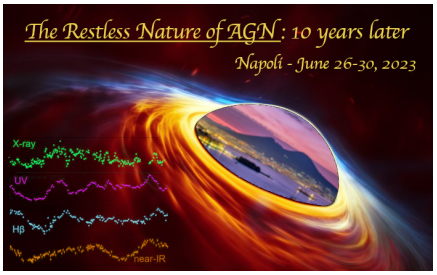

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Investigation of a small flaring event in NLS1 galaxy NGC 4051

A detailed broadband spectral and timing analysis of a small flaring event of a120 ks in a narrow-line Seyfert 1 galaxy NGC 4051 using simultaneous XMM-Newton and NuSTAR observations has been performed. The ˜300 ks long NuSTAR observation and the overlapping XMM-Newton exposure were segregated into pre-flare, flare and post-flare segments. We found that during the flare, the NuSTAR count rate peaked at 2.5 times the mean count rate before the flare. We explored the variation of X-ray emission in different time scales using various phenomenological and physical models. The 0.3-50 keV X-ray spectrum of the source can be described by a composite model consisting of a primary continuum, reprocessed emission, warm absorber and ultra-fast outflows. From the spectral analysis, we found that the reflection fraction drops significantly during the flare, accompanied by the increase in the coronal height to ˜12.2 Rg from ˜9.6 Rg (during the pre-flare phase) above the disc. The spectrum became softer during the flare supporting the “softer when brighter” nature of the source. After the alleviation of the flare, the coronal height drops to ˜7.4 Rg and the corona heats up to the temperature of 228 keV. This indicates that there could be inflation of the corona during the flare. We did not find any significant change in the inner accretion disc or the seed photon temperature. These results suggest that the flaring event occurred due to the change in the coronal properties rather than any notable change in the accretion disc.

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