

DISCOVERY OF A NEW δ SCUTI VARIABLE IN THE FIELD OF RW UMi

ALIS, S.^{1,2}; SAYGAC, A. T.^{1,2}; FISEK, S.¹; ESENOGLU, H. H.^{1,2}

¹ Istanbul University, Department of Astronomy and Space Sciences, 34119 Beyazit, Istanbul, Turkey
e-mail: salis@istanbul.edu.tr

² Istanbul University Observatory Research and Application Centre, 34119 Beyazit, Istanbul, Turkey

During observations of the old nova RW UMi a new variable has been identified in the same field. RW UMi, new variable, and comparison stars are marked in the finding chart given in Fig. 1. Variability of this star noticed as it was being used as a comparison star of RW UMi. Light curves that can be seen in Fig. 2, reveal that the new star is a short-period pulsator, likely a δ Scuti star.

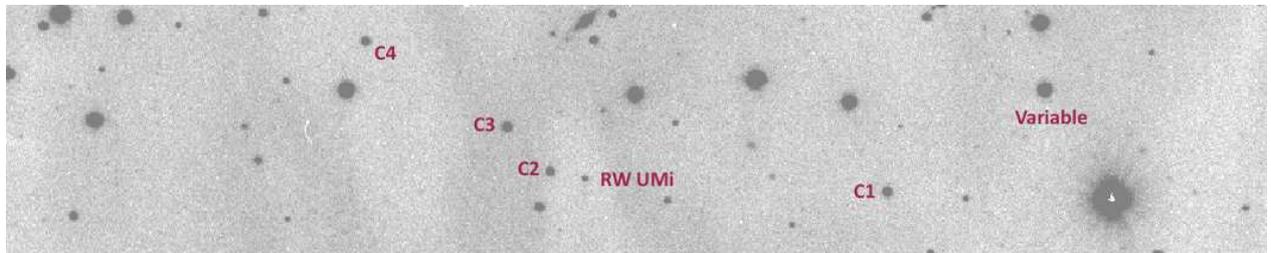


Figure 1. Identification chart of the field. New variable, RW UMi and comparison stars are marked.

RW UMi has been observed several nights since August 2015 with the 1.5 m RTT150 telescope of the TUBITAK National Observatory (aka. TUG) (Antalya, Turkey) and TFOSC imaging spectrograph attached to the telescope's Cassegrainian focus. TFOSC has a $2k \times 2k$ Fairchild 447 back-illuminated chip with a pixel size of 15 microns. In order to increase temporal resolution, the field was observed in the sub-frame mode which yields an effective area of 1040×200 pixels. Processing of frames led to an identification of a new variable. Five out of 13 nights observations could be used to construct the light curves of the new variable. This is due to overexposure for the variable as the program object RW UMi is very faint ($i \simeq 19$ mag). All the data were reduced in standard way using appropriate IRAF¹ packages. Photometry of objects was performed with aperture photometry. Differential magnitudes of the new variable were computed

¹Image Reduction and Analysis Facility, <http://iraf.noao.edu>

against the comparison star C1. Other comparison stars were used to check C1 and were not found any variability for all observing runs. Light curves of the variable are given in Fig. 2.

Table 1. Log of observations.

Date	JD Interval 2457000+	Duration (hours)	Number of Frames	Filter	Exposure Time (seconds)
07.08.2015	242.2814 – 242.5742	7.02	245	Clear	40
18.09.2015	284.3248 – 284.4500	3.00	235	Clear	30
19.09.2015	285.3157 – 285.3818	1.59	82	Clear	60
10.09.2016	642.3663 – 642.5736	4.98	64	Clear	45
02.06.2017	907.3219 – 907.4308	2.61	155	Clear	45

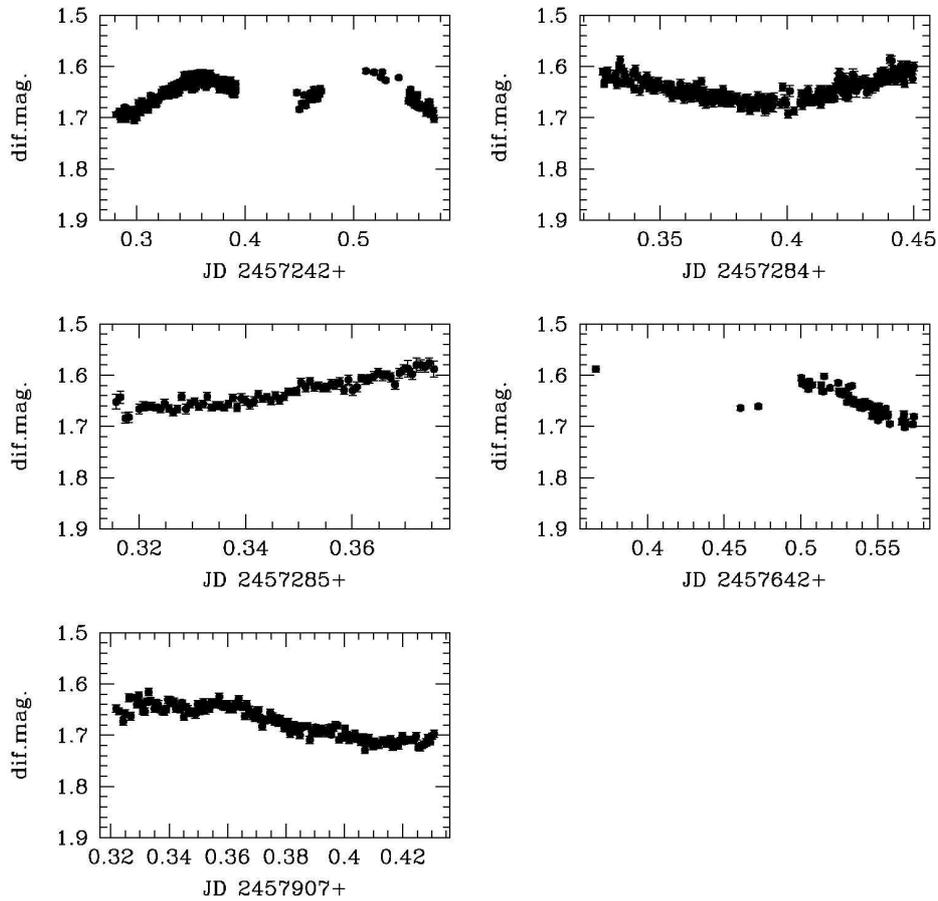


Figure 2. Light curves of the new variable. Differential magnitudes are computed using comparison star C1.

New variable has no record in the SIMBAD Astronomical Database or in General Catalogue of Variable Stars, either. However, the object is detected in the Sloan Digital Sky Survey with i -band magnitude $i = 14.55$. Coordinates of the new variable

taken from SDSS are $\alpha = 16^{\text{h}}48^{\text{m}}8^{\text{s}}.23$ (J2000) and $\delta = +76^{\circ}58'02''.53$ (J2000) (SDSS J164808.23+765802.5).

In order to perform a Fourier analysis, all available data given in Table 1 are combined. Fourier analysis performed with Period04 (Lenz & Breger, 2005) revealed a frequency of 7.62731 c/d which corresponds a period of 0.131 d (3.147 h). Power spectrum of the Fourier transformation is given in Figure 3. Light curves of the first two runs are plotted with the resulting model in Figure 4.

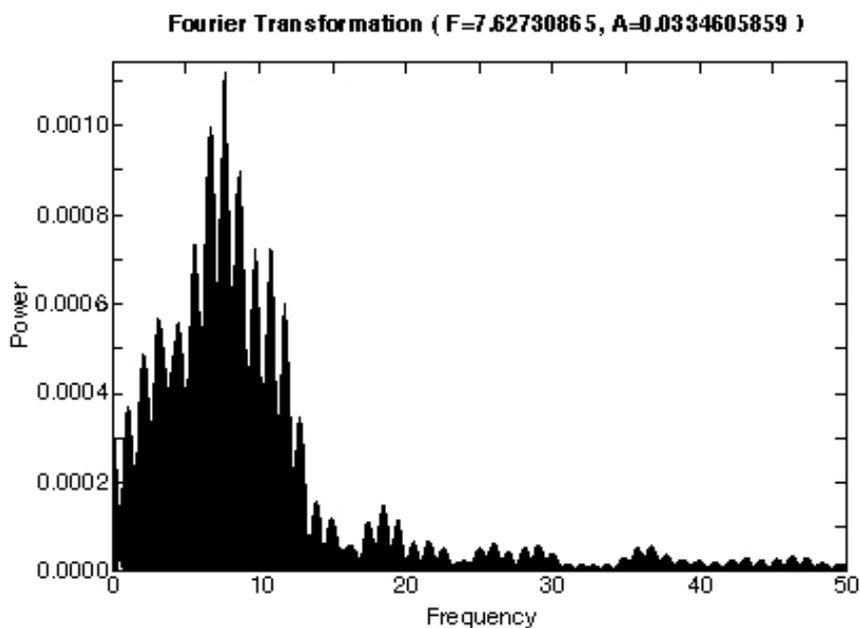


Figure 3. Power spectrum of the Fourier transformation.

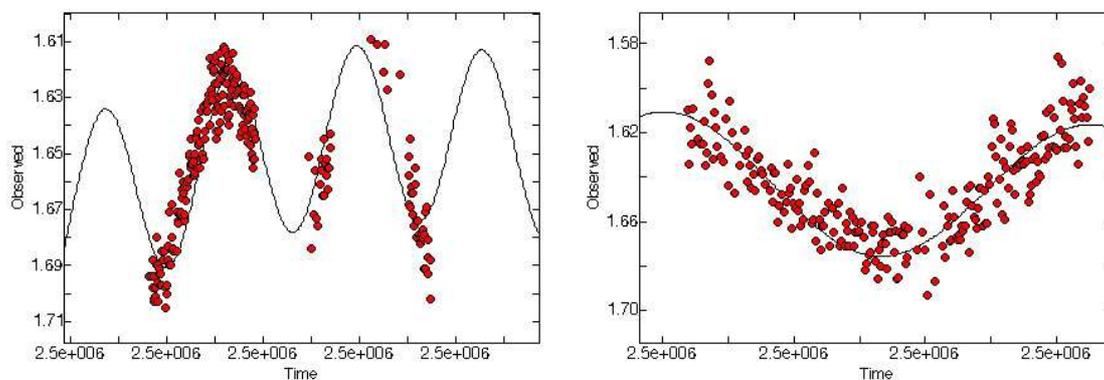


Figure 4. Model curves overplotted on light curves of the 07.08.2015 (left) and 18.09.2015 (right) runs.

Based on the SDSS *ugriz* magnitudes, $B - V$ colour of the new variable is computed using Karaali, Bilir and Tuncel (2005) transformation equations which then yielded a colour index of $B - V = 0.62$. This colour index implies an effective temperature of $T_{\text{eff}} = 5800$ K (Ramirez & Melendez, 2005). Thus, period determined from Fourier analysis and effective temperature indicate that this new variable is most probably a δ Scuti-type pulsating star.

Acknowledgements: We thank to TUBITAK for a partial support in using RTT150 (Russian-Turkish 1.5 m telescope in Antalya) with project numbers 15BRTT150-864 and 17AT100-1174.

References:

- Karaali, S., Bilir, S., Tuncel, S., 2005, *PASA*, **22**, 24 DOI
Lenz, P. and Breger M., 2005, *CoAst*, **146**, 53 DOI
Ramirez, I. and Melendez, J., 2005, *ApJ*, **626**, 446 DOI