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TYC3551-1535-1: A NEW VARIABLE STAR OF δ SCT TYPE

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In 2013 some close double stars were observed on Maidanak Observatory of Uzbekistan. The star V2364 Cyg (RA₂₀₀₀=19^h22^m11^s.73; DEC₂₀₀₀=+49°28′34″.43) was observed in July 2013. The star TYC3551-1535-1 was in the field of view during 12 nights and indicated variability with amplitude about 0.02-0.03 magnitudes.

The observations were done with the 60-cm telescope Zeiss-600 with focal length of 7200 mm. The CCD camera is FLI MicroLine, the chip is a Kodak KAF-1001E, scale is 0″.687 per pixel which gives the field of view of 11′.7 × 11′.7. Observations were carried out in Bessell filter *R*. We provide some observational information in Table 1: start and end times of observation (at middle time of exposure), the exposure time, air mass for the first and the last frames and average Full Width on Half Maximum (FWHM) of a stellar profile. The air mass initially decreased till its minimal value 1.018 and then increased again.

Basic reduction of the frames was done using standard IRAF[†] software. We did the aperture photometry for all stars which can be used as the comparison stars. In the end, we decided that the star marked as *C1* in the Figure 1 is more suitable to be a comparison star. During few days this star was located on bad CCD column and as a result we used *C2* star as the comparison star. Since we used different comparison stars, nightly average values were subtracted from each light curve. Neither linear nor parabolic trends were removed and no differential extinction corrections were applied.

We plot the light curves of the variable star in Figure 2. The final light curve contains 8067 data points. Both the close binary system V2364 Cyg and TYC3551-1535-1 are located very close but not on the *Kepler*'s field and as a result we were not able to compare our light curve with *Kepler*'s ones. For the power spectral analysis of the light curves the FAMIAS software package (Zima, 2008) was used. Figure 3 presents the spectral window and the power spectra of two modes. The width of the smoothing window for noise level estimation (box size) was set to 8 c/d. Only two modes exceed 4 σ criteria. We show the results in Table 2.

In order to classify the type of variability of TYC3551-1535-1 we need to know its spectral type. We estimated it from the *J – H* color of TYC3551-1535-1 using templates by Stead & Hoare (2011). The resulting value is F2. Considering the amplitude and period of oscillations as well as spectral type we tend to assume that TYC3551-1535-1 could be a variable star of δ Sct type.

Table 1: Observational info

| Date | Start time (UTC) hh:mm:ss | End time (UTC) hh:mm:ss | Exp. time sec | Air mass start : end | FWHM arcsec |
|---------|------------------------------|----------------------------|------------------|-------------------------|----------------|
| July 7 | 18:05:11.0 | 22:36:45.0 | 20 | 1.076 : 1.170 | 1.8 |
| July 11 | 17:11:45.5 | 23:28:21.5 | 25 | 1.129 : 1.350 | 1.7 |
| July 12 | 17:06:07.5 | 23:18:58.5 | 25 | 1.131 : 1.332 | 1.7 |
| July 14 | 17:00:07.5 | 23:31:29.0 | 25 | 1.128 : 1.404 | 1.7 |
| July 15 | 16:54:47.5 | 23:24:02.5 | 25 | 1.131 : 1.391 | 1.8 |
| July 17 | 16:40:46.5 | 22:52:09.5 | 25 | 1.141 : 1.309 | 1.8 |
| July 18 | 16:35:46.0 | 19:49:39.0 | 30 | 1.143 : 1.027 | 2.5 |
| July 19 | 16:41:28.0 | 23:30:05.0 | 30 | 1.127 : 1.480 | 1.9 |
| July 20 | 17:41:39.5 | 23:30:47.5 | 25 | 1.067 : 1.501 | 1.6 |
| July 21 | 16:31:57.0 | 21:17:19.0 | 30 | 1.077 : 1.137 | 2.0 |
| July 25 | 16:52:09.5 | 23:43:06.0 | 30 | 1.077 : 1.679 | 1.9 |
| July 26 | 16:30:05.0 | 22:06:46.0 | 30 | 1.102 : 1.279 | 2.0 |

Table 2: Mode parameters

| Mode | P c/d | σ_P c/d | A mmag | σ_A mmag | S/N |
|------|------------|-------------------|-------------|--------------------|-------|
| f1 | 8.9039 | 0.0004 | 4.77 | 0.07 | 13.3 |
| f2 | 8.9659 | 0.0013 | 1.76 | 0.07 | 4.9 |

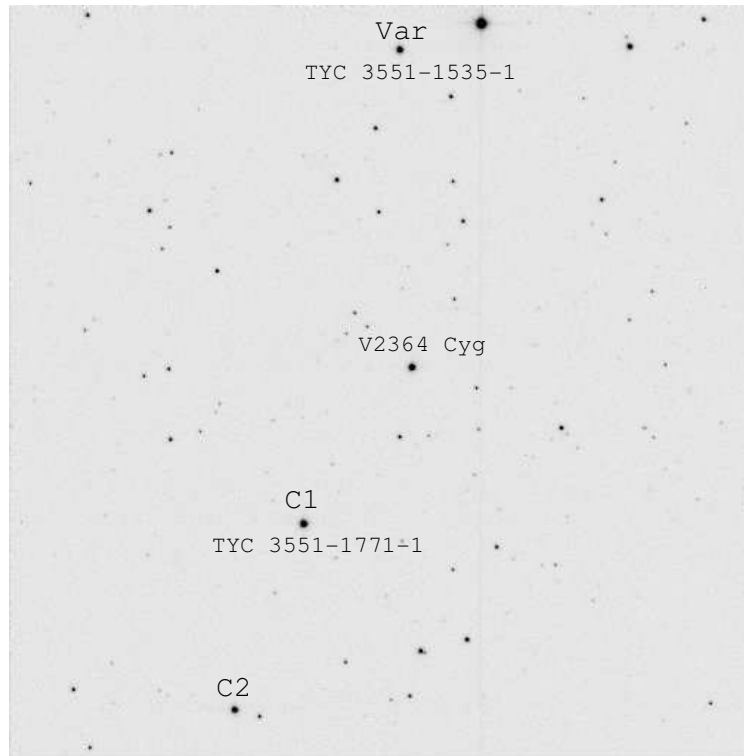


Figure 1. Finding chart for variable and comparison stars. North is up and East is to the left.

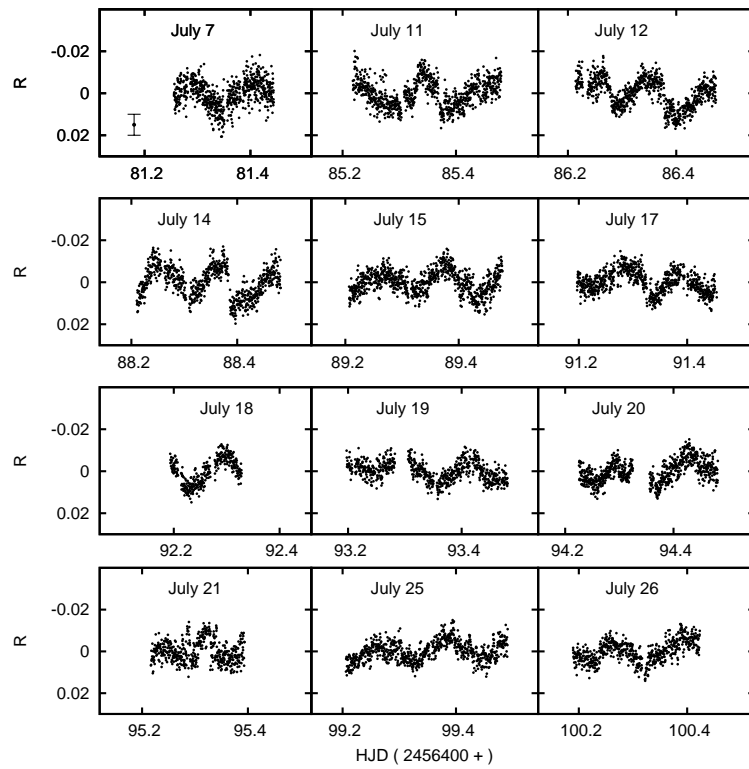


Figure 2. Light curves of TYC3551-1535-1. On the top left panel we show the largest error bar.

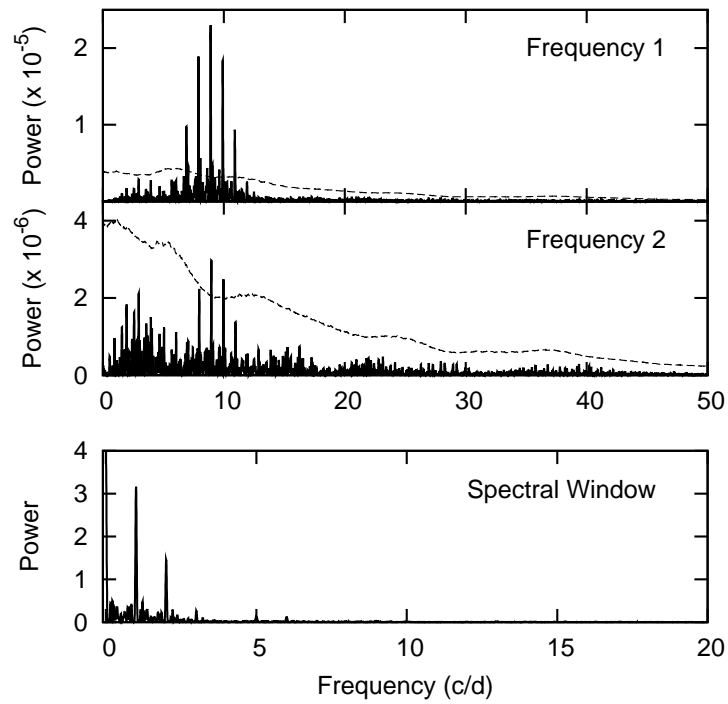


Figure 3. Spectral window and power spectra. The dashed line is 4σ significance level.

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- Stead, J. J., Hoare, M. G., 2011, *MNRAS*, **418**, 2219 (VizieR Online Data Catalog: J/MNRAS/418/2219/tablea1)
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