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A search for the elusive radio-quiet BL Lacs

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Abstract. Two years ago, we started a programme to search for the elusive radio-quiet BL Lacs, by carrying out a systematic search for intranight optical variability (INOV) in a subset of weak emission line quasars which are already designated as high-confidence BL Lac candidate and are also known to be radio quiet. We monitored 15 such radio-quiet weak emission line quasars (RQWLQs) over 30 sessions in R-band with typical exposure of 5 − 8 minutes. Each object was observed more than 3.5 hrs, using the 1.3m telescope at Devasthal, India. These 30 differential light curves are subjected to a statistical analysis using F−test. In our study, we detected strong (blazar-like) INOV for two session in two RQWLQs and hence these are designated as the best known candidates for radio-quiet BL Lacs, deserving to be pursued further.

Keywords : `galaxies`-active -BL Lacertae objects, emission line- quasars.

1. Introduction

Weak emission line quasars (WLQs) is a relatively recently discovered and rather enigmatic class of AGN. They exhibit abnormally weak broad emission-lines (i.e. rest-frame EW< 15.4Å for the Ly+NV emission-line complex). Intranight optical variability (INOV) also play an important role to distinguish among various models. In blazar, INOV fraction (∼ 32%) is to be much higher than RQQs (∼ 6%). The INOV fraction for WLQs are also expected to be high like blazar if similar mechanism are at play. Therefore, we started a first systematic investigation (Gopal-Krishna et al. 2013) of the INOV properties of radio-quiet weak emission line quasars and is targeted on their subset classified in the literature as good candidates for radio quiet BL Lacs.

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2. Result and Discussion

Our INOV results are based on the F^{η}-test (de Diego et al. 2010), which offers an additional advantage in that our INOV results for the RQWLQs can be directly compared with those reported in recent literature for other prominent AGN classes (Goyal et al. 2013). The INOV duty cycle for the entire set is found to be ~ 5 percent (Kumar et al. 2015). In our programme, two of the RQWLQs were found in two sessions to exhibit strong INOV (amplitude $\psi > 10\%$), a level never observed in our 2-decade long INOV programme except for BL Lacs. The two RQWLQs, namely J090843.25+285229.8 ($\psi \sim 31\%$ on 10.02.2013) (Chand et al. 2014) and J140710.26+241853.6 ($\psi \sim 36\%$ on 03.05.2014), are thus currently the best available candidates for the elusive population of radio-quiet BL Lacs and hence need to be followed up.

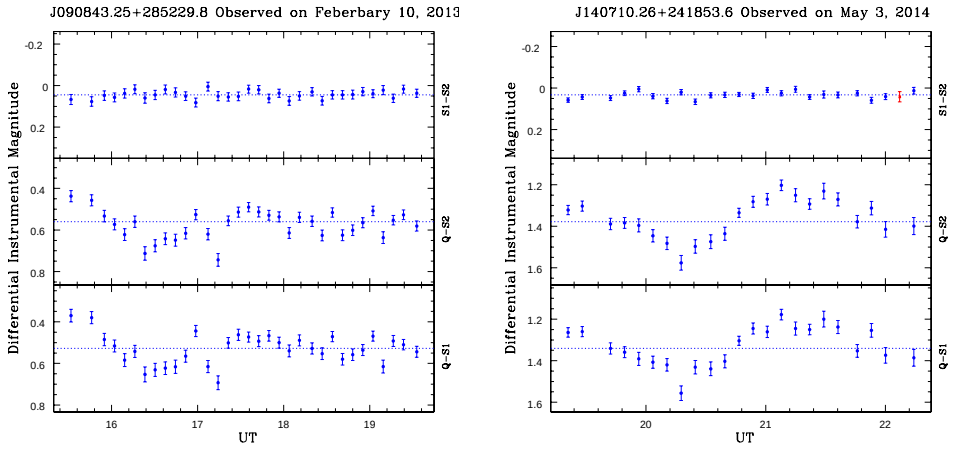

Figure 1. Differential light curves (DLCs) for the 2 RQWLQs from our sample. The name of the RQWLQ together with the date and duration of its monitoring are given at the top of each panel. In each panel the upper DLC is derived using the two non-varying comparison stars, while the lower two DLCs are the quasar-star DLCs, as defined in the labels on the right side.

References

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