Maxima Times of Selected Pulsating Variables Obtained in 2023-2024

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Abstract

We present 16 times of maxima of 8 δ Scuti and 1 RR Lyr type pulsating variables obtained with the IST40 telescope of the Istanbul University Observatory between May 2023 - May 2024.

Özet

Bu çalışmada İstanbul Üniversitesi Gözlemevinin İST40 teleskobuyla Mayıs 2023 -Mayıs 2024 tarihleri arasında 8 δ Scuti ve 1 RR Lyrae yıldızı için elde edilen 16 maksimum zamanı sunulmaktadır.

Key words: stars: variables: Scuti – methods: observational – techniques: photometric

1 Introduction

In the framework of monitoring variable stars from Istanbul University Observatory, we obtained several maxima times of various pulsating variables.

Target systems were selected based on their brightness ($V{<}15$) and pulsation period ($P{<}1^{\rm d}$). Targets were selected from the General Catalogue of Variable Stars (GCVS) (Samus' et al. 2017). As the transparency of the sky at the Beyazit Campus is very variable, we focus mainly on short period pulsators such as δ Scuti variables in order to obtain entire light curves or only maxima profiles for the measurements of light maxima in a single observation.

The variable star monitoring program is conducted as a training for the undergraduate students of the Astronomy and Space Sciences Department of Istanbul University. The program is performed mainly by the 2nd, 3rd and 4th-year students with an increasing interest from the junior and MSc students as well.

2 Observations and Data Reduction

All observations presented in this study were carried out with the 0.4m Schmidt-Cassegrain telescope (aka. IST40) of the Istanbul University Observatory. The telescope is located in the university campus at Beyazit, Istanbul (N 41°01167, E 28°96528, altitude 65 m).

Observations were performed with a thermoelectrically cooled CCD consisting a KAF-8300 chip which has $3358{\times}2536$ pixels. Pixel size of 5.4 μm yields $0{.}''27$ pixel^{-1} resolution at the focal plane and this resolution allows to capture $16''{\times}12''$ field of view.

All frames were bias, dark and flat-field corrected in a standard manner. Several bias and dark frames were combined
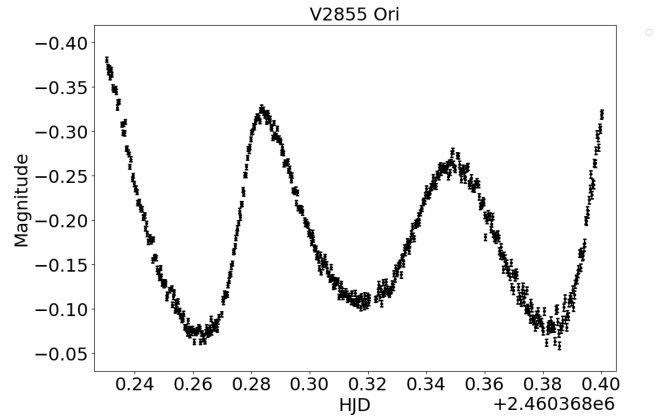
Figure 1. An example light curve of V2855 Ori obtained with IST40 telescope. Light curve is given in instrumental magnitudes and Julian Day fraction. Details can be seen in Table 2.

in order to create a master calibration frame. Flat-fielding was done with sky flats obtained at dusk. Calibration images were obtained in each observing night. The log of observations is given in Table 1.

Instrumental magnitudes were determined with aperture photometry using *Muniwin* software of the C-Munipack package (Hroch 2014). Photometry procedures of the C-Munipack package are based on the well-known DAOPHOT (Stetson 1987) package. To give an impression to the reader, we provide an example light curve of the V2855 Ori in Fig. 1.

Maximum times of pulsating variables were computed with the help of Peranso software (Paunzen & Vanmunster 2016) which uses Kwee and van Woerden method (Kwee & van Woerden 1956). This method requires a homogeneous temporal coverage of the maximum light with an odd number of

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Table 1. Log of observations. Observers are as follows; EED: Elif Ece Devecioğlu, YD: Yasin Dalkılıç, ZT: Zafer Toy, CB: Canday Beyaz, EG: Ege Gültekin, ANO: Aleyna Nur Öztürk, SF: Sajed Fateh, MIE: Melike İlayda Eryılmaz, FIK: Fatmanur İlayda Keleş, ANA: Asuman Nura Altınöz, YEC: Yunus Emre Çetinkaya, HE: Hilal Erişti, KNK: Kifayet Nur Kın, YA,YAV: Yusuf Avcıoğlu, YAL: Yağız Altıkulaç, LFT:Latife Fatıma Türkoğlu, IZK: İrem Zeynep Kelkitli, SB: Safahan Başara, AK:Ayşenur Köse, BD: Batıkan Demirel, SE: Sedanur Eroğlu. Remark: BP Peg is classified as δ Scuti variable in the GCVS but listed as a RR Lyr variable in SIMBAD.

Date (y-m-d)	JD Interval 2460000+	Duration (h)	Star	Variable Type	Number of Frames	Filter	Exp. Time (s)	Observers
2023-06-25	121.29178 - 121.386815	2.28	V1535 Her	δ Scuti	398	V	30	YD,SF
2023-07-14	140.329181 - 140.525084	4.70	V411 Sge	δ Scuti	584	R	20	YD,EED,SF,HE
2023-07-17	143.331494 - 143.488812	3.78	V437 Sge	δ Scuti	299	V	25	MIE,EED,SF,EG
2023-07-24	150.308241 - 150.485291	4.25	V437 Sge	δ Scuti	555	V	20	MIE,EED,SF,EG
2023-07-25	151.336420 - 151.548197	5.08	VY Equ	δ Scuti	368	V	40	ZT,CB,ANA,FIK
2023-07-29	155.384532 - 155.569215	4.43	BP Peg	δ Scuti*	338	V	40	YD,SB
2023-09-08	196.398636 - 196.529107	3.13	KO Psc	δ Scuti	175	R	40	ANO,HE,YEC
2023-10-21	239.249791 - 239.451908	4.85	AV Peg	RR Lyrae	299	V	50	SB,SE,BD
024-01-23	333.202532 - 333.336965	3.23	V1392 Tau	δ Scuti	173	R	60	ZT,AK,IZK
2024-02-27	368.230315 - 368.400336	4.08	V2855 Ori	δ Scuti	546	R	20	ZT,ANO
2024-03-04	374.253696 - 374.357170	2.48	V2855 Ori	δ Scuti	470	V	10	YAL,KNK,YAV,MIE

Table 2. List of maxima times. Table lists UT date, maximum time (HJD), uncertainty of the maximum (days), filter used in the acquisition of the light curve. V and R are standard Johnson filters.

Star	UT Date (y-m-d)	T_{max} (HJD 2400000+)	Uncertainty (days)	Filter
V1535 Her	2023-06-25	60121.3653	0.0011	V
V411 Sge	2023-07-14	60140.3825	0.0014	R
V437 Sge	2023-07-17	60143.3991	0.0002	V
V437 Sge	2023-07-24	60150.3936	0.0004	V
VY Equ	2023-07-25	60151.4092	0.0012	V
BP Peg	2023-07-29	60155.4324	0.0005	V
BP Peg	2023-07-29	60155.5442	0.0002	V
KO Psc	2023-09-08	60196.4166	0.0005	R
KO Psc	2023-09-08	60196.5033	0.0002	R
AV Peg	2023-10-21	60239.3962	0.0010	V
V1392 Tau	2024-01-23	60333.2494	0.0002	R
V1392 Tau	2024-01-23	60333.3157	0.0009	R
V2855 Ori	2024-02-27	60368.2850	0.0002	R
V2855 Ori	2024-02-27	60368.3490	0.0002	R
V2855 Ori	2024-03-04	60374.2725	0.0002	V
V2855 Ori	2024-03-04	60374.3279	0.0003	V

data points forming a symmetrical profile. Rather symmetrical nature of Delta Scuti light curves making their maxima times to be measured with the K-vW method. Thus, we use the data halfway from the maximum at each side. In result, we omit maxima when the ascending or descending of the light curve is not complete. In this way, we ensure the precision of the maxima times given in Table 2. All times in the table were converted into Heliocentric Julian Date (HJD).

3   Results

Table 2 lists the maxima times that we obtain in this study. Date (UT), maximum time and its uncertainty, and filter are given in the table as well as the star name. The V and R filters are standard Johnson filters.

This research made use of Peranso, a light curve and period analysis software.

References

Hroch F., 2014, Munipack: General astronomical image processing software (ascl:1402.006)

Kwee K. K., van Woerden H., 1956, Bull. Astron. Inst. Netherlands, 12, 327, ADS

Paunzen E., Vanmunster T., 2016, Astronomische Nachrichten, 337, 239

Samus' N. N., Kazarovets E. V., Durlevich O. V., Kireeva N. N., Pastukhova E. N., 2017, Astronomy Reports, 61, 80

Stetson P. B., 1987, PASP, 99, 191

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