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X-ray variability plane revisited: Role of obscuration

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Scaling relations are the most powerful astrophysical tools to set constraints to the physical mechanisms of astronomical sources and to infer properties for objects where they cannot be accessed directly. We have re-investigated one of these scaling relations using powerful type 1 Seyferts; the so-called X-ray variability plane (or mass-luminosity-timescale relation, McHardy et al. 2006). This relation links the power-spectral density (PSD) break frequency with the SMBH mass and the bolometric luminosity. We used all available XMM-Newton observations to study the PSD and spectra in short segments within each observation. This allows us to report for the first time that the PSD break frequency varies for each object, showing variations in 19 out of the 22 AGN analyzed. Our analysis of the variability plane confirms the relation between the break frequency and the SMBH mass and finds that the obscuration along the line of sight (or the variations on the obscuration using its standard deviation) is also a required parameter. We constrain a new variability plane of the form: $log(\nu_{Break}) = -Alog(M_{BH}) + Blog(N_H) - C$ (or $log(\nu_{Break}) = -Alog(M_{BH}) + B\Delta(N_H) + C$). The X-ray variability plane found by McHardy et al. (2006) is roughly recovered when we use unobscured segments. We speculate the PSD shape is related with the outflowing wind close to the accretion disk at least for these powerful type 1 AGN (Gonzalez-Martin 2018).

Topic

Active Galactic Nuclei: accretion physics and evolution across cosmic time

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