SIGNATURES OF QUASAR FEEDBACK

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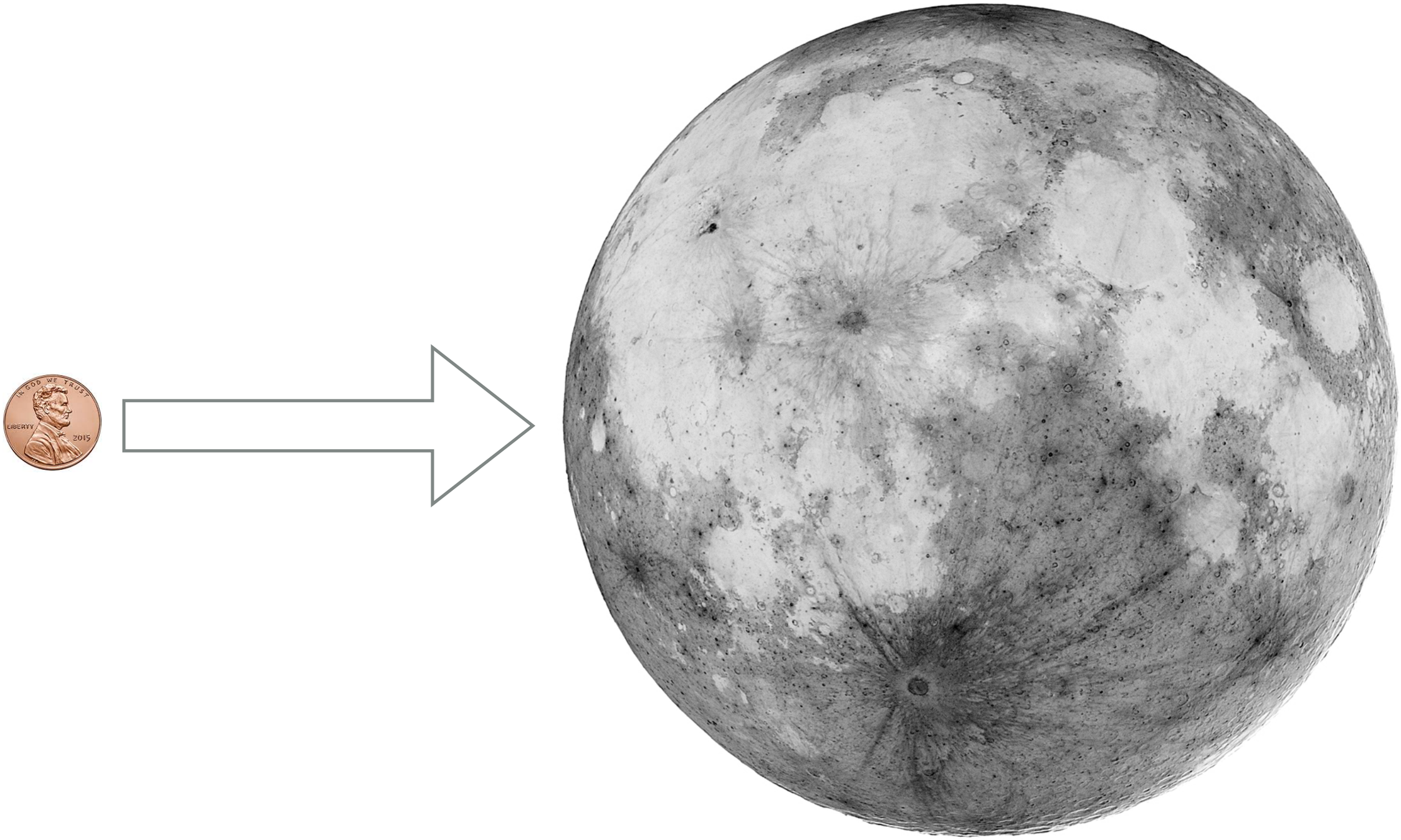
INTRODUCTION



INTRODUCTION

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released energy by BH

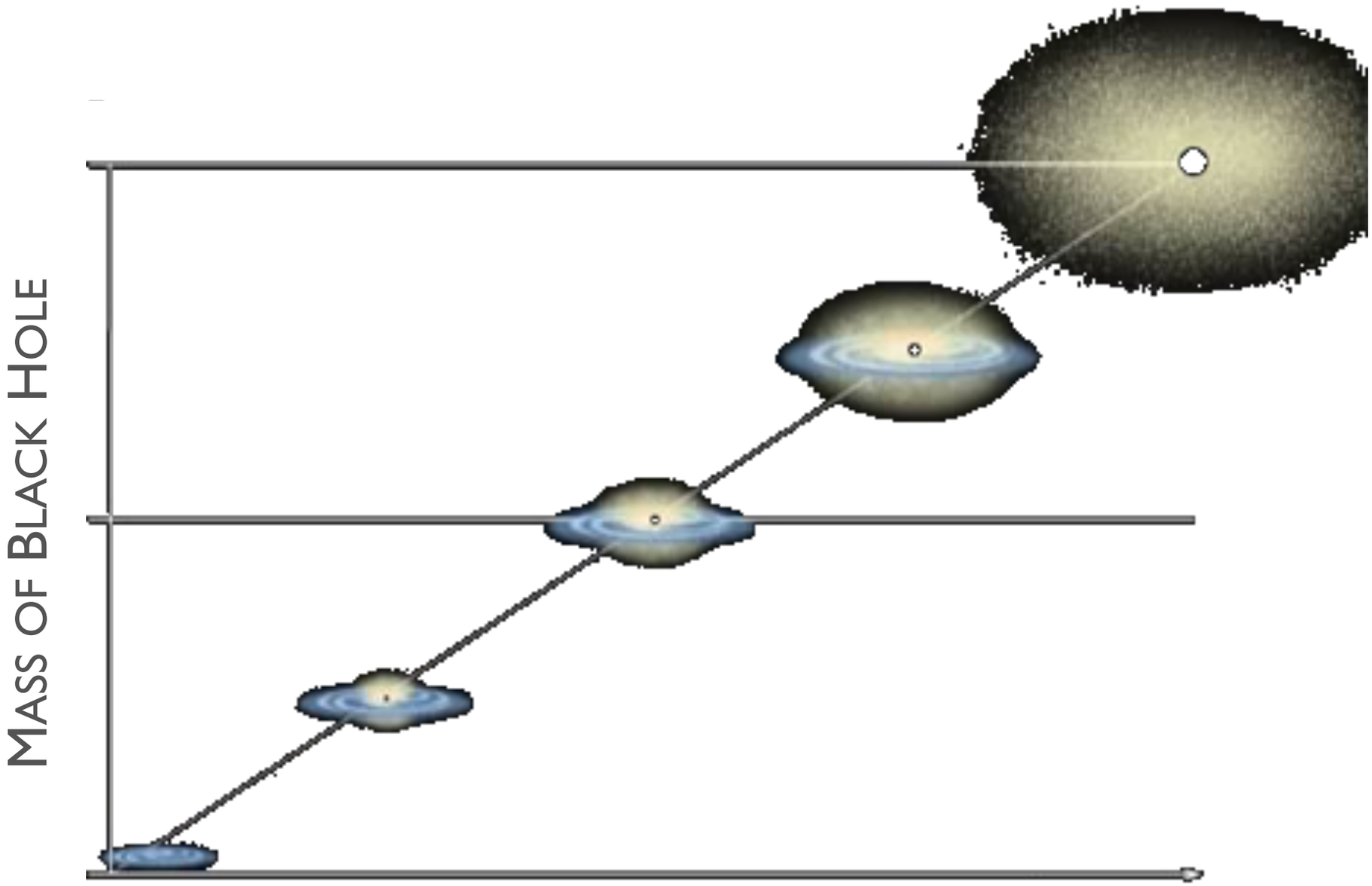
$0.1 M_{BH} c^2$

$\gg$

binding energy of galaxy

$M_{gal} \sigma^2$

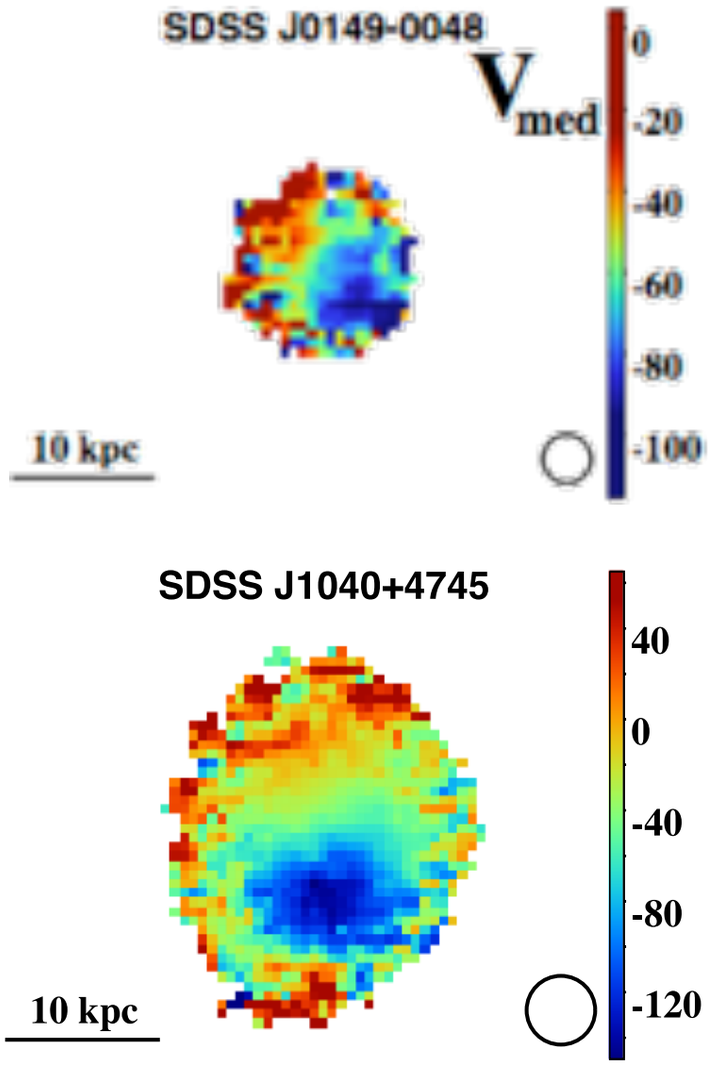
INTRODUCTION

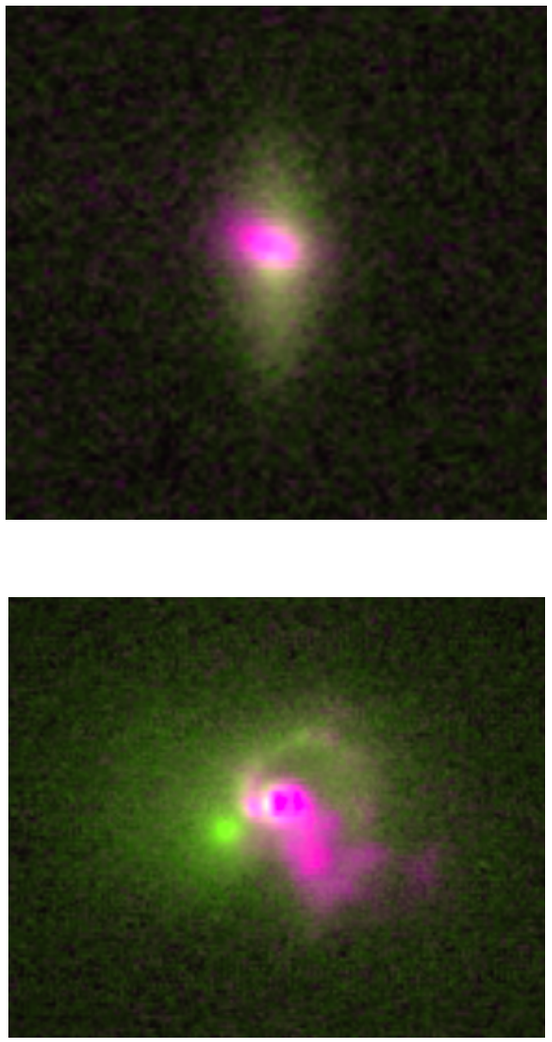


OBSERVATIONAL EVIDENCE

galaxy-wide outflows

scattering cones

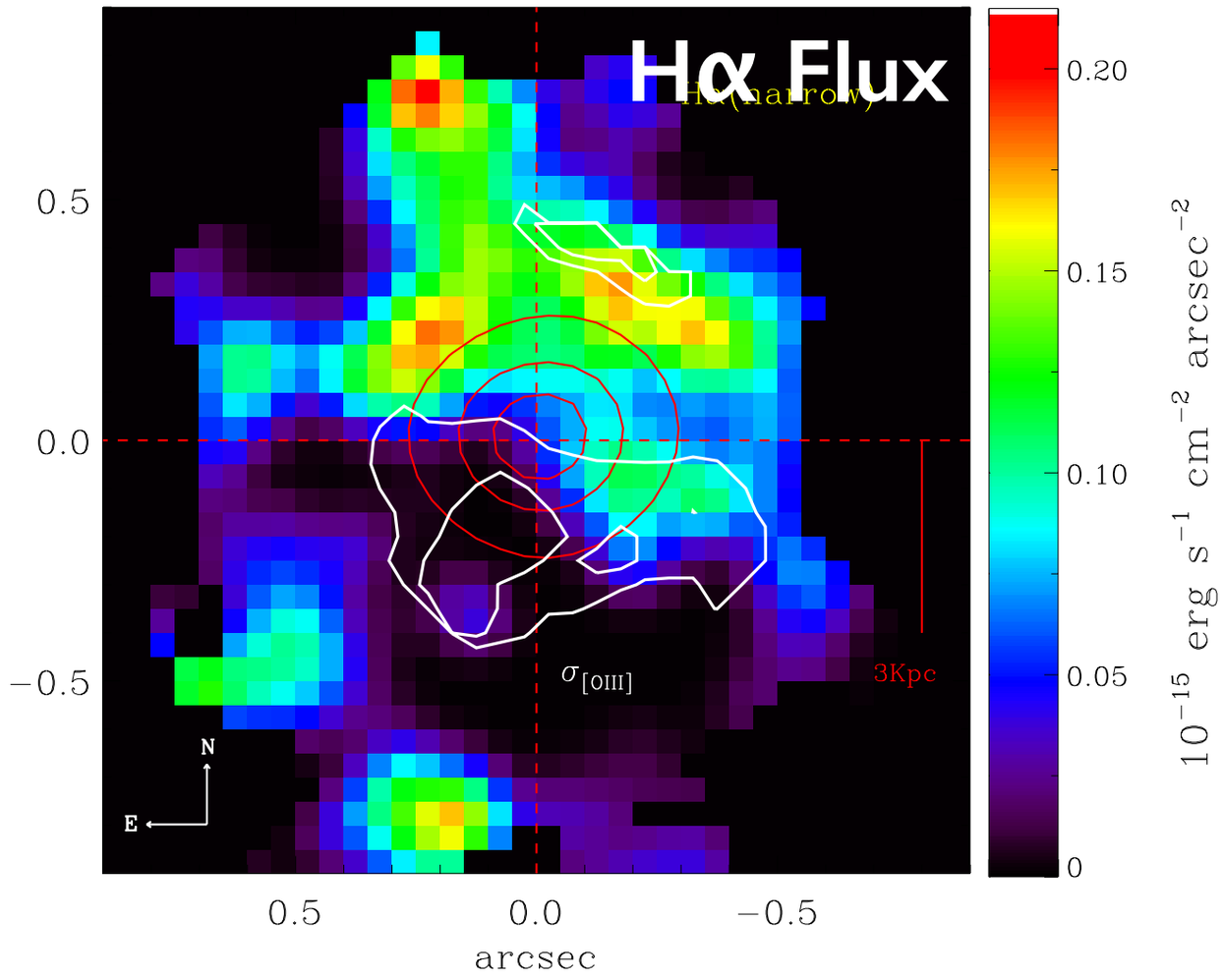




Liu+2013a,b, Wylezalek+2016a, Obied+2016

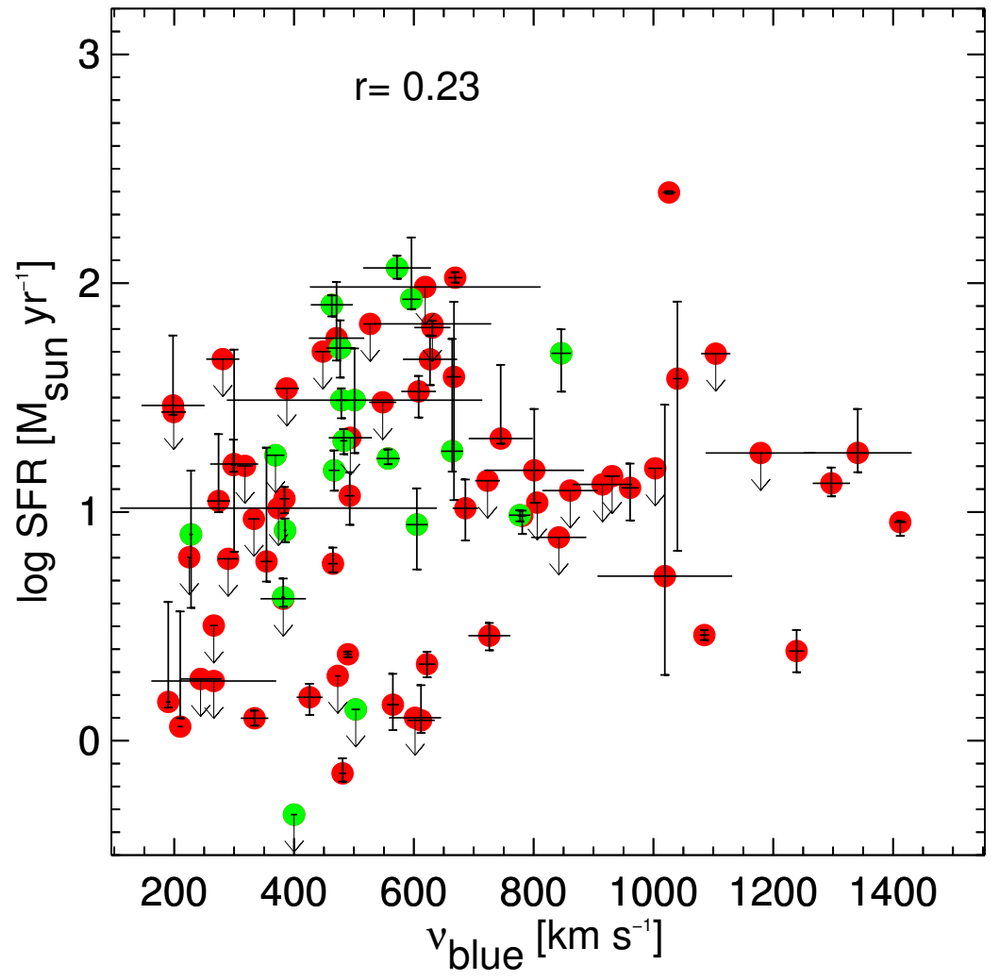
OBSERVATIONAL EVIDENCE

LOCAL EVIDENCE



Cano-Diaz+2012

GLOBAL EVIDENCE?

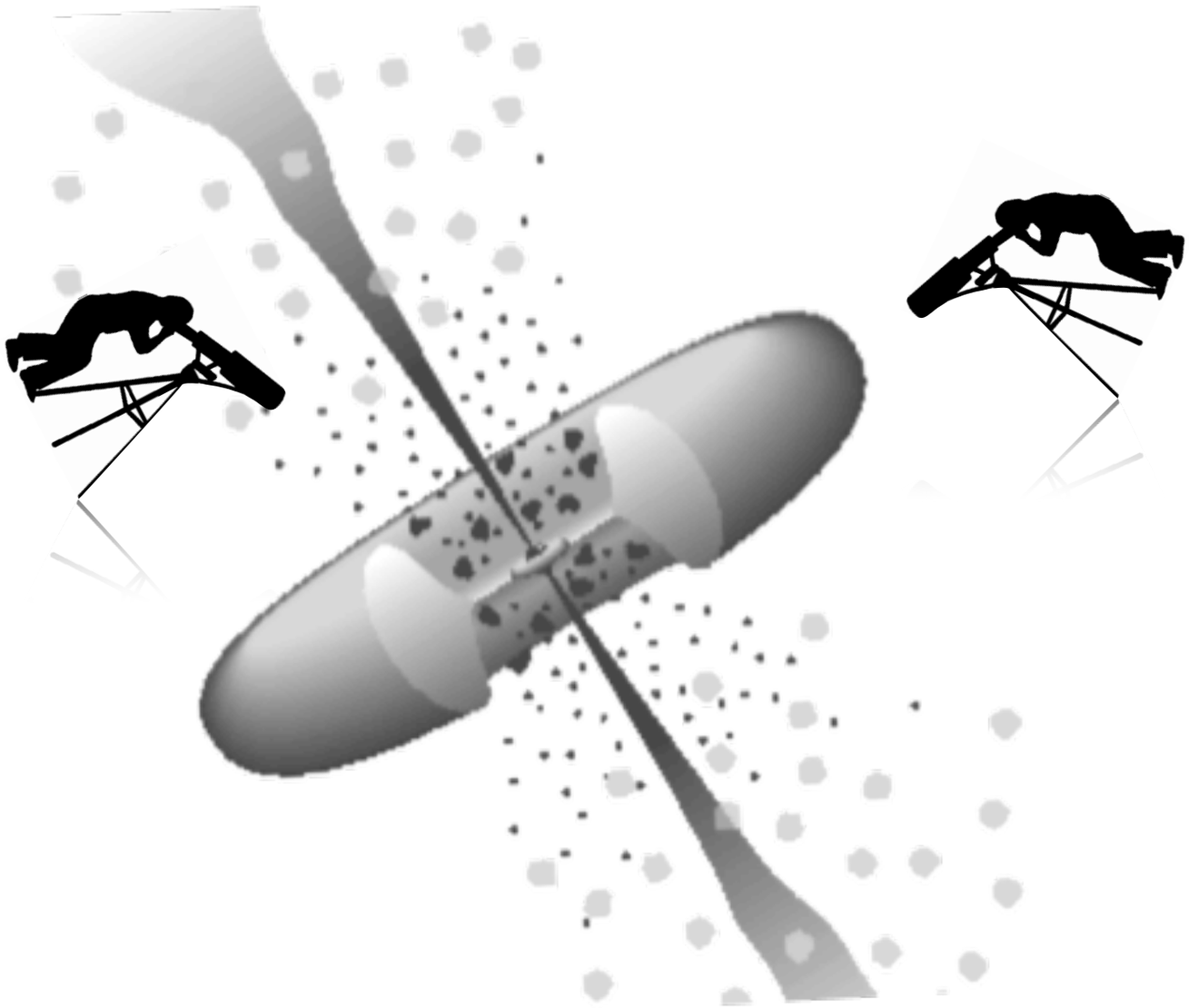


Balmaverde+2015

What are the observational signatures of AGN feedback?

How can we quantify AGN feedback?

SAMPLE SELECTION



type-2 AGN

SAMPLE SELECTION

OUTFLOW STRENGTH

STAR FORMATION RATE

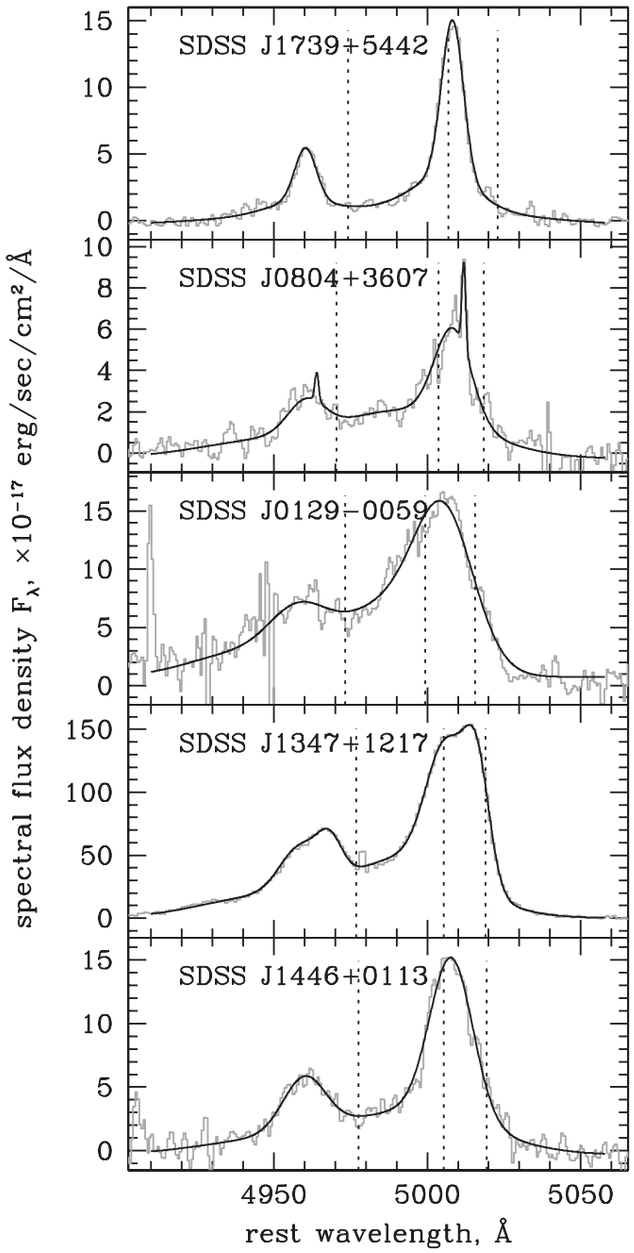
STELLAR MASS

SAMPLE SELECTION

OUTFLOW STRENGTH

[OIII] emission line at 5007Å

velocity width to quantify outflow strength



SAMPLE SELECTION

OUTFLOW STRENGTH

[OIII] emission line at 5007A

velocity width to quantify outflow strength

STAR FORMATION RATE

far-IR emission

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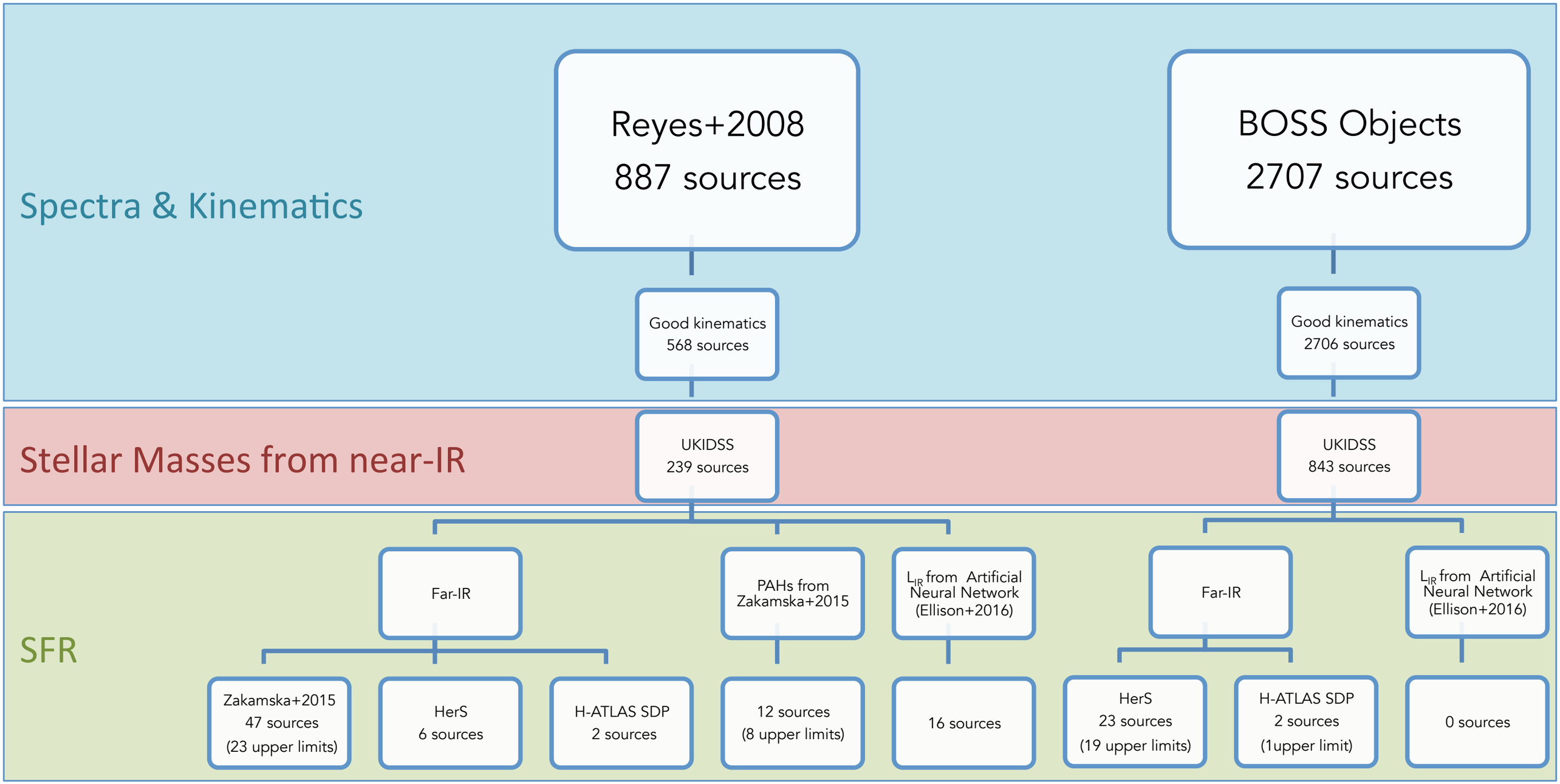
STELLAR MASS

NEAR-IR IMAGING DATA

SAMPLE SELECTION



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OUTFLOW STRENGTH

[OIII] emission line at 5007A

velocity width to quantify outflow strength

STAR FORMATION RATE

far-IR emission

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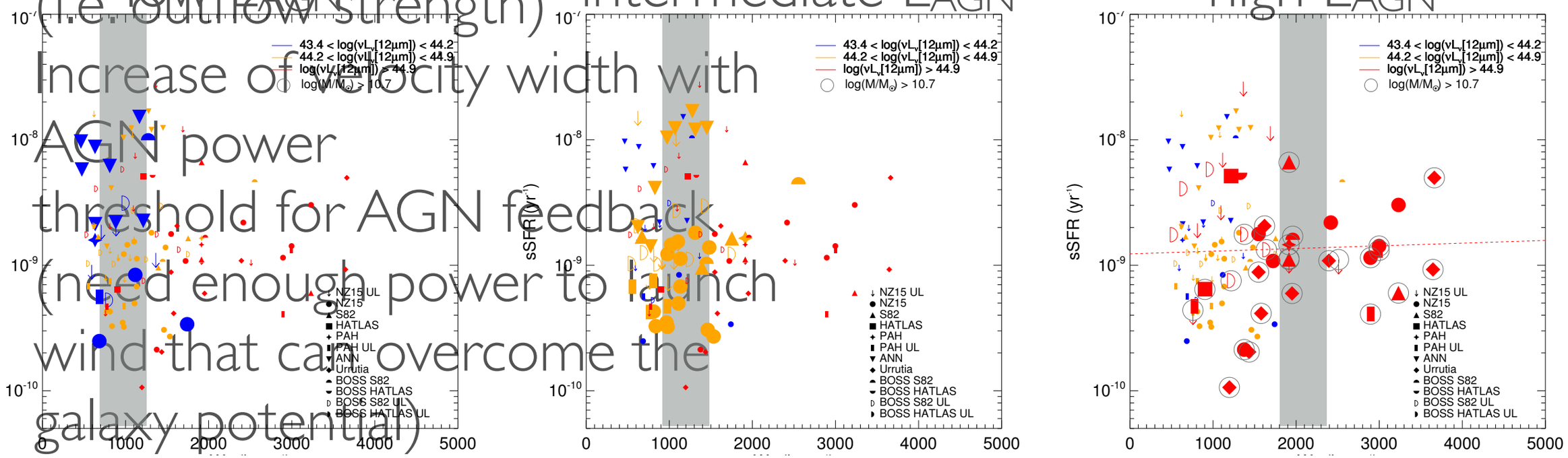
NEAR-IR IMAGING DATA

specific star formation rate sSFR

sSFR VS. VELOCITY WIDTH

No dependence of sSFR as a function of [OIII] velocity width (i.e. outflow strength)

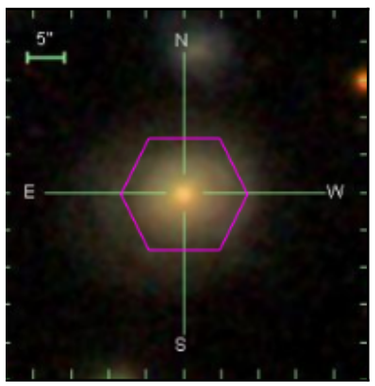
- No dependence of sSFR as a function of [OIII] velocity width (i.e. outflow strength)
- Increase of velocity width with AGN power
- threshold for AGN feedback (need enough power to launch wind that can overcome the galaxy potential)

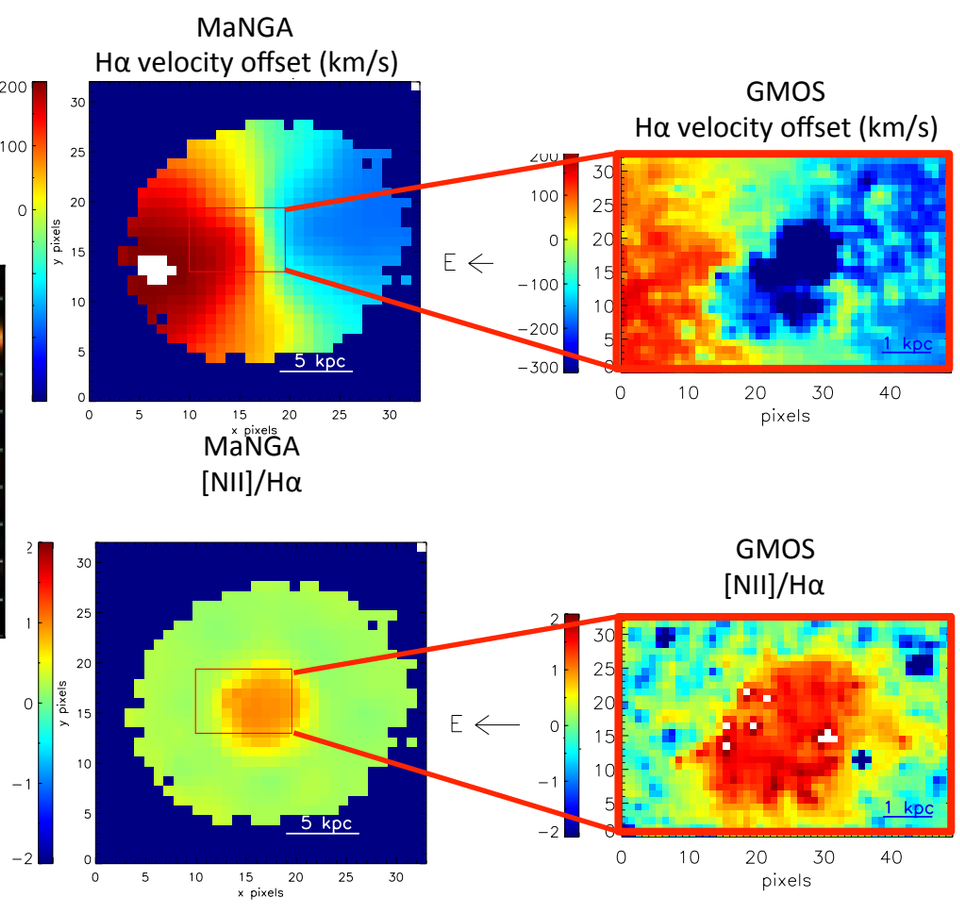


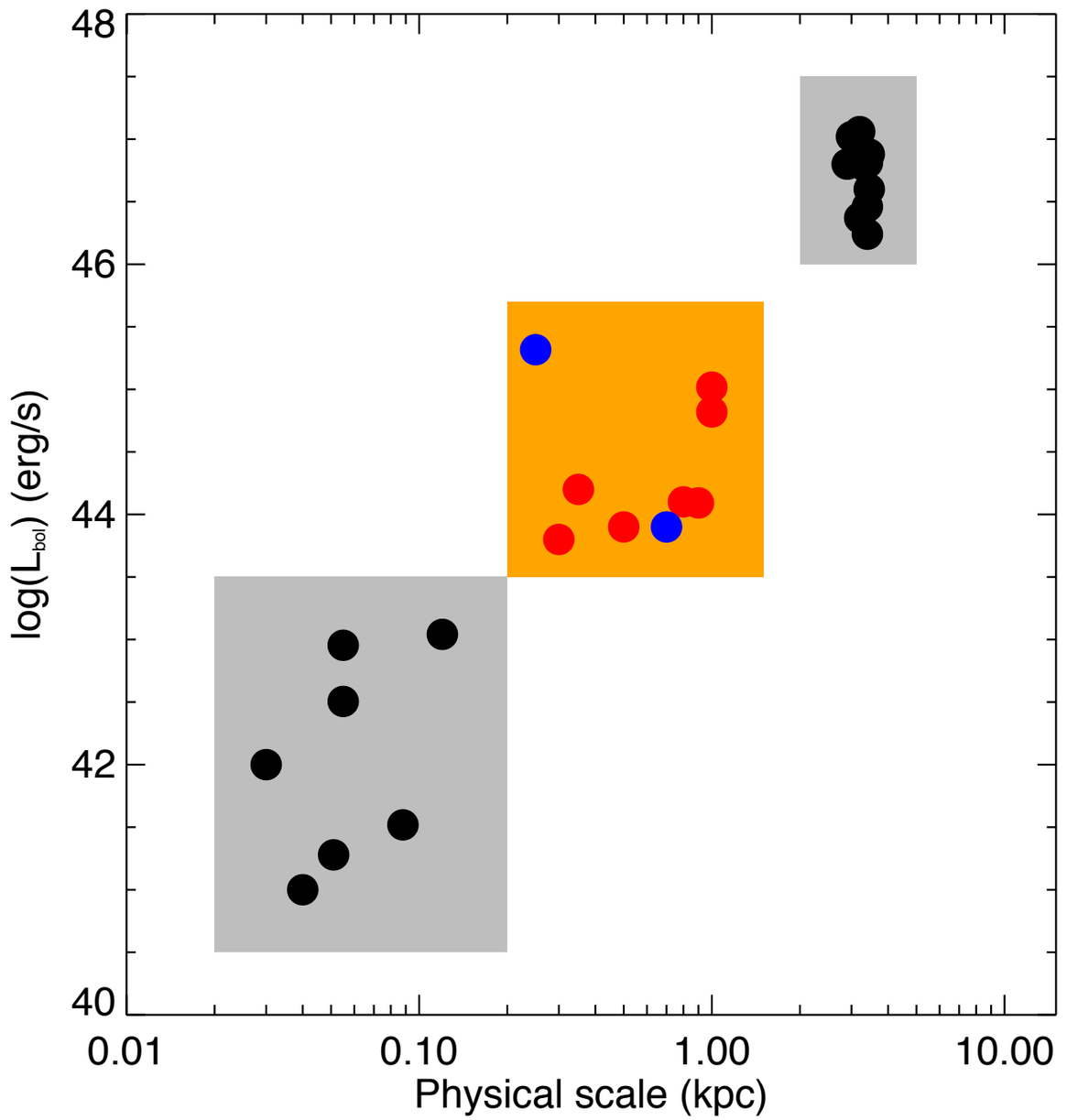
Wylezalek+2016b (in prep.)

FEEDBACK THRESHOLD WITH MANGA/GMOS

Object 1



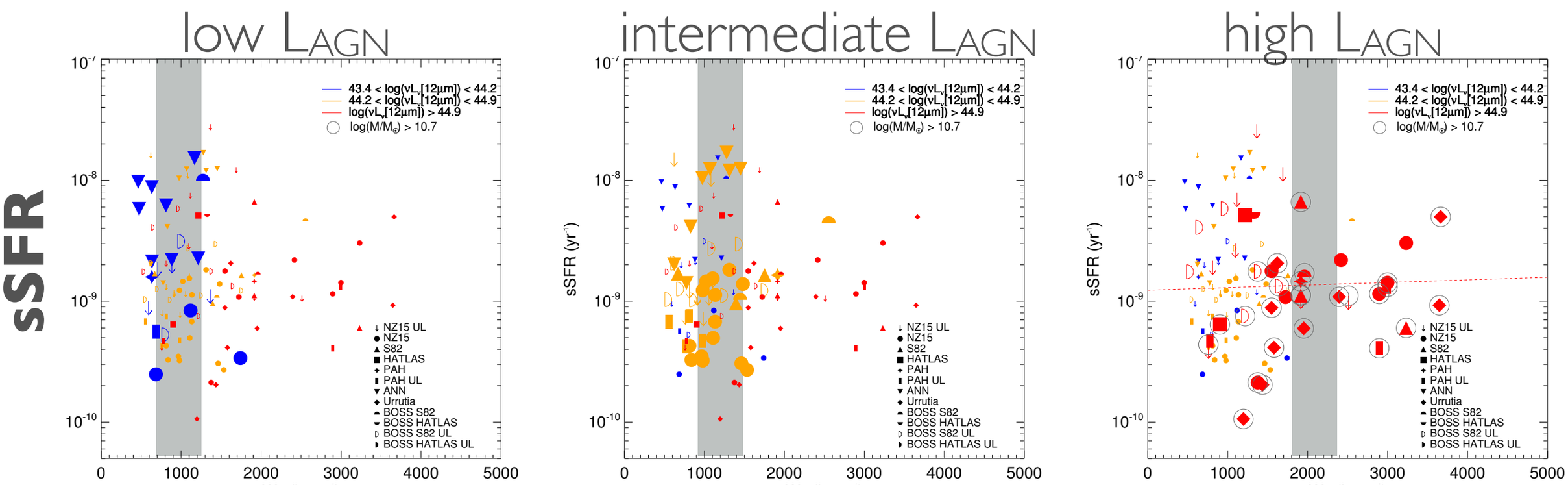




Wylezalek, Zakamska, Schnorr Müller, Storchi-Bergmann+ in prep.

sSFR VS. VELOCITY WIDTH

No dependence of sSFR as a function of [OIII] velocity width (i.e. outflow strength)



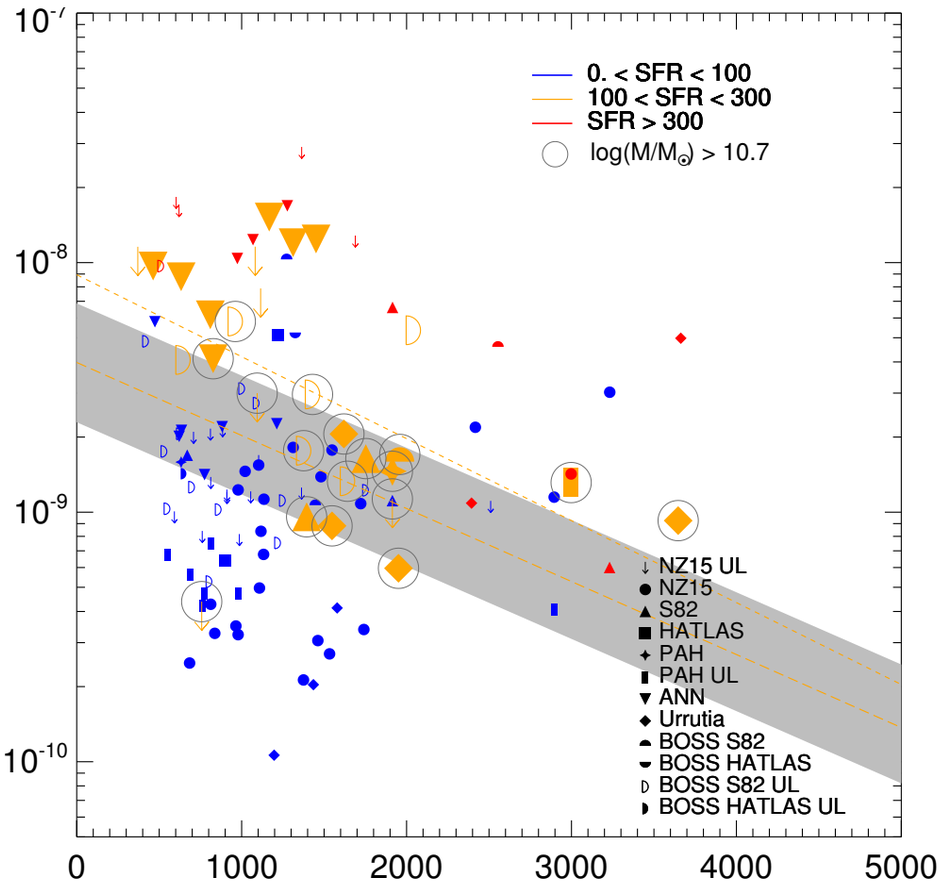
Wylezalek+2016b (in prep.)

BUT

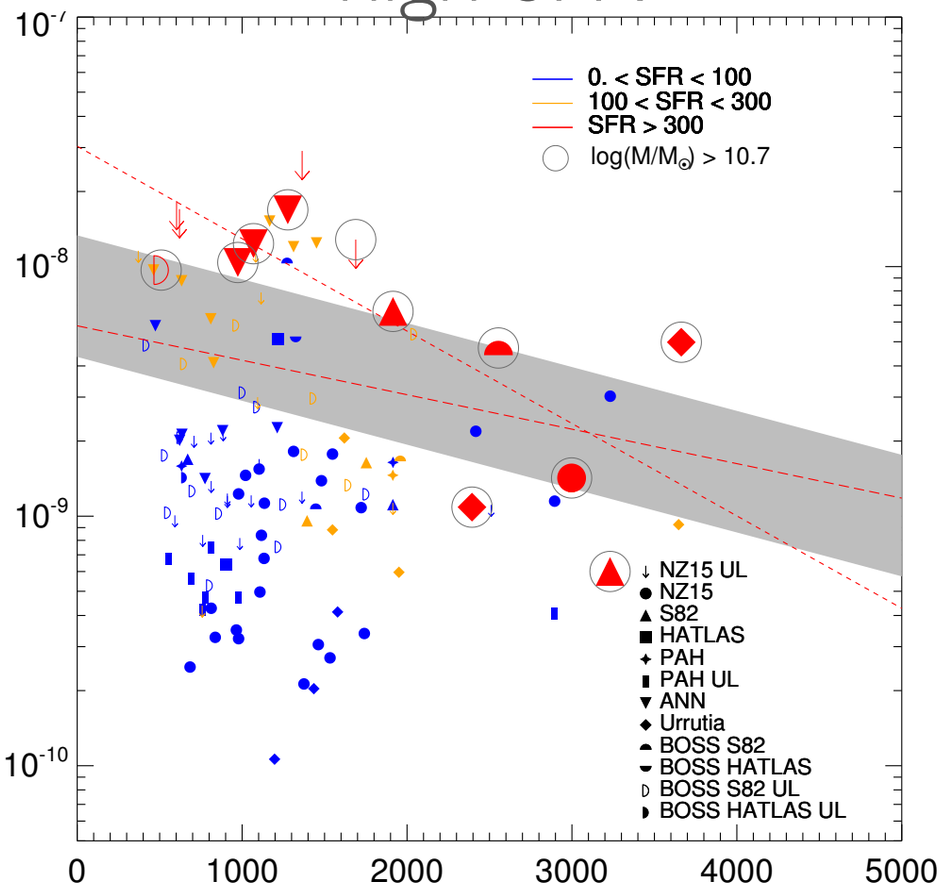
sSFR VS. VELOCITY WIDTH

Strong negative correlation between sSFR and velocity width at high SFRs

intermediate SFR



high SFR



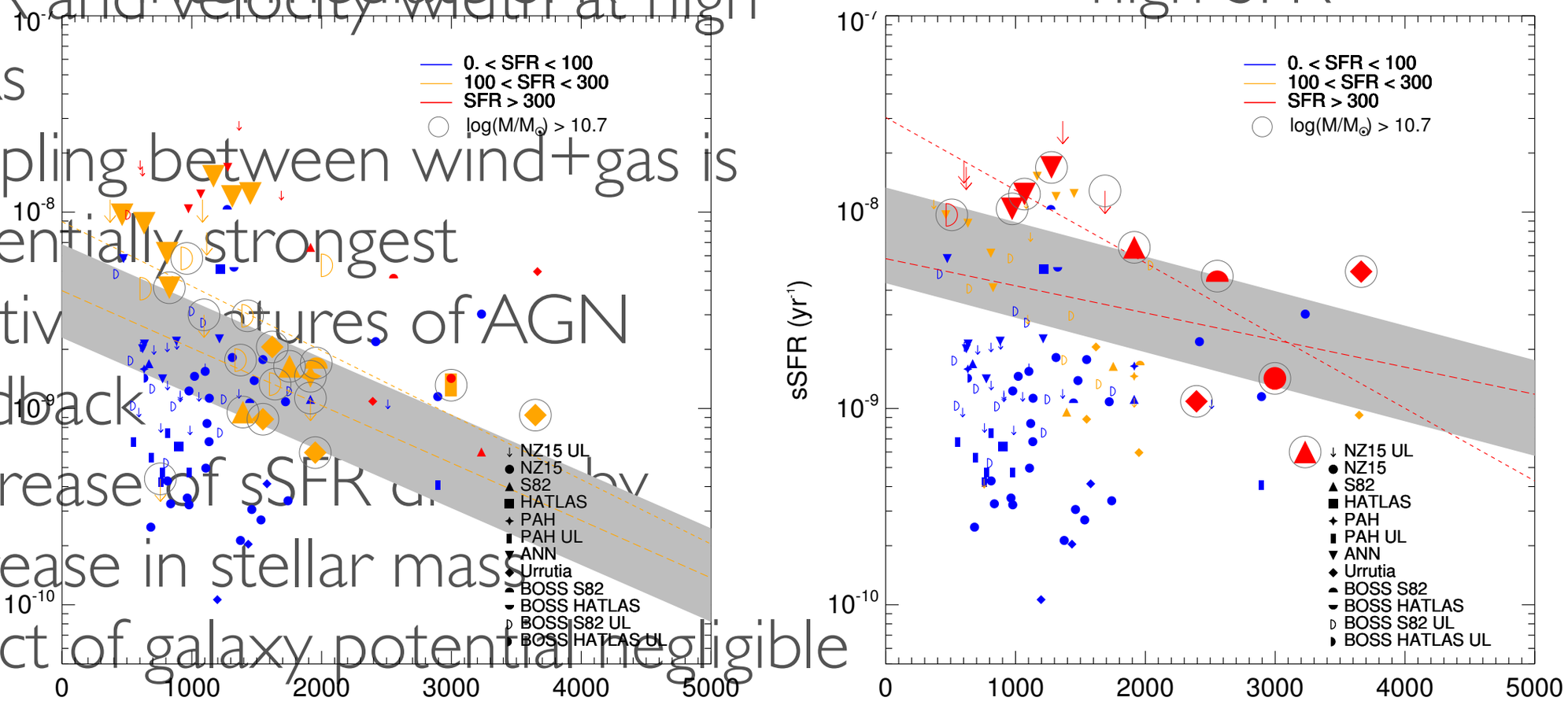
velocity with of [OIII] (W90)

Wylezalek+2016b (in prep.)

sSFR VS. VELOCITY WIDTH

Strong negative correlation between sSFR and velocity width at high SFRs

- negative correlation between sSFR and velocity width at high SFRs
- coupling between wind+gas is potentially strongest
- relativistic features of AGN feedback
- decrease of sSFR driven by increase in stellar mass
- effect of galaxy potential negligible



Wylezalek+2016b (in prep.)

SUMMARY

- one of the first direct observational proofs of AGN having a "negative" impact on galaxy evolution

- effect of wind-gas coupling important, at high SFRs can be neglected

- large, uniform samples needed

THANK YOU!

- one of the first direct observational proofs of AGN having a "negative" impact on galaxy evolution
- effect of wind-gas coupling important, at high SFRs can be neglected
- large, uniform samples needed

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SAMPLE SELECTION

OUTFLOW STRENGTH

[OIII] emission line at 5007Å

velocity width to quantify outflow strength

STAR

see a