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Affiliation: University of Michigan-Flint

Rajib Ganguly

Reverse Engineering the Fine Dining Needs of Black Hole Divas

Abstract

Among the strategic goals of this decade of astrophysics, we are interested in understanding the role that accretion onto and growth of supermassive black holes (so-called quasars) play in the evolution of galaxies. A crucial aspect of this is having a complete picture of the structure of quasars and their host galaxies. Within this context, we are interested in resonant ultraviolet absorption lines that appear in the spectra of quasars. This regime is useful as the lines arise from a wide variety of ionization species and current technology allows for high dispersion spectra with resolutions down to $<$10 km/s. This is essential for being able to understand the detailed kinematics of the absorbing gas and the column densities of different ions which then allow for robust determinations of ionization structure and physical properties.

These absorption features arise in a wide range of velocity dispersions from $<$500 km/s to ~30,000 km/s and velocity separations up to 0.2c. The broad end of the distribution is readily explained by an outflow that is driven off a disk of accreting material. However, the narrow end of this distribution is comparable to the velocity dispersion of stars in galaxies and many of these lines are indeed due to intervening structures that are unrelated to either the quasar or host galaxy. However, a subset does correlate with quasar properties and hence is likely to be part of the overall structure. Furthermore, an important subset of these narrow absorption lines (NALs) are those that appear near the quasar redshift (so-called associated absorbers or AALs). The lack of redshift separation precludes significant cosmological separations. In this talk, I will review the state of research into AALs, what we think we know, how we think we know it, and what we don't know.