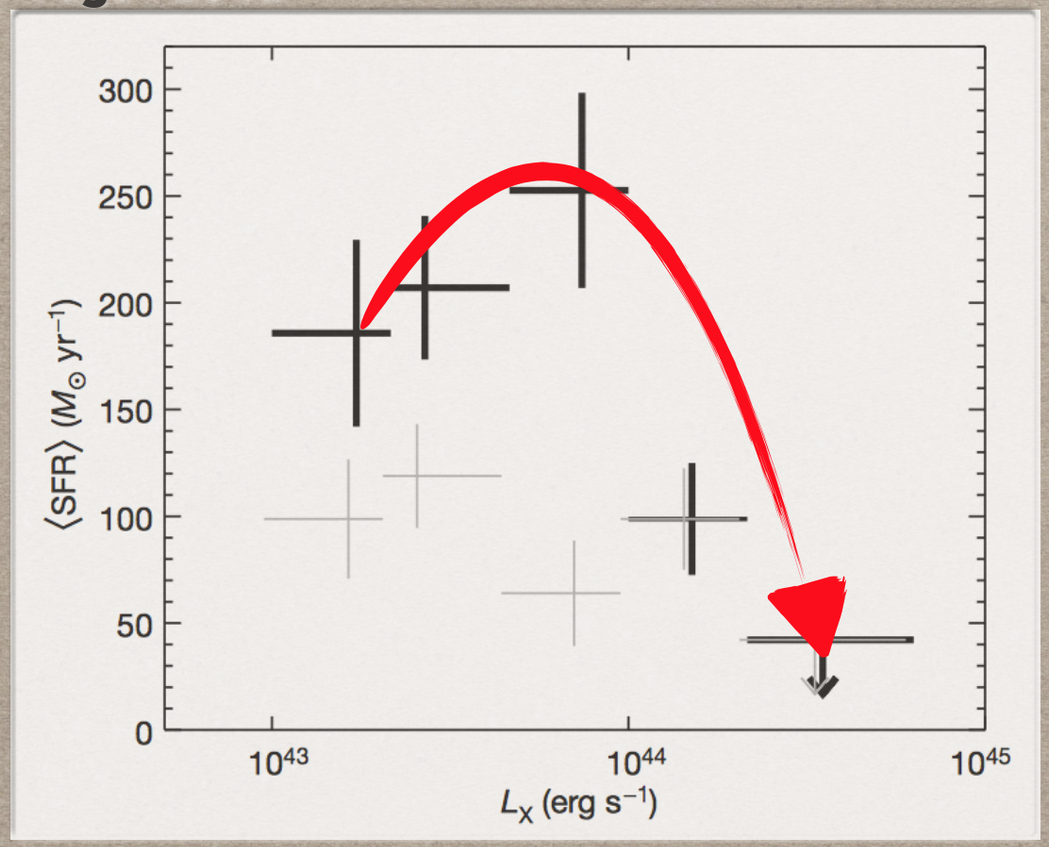


NEGATIVE FEEDBACK OR POSITIVE FEEDBACK?

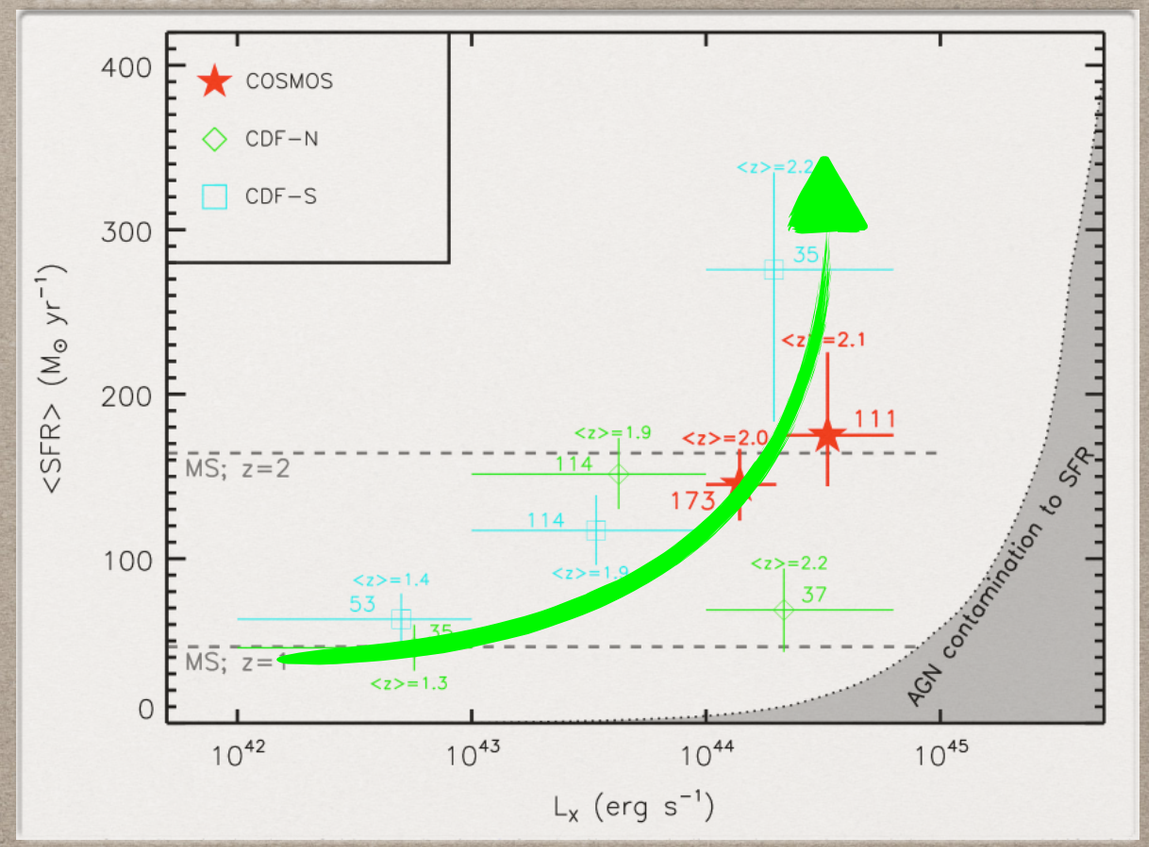
Direct evidence for star formation quenching by AGN negative feedback?

The details of this feedback are not well understood!

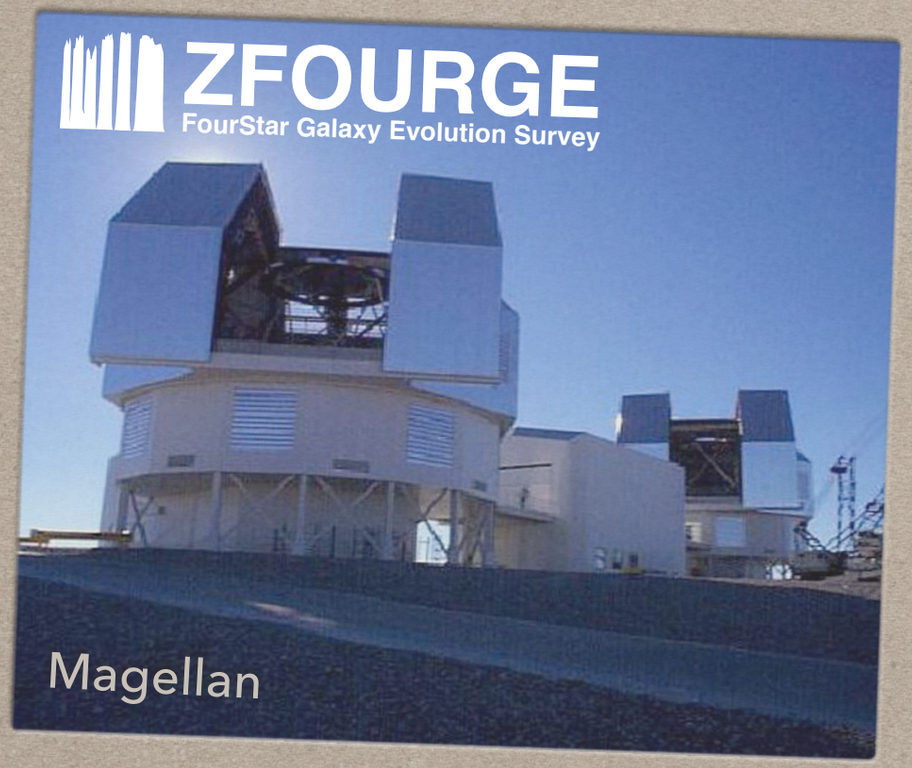
Page+ 2012

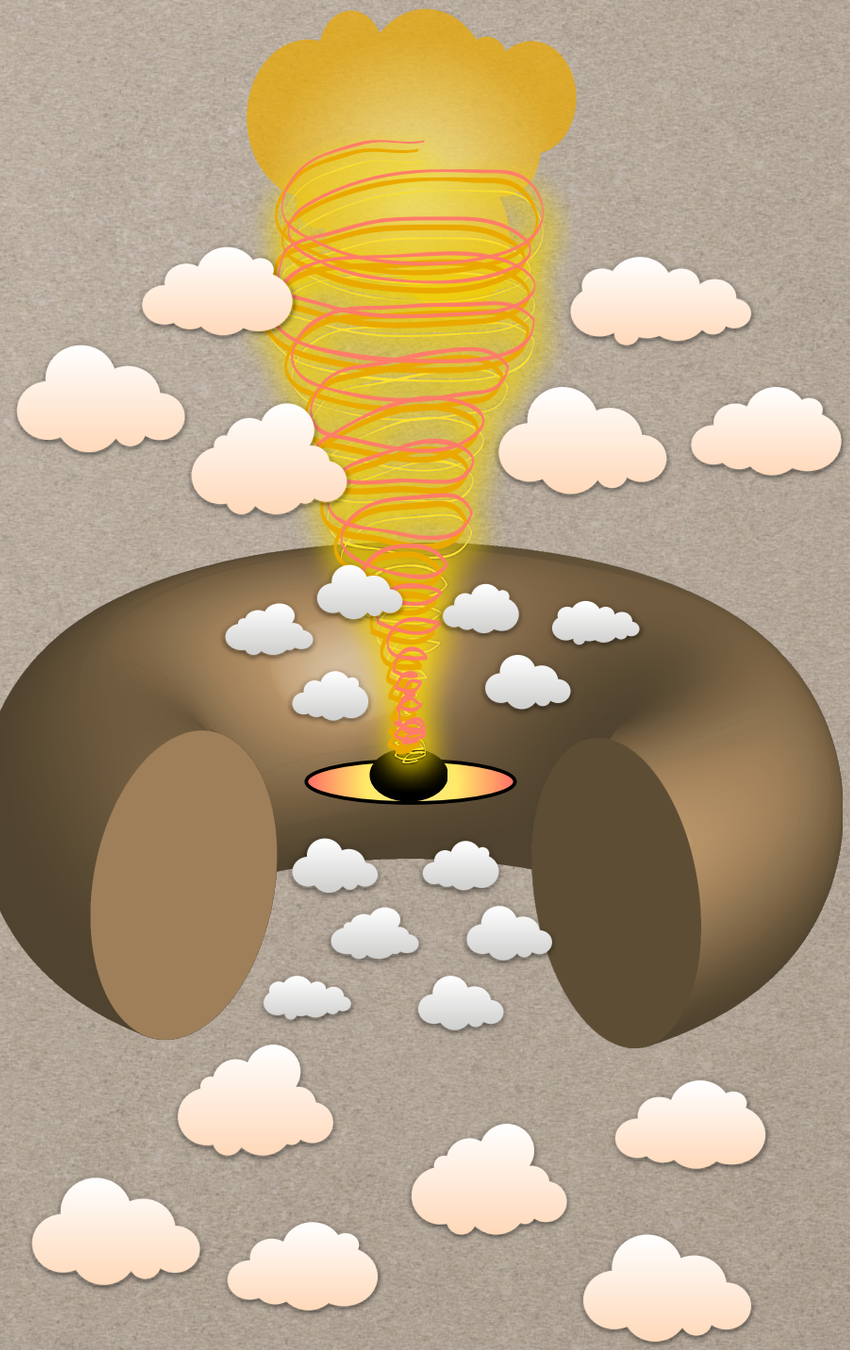


Harrison+ 2012a



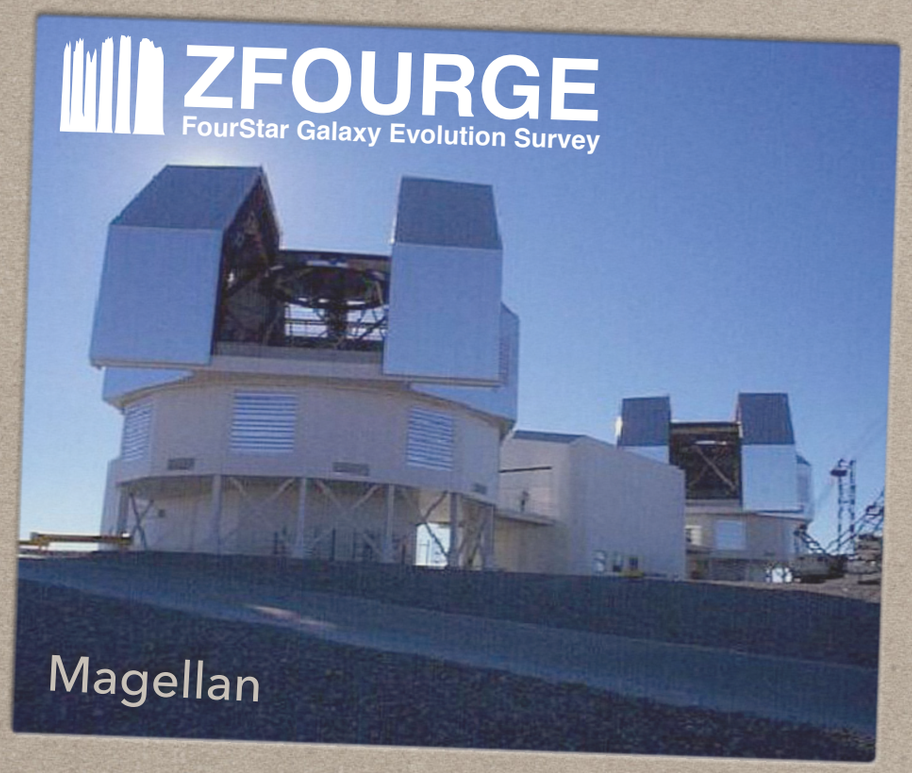
GOAL: COMPARE STAR FORMATION ACTIVITY IN AGN HOSTS AND NON-AGN

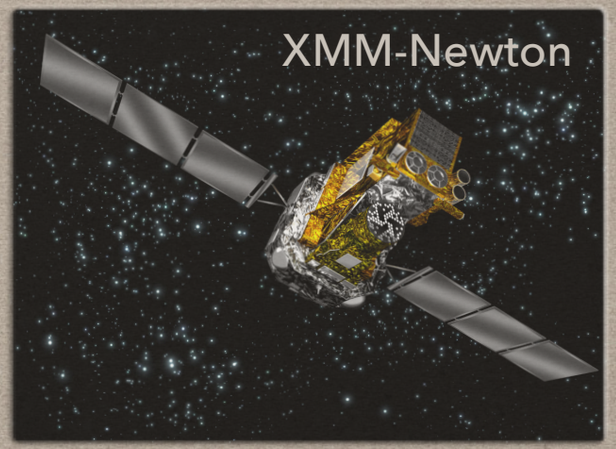




Requires a **multi-wavelength** approach

GOAL: COMPARE STAR FORMATION ACTIVITY IN AGN HOSTS AND NON-AGN





Requires a **multi-wavelength** approach

IDENTIFYING AGN IN ZFOURGE

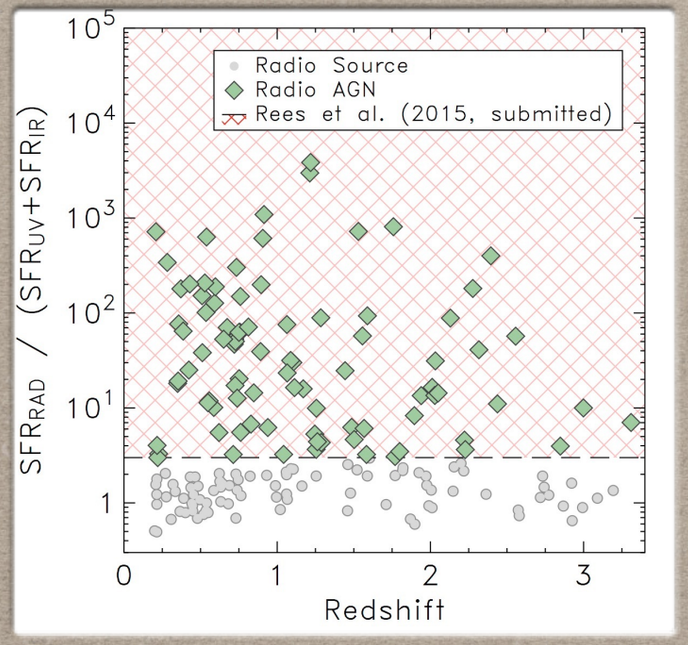
Requires a multi-wavelength approach

A source with excess radio emission is identified as a radio AGN

A source with excess X-ray emission is identified as a X-ray AGN

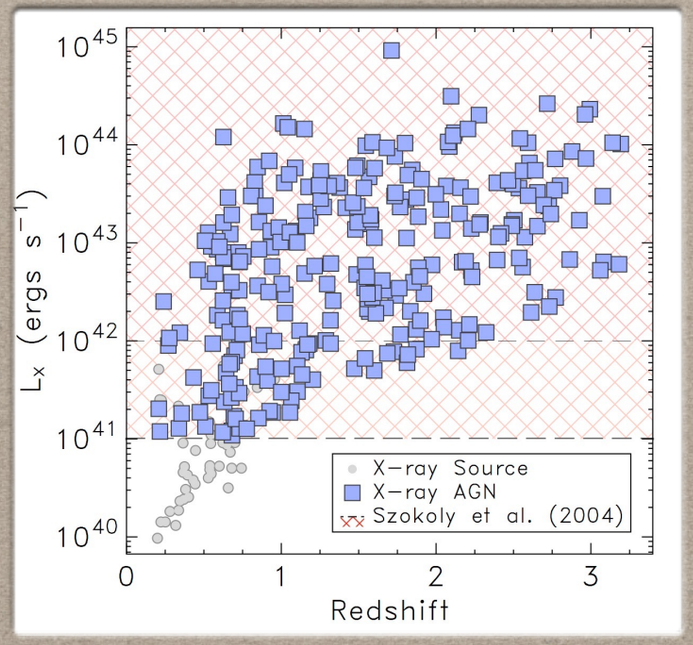
A source in Messias+12 colour space is identified as an infrared AGN

Radio SFR / IR+UV SFR



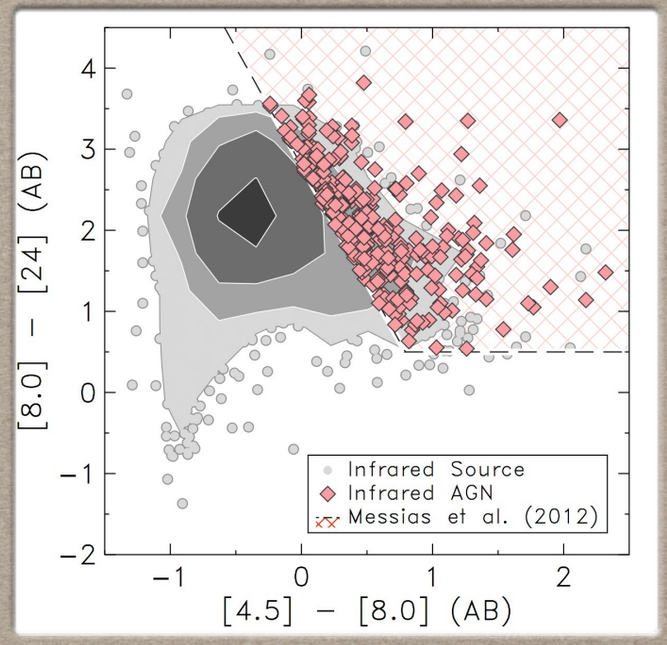
Redshift

X-Ray Luminosity



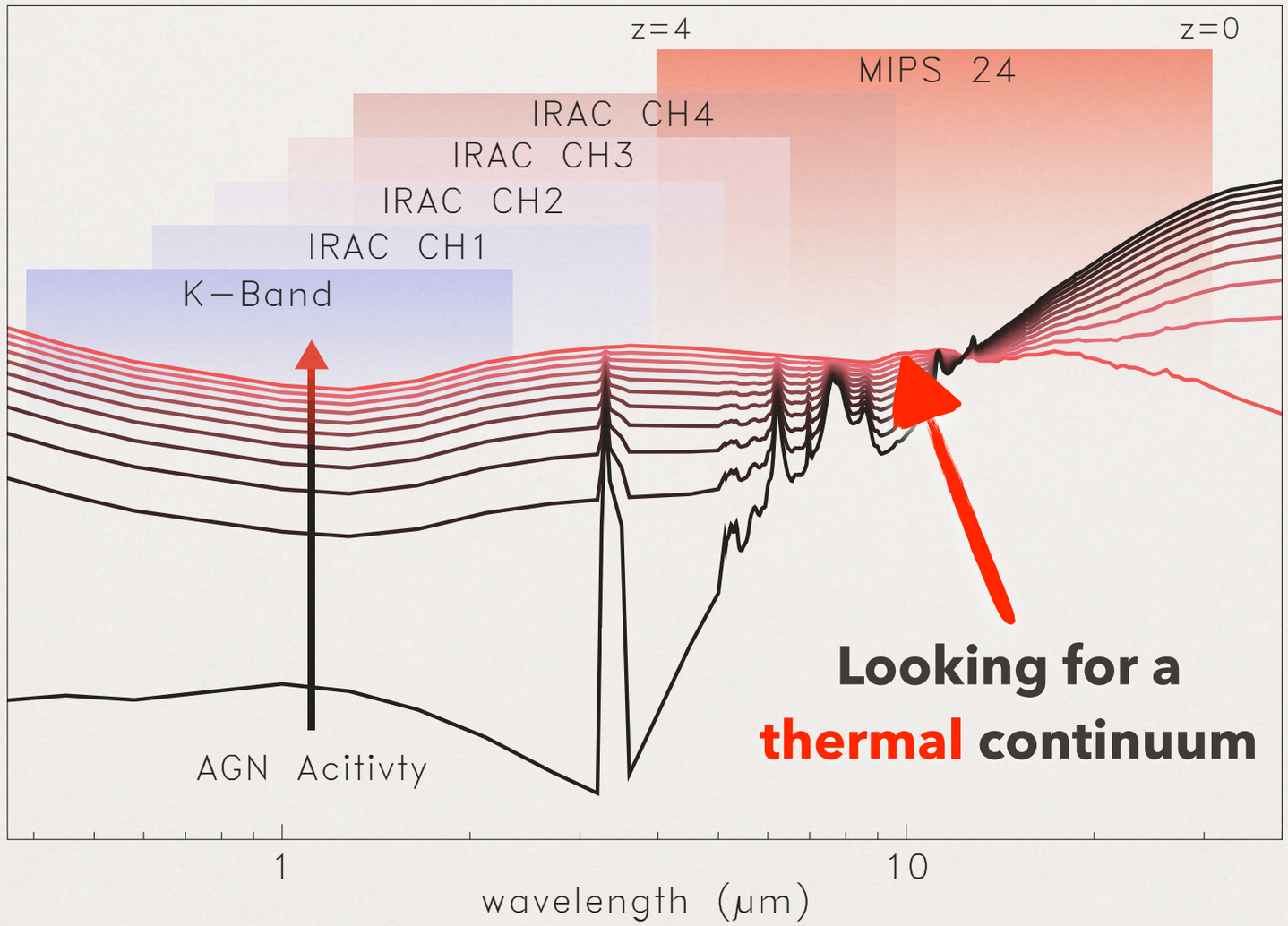
Redshift

IRAC CH4 - MIPS24



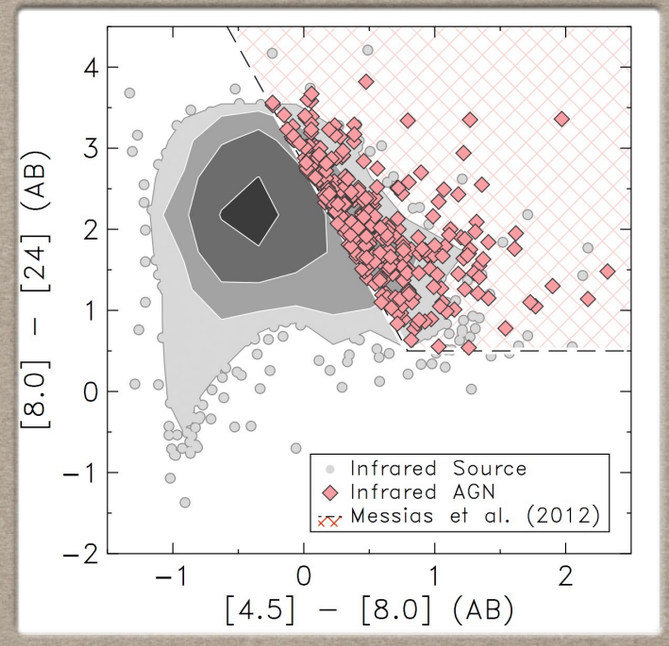
IRAC CH2-CH4

IDENTIFYING INFRARED AGN IN ZFOURGE



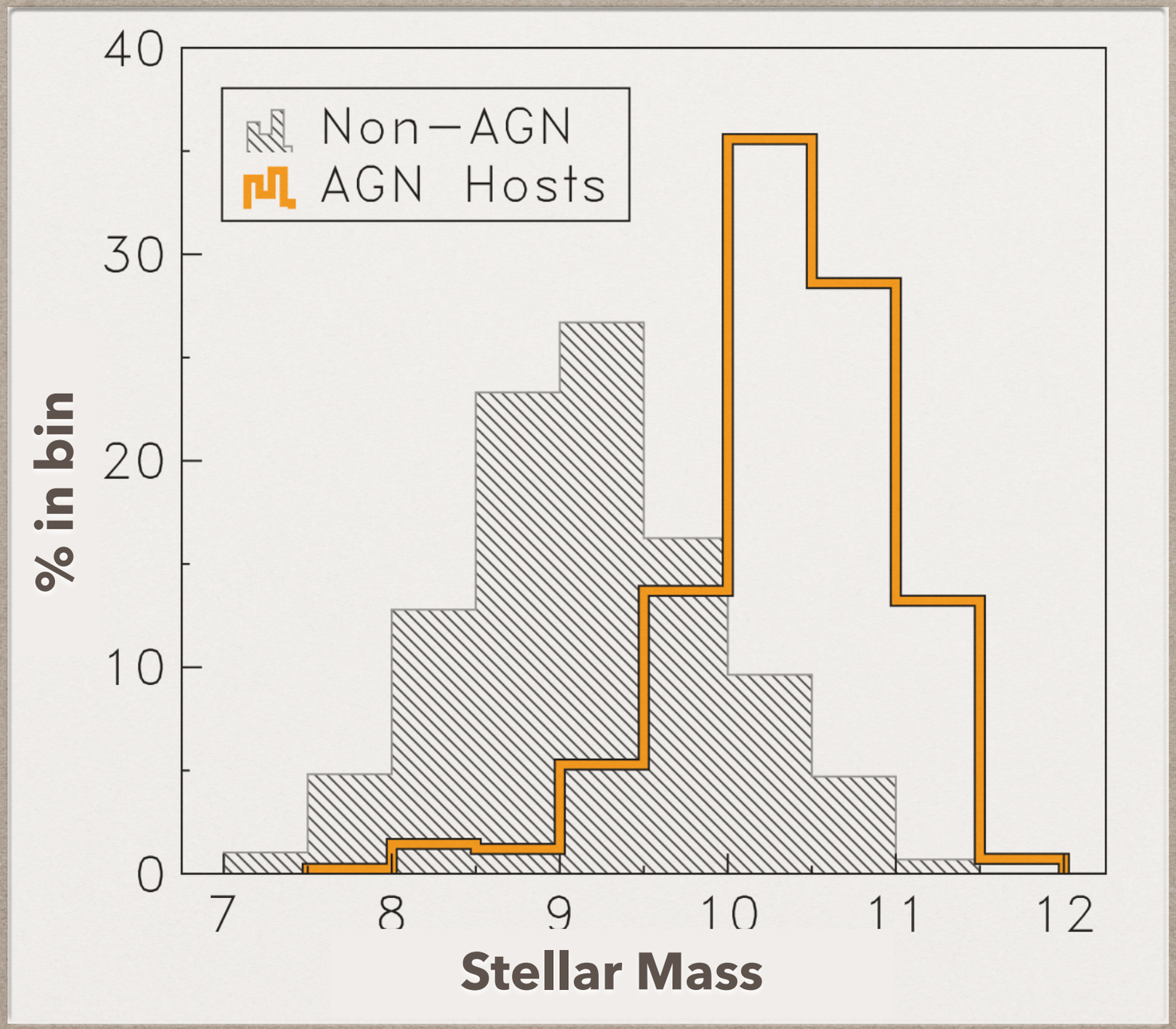
A source in Messias+12 colour space is identified as an infrared AGN

IRAC CH4 - MIPS24



IRAC CH2-CH4

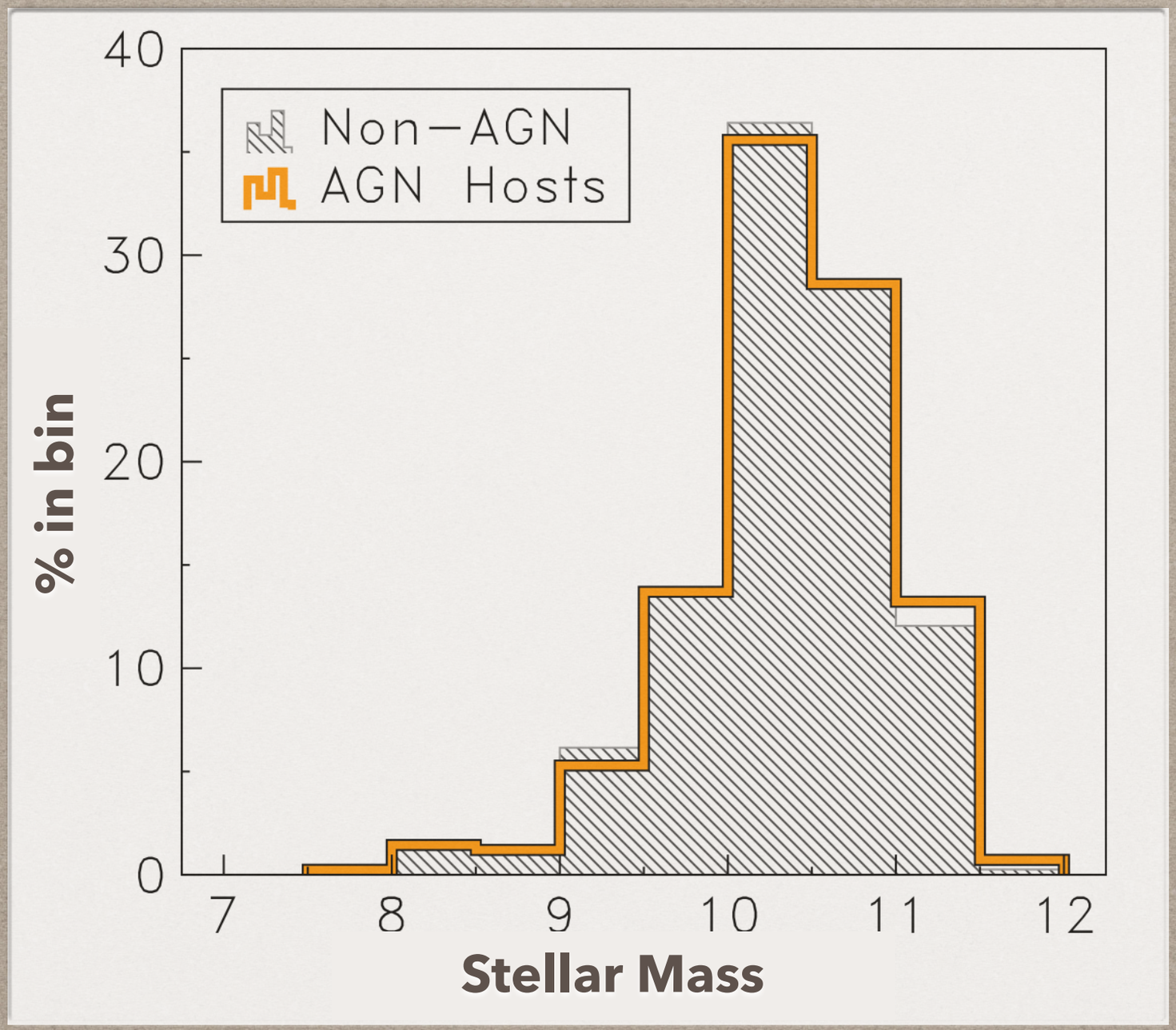
GOAL: COMPARE STAR FORMATION ACTIVITY IN AGN HOSTS AND NON-AGN



AGN are preferentially hosted in galaxies with high stellar mass (e.g., Aird+12)

A galaxy's stellar mass is tightly correlated with its star-formation rate (e.g., Noeske+07)

GOAL: COMPARE STAR FORMATION ACTIVITY IN AGN HOSTS AND NON-AGN ...OF SIMILAR MASS

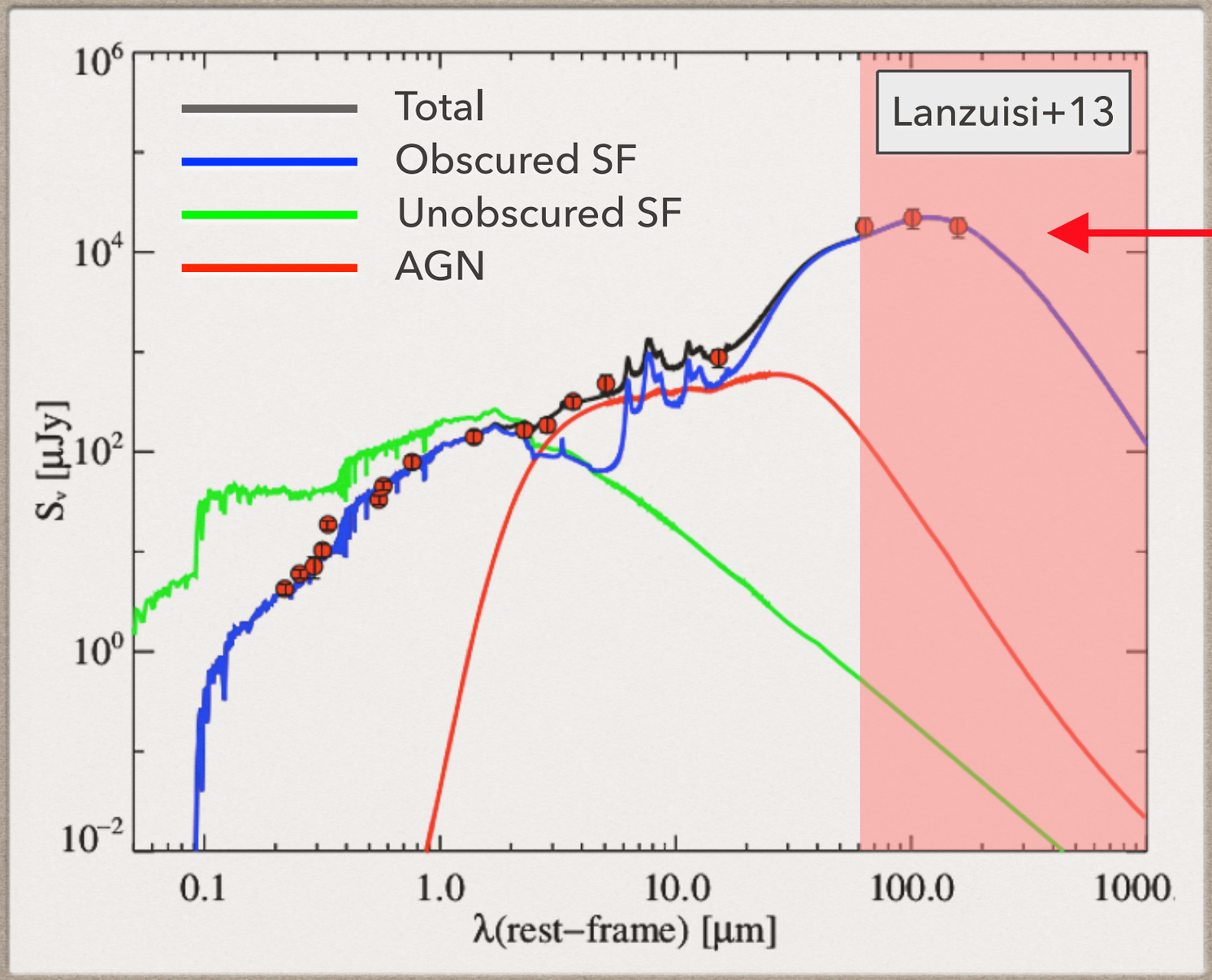


AGN are preferentially hosted in galaxies with high stellar mass (e.g., Aird+12)

A galaxy's stellar mass is tightly correlated with its star-formation rate (e.g., Noeske+07)

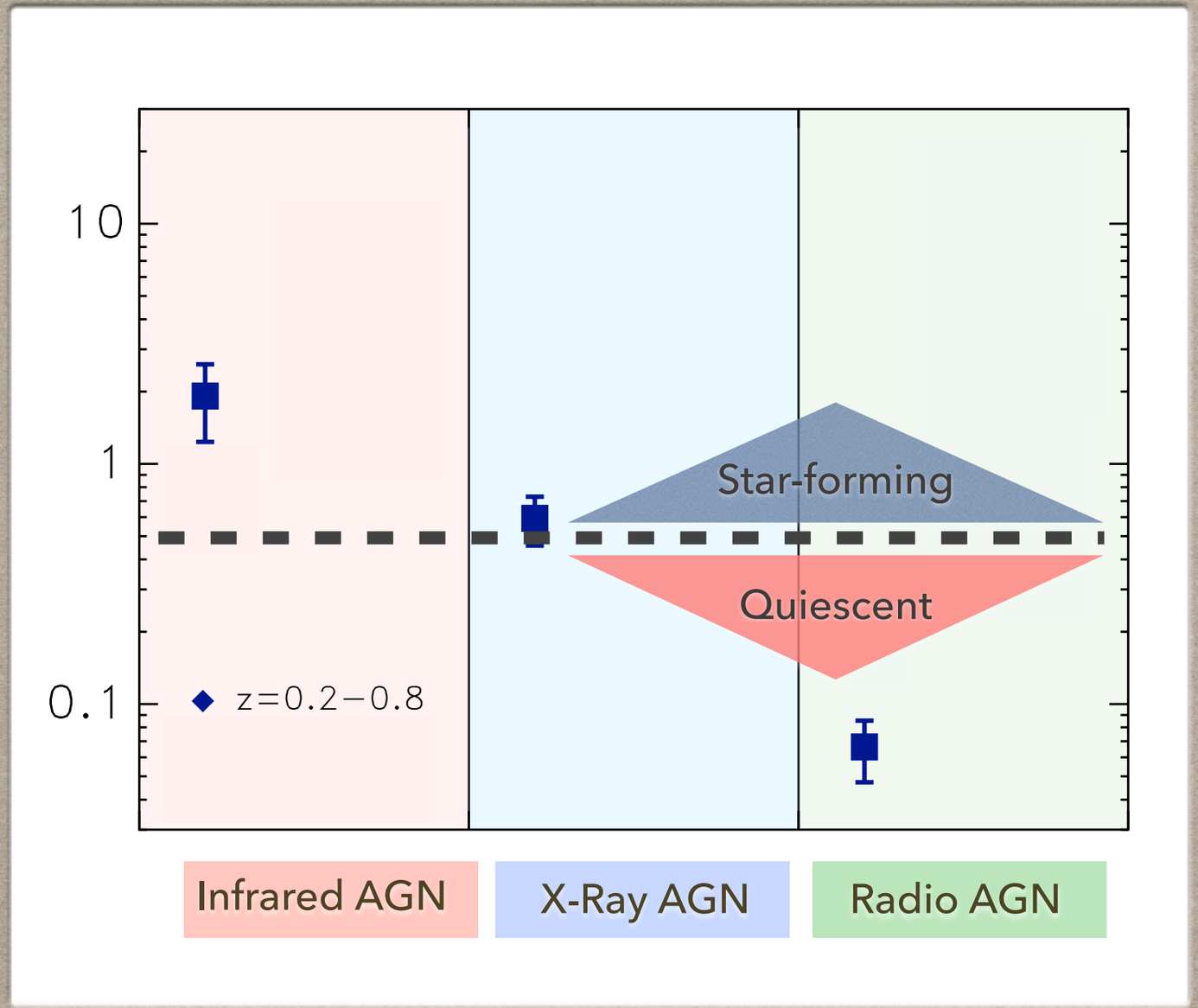
MEASURING SF ACTIVITY IN AGN HOSTS

Reducing the impact of AGN contamination when measuring the SFR



24μm SFRs up to
~23% contamination
24μm + Herschel
SFRs up to **~5%**
(Pozzi+12)

STAR FORMATION ACTIVITY OF LOW-Z AGN HOSTS



Infrared AGN

Star forming hosts

X-Ray AGN

Straddles between star-forming and quiescent

Radio AGN

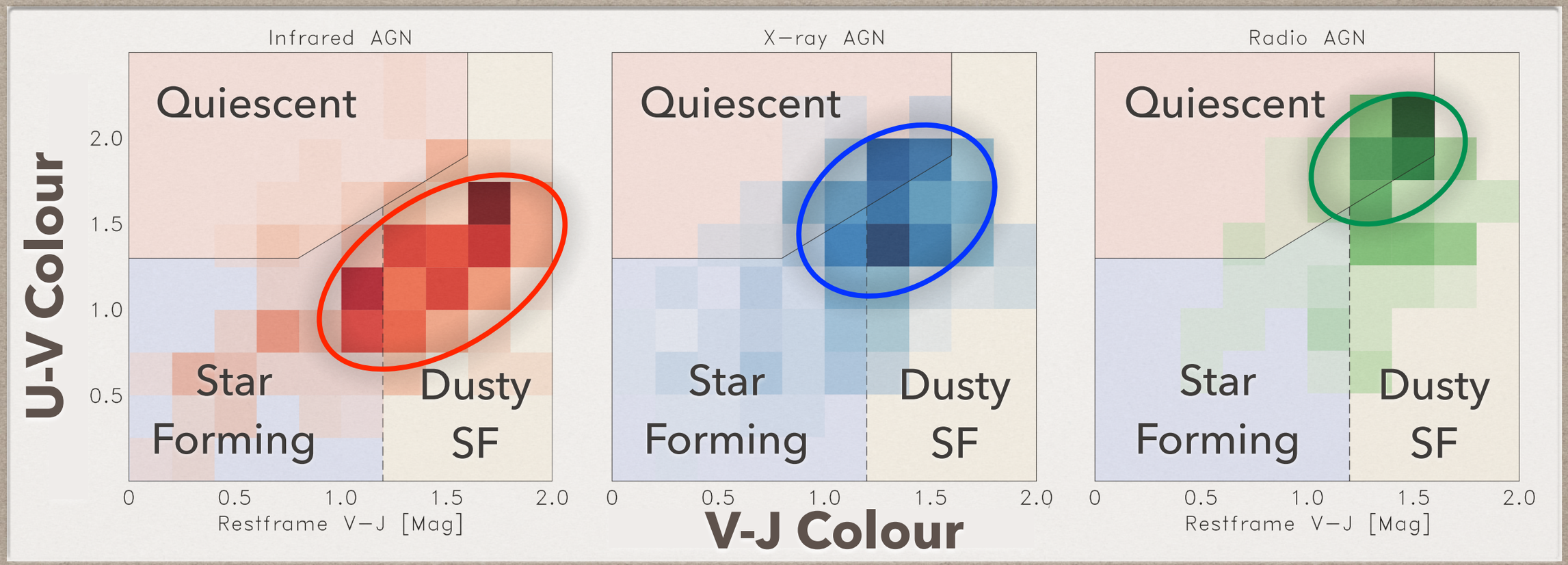
Quiescent hosts

U-V vs V-J COLOURS OF AGN HOSTS

Infrared AGN

X-Ray AGN

Radio AGN

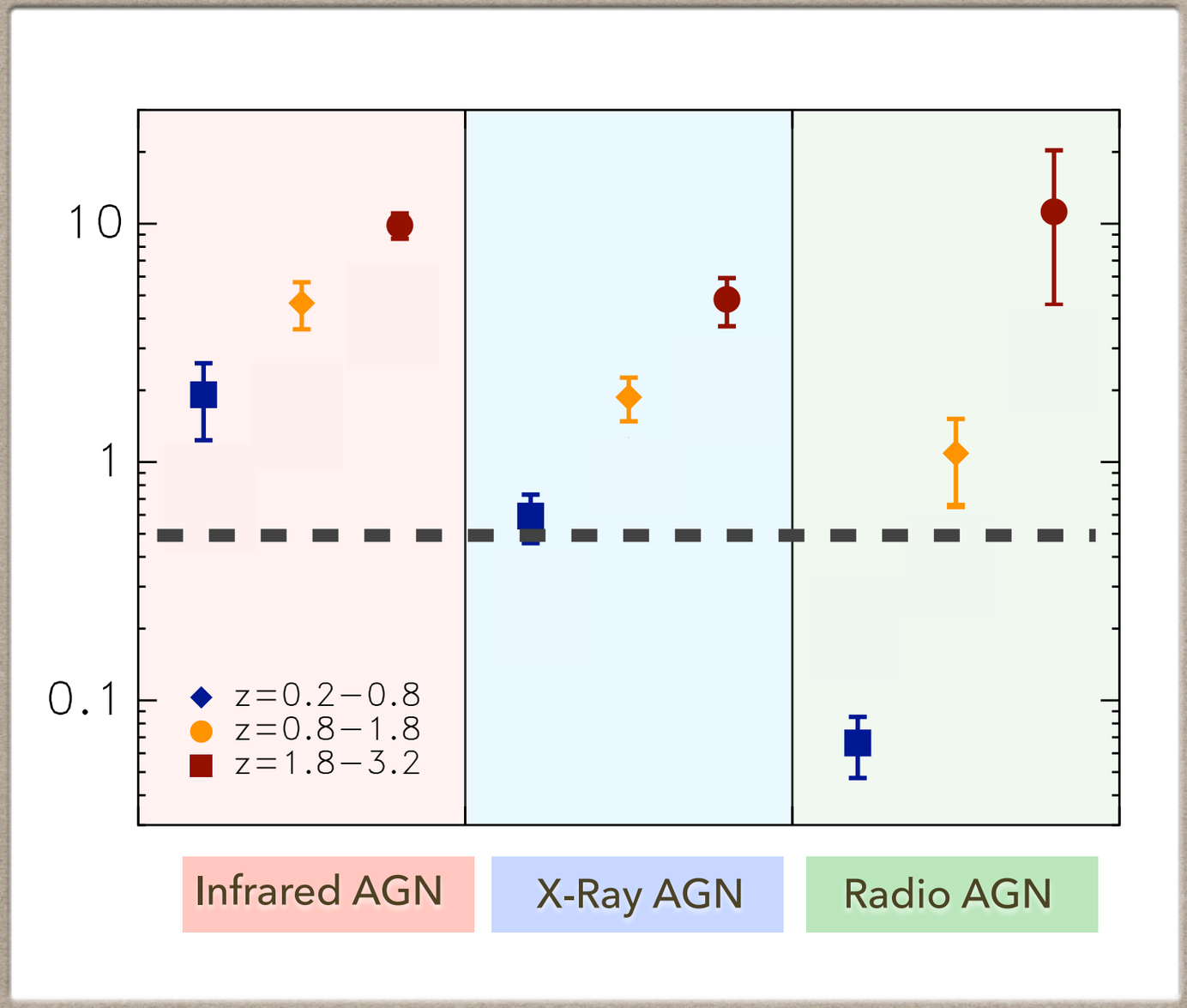


Star forming hosts

Straddles between star forming and quiescent

Quiescent hosts

STAR FORMATION ACTIVITY OF HIGH-Z AGN HOSTS



Infrared AGN

Star forming hosts

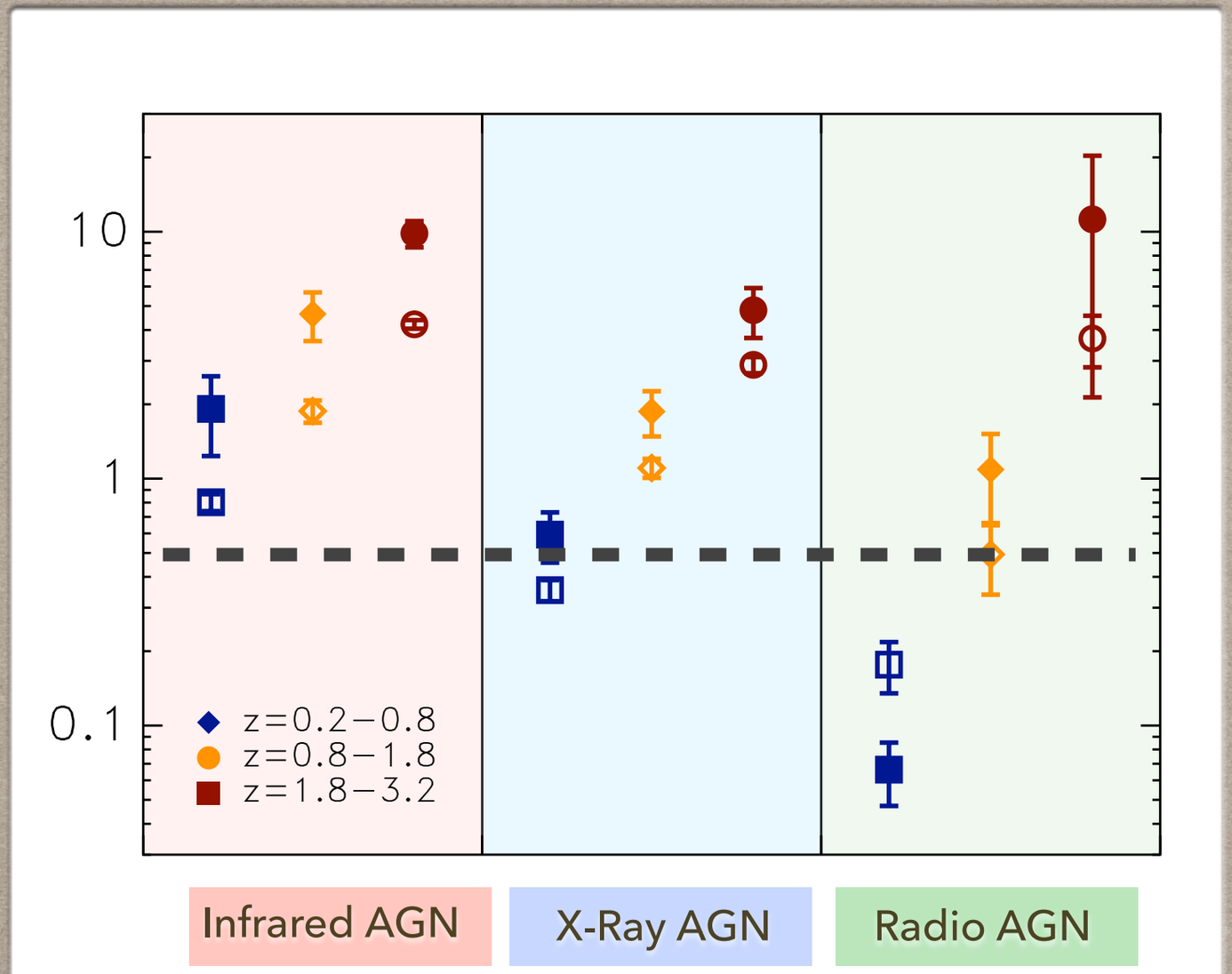
X-Ray AGN

Star forming hosts

Radio AGN

Star forming hosts

STAR FORMATION ACTIVITY OF AGN HOSTS AND NON-AGN



Infrared AGN

Star forming hosts

X-Ray AGN

Star forming hosts

Radio AGN

Star forming hosts

Non-AGN

Lower SF activity than AGN

SUMMARY

- At low-z, radio, X-ray and IR-selected AGN exhibit colours consistent with distinct galaxy populations.
- The mean star-formation activity of AGN hosts tends to be slightly elevated over non-AGN galaxies
- Given this elevation is present in all AGN types and over most of cosmic time, calls into question the significance of AGN quenching