

A comparative study of the intra-night optical variability of powerful AGNs

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Abstract. In order to address a currently much debated issue, we are carrying out a systematic search for intra-night optical micro-variability in major classes of powerful ($M_v \geq -23.0$ mag) active galactic nuclei (AGNs). Our sample includes 7 sets of AGNs, covering narrow redshift bins across the range $0.18 \leq z \leq 2.2$. Each set consists of a radio-quiet quasar, a radio lobe-dominated quasar, a BL Lac object and/or a radio core-dominated quasar (blazar), all having $m_v \sim 16$ mag. The observations were made primarily using the 104-cm telescope of State Observatory, Nainital. The monitoring completed so far (~ 90 nights) clearly indicates that, compared to the other AGN types, BL Lacs are distinctly more prone to exhibit intra-night optical variations.

Keywords : Photometry - AGN - QSOs-variability

1. Introduction

Major classes of powerful AGNs include radio-quiet quasars (RQQSOs), radio-loud quasars (RLQSOs) and BL Lac objects. The relationship between the radio-loud and radio-quiet AGNs is still a major puzzle. To obtain observational clues on this basic question, we are carrying out a systematic comparison of the intra-night optical variability of these AGN classes. This can provide useful clues on the conditions and physical structure within the innermost ~ 1 light-day of the central engine of the AGN (accretion disk plus any non-thermal relativistic micro-jet), which is entirely beyond the reach of any imaging telescopes. Our observations are also expected to provide a straightforward test of the two competing classes of theoretical models (jet or accretion disk based) that have been proposed so far to explain the optical micro-variability of powerful AGNs, taking such

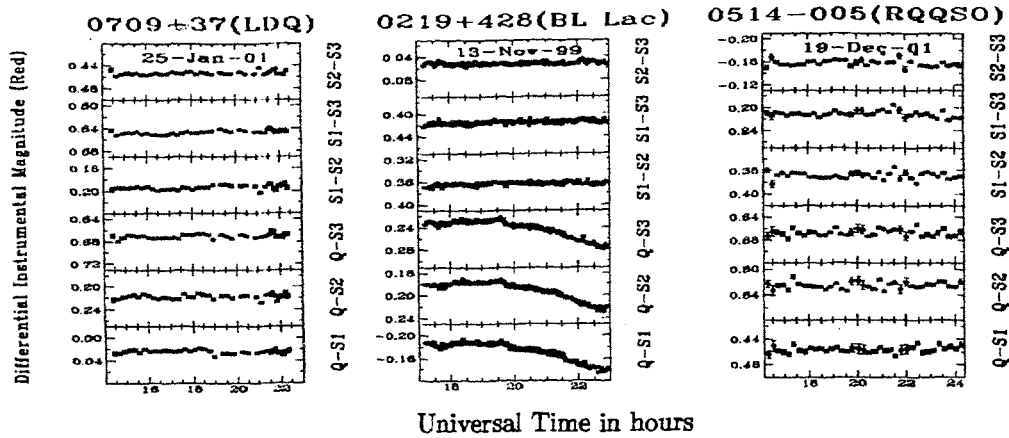


Figure 1. DLCs of the quasar with respect to three comparison stars labelled S1, S2 and S3 as well as between the comparison stars. The left, middle and right panels are for the LDQ, BL Lac and RQQSO respectively

variability to be intrinsic to the object (see Gopal-Krishna et al. 2000 and references therein).

2. The Sample and Observations

Our sample, derived from the catalogue of Veron-Cetty & Veron(1998), consists of 7 sets of AGNs covering narrow redshift intervals centered at $z = 0.21, 0.24, 0.34, 0.43, 0.50, 0.96$ and 1.92. Each set consists of a RQQSO, a lobe dominated quasar (LDQ), a BL Lac object and/or a core dominated quasar (CDQ). Continuous R band CCD observations for a minimum of 5 hours duration are carried out for each target AGN on atleast 3 epochs and differential light curves (DLCs, typically measured relative to 3 comparison stars present on the same CCD frame) have been derived to look for micro-variability. A few examples of the DLCs is shown in Fig. 1.

3. Results

Our systematic observations carried out so far for about 90 nights indicate that RQQSO, LDQs and CDQs exhibit much less frequent and distinctly milder intra-night optical variability compared to BL Lac objects. Quantitative details will be reported shortly.

References

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