S27a Does the mid-infrared–hard X-ray luminosity relation for active galactic nuclei depend on Eddington ratio?

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We revisit the correlation between the mid-infrared (6 μm) and hard X-ray (2–10 keV) luminosities of active galactic nuclei (AGNs) to understand the physics behind it. We construct an X-ray flux-limited sample of 571 type 1 AGNs drawn from the *ROSAT* Bright Survey catalog. Cross-matching the sample with infrared data taken from *WISE*, we investigate the relation between the rest-frame 6 μm luminosity (L_6) and the rest-frame 2–10 keV luminosity ($L_{\rm X}$), where L_6 is corrected for the contamination of host galaxies by using the SED fitting technique. We confirm that L_6 and $L_{\rm X}$ are correlated over four orders of magnitude, in the range of $L_{\rm X} = 10^{42-46}$ erg s^{-1}. We investigate what kinds of physical parameters regulate this correlation. We find that $L_{\rm X}/L_6$ crelary depends on the Eddington ratio ($\lambda_{\rm Edd}$) as $\log \lambda_{\rm Edd} = -(0.56 \pm 0.10) \log (L_{\rm X}/L_6) - (1.07 \pm 0.05)$, even taking into account quasars that are undetected by *ROSAT* as well as those detected by *XMM-Newton* in the literature. We also add hyper-luminous quasars with $L_6 > 10^{46}$ erg s^{-1} in the literature and perform a correlation analysis. The resultant correlation coefficient is -0.41 ± 0.07, indicating a moderately tight correlation between $L_{\rm X}/L_6$ and $\lambda_{\rm Edd}$. This means that AGNs with high Eddington ratios tend to have lower X-ray luminosities with respect to the mid-infrared luminosities. This dependence can be interpreted as a change in the structure of the accretion flow. (Toba et al. 2018, MNRAS, submitted).