"The dependence of Star Formation on AGN activity and obscuration"



V. A. Masoura

PhD student National Observatory of Athens, IAASARS

In collaboration with: G. Mountrichas, I. Georgantopoulos, A. Ruiz, G. Magdis, M. Plionis



Main questions...

Is there any correlation between the AGN power and the SFR?



Introduction

Most galaxies host a SMBH in their center

Coeval growth of the galaxies and the resident SMBH

(e.g. Boyle & Terlevich 1998; Ferrarese & Merritt 2000; Gebhardt et al. 2000)

Connection between the AGN and the SF properties

(Alexander & Hickox 2012)

The Approach

• X-ray selected AGN

• AGN power \longleftrightarrow X-ray









Studies with large samples

- High number statistics
 - Lanzuisi et al. 2017, 692 AGN, COSMOS
 - Brown et al. 2019, 703 AGN, Chandra Xboötes



Our Sample The largest X-ray sample

(Masoura et al. 2018)

- I) XMM-XXL (North 25 deg²)
 II) X-ATLAS (7 deg²)
- SED fitting (CIGALE) SFR Photometry : SDSS, VISTA, WISE (608 sources with Herschel – Callibrating the SFR estimations)
 - 1872 spectroscopic sources
 - Machine learning technique Photometric redshifts (Mountrichas, Corral, Masoura, et al. 2017)

3336 X-ray

AGN

Redshift and X-ray luminosity distribution of our sample

0.03 < z < 3log L_x(2-10 keV)=(41-45.5) erg s⁻¹

Calibrating SFR estimations

Clear Dependence !

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Evolution of SFR with M*

Disentangling the effects of M* and z on the SFR

• Estimate the SFR_{norm} :

$$SFR_{norm} = SFR_{AGN} / SFR_{MS}$$

(Schreiber et al. 2015)

LOG SFR_{norm} > 0 : AGN SFR higher than SFR of a MS galaxy with the same M*,z (*i.e. AGN lies above the MS*)

LOG SFR_{norm} < **0** : AGN SFR lower than SFR of a MS galaxy with the same M*,z (*i.e. AGN lies below the MS*)

But... In Lx bins the trend is changed!

Does X-ray Absorption affects the SFR -Lx?

Masoura et al. in prep.

*Preliminary Results

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Summary

- Largest X-ray AGN sample XMM-XXL North & X-ATLAS.
- There is a linear correlation between Lx and SFR at all redshifts and luminosities spanned by our sample.
- There is an evolution of the SFR with M* and z.
- After disentagling the effects of M* and z on SFR we re examine the correlation between Lx and SFR :
- *i)* SFR binning: The AGN enhances the SF of its host galaxy when the galaxy lies below the main sequence and quenches the SF of the galaxy when the host lies above the main sequence.
- *ii) Lx binning: The AGN enhances the SF of its host galaxy regardless of its position with respect to the MS.*

Preliminary results:

• The dependence of SFR on the Lx is not affected by the X-ray absorption.

• *Work in progress :* i) *Does* the optical / mid-IR obscuration affect the SFR- Lx relation? ii) Estimation of the fraction of obscuration as a function of SFR.

