Detecting Ultra-fast Outflows in Active Galactic Nuclei

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By observing the centers of galaxies, we find Supermassive Black Holes (SMBHs). As the SMBH accretes material such as gas, dust, and stars, the galaxy is said to be “active” and contains an Active Galactic Nucleus (AGN). A 2010 paper by Tombesi et al. reports evidence for blue-shifted absorption features in the spectra of 35% of the studied sample of AGN. These blue-shifted features can be explained by the presence of a highly ionized wind of material being expelled from the AGN. These winds are deemed Ultra-Fast Outflows (UFOs). The presence of a UFO can affect star formation in the host galaxy, and therefore how it evolves over time, and various other properties. The presence of a wind or jet has also been shown to affect the properties of neighbouring galaxies such as those in a cluster. Analyzing the significance of these spectral features is therefore vital to how we understand the physical phenomena around AGN as well as the life and evolution of galaxies. A new methodology is presented for measuring the statistical significance of spectral features. We find that in many cases the detection of a significant UFO feature may be model and binning dependant, and also influenced by other factors during the data simulation and analysis process.