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Long term multi-wavelength analysis of the Flat Spectrum Radio Quasar OP 313

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The flat spectrum radio quasar OP 313 showed extremely intense γ-ray activity from November 2023 to March 2024, as observed by the Large Area Telescope on board the Fermi Gamma-ray Space Telescope. This initiated a large number of follow-up campaigns at all wavelengths, resulting in a confirmation of the increase of the source activity from the radio to very high energy (VHE) bands. Remarkably, it also led to the first detection of the VHE emission from OP 313 by the Large-Sized Telescope (LST-1) of the Cherennkov Telescope Array Observatory at La Palma and it is also the most distant Active Galactic Nuclei detected at these energies.

We present a multi-wavelength analysis covering 15 years of Fermi-LAT observations, from August 2008 to March 2024. From the Fermi-LAT study of the 15-year light curve, we identify different periods of activity states of the source: one quiescent and two flaring states, soft and hard, that can be compared with the data available from other instruments. In our study, we include X-ray, optical, and radio data collected by Swift Gamma Ray Burst Explorer, the Nordic Optical Telescope, and the Medicina radio telescope. We also make use of public datasets from the FERMI-GST AGN Multi-frequency Monitoring Alliance (F-GAMMA) and the and the Very Long Baseline Interferometry (VLBI) projects Monitoring Of Jets in Active Galactic nuclei with VLBA Experiments (MOJAVE) and VLBA Boston University Blazar. Using this wide multi-wavelength dataset, we want to show that the hard flares are produced outside the broad-line region allowing the relativistic electrons to be accelerated to higher energies. This approach helps us to understand the mechanisms involved in particle acceleration inside the jet, and how radiation in different wavelengths is connected in OP 313.

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