

Chemical abundance of type-2 AGN in different environments

M. Ahmed,^{1,21,2} M. Povičič,^{1,31,3}
¹ Space Science and Geospatial Institute (SSGI), Ethiopia
² Instituto de Astrofísica de Andalucía (IAA-CSIC), Spain
³ Instituto de Astrofísica de Andalucía (IAA-CSIC), Spain
⁴ Honorary lecturer, Mbarara University of Science and Technology, Uganda.
⁵ Honorary lecturer, Mbarara University of Science and Technology, Uganda.

In this study, we examine the metallicity properties of type-2 AGN in galaxy groups/clusters and in the field. We have obtained a catalogue of metallicity measurements of 11,957 Seyfert-2 galaxies, to our knowledge the largest to date. We find that Seyfert-2 galaxies have a median $12 + \log(\text{O}/\text{H})$ of 8.6, $\log(\text{N}/\text{O})$ of -0.6, and $\log \text{U}$ of -2.2, independent of redshift. Seyfert-2 galaxies, both early- and late-types, found in groups and clusters have on average higher $12 + \log(\text{O}/\text{H})$ metallicities compared to field galaxies in all redshift ranges studied.

Objectives

General objective:

To study the metallicity properties of type-2 AGN in different environments, and properties of metallicity in relation to other galaxy properties.

Specific objectives:

- To measure the Z of type-2 AGN,
- To compare the Z properties of type-2 AGN with their other properties,
- To study MZR of type-2 AGN in different environments,
- To study the Z properties of type-2 AGN in comparison to the properties of groups and clusters

Introduction

Carr et al. (2023) - Estimated O/H for two sub-samples of Seyfert-2 galaxies, finding no significant variation of Z between low & intermediate redshift samples. Ly et al. (2016) - Compared the MZR of Seyfert-2 galaxies at $z = 0.1$ to that of SFGs across three redshift bins, finding an average offset of 0.13- 0.24 dex. Matsuoka et al. (2009) - Studied the MZR for type-2 AGN at $z = 1.2 - 4$, finding a direct link between the Type-2 AGN Z and M^* follows a similar trend to that observed in SFGs. Dors et al. (2019) - Developed semi-empirical calibrations to relate emission line ratios to the Z of the NLR in type-2 AGN, finding that NLR Z is 2-3 times lower than in the BLR.

Methodology

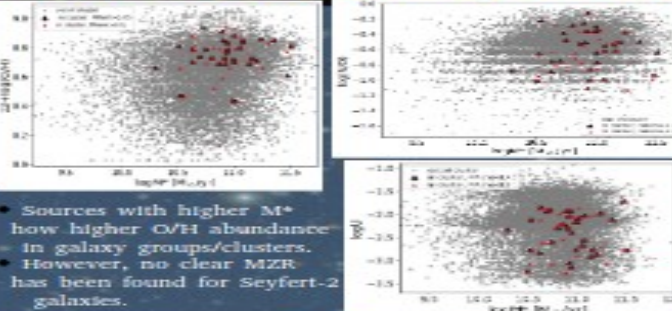
We have used HCM python code to measure Z (Pérez-Montero, 2014).

- Developed to analyze observational data observed in the UV, optical, or IR.

Main steps to run the code:

1. Setting the input file.
2. Selecting the SEDs of the models.
3. Selecting the grid of models.
4. Interpretation of HCM output

Mass-Z Relation (MZR)



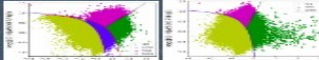
Summary

- We obtained a catalogue of Z measurements for Seyfert-2 galaxies. → THE MOST COMPLETE UP TO DATE.
- Seyfert-2 galaxies in groups/clusters have higher O/H abundances compared to field galaxies.
- We do not observe a clear and strong relation of MZR type-2 AGN.
- Inverse correlation between O/H and SPR, and no clear sign with N/O and logU.
- Our Z measurement is in agreement with previous studies.

Data

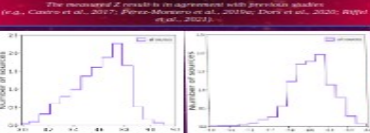
- MPI-BU SDSS DR8 spectroscopic catalogue (Kraußharms et al., 2003; Brinchmann et al., 2004; Salim et al., 2007)
- redMaPPer SDSS DR8 galaxy clusters and cluster member catalogues (Rykoff et al., 2014).

Sample selection

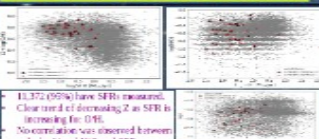


Analysis & results

Measurement of Z of Seyfert-2 galaxies from SDSS DR8 using for the first time the HCM code.
 Redshift ranges examined: $z \leq 0.34$.
 Errors in all cases $< 20\%$ for $> 20\%$ of galaxies.
 On average higher Z observed in groups/clusters in all z ranges (up to $z = 0.4$).
 We do not find any signs of Z evolution with z.



SFR vs. Z Relation



Z in relation to groups & clusters properties

