Selection and characterization of Red Geysers: What is the source of gas ionization?

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Introduction

Recently, an intriguing result, was reported on a sample of quiescent galaxies: bi-polar outflow seen in ionized gas and interpreted as being originated by centrally driven winds possibly due to a Radiatively Inefficient Accretion Flow onto the SMBH. These galaxies, dubbed “Red Geysers” (Cheung et al. 2016), do not show recent star formation episodes, show an excess of radio emission in comparison to inactive galaxies (Roy et al. 2018).

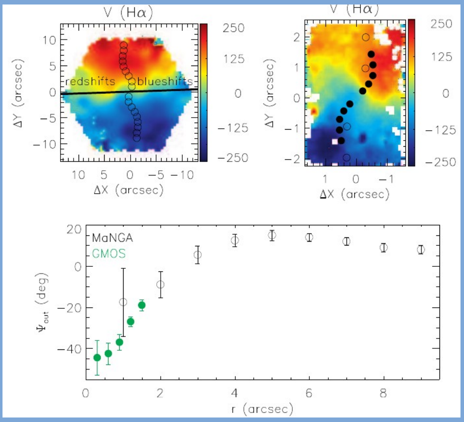


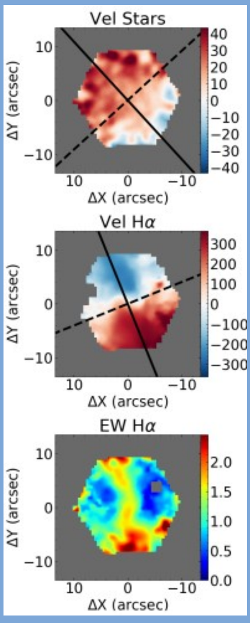
Figure 1: The orientation of the outflow in Akira galaxy obtained from velocity fields. Filled circles are for Gemini GMOS data and open circles for MaNGA data.

Riffel et al. (2019) found a variation of the outflow orientation with the distance from the nucleus to the Akira galaxy, the prototype of the Red Geysers. **This variation in outflow orientation was interpreted as produced by the precession of the AGN accretion disk.**

MaNGA and GMOS sample

Using the MaNGA survey, we define the sample of Red Geysers by adopting the following selection Criteria:

1-Quiescent nature with rest frame color NUV-r > 5;
2-Low star formation with log SFR < -2;
3-Difference in the orientation of the line of nodes of stellar and gas velocity fields (ΔPA) between 10° and 170°;



4-Bi-symmetric emission features in Ha equivalent width (EW) resolved map;
5-Gas velocity values which are at least 1.5 times as high as the values of the stellar velocity fields.

This selection resulted in 92 Red Geyser.

We selected **9 Red Geysers** from MaNGA sample to be observed with **GMOS**.

Figure 2: Difference in the orientation of the line of nodes of stellar and gas velocity fields, and equivalent width (EW) resolved map to the galaxy MaNGA 1-24104.

Goals

Our goals are to analyze if Red Geysers host an AGN and verify if the outflows seen in these galaxies have a different orientation at large and small scales. Furthermore, to analyze if the precession of the AGN accretion disk is responsible for the variation in the outflow orientation.

Results

We present preliminary results on the analysis of the nuclear emission lines of the Red Geysers, aimed to verify if these objects indeed present AGN activity.

Of the 92 Red Geysers selected in our sample, only 11% of them have ionized gas due to an AGN (into a nuclear aperture of 2″ radius) in both BPT and WHAN diagrams, see example in Figure 3. Figure 4 shows the WHAN and BPT diagrams using the GMOS data to the galaxy MaNGA 1-385124. Both diagrams show a clear signature of an AGN in this galaxy.

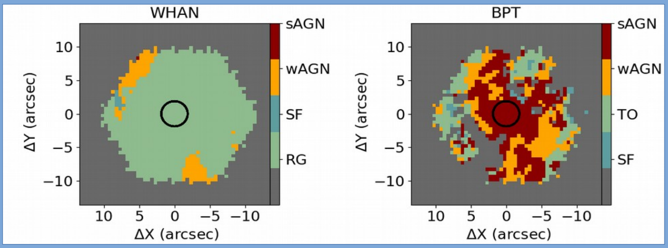


Figure 3: WHAN (Cid Fernandes et al. 2010) and BPT (Baldwin, Phillips &Terlevich 1981) diagrams to the galaxy MaNGA 1-385124 using MaNGA data. The following labels were used: SF or star-forming galaxies, TO (transition objects), wAGN or weak AGN (low-luminosity AGN), strong AGN (Seyferts) and RG (retired galaxies).

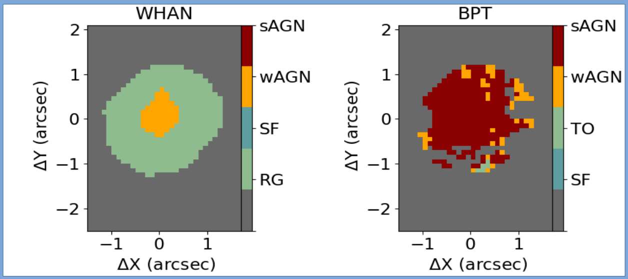


Figure 4: WHAN and BPT diagrams to the galaxy MaNGA 1-385124 using GMOS data. The labels are the same as in Figure 3.

Conclusion

We found clear evidence of AGN in only 11% of our sample. However, the low spatial resolution of MaNGA (2.5") does not allow the detection of weak AGN. Thus, the AGN fraction determined here can be considered a lower limit. **Using GMOS we can detect an AGN in MaNGA 1-385124 which is not possible only with MaNGA data.**

References:
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