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CONTRIBUTED POSTER

Variability Observations of Classical Novae with the Aristarchos Telescope

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Abstract: Photometric variability caused by orbital motion and different kinds of rapid brightness variations in a classical nova system are undetectable during the outburst phase, until the components emerge from the optically thick envelope ejected. In this later phase, the brightness of the system declines making it unavailable for observation with small telescopes. Thus, there is only a small number of photometric periods and rapid brightness variation studies published, as compared to the novae observed. In order to detect (or to confirm) photometric periodicities and rapid variations, V and R band CCD observations of three recent classical novae, during their latter phase of activity decline, were carried out in 2014 with the 2.3m Aristarchos telescope (Helmos Observatory, Greece). The monitoring duration or two of them, KT Eridani and V2467 Cygni does not allow looking for periodicity, but the curves show characteristic flickering variations. The third, V2362 Cyg, has been monitored extensively and allowed us to estimate a period of about 0.1525 days.

1 KT Eridani

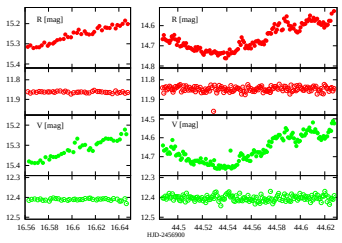

Figure 1: KT Eridani

KT Eri (Nova Eridani 2009) monitoring simultaneously in V and R band, lasted about 5.5 hours and revealed flickering type brightness changes. The full amplitude of the changes detected on this time scale reached about 0.2 magnitudes (Fig.1). For part of the observations, the strongest variations are superimposed with short lived single flares. They are visible especially for the longer observation run (right pannel) on the rising branch of the light curve and each flare lasted about half hour. It seems that, the flickering features are very similar in the both bands with one noticeable difference - the central part of the shorter light curve (left panel) exhibits flare which is stronger in V-band. The flickering amplitude increases for the shorter wavelengths, as long as the flickering source is expected to be located in the hot parts of the accretion disc.

Flickering in this system was observed during the decline phase of nova (about 100 and 1100 days after outburst maximum) [2]. Changes have been found which occurred with a much smaller amplitude (up to 0.043 magnitude) but the durations of monitoring and the flickering time scales are comparable with our results obtained 1755 and 1783 days after outburst maximum. Such increase of the flickering amplitude with time, after the outburst maximum, may be connected with the cooling of the accretion disc due to the lower radiation from the white dwarf in the later phases of final decline.

2 V2467 Cygni

V2467 Cygni (Nova Cygni 2007) is the only one classical nova among the objects presented here with a well established photometric periods available in literature. Very similar values were obtained independently (see [4] and [5]). However, the physical interpretations of the results were different, so

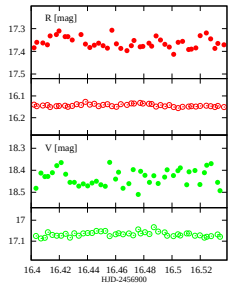

Figure 2: V2467 Cygni

it may be important to check, if brightness changes with those periods are still present in light curves. We monitored this nova only during one night and collected about three hours of simultaneous V and R band observations presented in Fig.2. We cannot confirm existence of variations with the orbital period of about 0.159 days reported in [4] and [5]) probably also due to the too short monitoring. Similarly, the brightness changes with period of about 0.024 days, reported by the same authors, are not visible in our data. Instead of them, modulations which resemble flickering are remarkable, especially at the beginning of the observations, in form of the clear flare. Its full amplitude is about 0.1 and 0.15 magnitude, in R and V band, respectively.

3 Short time scale periodicity of V2362 Cygni

An extensive photometrical monitoring of V2362 Cygni (Nova Cygni 2006) allowed us to collect about 16.4 hours of the simultaneous V and R band observations. The resulting light curves are presented on Fig.3. All they revealed strong variations with full amplitude of about 0.3 magnitude.

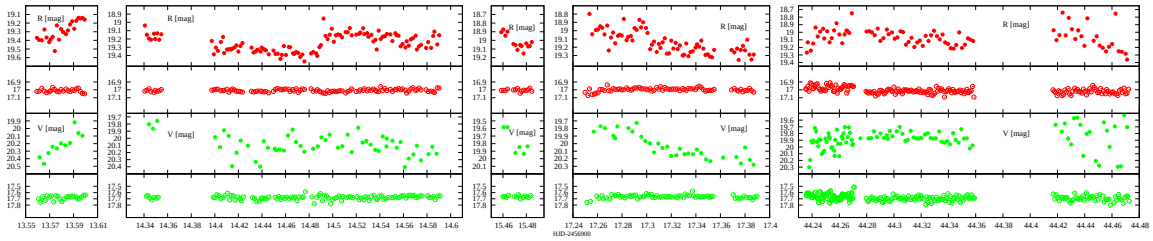

Figure 3: V2362 Cygni

To our best knowledge, there are only two reports on the periods found in the nova photometry. According to [3], observations obtained in Aug 2006 showed periodicity of 0.2070 day with aliases at 0.1714 and 0.2612 days. A shorter orbital period (0.06577 day) found from long term (2006-2007) monitoring is reported in [1]. Here we will present the result of the analyses of the whole our R band dataset. The light curves have been normalised substracting the average value for each night and Fourier analysis has been applied to the normalised data. The resulting periodogram power spectrum and spectra window are presented on the right panel of Fig.4. The highest peak on the periodogram, marked by an arrow, corresponds to the period 0.152499 days (3h39m35s.95). The normalised R band data were folded with this period and result is presented on the left panel of Fig.4 showing clearly sinusoidal variations. The obtained period is in the range of the novae typical orbital periods. In comparison with the periods found in literature, our result favours the longer one reported in [3]. The corresponding V band light curves analysis results are not presented here, because they are questionable due to much lower brightness in this band (about 20 magnitude).

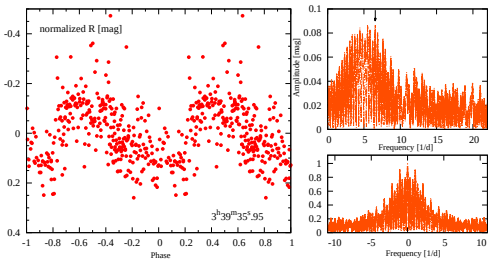

Figure 4: V2362 Cygni period estimation

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