Studying the X-ray/UV Variability of Active Galactic Nuclei with data from Swift and XMM archives

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21st July 2009

Abstract

Active Galactic Nuclei (AGNs) show flux variations over the entire electromagnetic spectrum. Indeed, variability was one of the first recognized properties of quasars. The variations appear to be aperiodic and have variable amplitude. At a fundamental level, the physical origin of variations is not known, although in the optical band they are believed to be produced by accretion-disk instabilities.

Rapid X-ray variability is a hallmark of AGNs. X-rays are expected to arise in a hot corona near the event horizon of the black hole, so X-ray variability could be an useful tool to constrain the nuclear regions of AGNs. We used archival data from the Swift and XMM serendipitous source catalogs to perform a study of the ensemble X-ray variability of a sample of quasars with optical spectra in the Sloan Digital Sky Survey. We used a structure function (SF) analysis to express a curve of growth of variability with time lag. The index of the power law portion of the SF contains important information on the variability mechanism and could be used to put constraints on emission models.

Moreover, it is known that UV and X-ray luminosities of quasars are correlated and recent studies quantified this relation across 5 orders of magnitude. Such studies inform ongoing efforts to understand the structure and the physics of quasars nuclear regions, providing constraints on models of physical associations between UV and X-ray emissions. Because UV photons are generally thought to be radiated from the accretion disk while X-rays are produced in the disk corona, the UV/X-ray luminosity relation is an indication of the balance between accretion disks and their coronae. In this context, we present here some preliminary results on the X-ray/UV relation from simultaneous observations in UV and X-ray bands of a sample of quasars with data from XMM archive.