THE INTRANIGHT VARIABILITY OF OPTICAL POLARIZATION IN PKS 0109+224

L. VALTAOJA
Nordita, Blegdamsvej 17, DK-2100 Copenhagen, Denmark

Abstract. It is found that the statistics of the photopolarimetric intraday data of PKS 0109+224 do not favor the shocked jet scenario as an explanation for intranight variability in this source.

Here we consider the optical variability of PKS 0109+224, which has both flux and polarization varying in different timescales including intranight variations. We have obtained truly simultaneous UBVRI-photopolarimetric observations with Nordic Optical Telescope (NOT). The data includes four long integrations (between 17th and 20th September 1991), which allow us to study the intranight phenomena.

In the optical bands the microvariability seems to be intrinsic. There are basically three kinds of mechanisms to produce it. The models based on phenomena in the accretion disks are difficult to compare with the observations. The so-called Christmas tree models are testable by looking at the correlations between the changes in the Stokes parameters at different colors. (We are working on that.) The shocked jet models are also able to produce short timescale variations. The shock scenario gives us some statistical predictions, which we compare here with the observations.

The polarization (P), the position angle (PA) and the flux vary considerably during a single night, and even the character of the frequency dependence of the polarization (FDP) changes during the night. Statistical analysis of our data gives following results. 1) The observed quantities in different colors (UBVRI) are highly correlated. 2) The degree of polarization and the total flux are only weakly correlated. 3) The changes in the total flux do not correlate with the changes in polarized flux. 4) The strength of FDP does not correlate with P, PA or flux. 5) Largest changes in PA occur at minimum P.

According to the shock scenarios one would expect the total flux and the degree of polarization to depend on each other. In the long timescale data this seems to be the case, but not in the intranight data (2). In addition the appearance of the more polarized shock should cause the changes of total flux to correlate with changes of polarized flux, which was not the case (3), again contrary to the behaviour seen in the long timescale observations. Neither does the non-existing correlation between the stregth of the FDP and the polarization support the shocked jet model (4). Thus, unlike for the long timescale data, the statistical information does not seem to favor the growth and decay of shocks in the jet as a reason for the microvariability. For more details see L. Valtaoja et al., AJ, in press (1993).

T. J.-L. Courvoisier and A. Blecha: Multi-Wavelength Continuum Emission of AGN, 474.