Star formation in luminous high-z QSOs with ALMA

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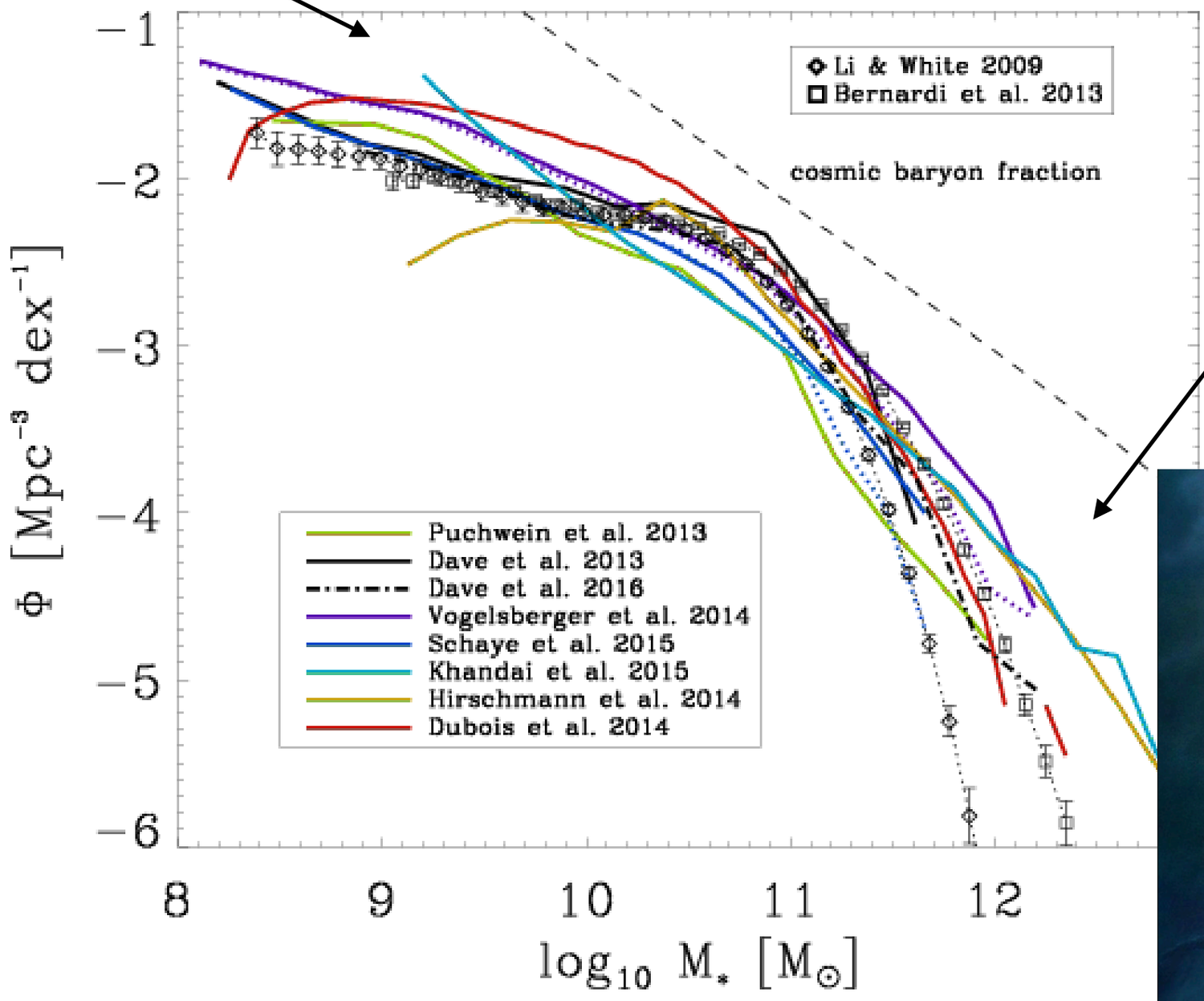
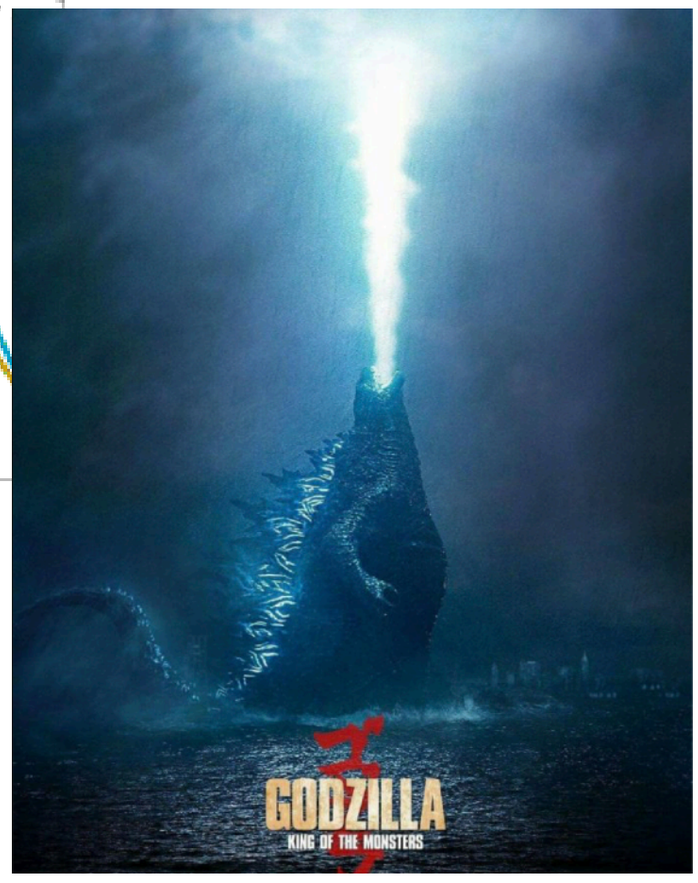
Andreas Schulze, E. Daddi, W. Rujopakarn, M. Schramm et al.

Cosmological simulations of galaxy formation

supernova feedback



feedback from supermassive black holes

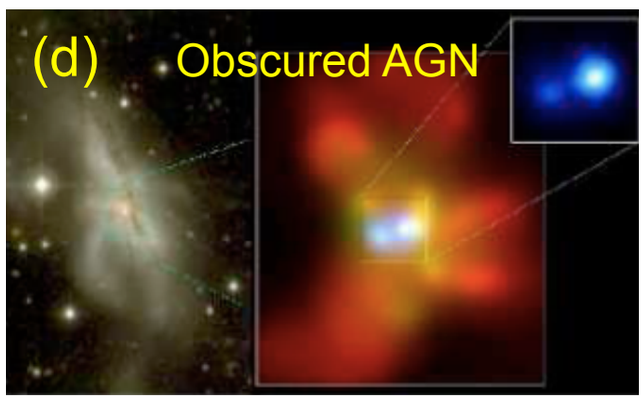


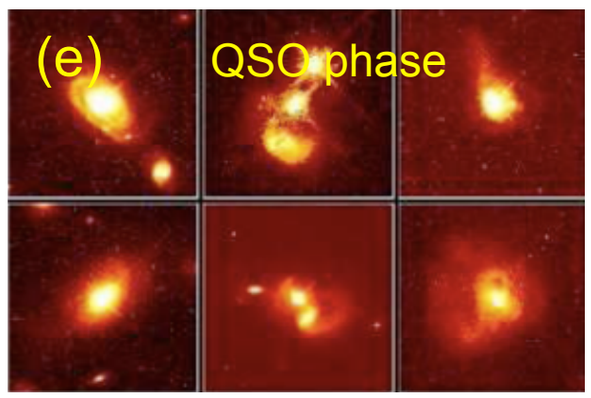
Naab & Ostriker 2017

One possible pathways for galaxies to evolve

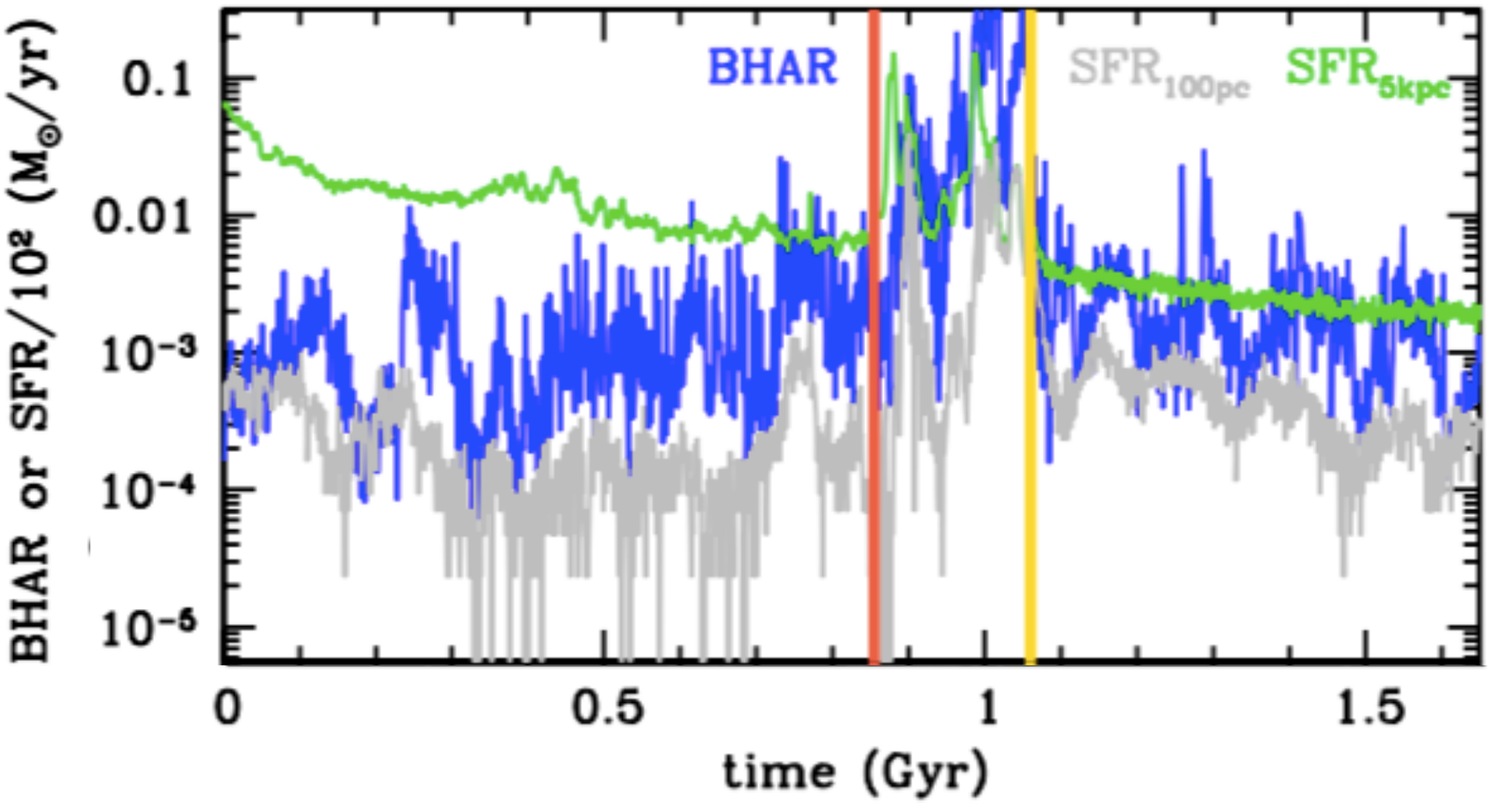
Evolutionary sequence

Galaxy merger ⟶ starburst + active supermassive black hole ⟶ old, mature massive galaxy

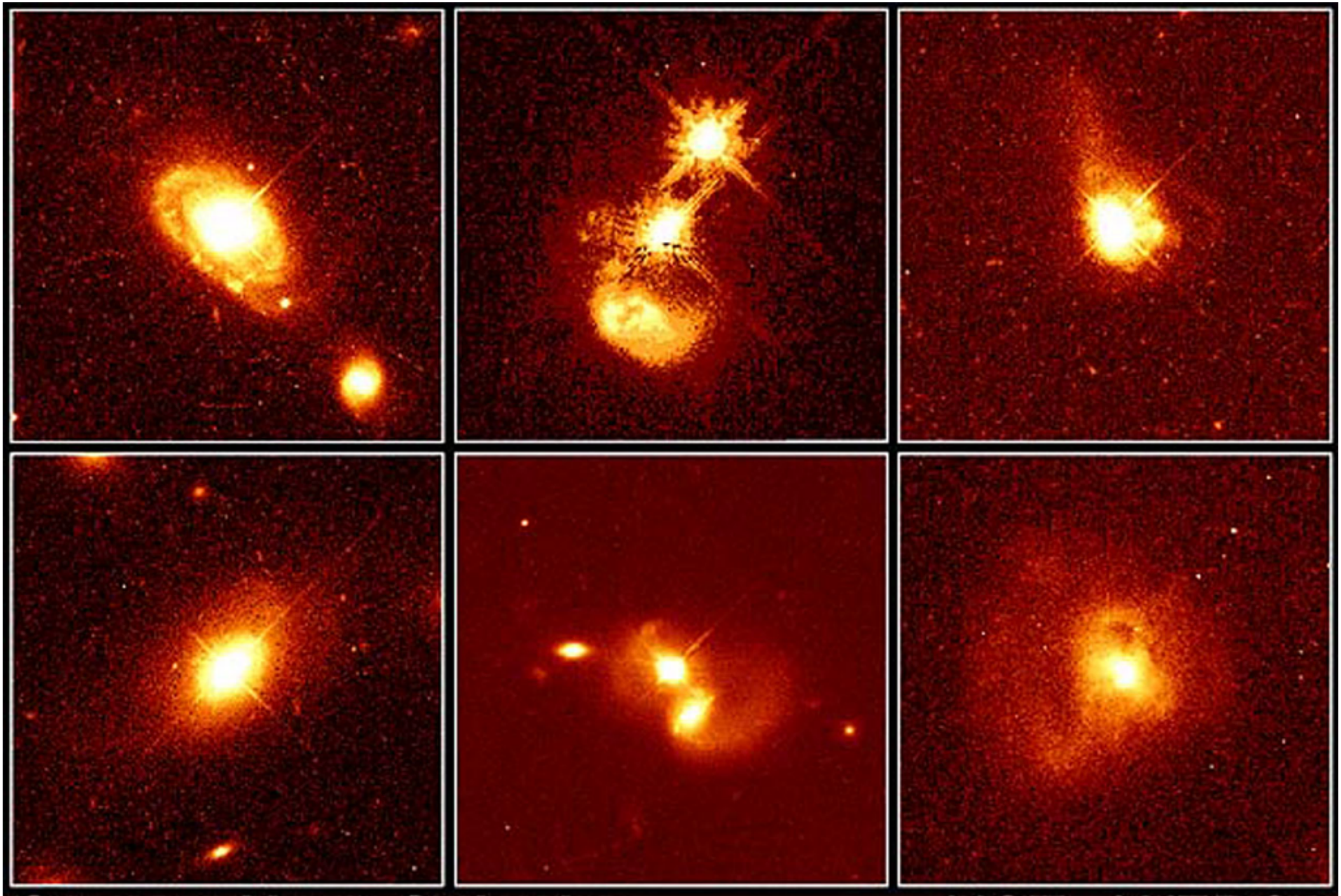




Sanders et al. 1998; Hopkins et al. 2008



Volonteri et al. 2015



Quasar Host Galaxies

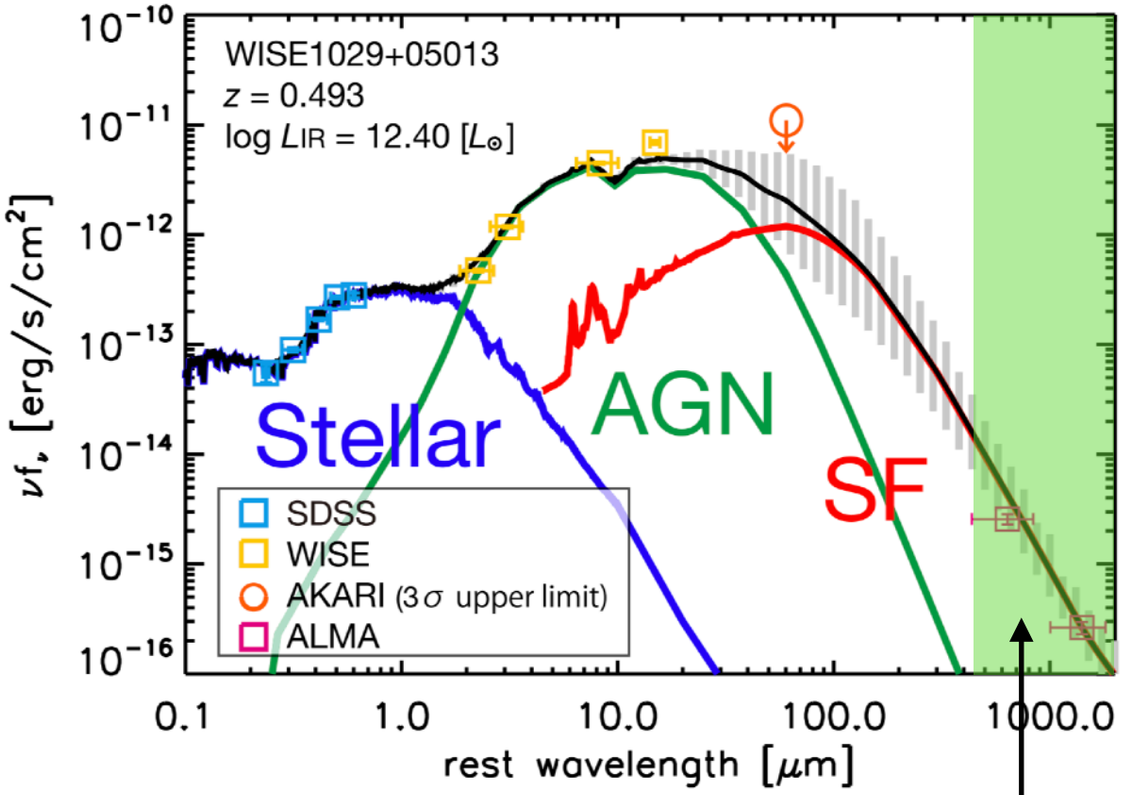
HST • WFPC2

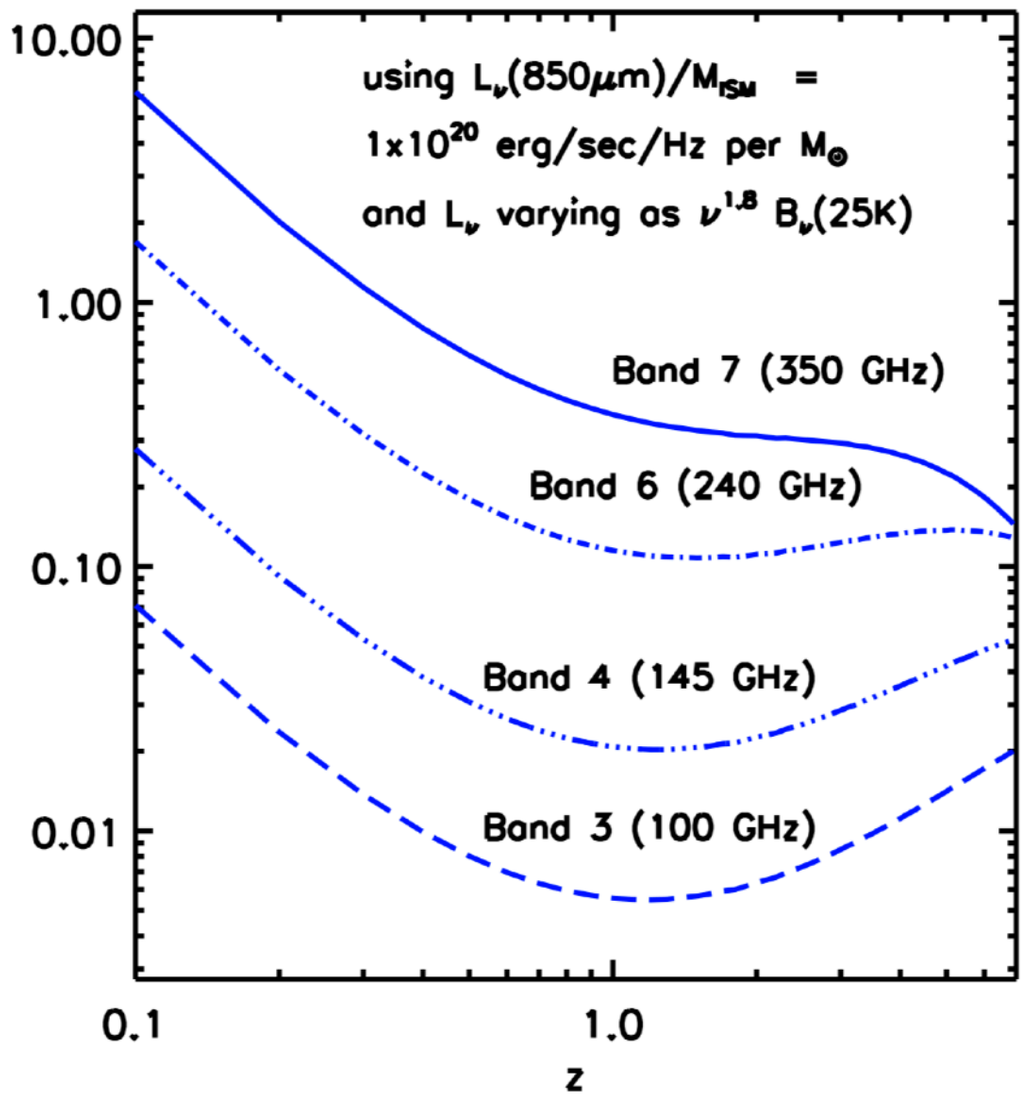
PRC96-35a • ST ScI OPO • November 19, 1996

J. Bahcall (Institute for Advanced Study), M. Disney (University of Wales) and NASA

Atacama Large Millimeter/submillimeter Array

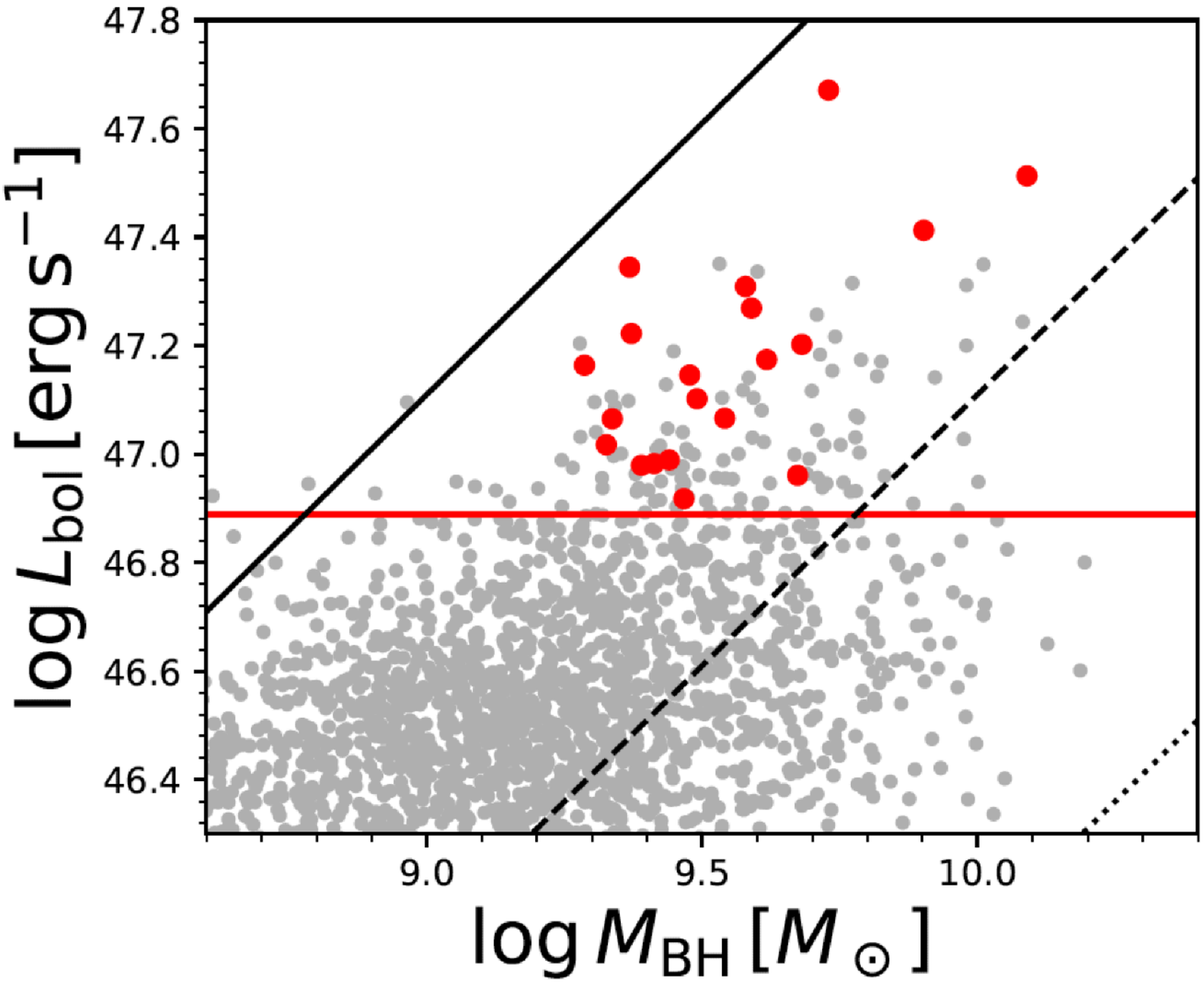
Dust-obscured galaxy (Toba et al. 2017)

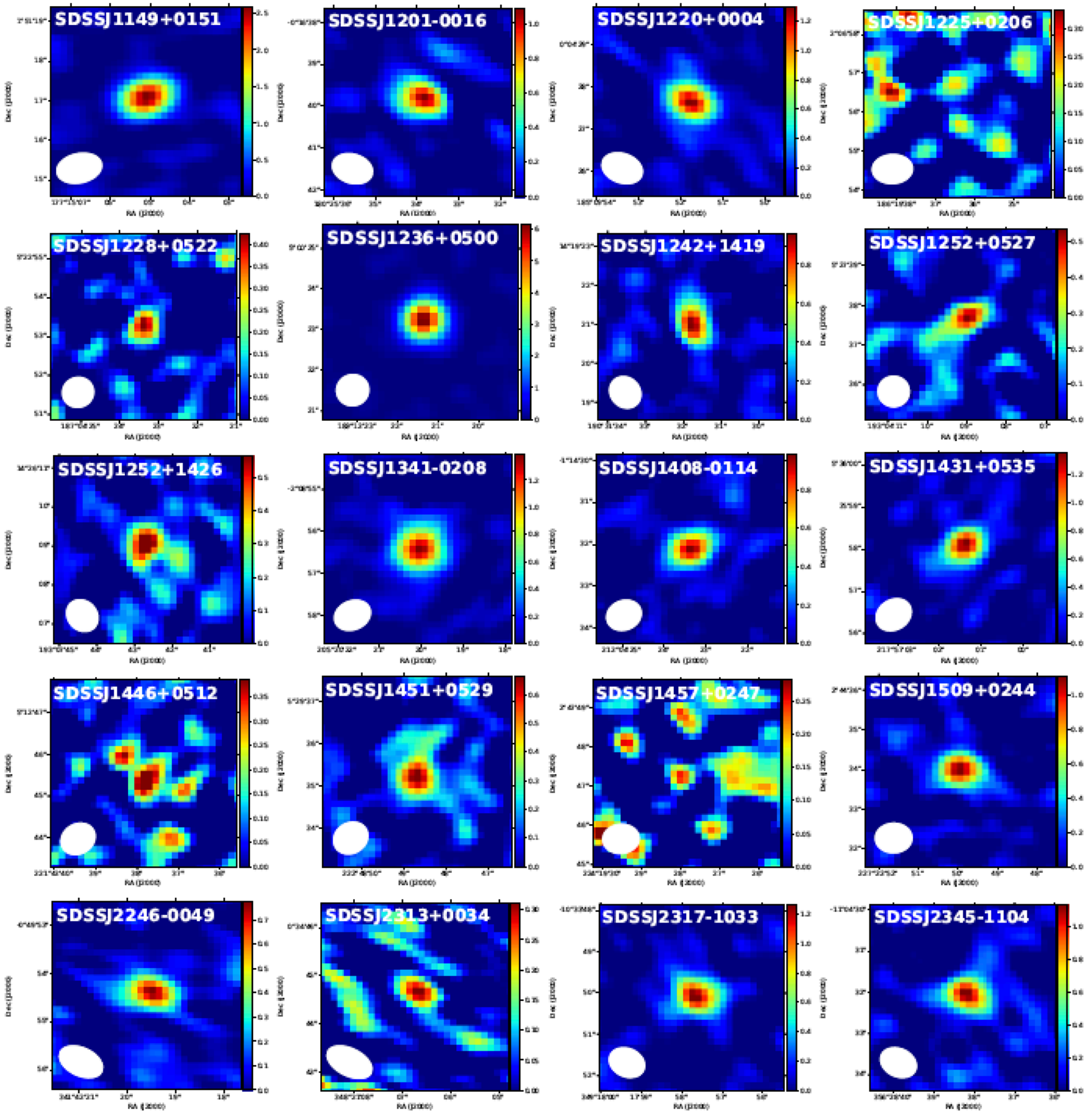




Scoville et al. 2014

20 most luminous SDSS QSOs at z ~ 2
observed in band 7 (~850 μm rest-frame)




SDSSJ1149+0151
SDSSJ1201-0016
SDSSJ1220+0004
SDSSJ1225+0206
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SDSSJ1252+0527
SDSSJ1252+1426
SDSSJ1341-0208
SDSSJ1408-0114
SDSSJ1431+0535
SDSSJ1446+0512
SDSSJ1451+0529
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SDSSJ2317-1033
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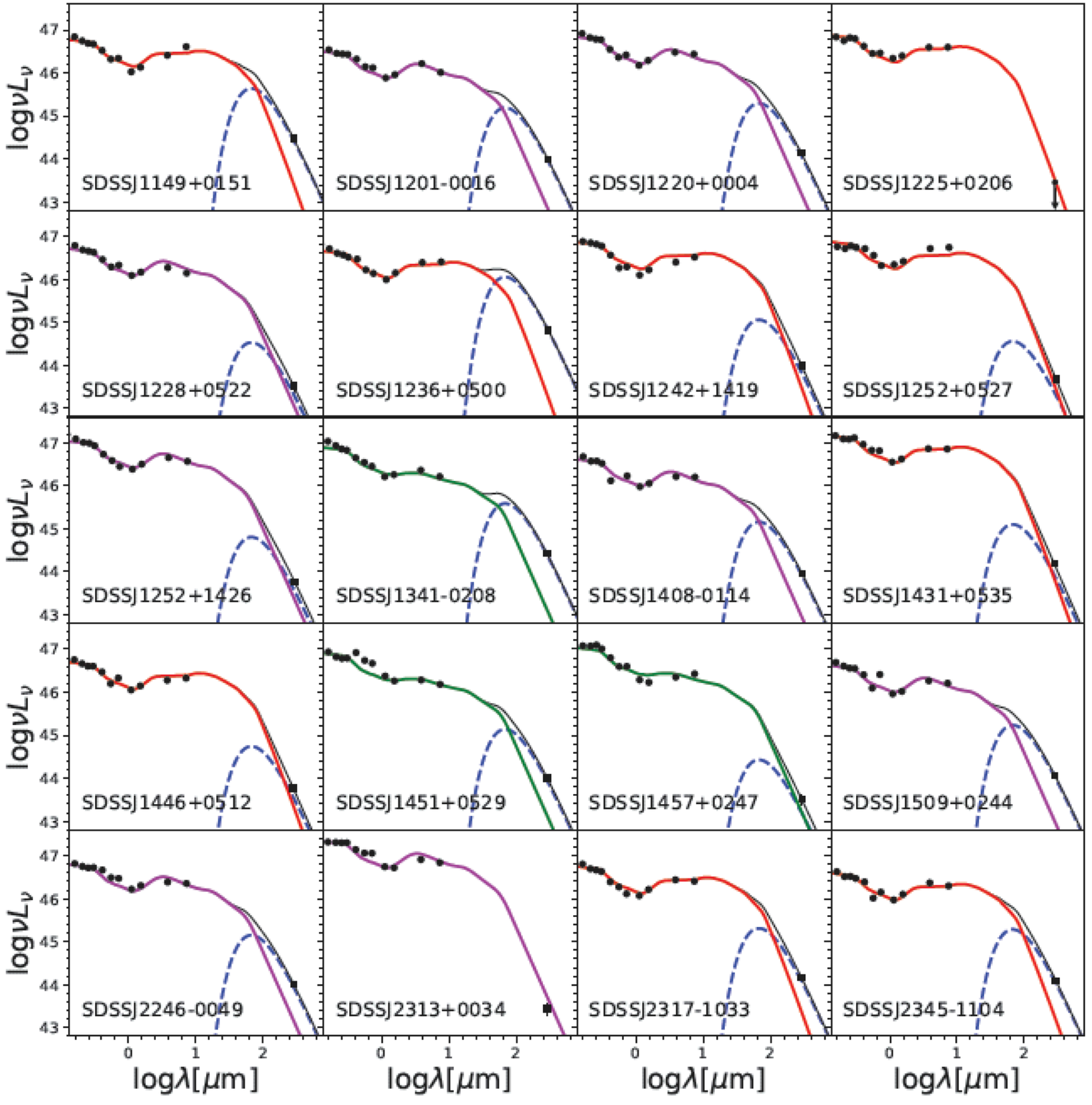
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SDSSJ1252+0527
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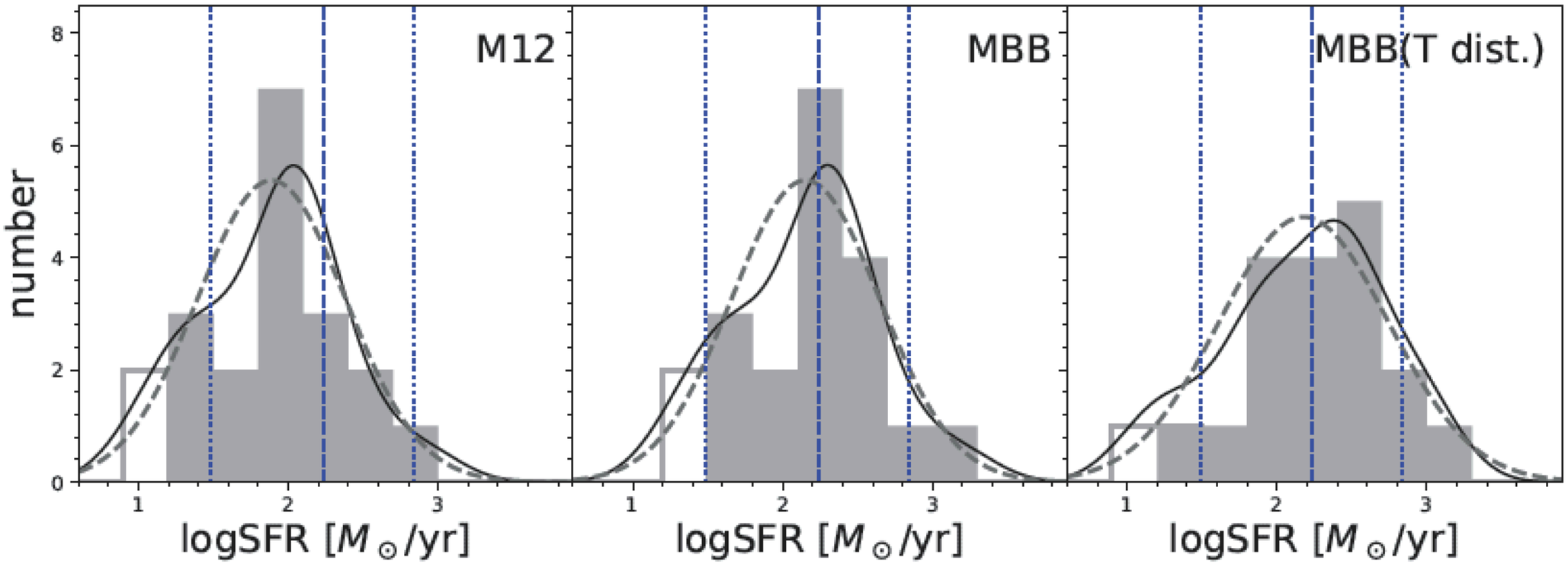
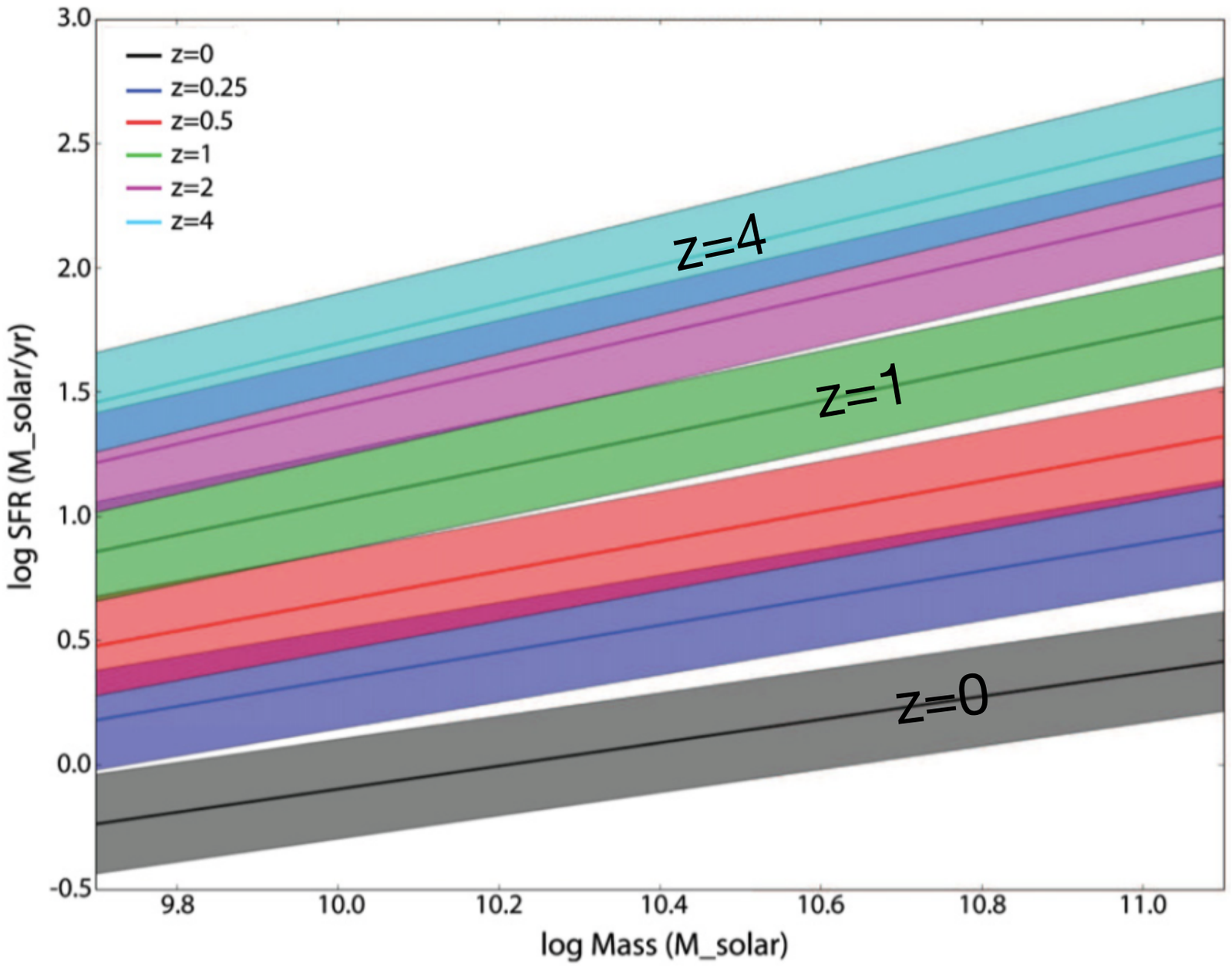
SDSSJ1446+0512
SDSSJ1451+0529
SDSSJ1457+0247
SDSSJ1509+0244
SDSSJ2246-0049
SDSSJ2313+0034
SDSSJ2317-1033
SDSSJ2345-1104
logνL_ν
logλ[μm]
43
44
45
46
47
0
1
2

Star formation rate distribution

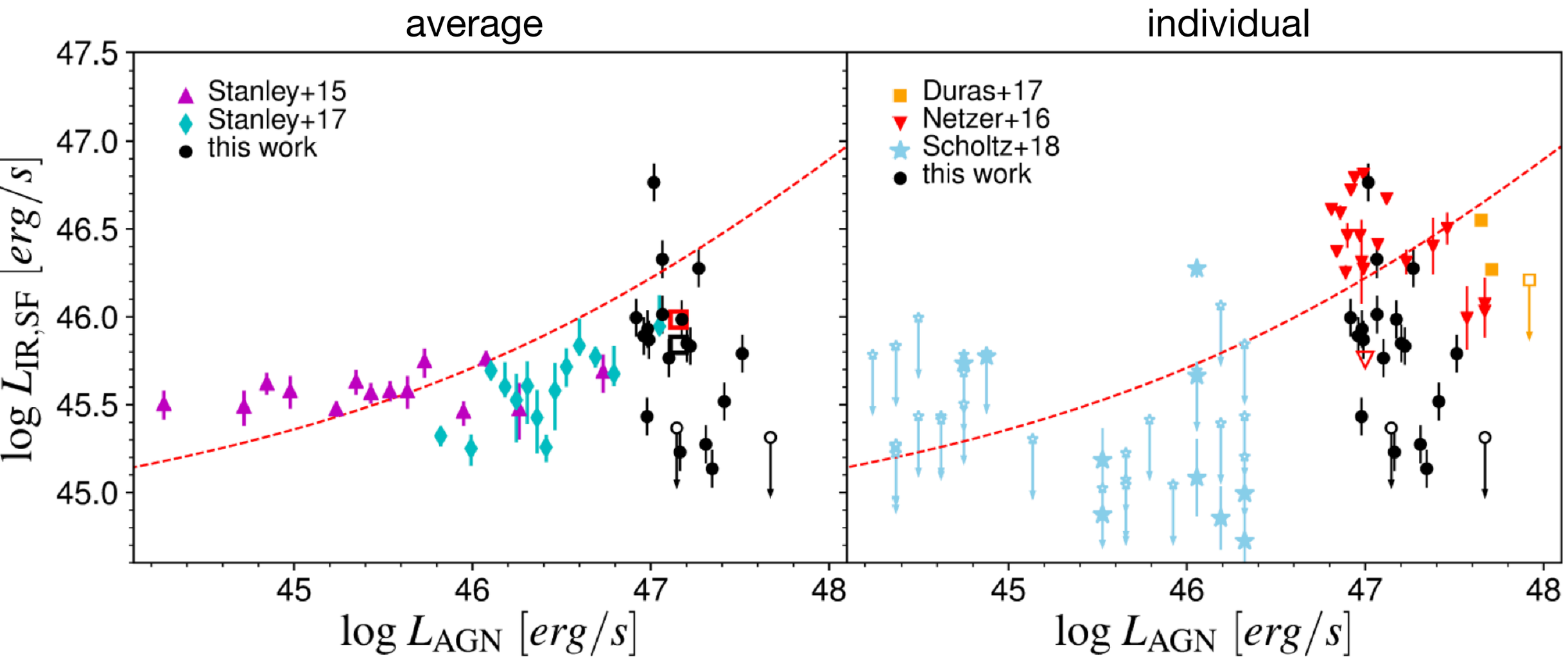


Star-forming main sequence



Speagle, Steinhardt, Capak & JDS 2014

Relation between accretion and star formation



Remarks

Questionable whether AGN feedback or direct connection with star formation is evident

Different time scales are always a possibility

Link with common gas reservoirs