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# Multi-wavelength studies of blazars

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To provide a detailed understanding of blazar and its environment, we study variability over diverse timescales using various statistical methods. As optical flux variations in blazars are often followed by spectral changes, thus we examine their colour –magnitude relationship on diverse timescales which helps us to understand the origin of variability. Presence or absence of correlation among multiple frequencies, variability timescales or a quasi-periodic oscillation can be used to constraint the size of the emitting region and also derive black hole mass. For this, we have developed a suite of time series analysis techniques namely, Structure Function, Discrete Correlation Function, Lomb-Scargle periodogram, Wavelet analysis and Power Spectral Density which we apply to analyze blazar light curves. Further, to study the core-jet morphology of blazars, we develop a piecewise Gaussian fit analysis technique. Using this, we are able to find spectral indices, time lags, core position offset, core radius, mean magnetic field strength, and other jet parameters. In essence, we explore complex phenomena governing blazars through the analysis of observational data and its applications using various theoretical models which further helps us to understand the physics of the inner regions of blazars.

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