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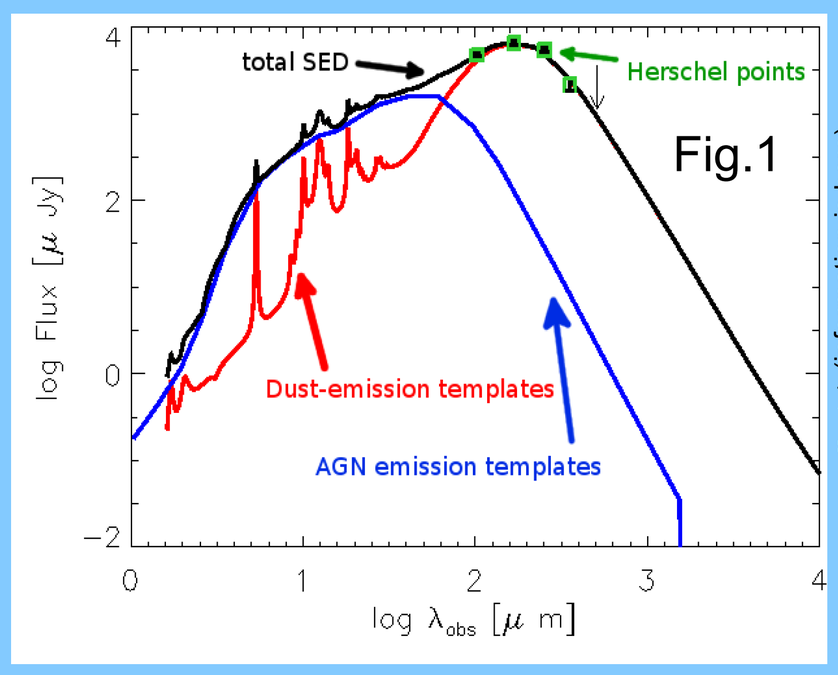
Introduction

The relations between the mass of the SMBH and the properties of the host galaxies, as well as the similar evolution of the BHAR and SFR densities imply a connection between nuclear activity and star formation. **AGN are found to preferentially live in star-forming galaxies.** However, the **gas content is a more fundamental quantity than SFR** in galaxies (because of the Schmidt-Kennicutt relation). Gas is also what accretes onto SMBH during the AGN phase. In this work, we looked for a **possible difference in the gas mass between active and inactive galaxies** that could explain the link between AGN and star formation.

Sample

- 801 AGN and ~175000 galaxies at z<1 in COSMOS, GOODS-S and -N (K-band selected)
- Wide multiwavelength datasets (from FIR to X-rays).
- Objects classified as AGN on the basis of optical, X-ray and SED information



Method

$$M_{gas} = M_{dust} / DGR$$

- M_{dust} from FIR SED fitting (Fig.1; **first time this method was applied to AGN!**); Herschel fluxes were stacked to increase completeness (by including Herschel-undetected objects).
- Stellar mass from optical/NIR SED fitting
- Metallicity from Fundamental Metallicity Relation
- Dust-to-gas ratio (DGR) from scaling relations with metallicity

(II order effects) (information is here)

BLACK HOLE ACCRETION PREFERENTIALLY OCCURS IN GAS-RICH GALAXIES!

Questions/comments? Talk to me!

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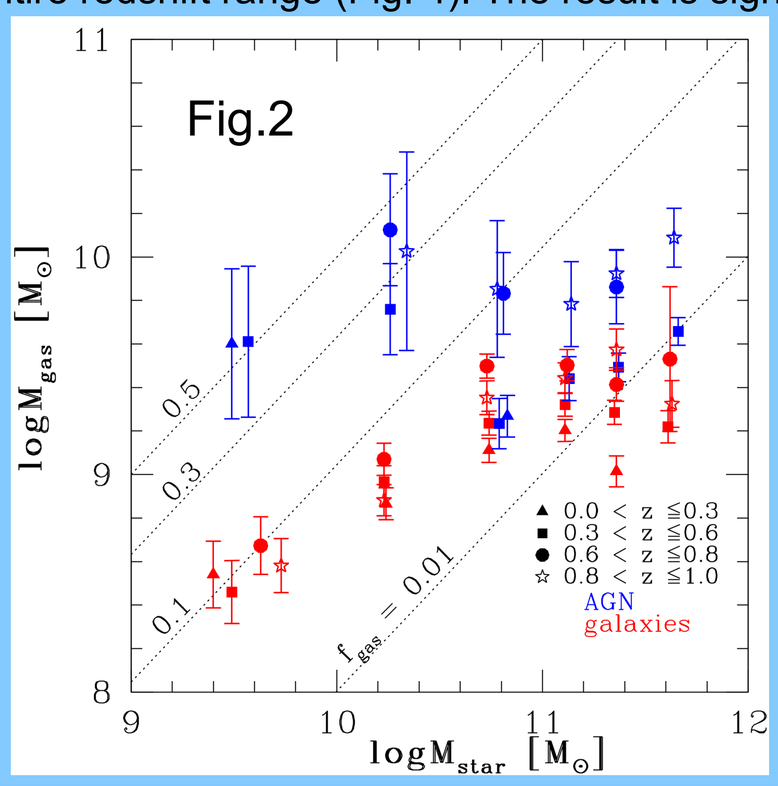
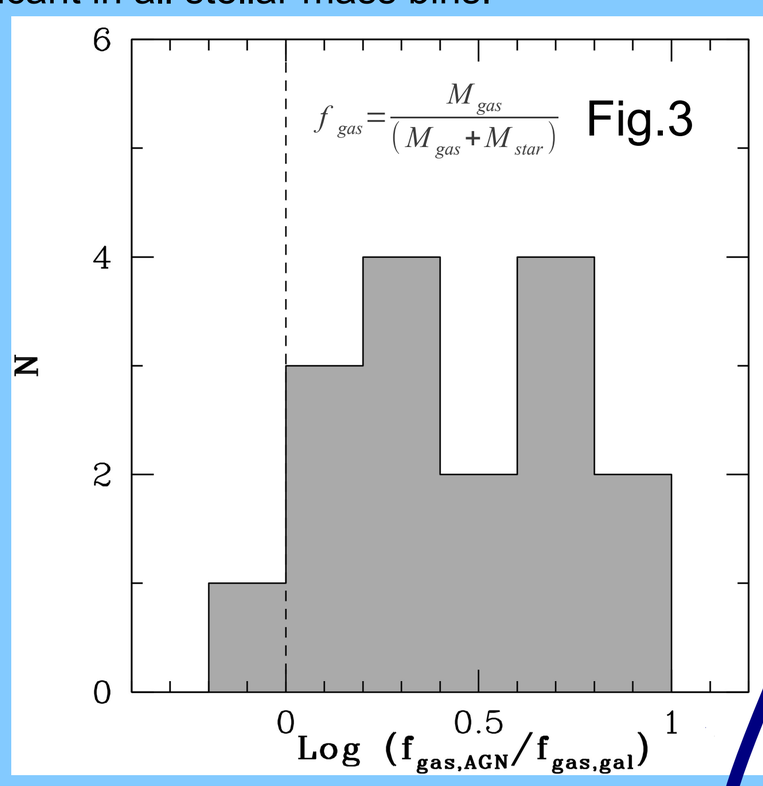
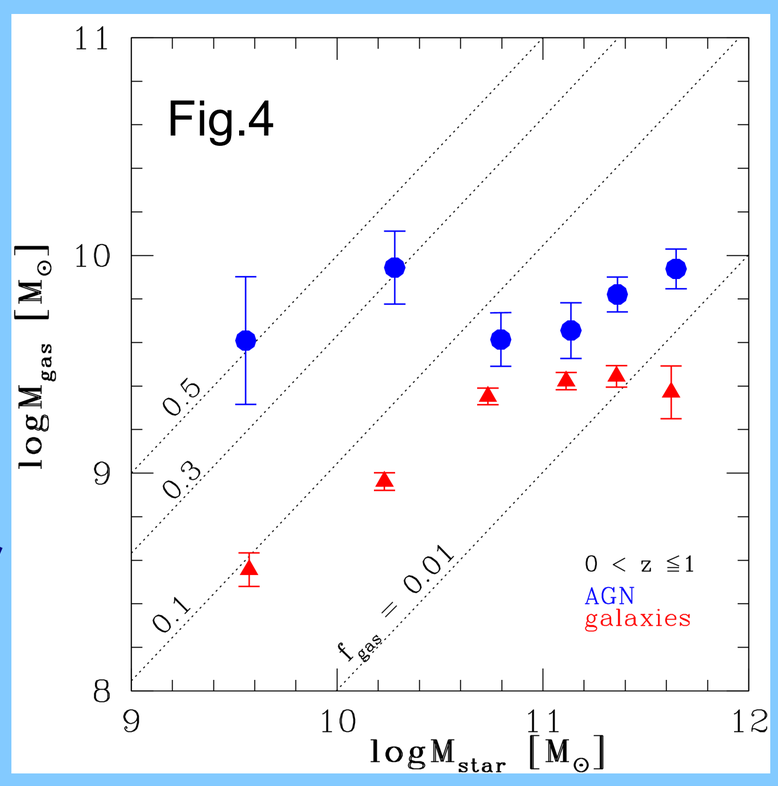
Results

The gas mass in AGN hosts is larger than in inactive galaxies in the same *z* and stellar mass bins by up to a factor of ~10 (Fig. 2). The ratio of the gas fraction in AGN and galaxies returns the histogram in Fig. 3: in almost half of the bins the gas fraction in AGN is a factor of >3 larger than in galaxies (same for the gas mass). To gain statistics, we computed the average gas mass in AGN and galaxies over the entire redshift range (Fig. 4). The result is significant in all stellar mass bins.







Discussion

This result strongly suggests that **the likelihood of having an AGN is primarily given by the amount of gas in the host galaxy** (with the specific triggering mechanism likely playing a secondary role) and can be interpreted in simple statistical terms: it is more likely that a gas cloud falls into the potential of the SMBH if there are overall more gas clouds in the host galaxy. The fact that AGN live in gas-rich galaxies **naturally explains why they are preferentially found in star-forming galaxies** (because of the Schmidt-Kennicutt relation).

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