XIV Serbian Conference on Spectral Line Shapes in Astrophysics
Bajina Bašta, Serbia, June 19 - 23, 2023
Book of Abstracts, Eds. Luka Č. Popović, Nataša Bon, Edi Bon and Sylvie Sahal-Bréchot

EXPLORING THE JET-BLR CONNECTION: FLARE-INDUCED VARIABILITY IN THE OPTICAL EMISSION LINES

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Relativistic jets are among the most important players in the feedback processes between active galactic nuclei (AGN) and their host galaxies. By propagating through the interstellar medium, they can transfer part of their energy into the gas and heating it up, or produce compression shocks that eventually induce star formation. In a few cases, during relativistic jets' flares, the innermost part of the AGN seems to be affected. The broad-line region (BLR), indeed, can respond to the flares, by increasing (or decreasing) the line luminosity. To date, only a handful of sources have shown this behavior, mostly powerful flat-spectrum radio quasars, such as CTA 102, 3C 454.3, and 3C 345. Howeve, this phenomenon was recently observed for the first time in a jetted narrow-line Seyfert 1 galaxy, PKS 2004-447. The source underwent a gamma-ray flare in 2019, which altered the BLR and produced a flux excess redshifted by 250 km/s, and observed by the X-shooter instrument in the Balmer, Paschen, and He I permitted lines. This new emission feature was no longer visible 1.5 years later, suggesting a causal connection with the flare. The emission lines coming from the same atomic transition series show a similar velocity offset for this "red excess", but the offset changes for different line series. This discovery suggests that the relativistic jet can affect the physics of the BLR in all classes of jetted AGN, and that flaring activity can lead to the formation of additional and localized broad emission components. Our results highlight the importance of optical spectroscopy for flaring jetted AGN, and that our understanding of the jet-BLR -connection is still very limited.