

BASS XXXV. The $M_{\text{BH}} - \sigma_*$ Relation of 105-Month Swift-BAT Type 1 AGNs

Wednesday, 17 May 2023 13:15 (1 minute)

We present two independent measurements of stellar velocity dispersions (σ_*) from the Ca H K & Mg I region (388–555 nm) and the Calcium Triplet region (CaT, 835–875 nm) for 173 hard X-ray selected Type 1 AGNs from 105-month Swift-BAT catalog. We construct one of the largest samples of local Type 1 AGNs that have both single-epoch (SE), ‘virial’ black hole mass (M_{BH}) estimates and σ_* measurements obtained from high-resolution data, allowing test various aspects of the usage of such methods for supermassive black hole studies. We report that two independent σ_* measurements are highly consistent with each other, with an average offset of merely 0.002 ± 0.001 dex. Comparing M_{BH} estimates based on broad emission lines and on stellar absorption features (coupled with the $M_{\text{BH}} - \sigma_*$ relation), we find that the former is systematically lower, by ≈ 0.12 dex on average than the latter. Consequently, Eddington ratios estimated through these M_{BH} determinations are similarly biased (but in the opposite way). We argue that the discrepancy is driven by extinction in the broad-line region (BLR). We also find an anti-correlation between the offset from the $M_{\text{BH}} - \sigma_*$ relation and the Eddington ratio. Our sample of Type 1 AGNs shows a shallower $M_{\text{BH}} - \sigma_*$ relation (a power law exponent of ≈ 3.5) compared with that of inactive galaxies, confirming earlier results obtained from smaller samples.

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Session Classification: Poster Prizes & closing