Extending the CO-based Comparison of Blazar Host Galaxies to z = 0-2.5

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Blazars are radio-loud active galactic nuclei with relativistic jets aligned close to our line of sight. They provide strong probes of jet physics and high-energy emission processes. Their host galaxies, however, remain less well characterized. Constraining molecular gas in blazar hosts can clarify the links among cold gas reservoirs, black hole accretion, and host galaxy evolution. In this work, we compile CO observations of blazars and related radio-loud AGN from archival products, including the ALMA Radio-source Catalogue of Audibert et al. (2022), by comparing them with published CO surveys of other AGN hosts. The compilation contains 57 blazars, an increase of 54 objects over the earlier pilot sample, among them 11 are detected in CO. To limit redshift mixing, we analyze three intervals: $z<0.05$ (4 blazars), $0.05<z<1$ (30 blazars), and $1<z<2.6$ (23 blazars).

Our preliminary results provide no clear evidence that blazars constitute a distinct population in molecular gas content. Their detections and upper limits overlap those of radio galaxies, quasars, other AGN hosts, and star-forming galaxies, suggesting that host galaxy properties and cosmic epoch may be more important than blazar classification. BL Lac objects and flat-spectrum radio quasars substantially overlap at $z<1$, whereas flat-spectrum radio quasars extend to higher molecular gas masses at $1<z<2.6$. This may indicate that flat-spectrum radio quasars preferentially inhabit gas richer systems with stronger accretion and star formation, while BL Lac objects represent a more evolved, gas poor phase. However, this interpretation remains tentative because of the small high-redshift BL Lac sample, mismatched redshift distributions, selection effects, and the large number of upper limits. A substantially larger and more uniformly selected sample, particularly of high-redshift BL Lac objects, is required to determine whether the apparent difference is intrinsic.