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Constraining the limiting brightness temperature and Doppler factors for the largest sample of radio bright blazars

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Relativistic effects dominate the emission of blazar jets complicating our understanding of their intrinsic properties. Although many methods have been proposed to account for them, the variability Doppler factor method has been shown to describe the blazar populations best. We use a Bayesian hierarchical code called Magnetron to model the light curves of 973 sources observed by the Owens Valley Radio Observatory's 40-m telescope as a series of flares with an exponential rise and decay, and estimate their variability brightness temperature. Our analysis allows us to place the most stringent constraints on the equipartition brightness temperature i.e., the maximum achieved intrinsic brightness temperature in beamed sources which we found to be $\langle \mathrm{T_{eq}} \rangle = 2.78 \times 10^{11}\mathrm{K} \pm 26\%$. Using our findings we estimated the variability Doppler factor for the largest sample of blazars increasing the number of available estimates in the literature by almost an order of magnitude. Our results clearly show that γ-ray loud sources have faster and higher amplitude flares than γ-ray quiet sources. As a consequence they show higher variability brightness temperatures and thus are more relativistically beamed, with all of the above suggesting a strong connection between the radio flaring properties of the jet and γ-ray emission.

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