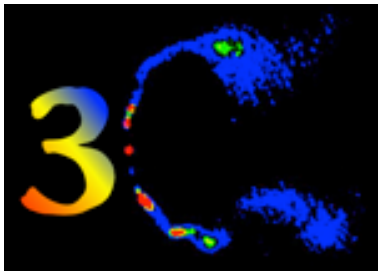

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Exploring the Dominant Gamma-Ray Emission Mechanism using Multiwavelength Variability Analysis. Case Study: 3C 279

Friday, 20 September 2019 10:10 (20 minutes)

In this contribution, I will present the results of a paper on the Flat Spectrum Radio Quasar 3C 279. We use light curves that cover a time-frame of six years, at different wavelengths: Gamma-rays, X-rays, UV 3000 Å continuum, optical V band, Near-Infrared (NIR) JHK bands, 1mm, as well as optical spectropolarimetry. By applying cross-correlation analysis, We find that the UV continuum, optical, and NIR bands are correlated with delay zero. This correlation suggests that the emission regions are co-spatial. We also find a correlation between the UV continuum and the 1mm emission, implying that the dominant emission mechanism is synchrotron, and therefore the same is true for the optical and NIR. This is supported by the high optical polarization degree observed. Based on the behaviour of the gamma-ray light curve, we identified three different activity periods (A, B, and C), and we repeated the cross-correlations between the different light curves, on each different period. The results for activity period A suggest that the gamma-ray emission is dominated by Synchrotron Self-Compton. The results for activity period C imply that External Inverse Compton is the dominant gamma-ray emission mechanism. Meanwhile, activity period B shows flares in all bands, with the exception of the gamma-rays which appear to not have any significant activity on this period. We propose that the lack of gamma-ray activity during period B is caused by an increase in the electron-positron pair production. In order to test this, we developed an analytical model to calculate the interaction cross-sections for both, inverse Compton scattering and electron-positron pair production. Our results state that an increase in Lorentz factor can cause the pair production cross- section to increase at higher rates than the inverse Compton. This makes our theory plausible. This is the first time that observational proof has been published, that the dominant gamma-ray emission mechanism in blazars changes with time.

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Session Classification: Quasars and Blazars: the heritage of 3C273, 3C279, and 3C454.3