S08a Disk–Jet Connection in Active Supermassive Black Holes

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We report our study on the disk-jet connection in supermassive black holes by investigating the properties of their optical and radio emissions. We use the SDSS-DR7 and the NVSS catalogs. Our sample contains 8461 quasars with detection both at 1.4 GHz and SDSS optical spectrum. Based on SDSS datasets, we have an information of virial masses of their central galactic black holes. Using this sample, we investigate the correlation among the jet power ($P_{\rm jet}$), the bolometric disk luminosity ($L_{\rm disk}$), and the black hole mass ($M_{\rm BH}$). We find that the jet powers correlate with the bolometric disk luminosities as $\log P_{\rm jet} = \log L_{\rm disk} + (-0.81 \pm 6.2 \times 10^{-3})$. This suggests that the jet production efficiency of $\eta_{\rm jet} \simeq 7.1^{+25.3}_{-5.5} \times 10^{-3}$ assuming the disk radiative efficiency of 0.1 implying low black hole spin parameters and/or low magnetic flux for radio selected quasars. But it can be also due to dependence of the efficiency on geometrical thickness of the accretion flow which for quasars accreting at the disk Eddington ratios $0.01 \lesssim \lambda \lesssim 0.3$ is expected to be small. We also investigate the fundamental plane of our samples among $P_{\rm jet}$, $L_{\rm disk}$, and $M_{\rm BH}$. Although the fundamental plane can be given by $\log P_{\rm jet} = (9.1 \pm 0.54) + (0.79 \pm 1.3 \times 10^{-2}) \log L_{\rm disk} + (-0.038 \pm 1.5 \times 10^{-2}) \log M_{\rm BH}$, we could not find a statistically significant correlation between $M_{\rm BH}$ and $P_{\rm jet}$. We further investigate the relation between λ and the radio loudness R. As previously discussed, there is a weak negative correlation between λ and R with the correlation coefficient of -0.18.