

TACOS

Team Applying Cloudy to Outflow Spectra

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Introduction

AGN driven outflows are expected to provide an important form of feedback in the host galaxy, by heating and/or expulsion of gas, hindering star formation, and altering the future evolution of the galaxy.

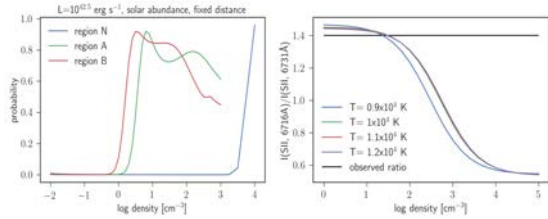
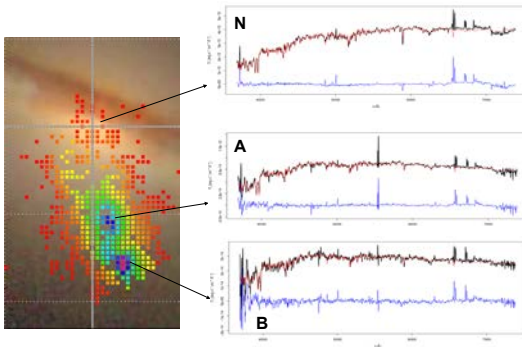
NGC 0681 is a Seyfert 2 galaxy showing an extended H α emitting outflow in its CALIFA IFU data cube.

In this project we have studied the physical conditions of the outflowing gas using Cloudy.

Model 1

We use Cloudy to model a simple AGN SED and vary the density of the observed regions. The calculations are done on a grid of parameters, which is then used to calculate respective probability distributions for each region (left Fig.). The results for regions A and B are consistent with densities probed with the observed [SII] line ratio (right Fig.).

CALIFA Spectra

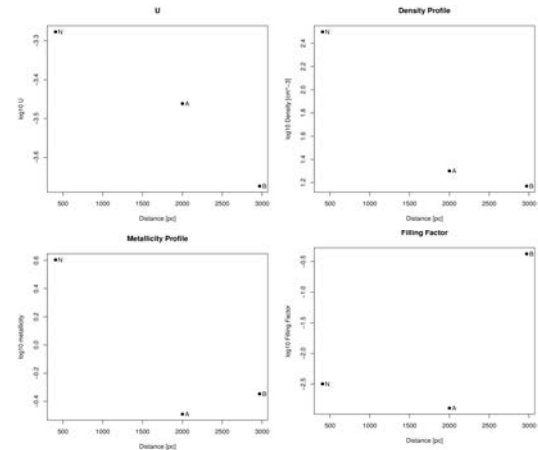
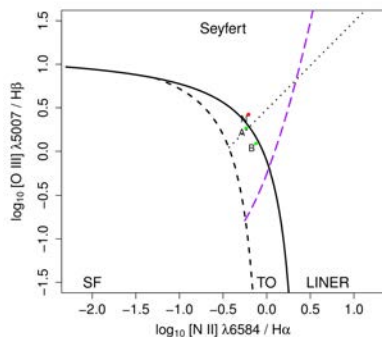


Model 2

Another approach that we explored was fitting the observed line intensities for each region using the combination of VARY and OPTIMIZE commands. The results are shown in the next figures, and except for the filling factor, they appear to be consistent with ionization by a central source with the U and metallicity parameter diminishing with distance.

Line Fluxes & BPT Diagram

Line	N	A	B
[O III] λ 5007	264.2	184.7	122.5
[O I] λ 6300	35.2	64.3	106.9
[N II] λ 6583	191.5	166.2	215.0
[S II] λ 6716	116.8	142.5	193.6
[S II] λ 6731	84.2	105.6	138.6
H α	310.0	286.0	286.0



Summary & Future Perspectives

- Model 1 gives reasonable results for gas density, but more calculations are needed to properly explore other physical properties of the ionized gas.
- Model 2 gives results for densities, ionization parameter and metallicity that are consistent with the gas being photoionized by a central AGN.
- Cloudy is a powerful tool for modeling ionized outflows from AGNs.