

# DRAGONS: clouDy nebulaR line diAGNostics acrOss the electromagNetic Spectrum



David Carr (Indiana University), Prerak Garg (University of Florida), Francisco Holguin (University of Michigan), Grace M. Olivier (The Ohio State University)

**Abstract:** The aim of this project is to model nebular line emission using Cloudy and match the observations at the optical and UV. We vary ionization parameter, metallicity, and SED shape and test how it affects the model's position on the diagrams.

## Results

**Top Left:** The grey points are star-forming galaxies, the red and blue triangles are Seyfert 2 galaxies. The green and blue grid are models created using the AGN command at a big bump temperature of one million kelvin. The red and brown grid are models created using SEDs for a simple stellar population with an age of 1 Myr. The range over which we vary metallicity and U are annotated on the plot. All models contain dust which was adjusted for the metallicity of each model.

**Bottom Left:** This plot is similar to the top left plot except it uses lines in the UV. The grey and cyan points are additional Cloudy models created by Feltre+16.

**Top Right:** Cloudy models created with radiation fields informed by stars in galactic disk section simulations (Holguin+18). The mismatch with observed O III ratio could be resolved with better Cloudy models, or using a global disk simulation instead.

**Bottom Right:** Comparison of Cloudy models run with different stellar population SEDs with ages of 1 Myr. The blue solid lines show a population of single stars from the Padova isochrones while the orange dashed lines show a population of binary stars from BPASS. We see that the parameter range covers similar areas of the BPT diagram, but the BPASS models lower the [O III]/H $\beta$  ratio, which is a result of the different SED shapes, not an effect of binaries.

