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**SIMULATIONS OF EMISSION LINES FROM THE NARROW LINE REGION IN SEYFERT GALAXIES**

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One of the biggest questions in astronomy and astrophysics is “How do galaxies form?” Due to the large time scales involved in the formation of galaxies, the only way to learn about the formation of galaxies is through studying galaxies outside the Milky Way by observation and simulation. Certain galaxies that contain supermassive black holes in their center produce more light than all of the stars within the galaxy, called active galactic nuclei (AGN). When modeling gas clouds in the narrow line region, researchers produce an incident spectral curve based on previous observations represents the spectrum of light generated by the AGN. The SED can be empirically parametrized using spectral indices, which determine the slopes in different areas of the curve. One aim of this research is to synthesize a regression model with data from previous research that will compute all the spectral indices based on one index. We perform our regression analysis using a chi square test using the mean values of the spectral indices provided by past research, and then we craft an initial incident spectral energy distribution curve in the program Cloudy. Next, the spectral indices are varied based on the regression model and the incident spectral curve is supplied to Cloudy to simulate gas clouds in the narrow line region. . Research so far has shown that our regression model is statistically significant and we have constrained the hydrogen number density, temperature, metallicity, and photon frequency of the incident curve. We fit our model to emission line ratios that the cloud creates as a consistency check, as these emission lines allow us to infer the characteristics of the cloud described above. [THIS IS CLOSE, BUT NOT ENTIRELY CORRECT. YOU CAN’T INFER MORPHOLOGY BASED ON THE SPECTRUM. THE OTHER CHARACTERISTICS CAN BE INFERRED FROM THE SPECTRUM COMING FROM THE *CLOUD*, NOT THE IONIZING SOURCE, BUT YOUR TEXT REFERS TO THE LATTER. AS FOR RESULTS HOW ABOUT INVESTIGATING EMISSION LINE RATIOS THAT CONSTRAIN THE SED BY VARYING THE INCIDENT SPECTRUM ACCORDING TO OUR STATISTICS?]