



Complex Optical/UV to X-ray spectral variability of 1H 0419–577

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Abstract. We study simultaneously observed X-ray and UV/Optical emission using seven archival XMM-Newton observations of Seyfert 1.5 1H 0419–577. All observations show strong soft X-ray excess below 2 keV, moderate broad Fe-K α and variable UV/Optical emission. We find strong correlation between X-ray and UV/Optical emission. We also find increasing fractional RMS variability amplitude (f_{rms}) towards higher energies. The estimated light-crossing timescale for UV to Optical emission is about few days to a week, respectively. The results thus suggest that the complex UV/Optical variability is possibly due to either X-ray reprocessing or Comptonization of the disc seed photons.

Keywords : galaxies: active, galaxies: Seyfert, galaxies: nuclei, X-rays: galaxies, galaxies: disc

1. Introduction

1H 0419–577 is a radio-quiet AGN at a redshift $z = 0.104$ and it is optically classified as a broad-line, UV bright and highly X-ray variable Seyfert 1.5 galaxy (Brissenden et al., 1987; Grupe, 1996; Marshall et al., 1995; Pal and Dewangan, 2013). This object has shown variable UV/Optical emission during 2000-2003. The origin of UV/Optical variability is not clearly understood. Though this can be described by various ways, for example, the variations associated to the accretion flow, X-ray reprocessing in the accretion disc, Comptonization in different regions of accretion disc, absorption or extinction due to intervening medium. Here we investigate the relationship between Optical/UV emission and X-ray emission using simultaneous Optical/UV and X-ray data.

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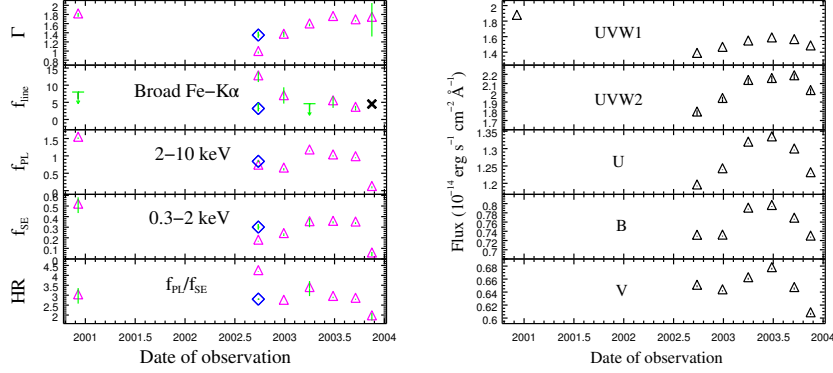


Figure 1 The symbols- triangles : X-rays (left panel) and UV/Optical (right panel); cross sign : no possible detection. The units of flux components are 10^{-11} ergs s^{-1} cm^{-2} for X-ray. The iron line flux is shown in units of 10^{-6} photon s^{-1} cm^{-2} . Sky blue points (diamond) are plotted when spectrum was modified by partial covering absorption in observation corresponding to revolution number 512. All error bars are displayed with 1σ error.

2. Results and discussion

We analyzed seven archival *XMM-Newton* observations (revolution number– 181, 512, 558, 605, 649, 690, 720) which consists of simultaneous X-ray data from EPIC instrument as well as UV/Optical data from Optical Monitor on-board *XMM-Newton*. We followed standard data reduction procedure using the Science Analysis System (SAS v14.0). We modeled the 0.3–10 keV band by a single or multiple blackbody for soft excess (SE), Laor model for Fe-K α and a powerlaw (PL) model. The derived X-ray, UV and Optical fluxes are correlated to each other as clearly seen Fig. 1. These fluxes show increasing f_{rms} towards lower wavelength from Optical to X-rays in the range $3.6(\pm 0.1)$ – $50.3(\pm 1.0)\%$. The light crossing timescale for UV to Optical emission is about few days to a week, respectively. These results thus imply that the UV/Optical variability is caused possibly due to either variations in X-ray reprocessing or Comptonization of disc seed photons.

References

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