Galaxy Evolution and Feedback across Different Environments
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POSTERS

Effects of AGN feedback on galaxy downsizing in different environments

Amirnezam Amiri[1,2,3,4], Kastytis Zubovas[5,6], Alessandro Marconi[1,2], Saeed Tavasoli[4] and Habib G. Khosroshahi[3]

[1]Dipartimento di Fisica e Astronomia, Universita di Firenze, via G. Sansone 1, I-50019, Sesto Fiorentino (Firenze), Italy

[2]INAF-Osservatorio Astrosico di Arcetri, Largo E. Fermi 2, I-50125, Firenze, Italy

[3]School of Astronomy, Institute for Research in Fundamental Sciences (IPM), PO Box 19395-5746 Tehran, Iran

[4]Physics Dept., Kharazmi University, Tehran, Iran

[5]Center for Physical Sciences and Technology, Vilnius LT-10257, Lithuania

[6]Vilnius University Observatory, Vilnius LT-10257, Lithuania

emails: amirnezam.amiri@unifi.it, amirnezamamiri@gmail.com

Abstract. We have investigated the role of AGN feedback on galaxy downsizing in cluster and void environments, using the sample from Amiri *et al.* (2019). Our results indicate that, at least in the local universe, the correlation between black hole mass and (specific) star formation rate is statistically indistinguishable in the two environments. Therefore, the role of the environment in modulating AGN feedback effects on the host galaxy star formation is negligible.

Keywords. AGN, black holes, environments, stellar parameters

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1. Introduction

Galaxies in cluster and void environments differ in their morphology, luminosity, star formation rates and other related parameters (Kreckel *et al.* 2012; Ricciardelli *et al.* 2014). Based on observations, the evidence of the relation between AGN and star formation in the host galaxy has been mixed. On long timescales, AGN are connected with quenching of star formation in their host galaxies (Siriri chawinski 2009), although they might induce brief starbursts as well (Silk 2005). On shorter timescales, the correlation between AGN luminosity and the host galaxy star formation rate (SFR) is generally weak, except in the highest-luminosity cases, where there is a positive correlation although it is probably just a consequence of the brightest AGN residing in the largest galaxies. The reason for this lack of correlation might be that AGN vary on timescales much shorter than the host galaxy can respond, therefore meaningful connections might only be possible when both AGN luminosity and SFR are averaged on several Myr timescales (Zubovas 2018). An AGN outflow regulates the host galaxy's SFR by removing gas out to large distances. If the galaxy resides in a denser environment, the outflow should stall at a smaller distance and gas can fall back into the galaxy on a shorter timescale. Therefore, we may expect the overall suppressing effect of AGN on the host galaxy's SFR to be smaller in cluster galaxies than in field/void galaxies. Moreover, The differential evolution of bright and faint AGNs with redshift has been described as downsizing (Barger *et al.* 2005). This implies that AGN activity in the low-z Universe is dominated by either high-mass BHs

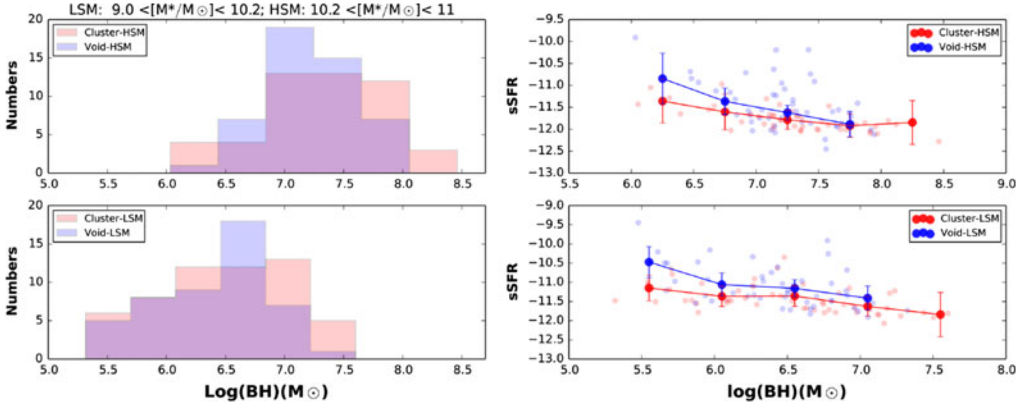

Figure 1. Left panels: Distribution of black hole masses for AGN samples in clusters and voids. The upper and lower panels consider high and low mass AGN hosts, respectively. The red histogram shows cluster galaxies and the blue one shows void galaxies. A KS test shows that there is no significant difference between the BH mass distributions of AGN in the HSM and LSM regimes, in both environments. Right panels: The relation between sSFR ans BH mass. The upper and lower panels are for high and low mass respectively. Transparent circles are the actual AGN, while solid-colour circles are bin averages. The only clear indication is that the correlation between sSFR versus BH mass is negative in all cases. When considering both a linear fit and a KS test, we can conclude that there is a negligible role of the environment for the sSFR of AGN hosts galaxies.

accreting at low rates or low-mass BHs growing rapidly. To analyse these issues, we look into the possible connections between the galactic environment and the co-evolution of its SMBH and stellar components.

2. Sample selection

Amiri *et al.* (2019) selected a volume limited sample of AGN host galaxies in both void and cluster environments, limited to objects brighter than $M_r = -18$ and covering a redshift range 0.01−0.04, which have been divided into low stellar mass (LSM, $9.0 \leqslant \log(M_\star/M_\odot) < 10.2$) and high stellar mass (HSM, $10.2 \leqslant \log(M_\star/M_\odot) < 11.0$) subsamples. Samples include 60 and 40 galaxies in LSM and HSM samples, respectively. For determining velocity dispersion, sSFR and BH mass, we have used the Max-Planck-Institute for Astrophysics (MPA)-Johns Hopkins University (JHU) SDSS DR7 catalogue Brinchmann *et al.* (2004). Also, we have used the Saulder *et al.* (2013) correction for velocity dispersion. Finally, We have estimated black hole masses by using the $M_{BH} - \sigma$ relation from Gultekin *et al.* (2011) (Fig. 1).

3. Conclusion

We have addressed the unsettled issue of the effects of AGN feedback on galaxy downsizing in different environments by comparing the galaxies hosting AGNs in the local universe, as a function of the stellar mass of the host galaxies. Based on Amiri *et al.* (2019), as figure 1 shows, we could conclude that there is a negligible role of the environment for the sSFR of AGN hosts galaxies.

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