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Magnetized disc-outflow symbiosis to unify blazar classification: FSRQ/BL Lac dichotomy

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The Fermi blazar observations show a strong correlation between γ -ray luminosities and spectral indices. BL Lac objects are less luminous with harder spectra than flat-spectrum radio quasars (FSRQs). Interestingly FSRQs are evident to exhibit a Keplerian disc component along with a powerful jet. We compute the intrinsic jet luminosities by beaming corrections determined by different cooling mechanisms. Observed γ -ray luminosities and spectroscopic measurements of broad emission lines suggest a correlation between the accretion disc luminosity and the intrinsic jet luminosity. Also, theoretical and observational inferences for these jetted sources indicate a signature of hot advective accretion flow and a dynamically dominant magnetic field at jet-footprint. Indeed it is difficult to imagine the powerful jet launching from a geometrically thin Keplerian disc. We propose a magnetized, advective disc-outflow symbiosis with explicit cooling to address a unified classification of blazars by controlling both the mass accretion rate and magnetic field strength. The large-scale strong magnetic fields influence the accretion dynamics, remove angular momentum from the infalling matter, help in the formation of strong outflows/jets, and lead to synchrotron emissions simultaneously. We suggest that the BL Lacs are more optically thin and magnetically dominated than FSRQs at the jet footprint to explain their intrinsic γ -ray luminosities.

References

- [1] Mondal T., Mukhopadhyay B., MNRAS, 495, 350 (2020)
- [2] Mondal T., Mukhopadhyay B., MNRAS, 486, 3465 (2019)

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