Optical spectropolarimetric behaviour of a selection of blazars

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Introduction

The spectral energy distributions (SEDs) of blazars display two broad, non-thermal components. At optical wavelengths, there is an underlying thermal component originating from the accretion disc, broad-line region, dusty torus, and host galaxy itself [1].

By combining optical spectropolarimetry and photometric information of blazars, we can disentangle the thermal (non-polarised) contribution from the non-thermal (polarised) contribution. In doing so, we can better understand the behaviour of blazars, as well as place constraints on SED- and jet-model parameters.

We present spectropolarimetry observations of a selection of blazars, coupled with optical- and gamma-ray photometric data. From this, we can investigate a) the change in the degree of polarisation from quiescent to active states, b) the evolution of the polarisation over time, and c) the overall behaviour of BL Lacs (BLLs) and Flat-Spectrum Radio Quasars (FSRQs).

Observing Campaign

Spectropolarimetry: Performed with the Southern African Large Telescope, using the Robert Stobie Spectrograph [2,3] (PG0300, with resolution R=170 – 530, or PG0900, R=670 – 1040). Data was reduced using IRAF and the polsalt pipeline [4].

Optical photometry: Taken with the LCO Telescope Network.

Gamma-ray: Light curves were taken from the Fermi Light Curve Repository (LCR) [5].

Discussion and Conclusions

Figure 1 shows the average degree of polarisation (3700Å – 9100Å) for the 18 blazars in this study. The sample consists of 8 BLLs and 10 FSRQs. For both the BLL and FSRQ samples, the degree of polarisation remained mostly below 10%.

Figures 2 and 3 are representative of the observations performed. These sources were observed for ~1 year to compare the behaviour of polarisation in BLLs and FSRQs. The BLL (AP Lib), has a smaller spread in the variability of the degree of polarisation (~4%) than the FSRQ (PKS 1034-293, ~10%).

The data collected in this study will be used in SED-modelling to aide in disentangling the emission components of blazar-emission, and constraining the jet-magnetic field and black-hole mass [6].

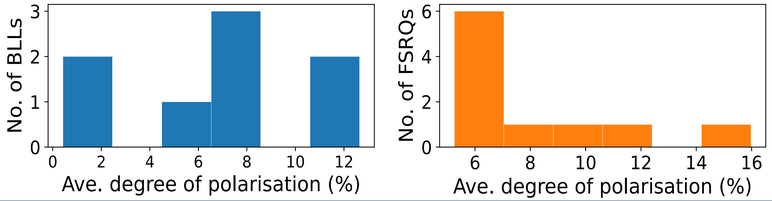

Figure 1: Distribution of the average degree of polarisation in both the BLLs and FSRQs.

BLL: AP Librae

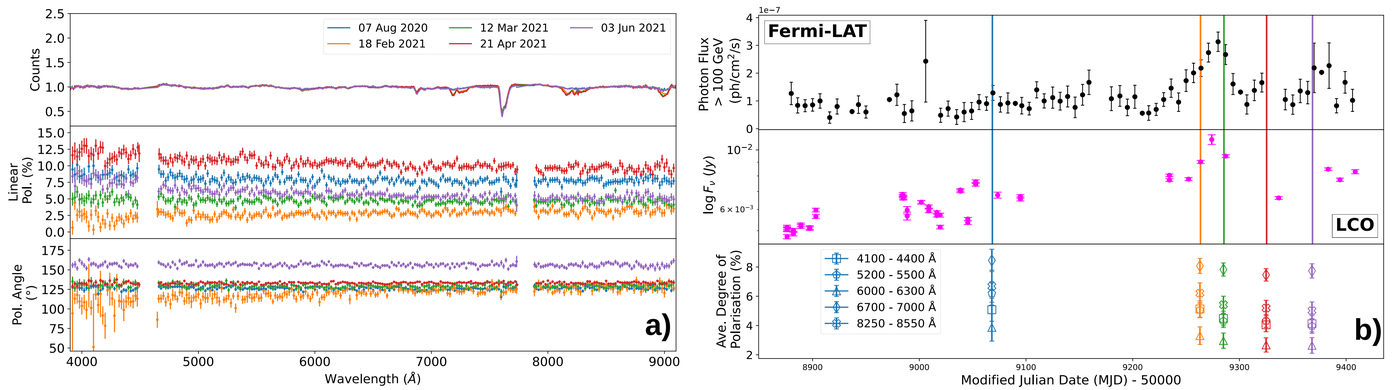

Figure 2: a) The spectra, degree of polarisation and polarisation angle of AP Lib, taken on five different days. b) The gamma-ray and optical lightcurves of AP Lib, coupled with the average degree of polarisation in five different wavelength bands for each of the five SALT observations.

FSRQ: PKS 1034-293

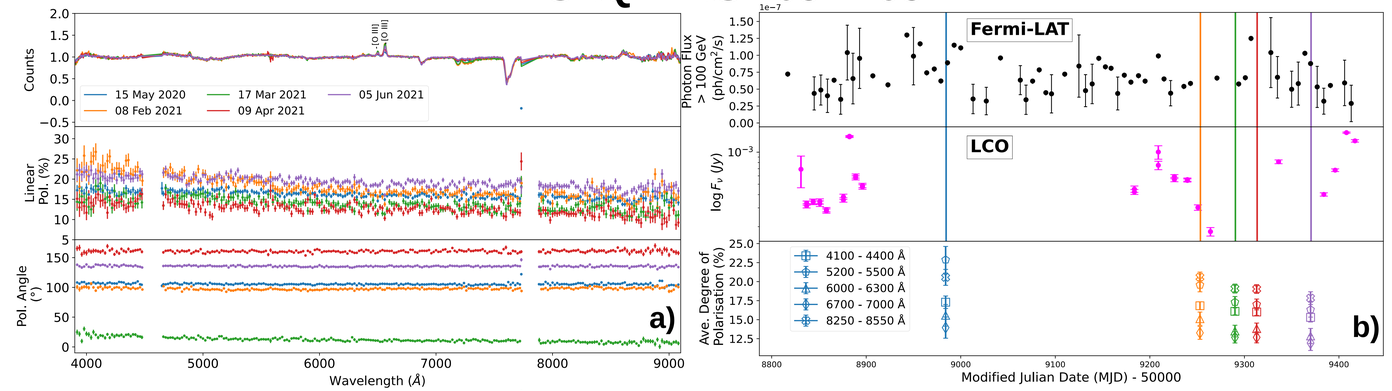

Figure 3: a) The spectra, degree of polarisation and polarisation angle of PKS 1034-293, taken on five different days. b) The gamma-ray and optical lightcurves of PKS 1034-293, coupled with the average degree of polarisation in five different wavelength bands for each of the five SALT observations.

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The observations from the LCO network was taken under a dedicated transient program (PI: B. van Soelen).
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References

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