

UNVEILING THE AGN INTRINSIC POWER AND ITS EFFECT ON THE HOST-GALAXY ISM

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The role of AGN

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- ▶ We need to both characterise the ISM properties and the AGN activity.
- ▶ Local Seyfert galaxies are the perfect laboratories, due to the wealth of multi-wavelength data, from the X-rays to radio frequencies.

A two-way approach:

Proper characterisation
of the AGN intrinsic
power

Study of the components of
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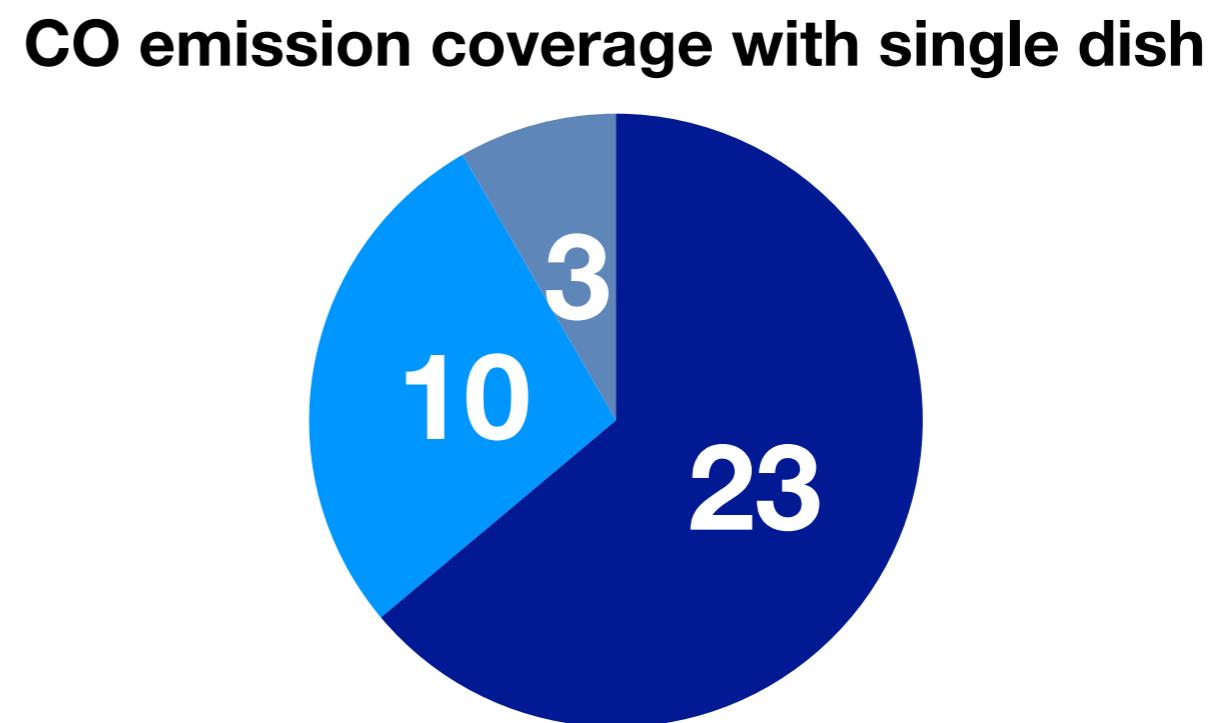
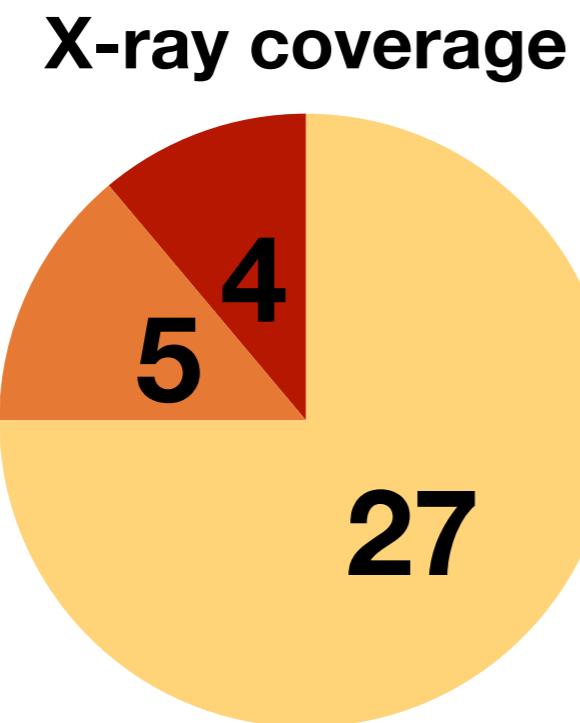
Unveiling the intrinsic power of the AGN

The first uniform broadband X-ray (\sim 0.5-30 keV) spectral analysis
on a sizable sample of local Seyferts to characterise the AGN
power and the level of obscuration (Salvestrini et al., in prep.)

The sample

36 Seyfert 2 galaxies from Gruppioni et al. 2016

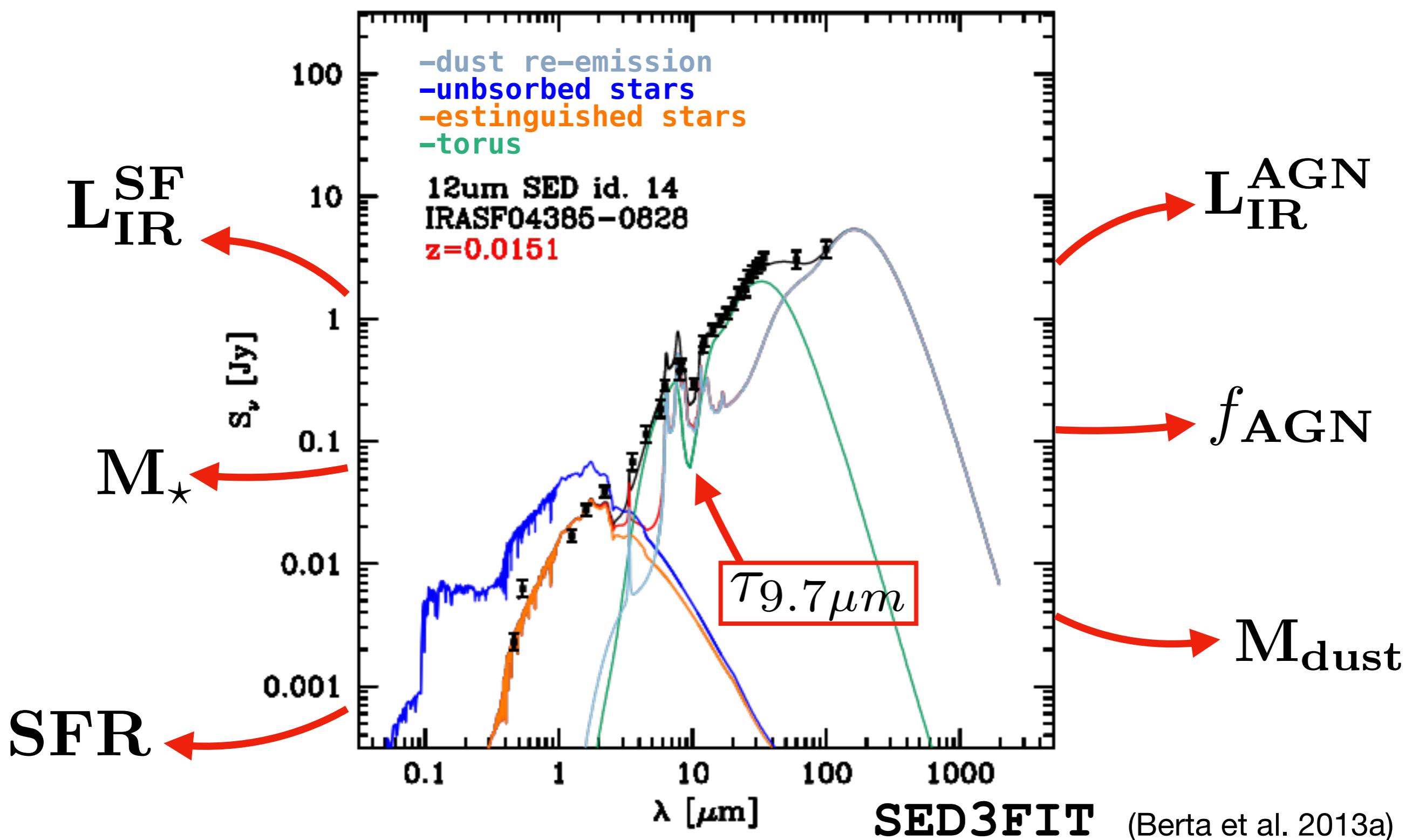
- mid-IR selected galaxies with $L_{\text{IR}} \sim 10^{11} L_{\odot}$
- optically selected as obscured (i.e. narrow-line features)
- $0.0023 < z < 0.1849$



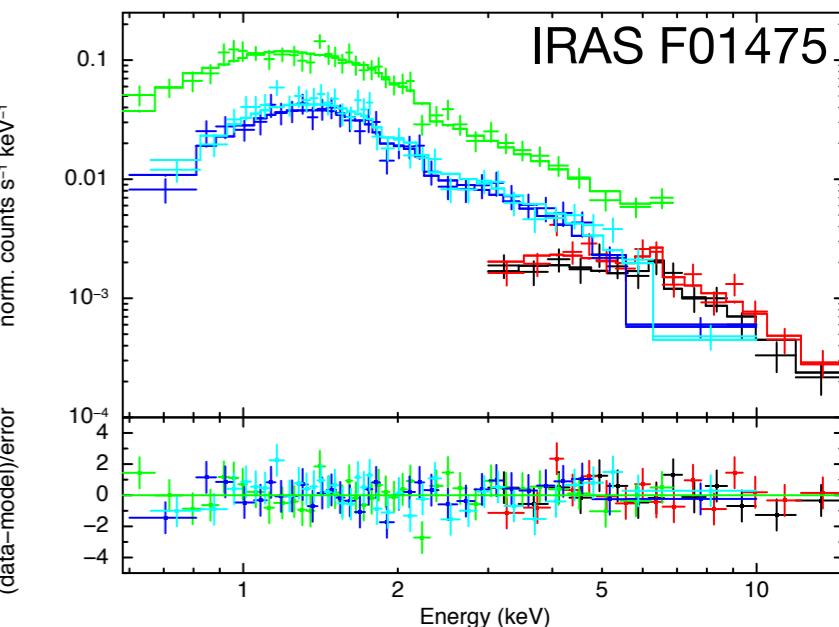
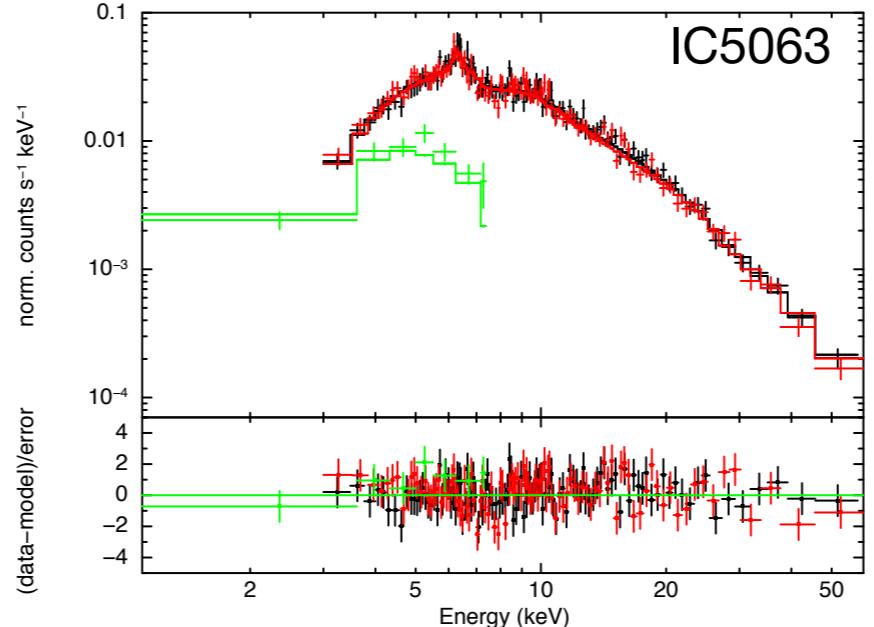
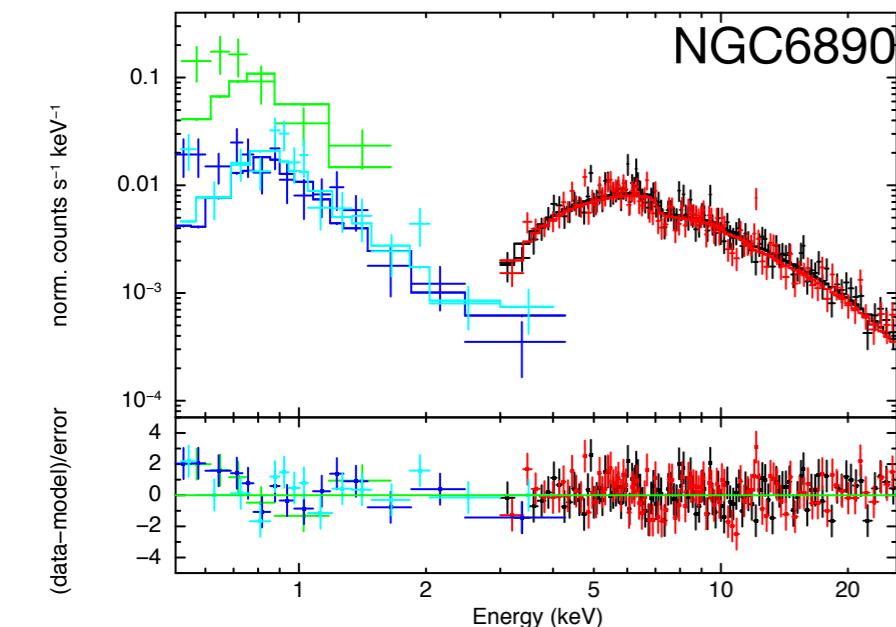
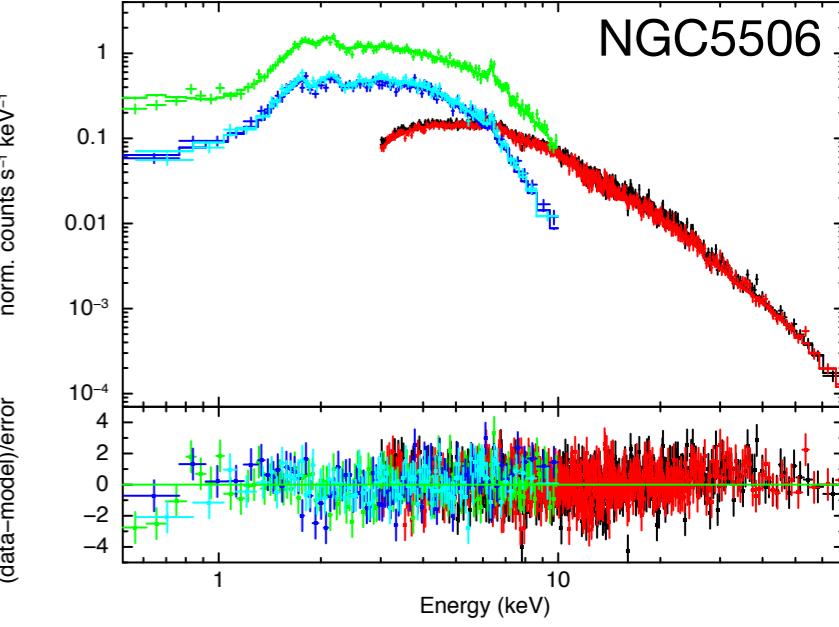
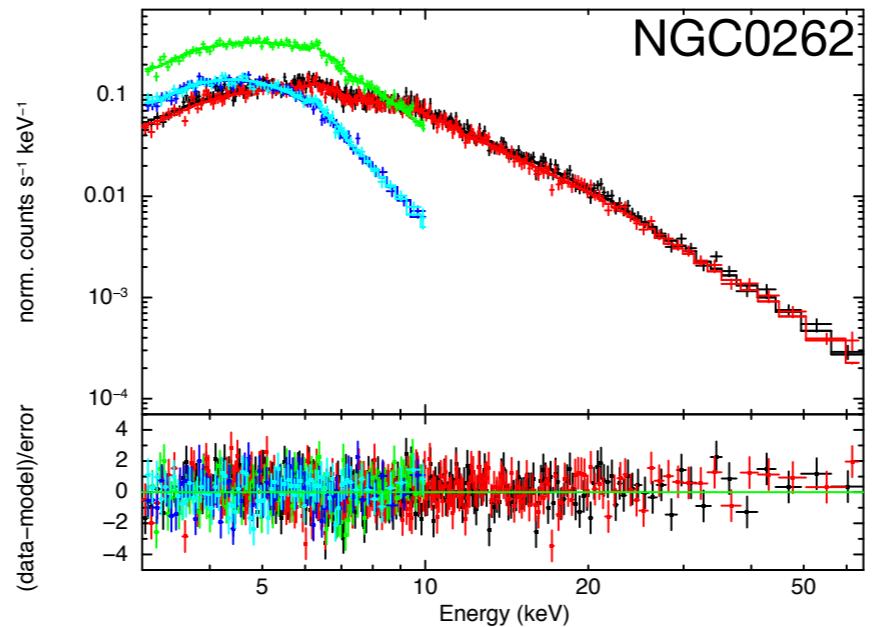
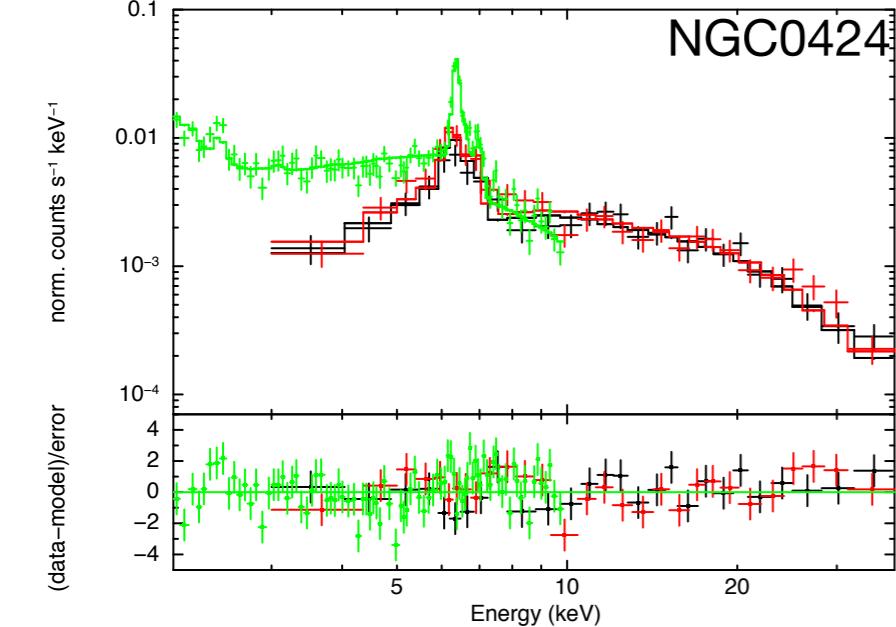
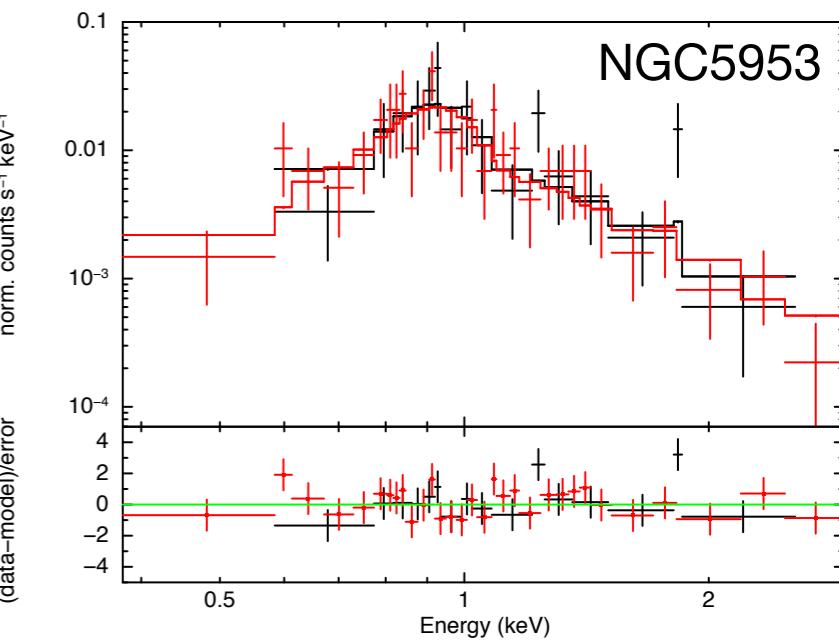
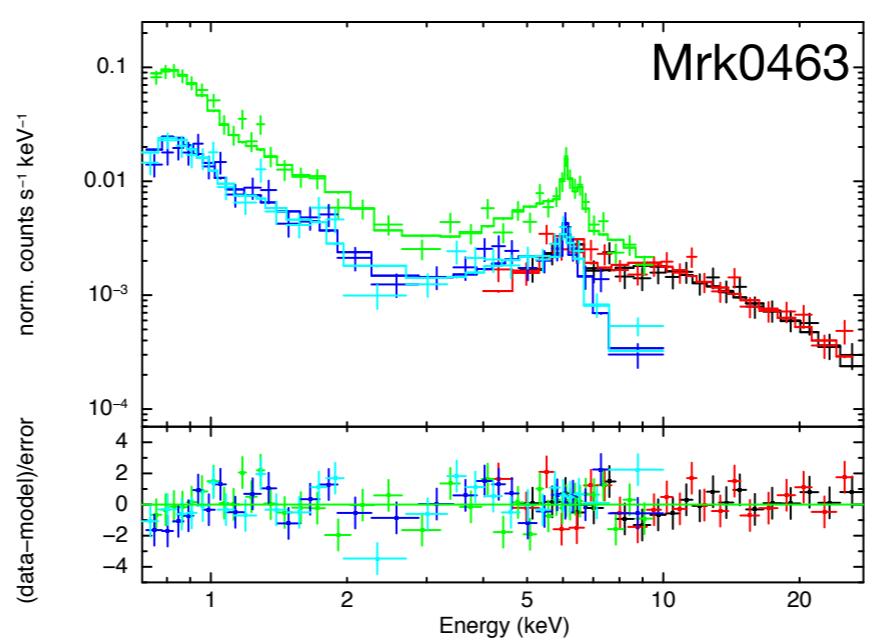
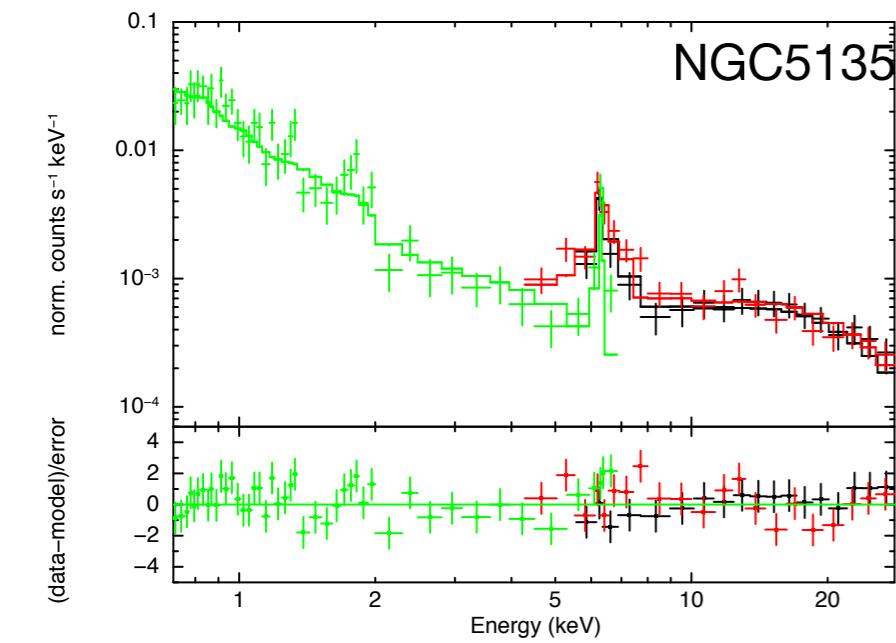
- NuSTAR + Chandra/XMM
- Chandra/XMM
- Not observed

- APEX CO(2-1), PI Salvestrini
- Literature, CO(1-0) & CO(2-1)
- No mm single dish obs.

SED decomposition analysis by Gruppioni et al. 2016

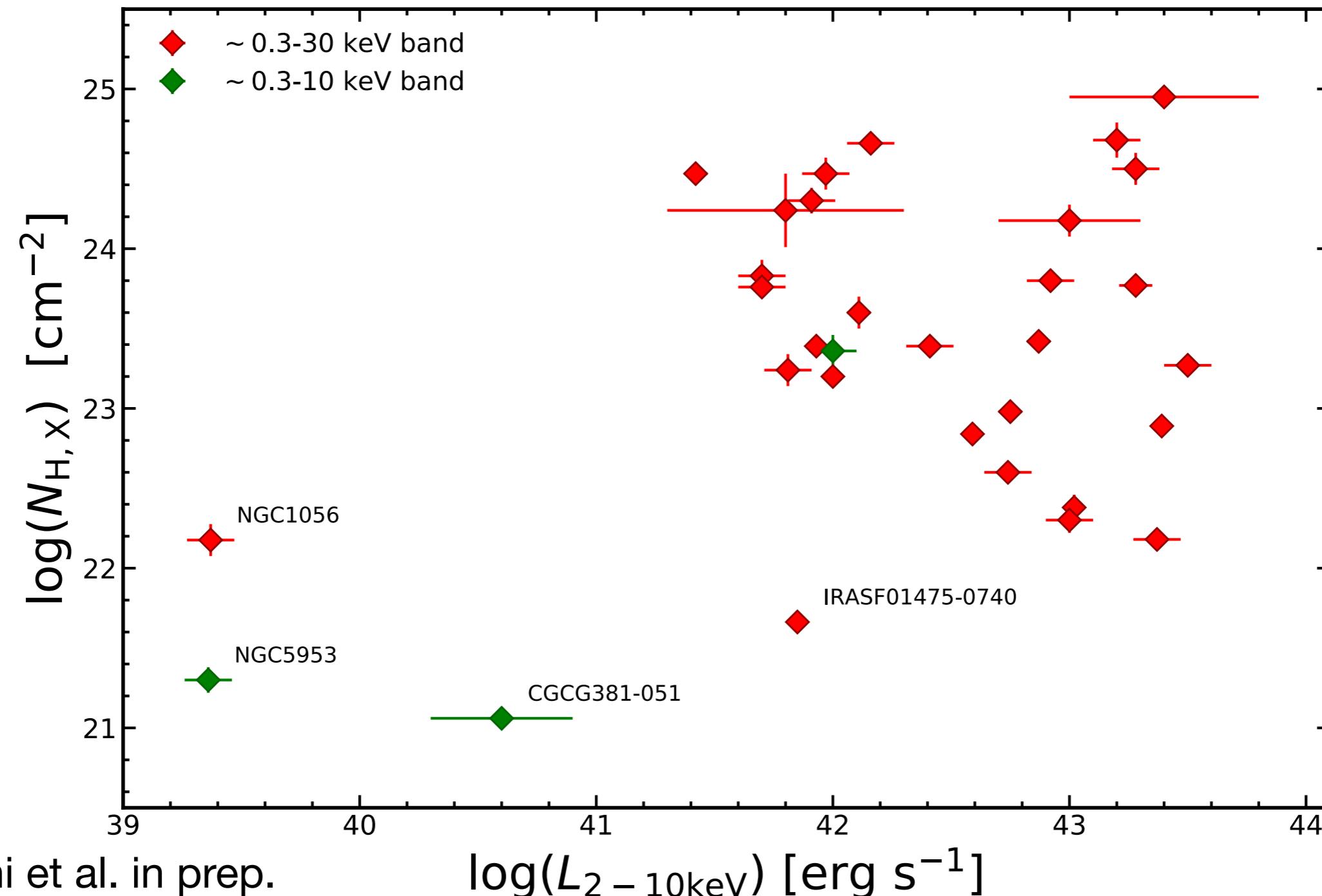


Unveiling the intrinsic power of the AGN

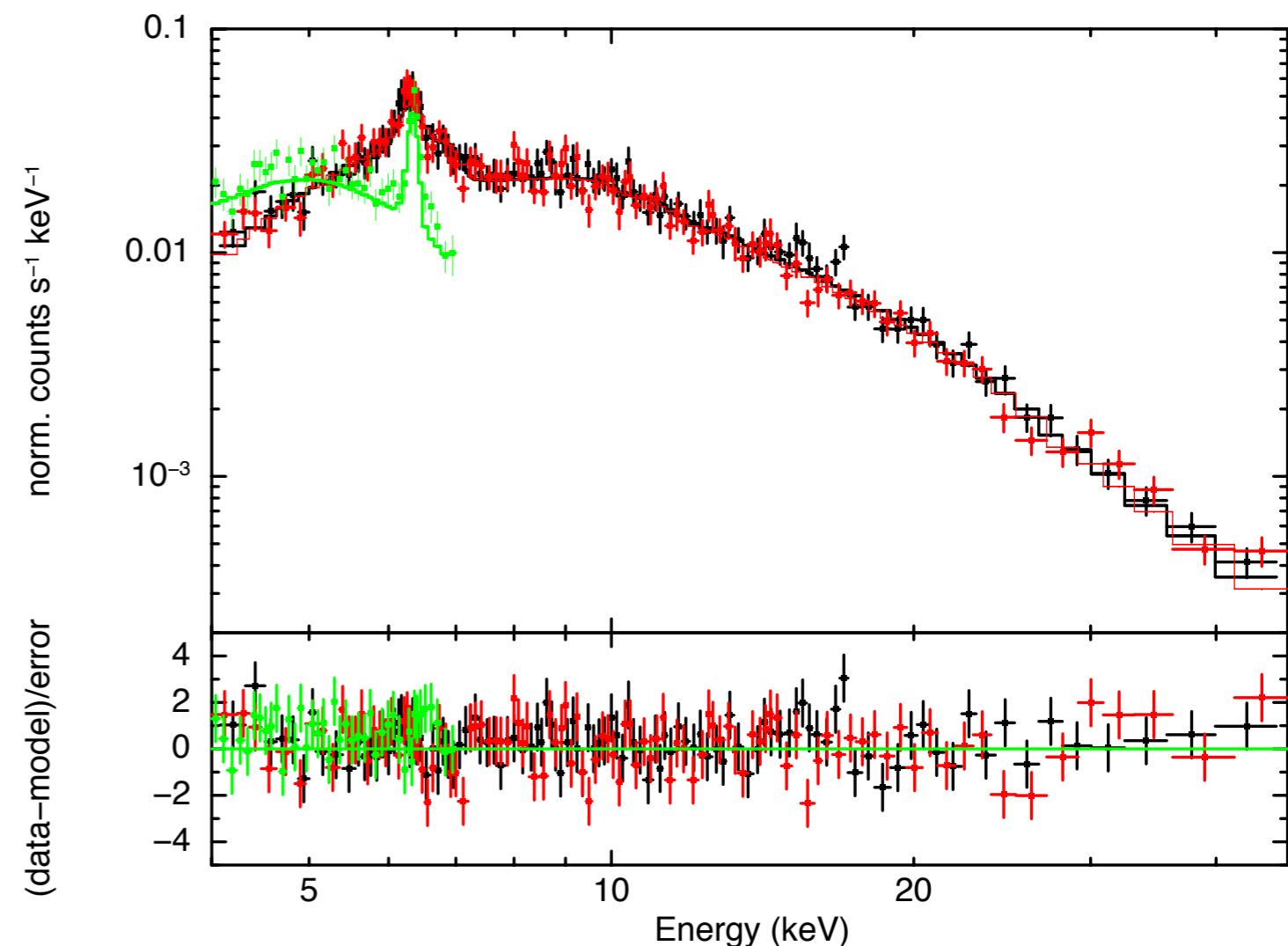
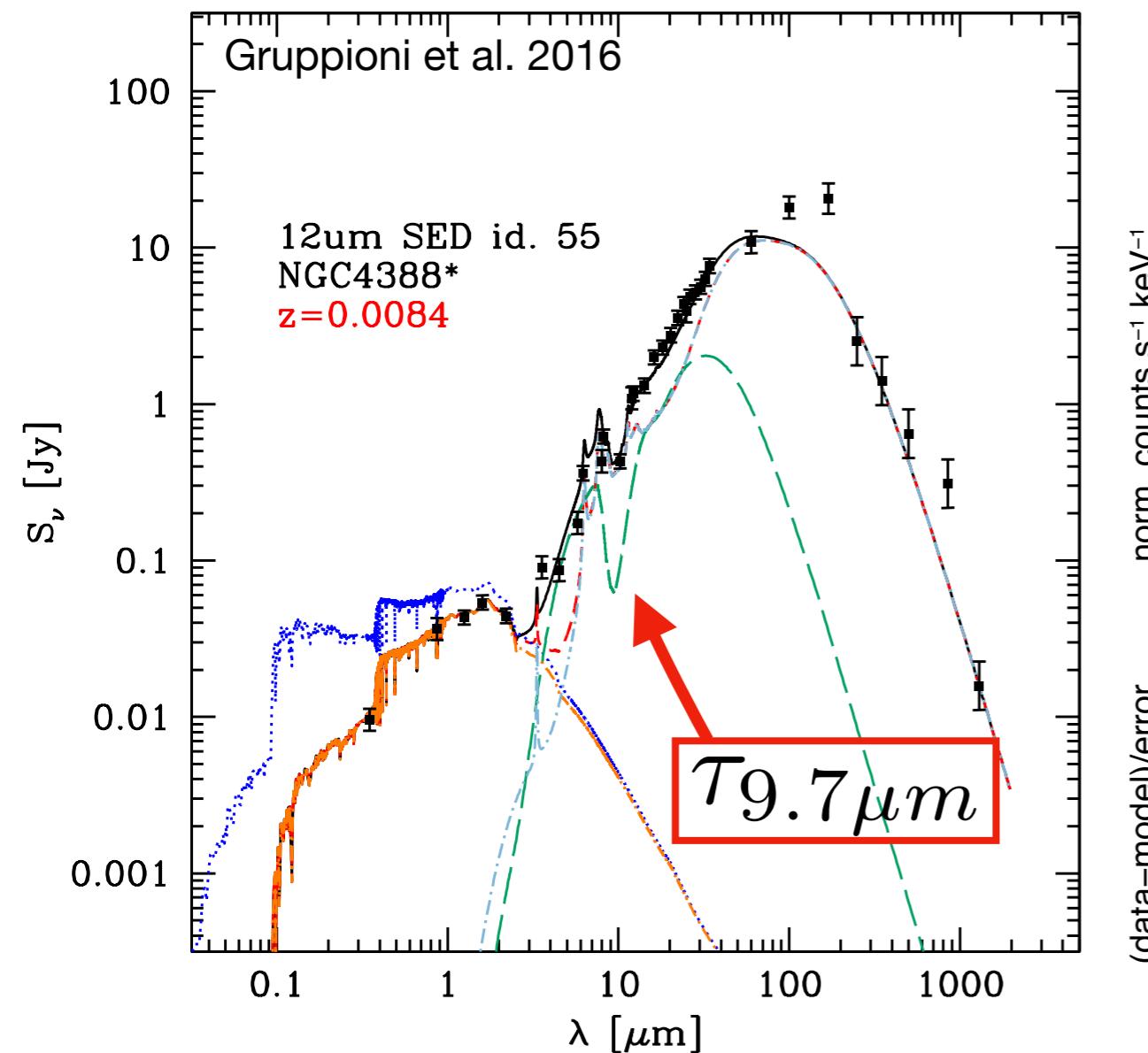


Systematic characterisation of the X-ray emission:

- **intrinsic power:** $L_{2-10\text{keV}} \rightarrow L_{bol}^{\text{AGN}}$
- **level of obscuration:** N_H



X-rays + IR: obscuration



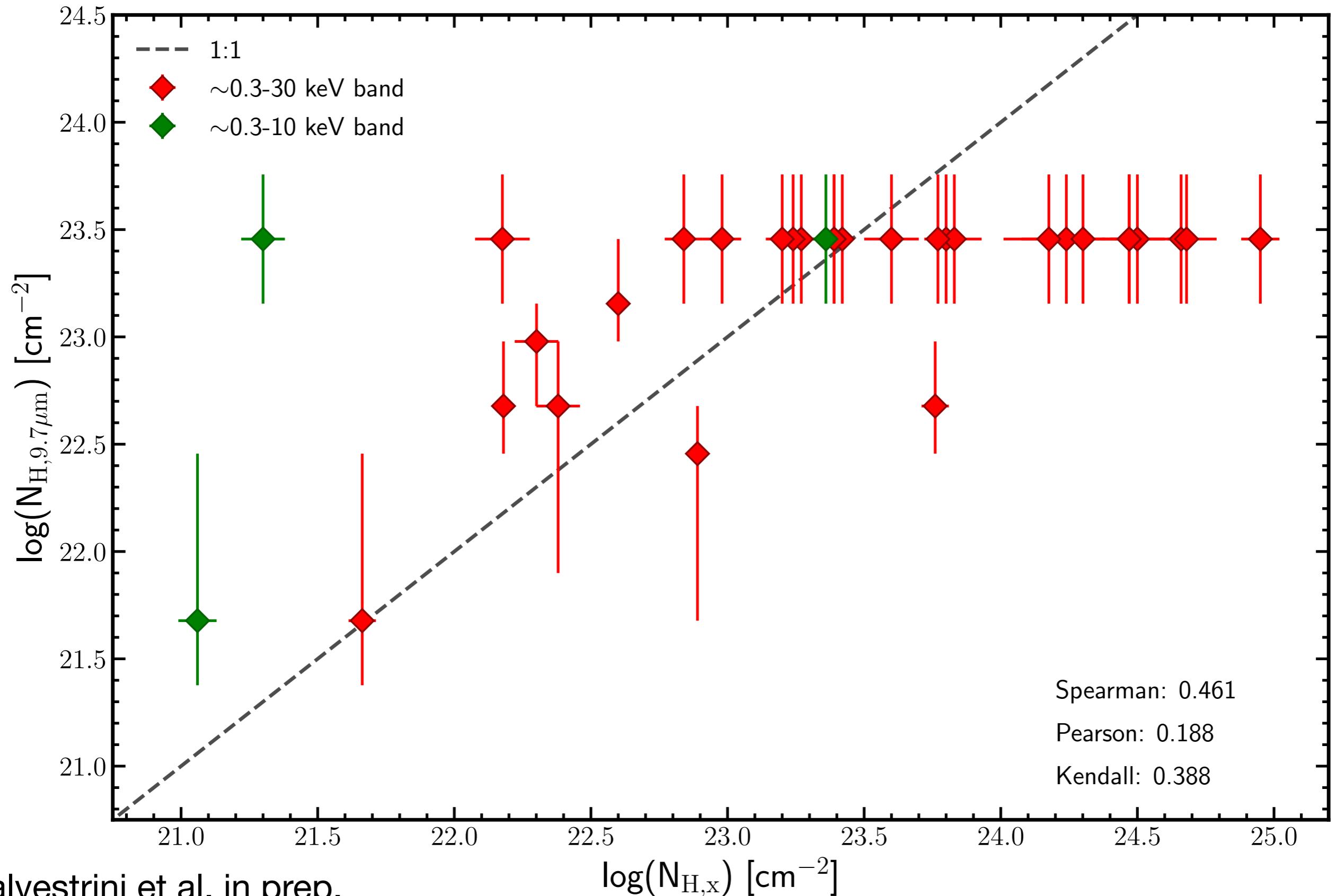
$$N_H(\tau_{9.7\mu m})$$

assuming a Galactic dust-to-gas ratio

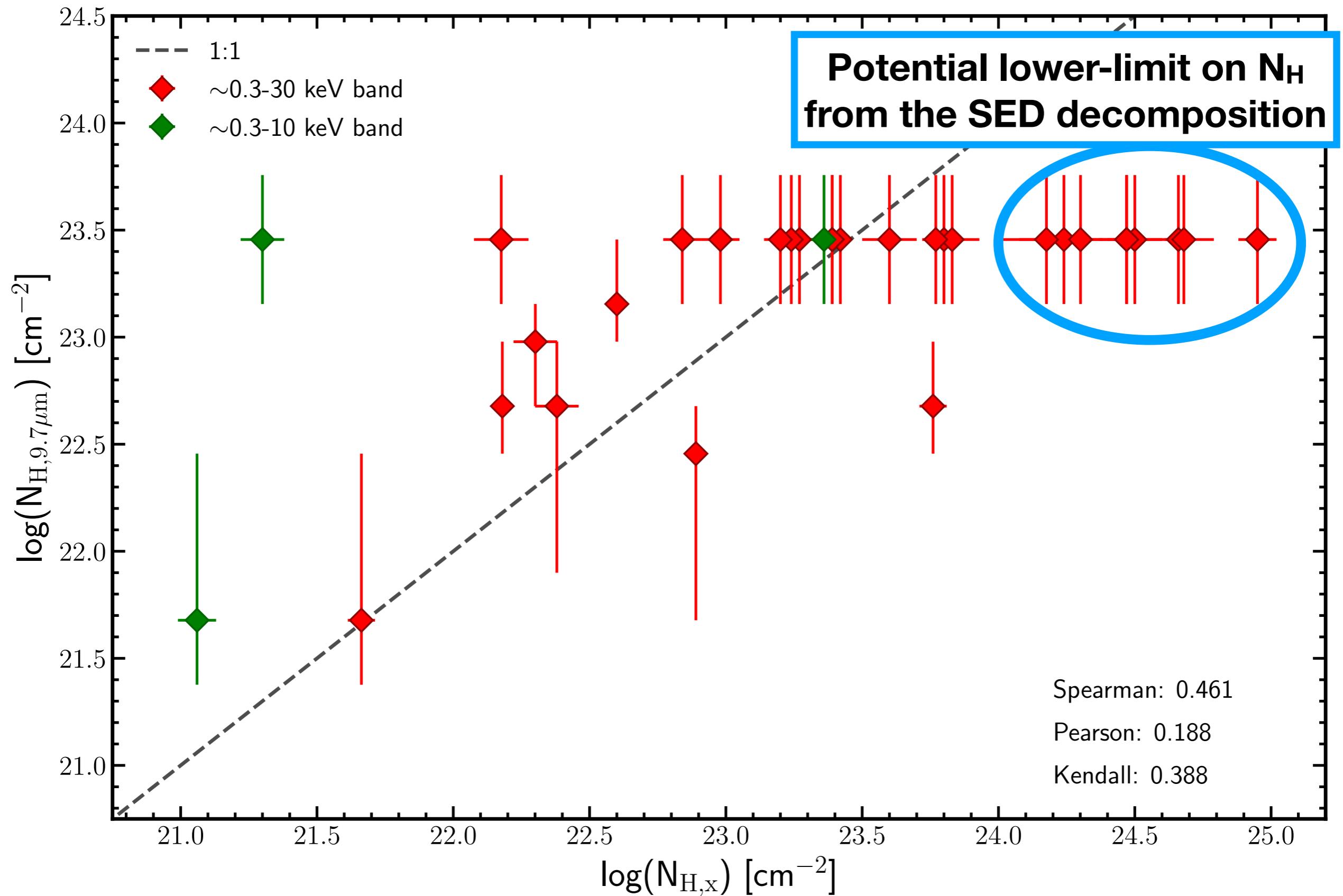
vs.

$$N_H(X-ray)$$

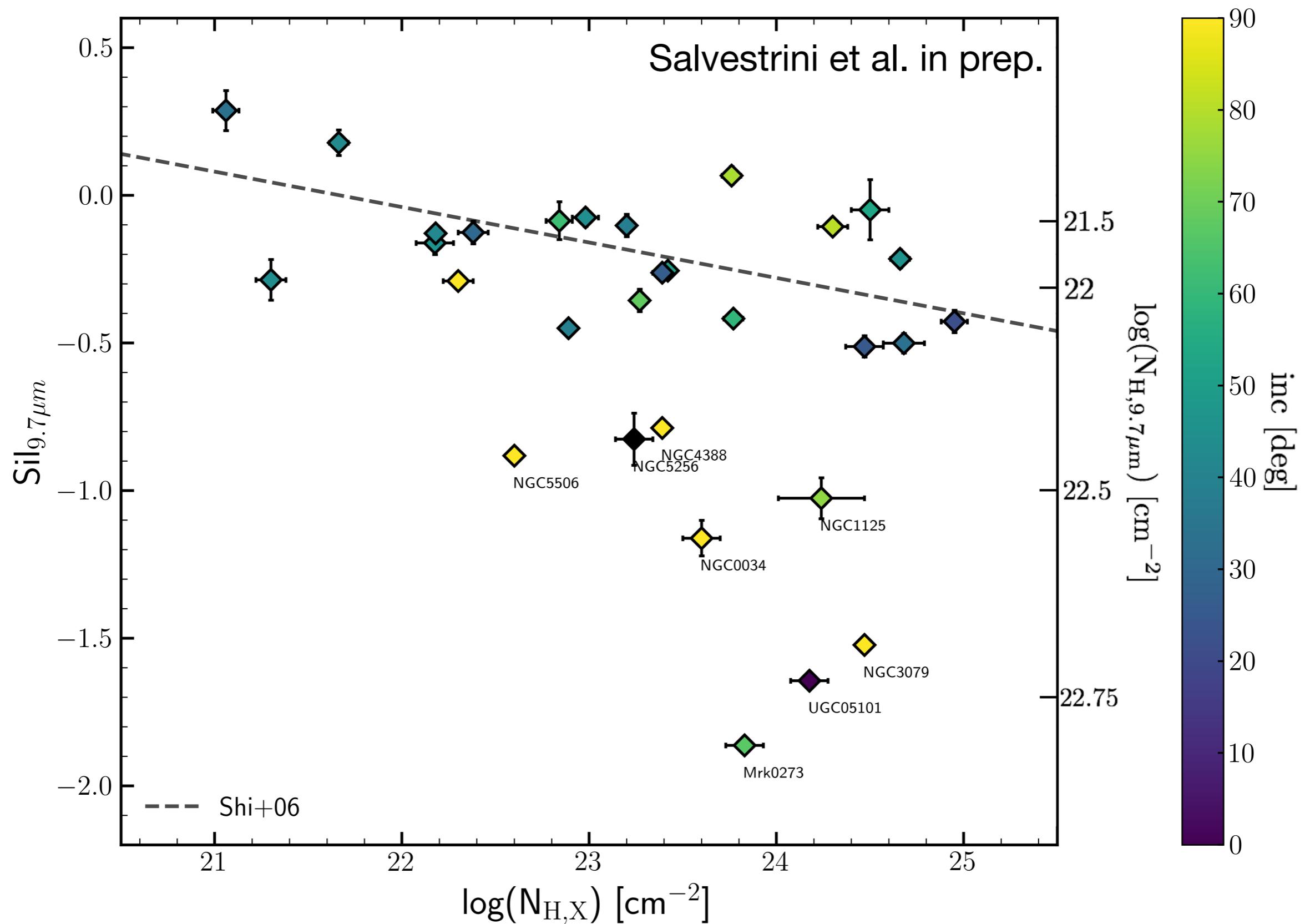
Comparing the level of obscuration: IR vs X-rays



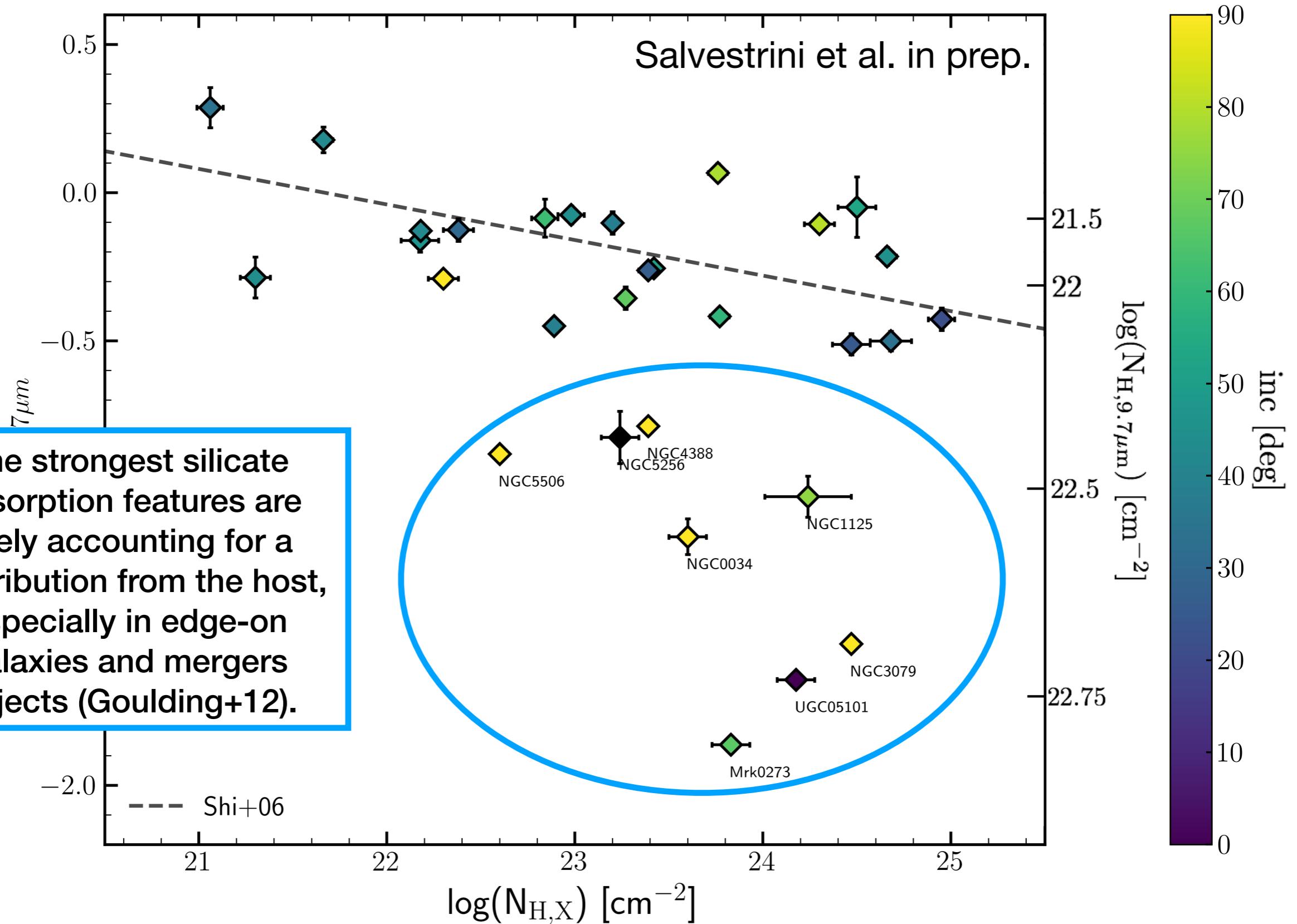
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I) Characterisation of the molecular gas properties

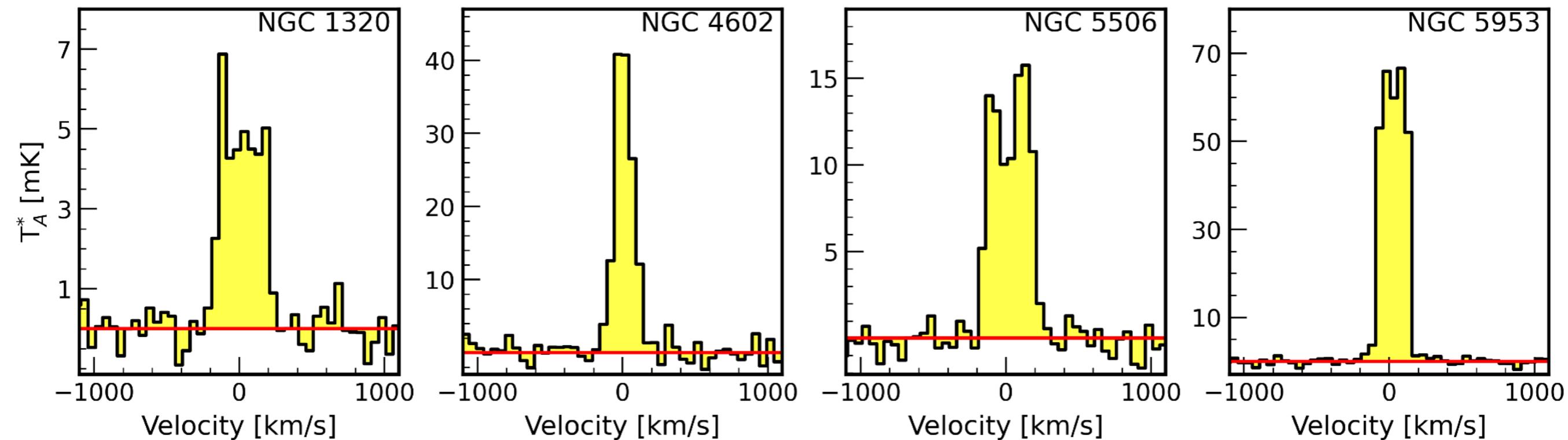
Unveiling the AGN impact on the whole molecular gas content
(Salvestrini et al., in prep.)

Measuring the molecular gas content

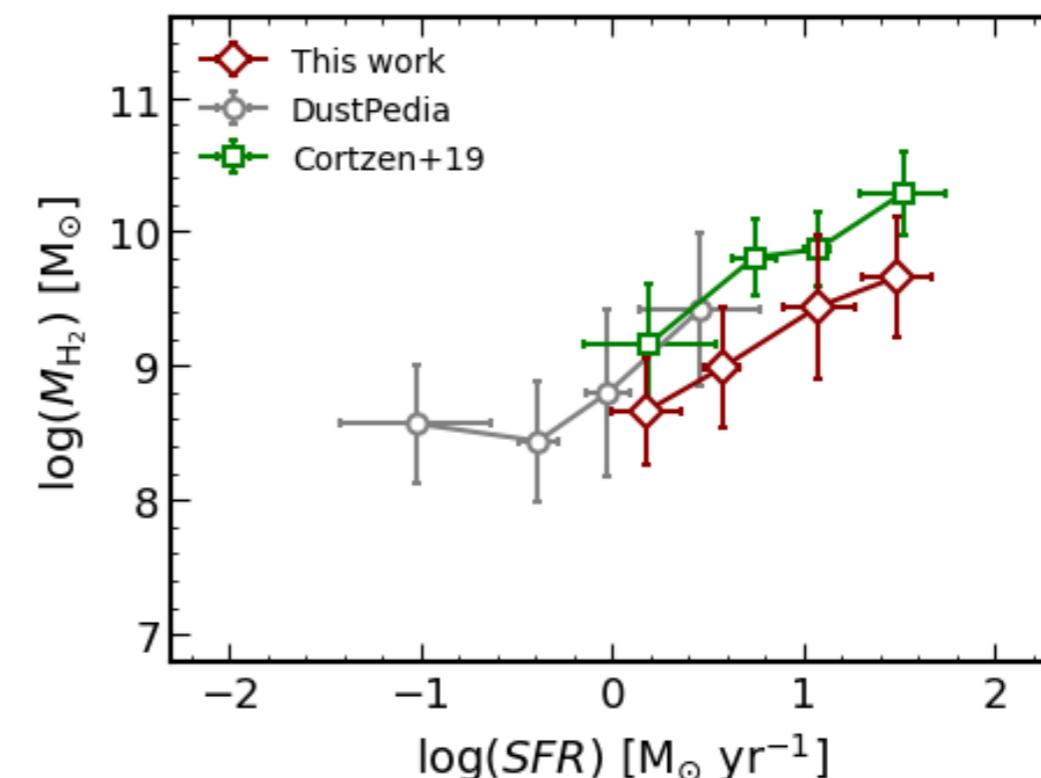
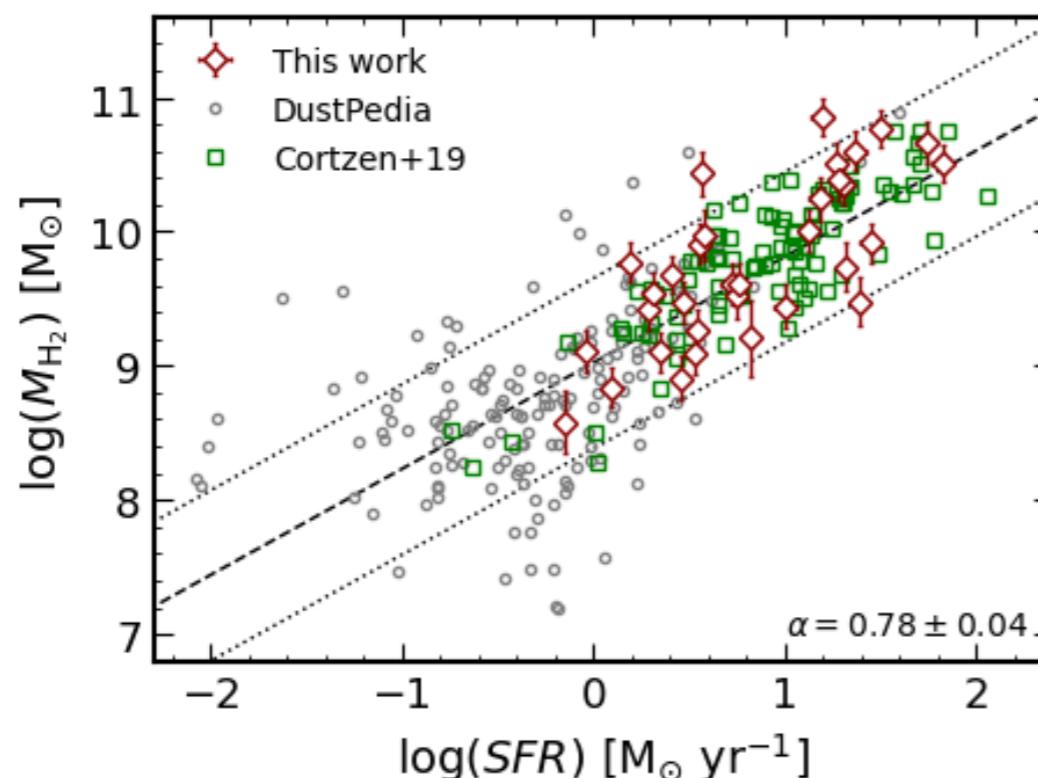
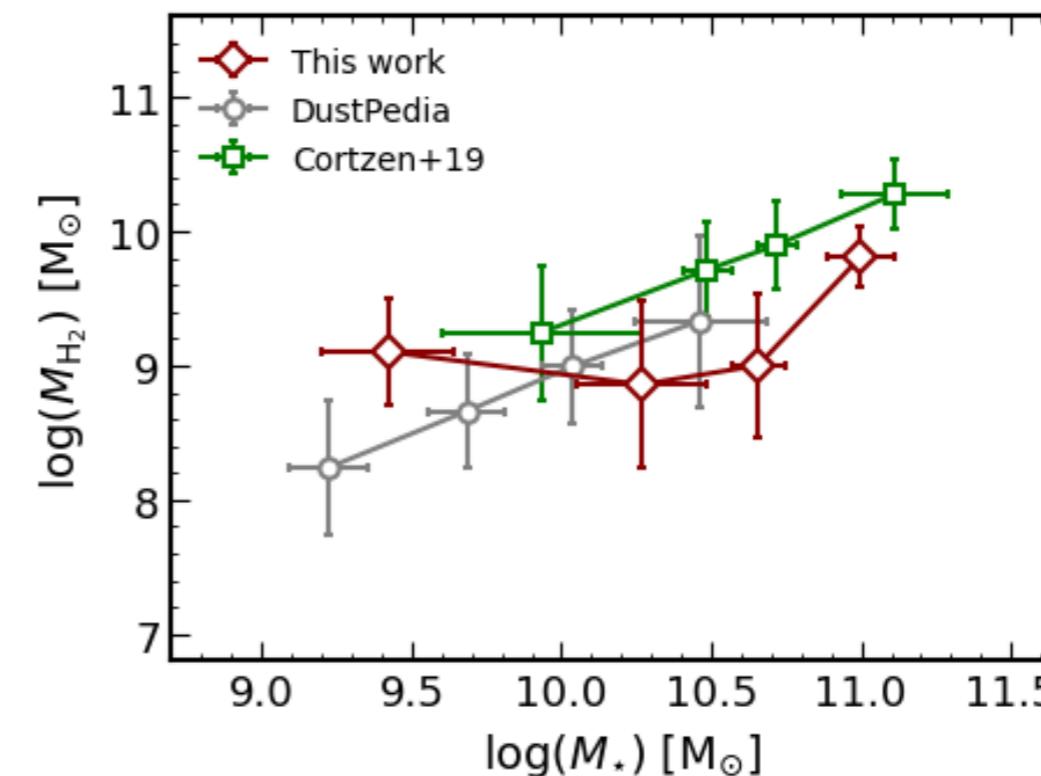
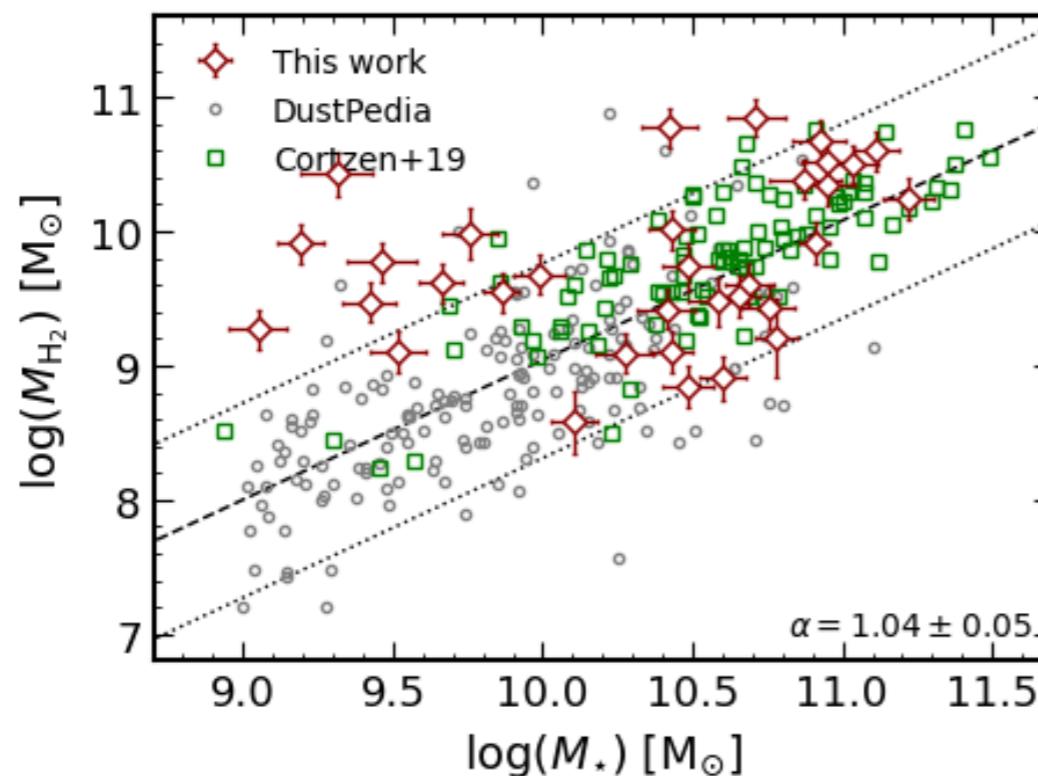
- Single-dish observations of low-J CO emission lines.

$$L'_{CO} = 3.25 \times 10^7 \times S_{line} \Delta v \frac{D_L^2}{(1+z)^3 \nu_{obs}^2} \text{ K km s}^{-1} \text{ pc}^2$$

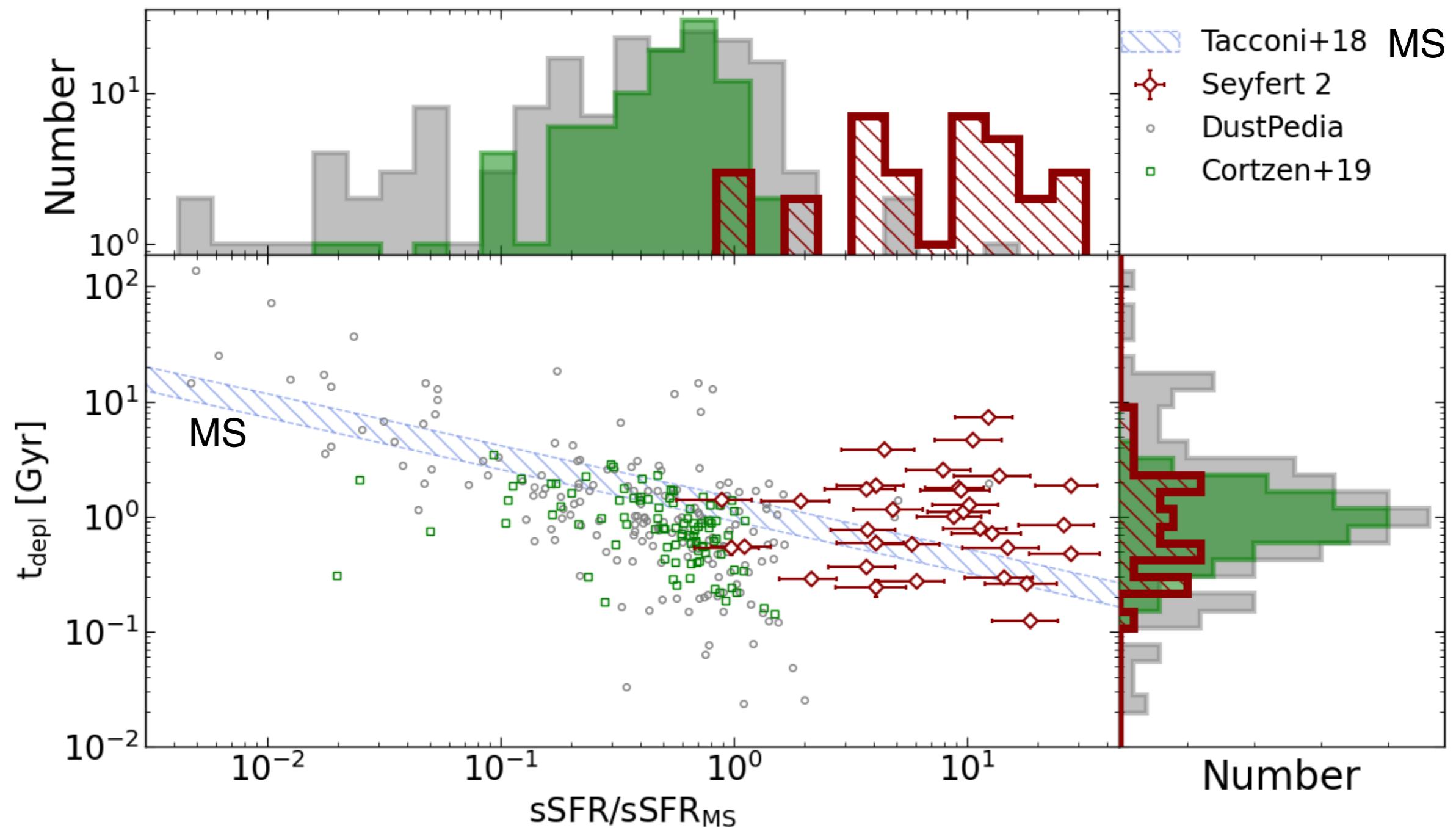
- Aperture corrected to derive the total amount of molecular gas (Boselli+14).
- Derivation of the molecular gas mass. $M_{H_2} = \alpha_{CO} L'_{CO}$



Comparing with a control sample: Host-galaxy properties



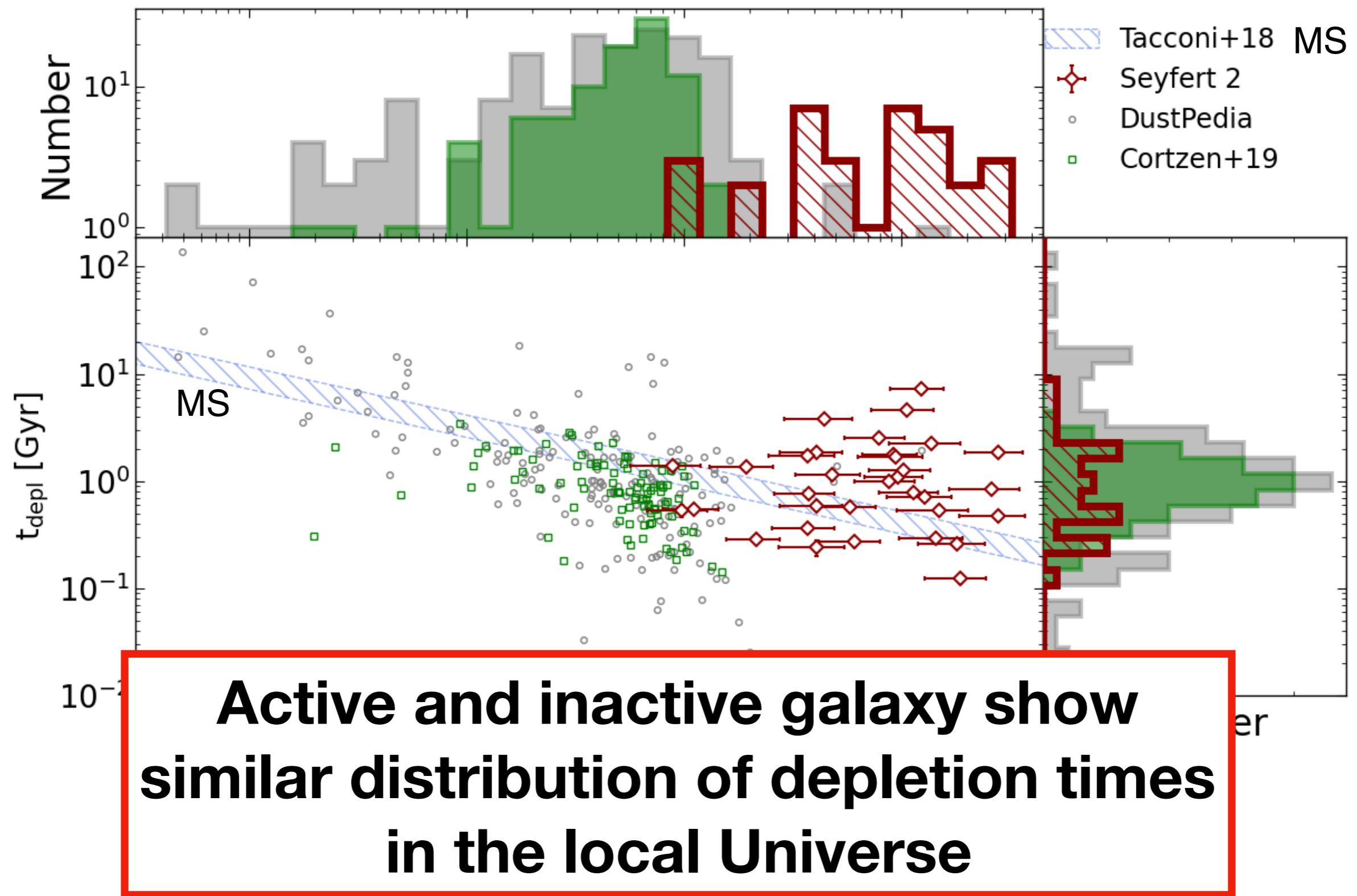
Does AGN affect the host-galaxy depletion time?



$$t_{\text{depl}} = M_{\text{gas}} / \text{SFR}$$

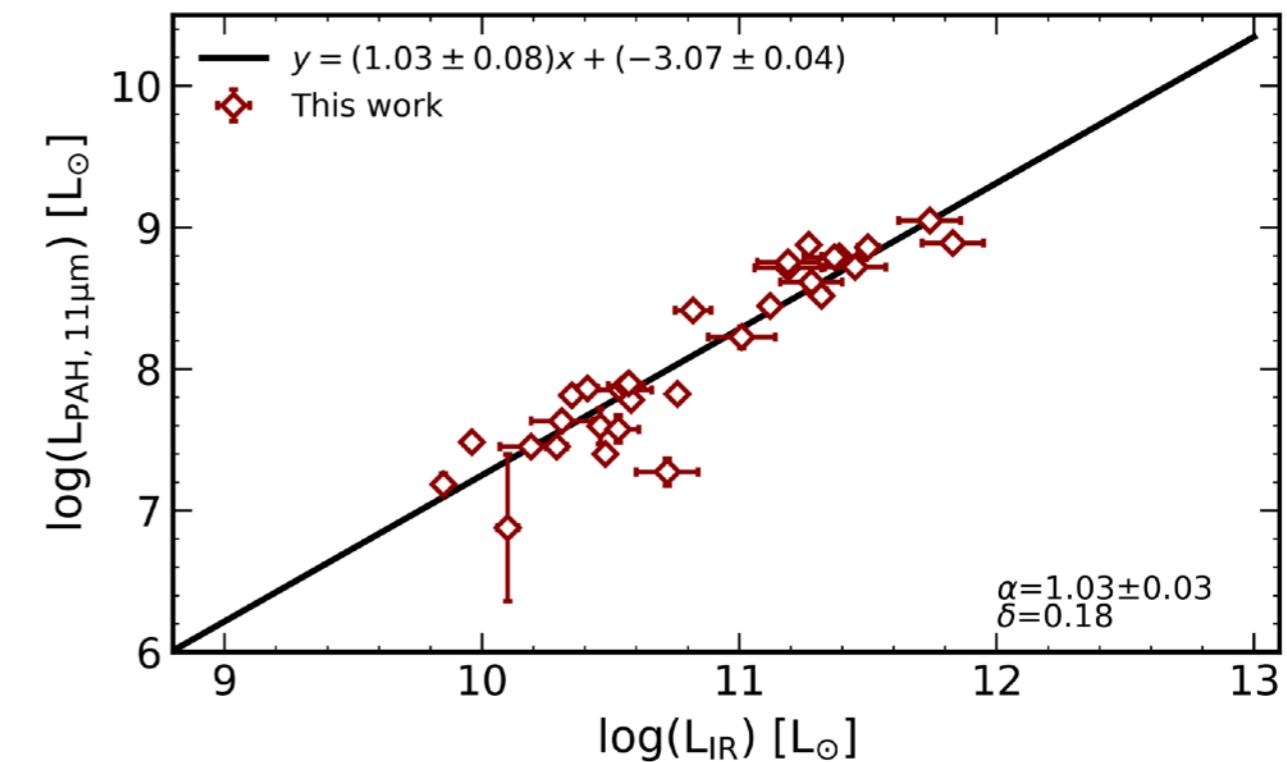
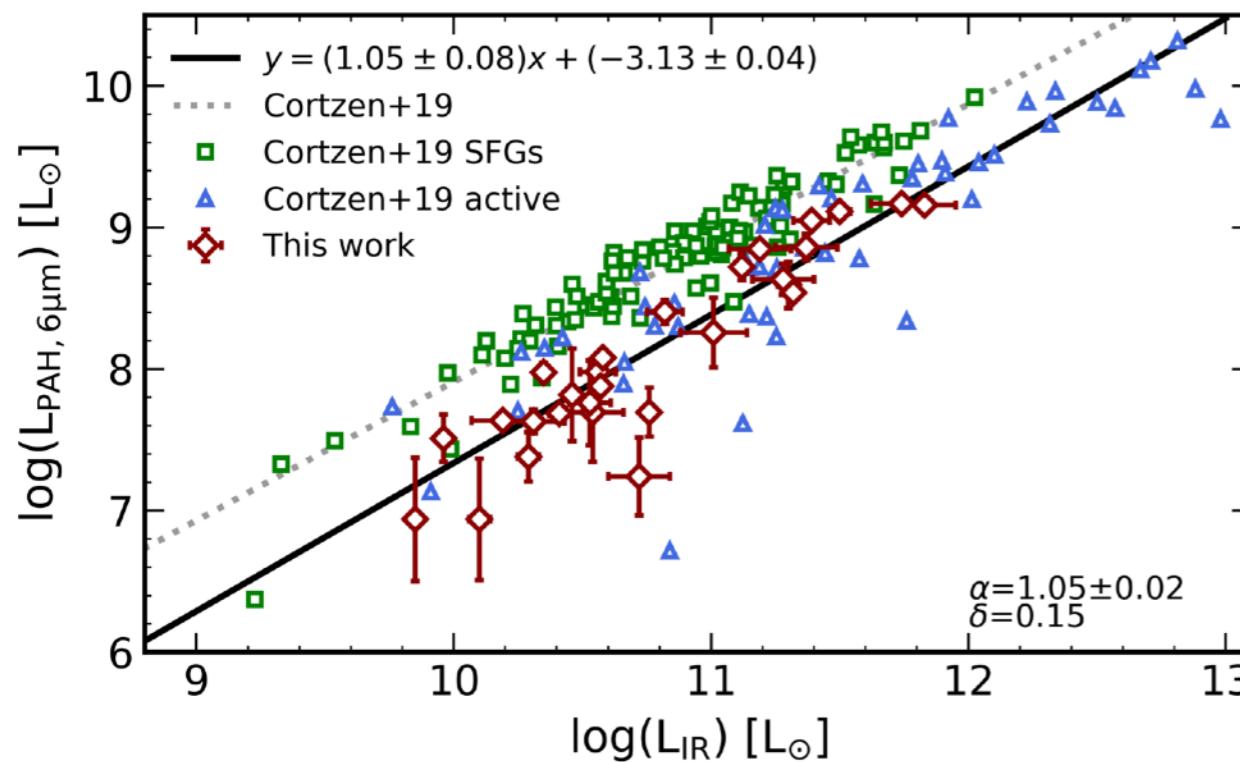
$a_{\text{CO}}^{\text{SFGs}} \sim a_{\text{CO}}^{\text{AGN}}$

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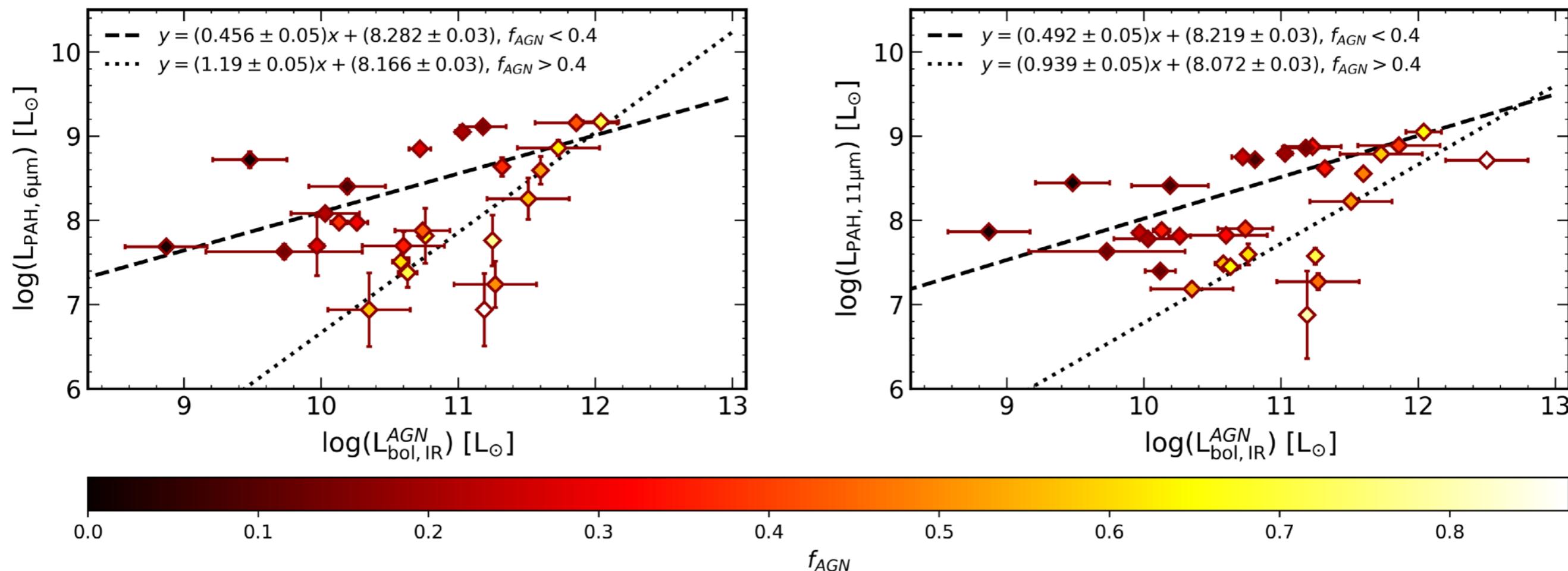


Are PAH features affected by AGN activity?

- Mid-IR features (6-11 μm) likely produced by the small ($<15\text{\AA}$) dust component.
- Does AGN enhance or deplete the PAH luminosity?
- L_{PAH} is known to be a SFR proxy.



Are PAH features affected by AGN activity?



- Seyfert galaxies show fainter PAH luminosity than SFGs.
- PAH luminosity is as much fainter in Seyfert as much the AGN dominates the IR emission.

Summary

Unveiling the intrinsic power of the AGN

(Salvestrini et al. in prep. - Paper I)

- ▶ **Goal:** Systematic study of the broadband X-ray properties of a well defined sample of local Seyfert II galaxies.
- Results:** Characterisation of the AGN intrinsic power.
Comparison of obscuration level: X-rays vs MIR.

Characterisation of the molecular gas content

(Salvestrini et al. in prep. - Paper II)

- ▶ **Goals:** Estimates of the molecular gas mass and depletion times.
Study of multiple ISM diagnostics.
- Results:** Local active and inactive galaxies show similar properties.
AGN activity suppress the emission of MIR features.

Millimetron Space Observatory (single-dish mode) will trace the dust and gas from the nuclear region (central few kpc) of local galaxies, where the AGN contribution is more relevant.