Galaxies and their SMBH

Observations of the Hubble Space Telescope showed that most of galaxies harbour a supermassive black hole SMBH in its center. There is a correlation between the mass of the SMBH and the luminosity of its galactic bulge.

There is general agreement on the hierarchical model of evolution but observation showed something different. Observations show an anti-hierarchical formation process. Two models to find the key: co-evolution and parallel formation. The parallel formation model implies that galaxies evolve independently as a result of an statistical process. Co-evolution model implies that galaxies interaction with their SMBH affects efficiency of star formation process.

Target Selection

We select a sample of z=1.1-1.8 AGNs from to spectroscopic survey: the Sloan Digital Sky Survey (SDSS) and the VIMOS VLT Deep Survey applying the following criterium:

1. - the object had to be observed with HST/NICMOS
2. - it was possible to derivate the BH mass estimate based on the MgII broad emission line.
3. - the redshifted wavelength of Hα is away from the OH sky emission line.
4. - the expected Hα luminosity, estimated from the OII flux, is sufficient to probe the galaxy kinematics.
5. - a star bright enough for the adaptive optic tip-tilt correction is available within 40 arcsec of the target galaxy.

Our targets

- J0959+024325.1
- J022529-044044

We target two AGN of similar mass and redshift but with very different Eddington ratios.

Integral Field Spectroscopy [1] 

The integral field spectroscopy (IFS) objective is to gather spectra from sky in a two dimensional field of view. The final product is a data-cube with axis x and y (spatial coordinates) and wavelength. The integral field spectrograph has two component: the spectrograph and the integral field unit (IFU). SINFONI is a near infrared (1.1-2.45 $\mu$m) integral field spectrograph fed by an adaptive optic module. It uses image slicer: the image is formed on a mirror that is segmented on 32 thin horizontal sections. A second segmented mirror is arranged to reformat the slices and redirect the light to the spectrograph. The advantage of using IFU is the better use of incident light when the object is extended, exploring spatially extended sources in a spatially extended way.

Data reduction and data analysis 

The data reduction was performed with the ESO-SINFONI pipeline. In complement, we wrote some specific Python routines to improve some reduction steps. In particular we generate a mask to identify wavelengths intervals affected by sky line residuals.

After calibration procedure, we perform the broad line fitting and deconvolution process (J0959+024325.1). First a 15 pixels region was integrated. The broad line was fitted into a gaussian ignoring the central part of the broad line.

We consider that the AGN emission, a normalization factor was applied to the fitting in order to use it in each spaxel. Subtracting the normalized fitting to the spectrum we get a residual. This residual would represent the host galaxy.

Future Work

Improving reduction steps for both objects J0959+0243 and J022529-044044 is the next step in this study. Also the deconvolution in the AGN and host galaxy components. Different methods of deconvolution will be applied. We aim then at deriving the physical and dynamical properties of J0959+0243 and J022529-044044 host galaxy.