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REFINING BLACK HOLE MASS ESTIMATES IN TYPE 1 AGN: DEPENDENCE ON Hβ LINE PROPERTIES

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Active Galactic Nuclei (AGN) are compact regions at the centers of active galaxies that exhibit a pronounced excess in luminosity, typically attributed to the accretion of gas onto a central supermassive black hole (SMBH). Reliable estimates of SMBH masses are essential for understanding both AGN physics and galaxy evolution. In this study, we explore the robustness of black hole mass estimates derived from the broad Hβ emission line in Type 1 AGN spectra, using a sample from the Sloan Digital Sky Survey (SDSS). We compare these virial mass estimates with stellar velocity dispersion (σ_*) as an independent tracer of supermassive black hole mass. Our analysis reveals that the correlation between Hβ-based masses and σ_* significantly improves in specific spectral sub-samples, namely those with broader Hβ profiles, red-ward asymmetry, high continuum luminosity, and no evident signatures of outflows. These results indicate that, in AGN exhibiting such spectral characteristics, the Hβ line can serve as a more reliable virial mass estimator. This has important implications for the selection of AGN sub-populations in future spectroscopic surveys and for refining empirical scaling relations used in SMBH mass determinations.