Sam Jenkins

**Introduction**

The temperature problem in high temperature narrow line galaxies has remained unexplained for decades. As Zhang, Liang and Hammer (2013) mention, there has been no clear explanation of the temperature problem, and most attempts to explain it have relied on unrealistic combinations of parameters. Komossa & Schulz (1997) attempted to solve this problem by increasing density, but their density values caused inconsistencies in other measurements. Richardson, Allen, Baldwin, Hewett & Ferland (2014) investigated the possibility that the temperature problem is actually a density problem causing false readings in the temperature sensitive line ratios, but determined that this was not actually the case.

Our research focuses on this temperature problem specifically in Active Galactic Nuclei (AGN) and uses data from the Sloan Digital Sky Survey as well as constraints on galaxy types established in Kewley et al. to separate our data set by galaxy type. Notably, we include no LINERs in our data set. Previous attempts at the temperature problem have relied on shock-wave heating, which is a LINER characteristic that does not explain these temperatures in non-LINER AGN. We omit LINERs, and therefore shocks, and focus on AGN.

We plot our SDSS data set on a collection of diagnostic diagrams in order to categorize them by characteristic conditions and type. The most popular and useful of these is the BPT Diagram, presented by Baldwin, Phillips and Terlevich in 1981. The BPT Diagram is a log[OIII] λ5007/Hβ vs. log[NII] λ6584/Hα plot that conveniently separates AGN from Star Forming (SF) galaxies, composites, and ambiguous objects, all of which are contained in our data set. log[OIII] λ5007/Hβ is a hydrogen density and ionization sensitive line ratio, and log[NII] λ6584/Hα is primarily sensitive to ionization. We used this log[NII] λ6584/Hα ratio again when we separate our galaxies by temperature, in a log[OIII] λ5007/4363 vs. log[NII] λ6584/Hα plot. This neatly categorizes our galaxies by their temperature, as 5007/4363 is a temperature sensitive emission line ratio. The high temperature outliers in our data set are apparent in this temperature plot, and we use it to compare with our simulations and check the temperature of our simulations. By comparing different iterations of simulations with these plots of our data set we are able to see the effects of changing different parameters, which helps us decide how to adjust our simulations. These plots also ensure that we are using realistic values of our parameters, and likely observed conditions, by showing us whether our simulations match our data.

**References**

BPT

Kewley

Cloudy

SDSS

Richardson 2014

Komossa & Schulz

Zhang, Liang Hammer