Accreting SMBH in the COSMOS field: the connection to their host galaxies

arXiv:1209.1640
The COSMOS survey

HST/XMM COSMOS

Scoville, Hasinger

2 deg² equatorial
HST treasury project
Deep: ACS $i_{AB} < 27$
Similar volume as SDSS, but fainter and higher $z$
Extensive multi-λ coverage

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Scientific Questions

• Statistically robust assessment of AGN demographics:
  • Which galaxies host (which) AGN?
  • AGN triggering: under which conditions do SMBH grow?
• Does AGN activity affect galaxies’ properties (at the population level)
  • Location of AGN in color-magnitude plots, etc.
  • Smoking guns of AGN feedback?

A complete, X-ray selected, AGN sample

- 1555 X-ray selected AGN (XMM; $f_{\text{lim}} \sim 5 \times 10^{-16} [0.5-2]; 3 \times 10^{-15} [2-10]$)
- 100% redshift complete (54% specz; 46% photoz)
- 602 Unobscured (71% specz; 29% photoz)
- 953 Obscured (42% specz; 58% photoz)
- Parent sample of $\sim$200k IRAC galaxies (photoz, $M_*$; Ilbert et al. 2010)

See also Brusa et al. 2010; Salvato et al. 2009; Lusso et al. 2011, 2012
Optical/NIR SED decomposition

- Rest-Frame 12 μ luminosity assumed to come from AGN (proxy for L_{bol})
- SFR estimates from optical/UV SED: lack a full IR modelling of SF

0: For each AGN host galaxy we measure stellar masses exactly in the same way as we do for the parent galaxy sample; for type 2, we measure SFR, too.
1: The probability of a galaxy to host an AGN growing at a given specific accretion rate is (almost) **independent of stellar mass**
2: Its normalization increases as $\sim (1+z)^4$ [cfr. sSFR density]

3: There appears to be a break consistent with $\sim$Eddington limit
Obscured AGN in sSFR-Mass plane
Obscured AGN in sSFR-Mass plane

4: Very little difference between (type 2) AGN hosts and parent sample in sSFR (once $z$ and $M_*$ factored out)
Using the redshift info, and the observed count rates, we extracted complete, rest-frame 2-10 keV selected sample ($f_{2-10}>1.8 \times 10^{-15}$; no $N_H-z$ bias)

5: No clear evidence of increase of obscured AGN fraction with redshift
Conclusions

1. The probability of a galaxy to host an AGN growing at a given specific accretion rate is (almost) independent of stellar mass.

2. AGN fraction normalization increases \( \sim (1+z)^4 \) [\( \sim \) sSFR density].

3. The AGN fraction distribution shows a break consistent with Eddington limit.

4. Very little difference between (type 2) AGN hosts and parent sample in sSFR (once \( z \) and \( M_\ast \) factored out). Where is AGN feedback smoking gun? (\( t_{AGN} \gtrsim t_{\text{quench}} \)).

5. In carefully selected (2-10 keV rest-frame) samples, no clear evidence of increase of obscured AGN fraction with redshift.

6. We are limited by statistics! To sample well \( L_X, z, M_\ast, N_H, \) SFR we need \( > 10,000 \) objects (eROSITA!).

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Thank you!

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