

A toy multi-zone model for multi-wavelength emission of blazars

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In this work, we develop a self-consistent multi-zone model to describe the time-dependent multi-wavelength emission of blazars. Based on Very Long Baseline Array observations of M 87 jet, we speculate and assume that numerous discrete emission zones throughout the jet of a blazar. We model the temporal evolution of the electron spectrum in each emission zone taking into account the injection, cooling and escape of relativistic electrons. By doing so, we are able to calculate the multi-wavelength light curve of each emission zone. The observed emission of a blazar is then the superposition of the emission from all discrete emission zones. This model can reproduce some observational phenomena of blazars, such as the flat radio spectra, Gaia-VLBI downstream offset, and the minute-scale gamma-ray variability, which are difficult to explain under the conventional one-zone models.

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