UV (spectro)polarimetry of quasars

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The far and mid-ultraviolet polarization of active galactic nuclei (AGN) is largely an uncharted territory.

Only two missions were equipped with far/mid-ultraviolet (UV) polarimeters in the past. The first one was WUPPE, the Wisconsin Ultraviolet Photo-Polarimeter Experiment that was a pioneering effort to explore polarization and photometry at UV wavelengths (1400 – 3300 Angs). It flew twice on board of american space shuttles on December 2 – 11, 1990 and on March 2 – 18, 1995. In total, WUPPE-1 and WUPPE-2 obtained UV spectropolarimetry for only 2 radio-quiet AGN, 2 radio-loud AGN and 1 BL Lac object. The second mission with mid-UV polarimetric capabilities was the Hubble Space Telescope (HST). Two instruments on board HST allowed optical, near- and mid-UV polarimetry: the Faint Object Camera (FOC) and the Faint Object Spectrograph (FOS). Both instruments were among the four original axial instruments on board HST and they were designed to take observations from 1150 to 6500 Angs. The FOS was removed from HST during the Second Servicing Mission in February 1997, and the FOC during Servicing Mission 3B in March 2002 after observing a few dozens of AGNs.

Both WUPPE and HST polarimetric observations brought important results in the field of AGN. They were, however, restricted to low-resolution capabilities (FOS linewidths 1.89 – 1.97 Angs, for a 3.7” x 1.3” and 0.26” aperture, respectively) and did not reach wavelengths below 1150 Angs. This is unfortunate, because polarization induced by scattering on small dust grains rises steeply into the blue (1200 – 3600 Angs). Moreover, contamination by the background starlight of AGN host galaxies is about three orders of magnitude lower at 0.1 μm than at 1 μm (for spiral galaxies). Hence, the contrast of polarimetric observations is expected to increase significantly from longer to shorter wavelengths, leaving today a vast new parameter space to be explored by a new high-resolution UV spectropolarimeter.

In this presentation, I will review what discoveries are expected from UV (spectro)polarimetry of quasars with a future instrument, ideally situated in space to reach the far and mid-UV wavebands.