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GSC 2293-1021:
A NEWLY DISCOVERED W URSAE MAJORIS VARIABLE

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The new variable star GSC 2293-1021 ($\alpha = 01^{\text{h}}28^{\text{m}}54^{\text{s}}.54$, $\delta = 30^{\circ}08'02''.7$, B1950, $V = 14.1$) was chosen as one of the comparison stars during the observations of the high-amplitude δ Scuti variable UV Tri. GSC 2293-1021 was first suspected to be a variable star on November 17, 1999. Since then, it was observed until January 2000 using the red-sensitive Thomson TH 7882 CCD photometer (Wei et al. 1990) attached to the 85-cm Cassegrain telescope at the Xinglong Station of the Beijing Astronomical Observatory (BAO). The dimensions of the CCD detector are 13.25 mm \times 8.83 mm, consisting of 576 \times 384 pixels, which corresponds to a sky field-of-view of 12'.3 \times 8'.4. The Johnson V filter and 5 comparison stars (C_1, C_2, C_3, C_4, C_5) were used. $C_1 =$ GSC 2293-1422 ($\alpha = 01^{\text{h}}29^{\text{m}}15^{\text{s}}.73$, $\delta = 30^{\circ}06'08''.4$, B1950, $V = 13.4$), $C_2 =$ GSC 2293-1028 ($\alpha = 01^{\text{h}}29^{\text{m}}19^{\text{s}}.64$, $\delta = 30^{\circ}08'13''.4$, B1950, $V = 12.9$), $C_3 =$ GSC 2293-1027 ($\alpha = 01^{\text{h}}29^{\text{m}}11^{\text{s}}.76$, $\delta = 30^{\circ}11'53''.2$, B1950, $V = 13.6$), $C_4 =$ GSC 2293-1461 ($\alpha = 01^{\text{h}}29^{\text{m}}13^{\text{s}}.83$, $\delta = 30^{\circ}02'19''.6$, B1950, $V = 14.0$), $C_5 =$ GSC 2293-1456 ($\alpha = 01^{\text{h}}29^{\text{m}}03^{\text{s}}.60$, $\delta = 30^{\circ}05'54''.8$, B1950, $V = 14.1$). The relative positions of the new variable and the comparison stars are shown in Fig. 1. Depending on the weather conditions from night to night, different exposure times (ranging from 20 to 80 seconds) were used. No variability higher than 0.01 mag was found for any of the 5 comparison stars. However, we found the magnitude difference between GSC 2293-1021 and all other comparison stars to vary as a sine-like curve. We used Hao's (1991) program and PERIOD96 (Sperl 1996) to complete the period analysis. An oscillation frequency of 7.665 cd^{-1} (period = 0.131 days) was obtained. However, we found the magnitudes of both maxima to be unequal. So, we think that this might indicate two eclipses evenly spaced with a period of 0.262 days. The light curve of two nights of observations folded with $P = 0.262$ days is shown in Fig. 2. To identify the type of the new variable star, we obtained two spectra on February 6 and March 11, 2000 using the low-dispersion Cassegrain spectrograph of the 2.16-m telescope at the Xinglong Station of BAO. The spectrum of GSC 2293-1021 obtained on March 11, 2000 is shown in Fig. 3. In addition to two O_2 telluric bands at 6870 Å and 7620 Å, some neutral metal lines, such as Na I (5890 Å, 5896 Å), Cr I (5192 Å, 5273 Å, 7219 Å), and Ca I (5601 Å), can easily be identified the spectrum. Thus, we estimate the spectral type of GSC 2293-1021 to be between late-G and early-K. According to the spectral type and the shape of the folded light curve, we think that this may be a W Ursae Majoris type variable.

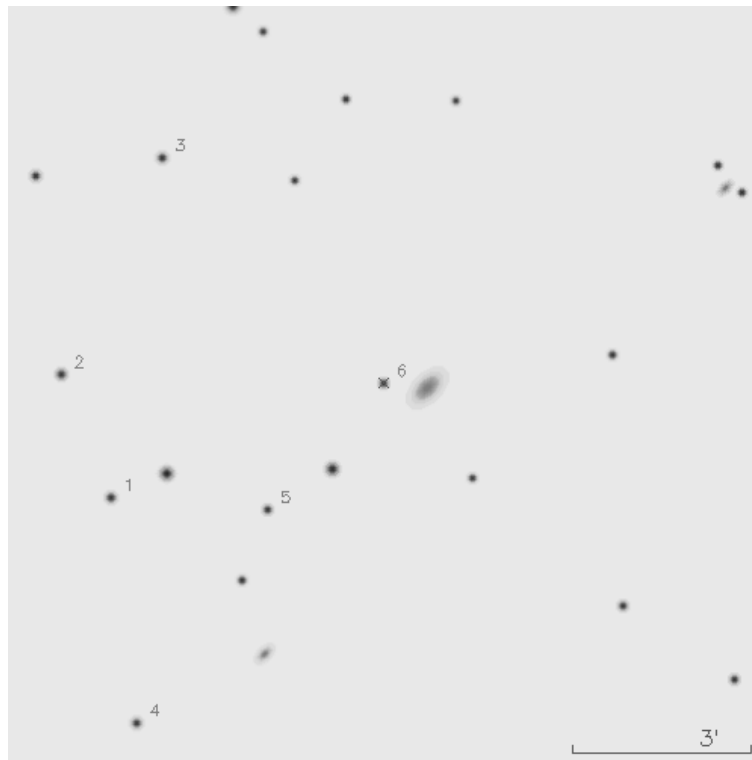


Figure 1. Identification chart of the new variable GSC 2293-1021 (labelled “6”) and 5 comparison stars denoted with No. 1–5 respectively. The scale of the field is marked on the right bottom part.

North is up and East is to the left

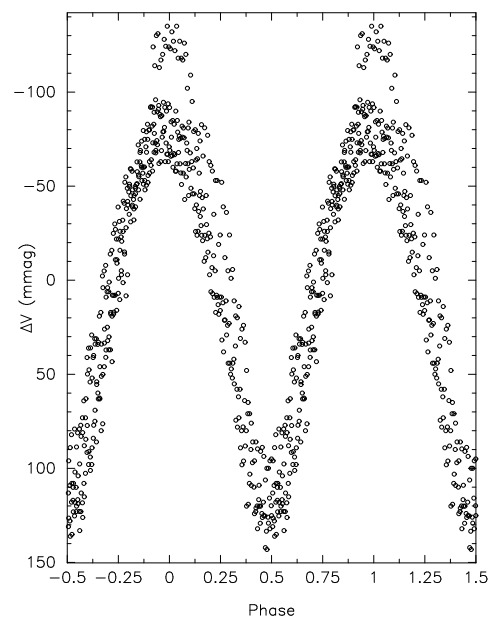


Figure 2. Folded light curve of GSC 2293-1021. The ordinate, ΔV , is the magnitude difference between the new variable star and the comparison star C_1

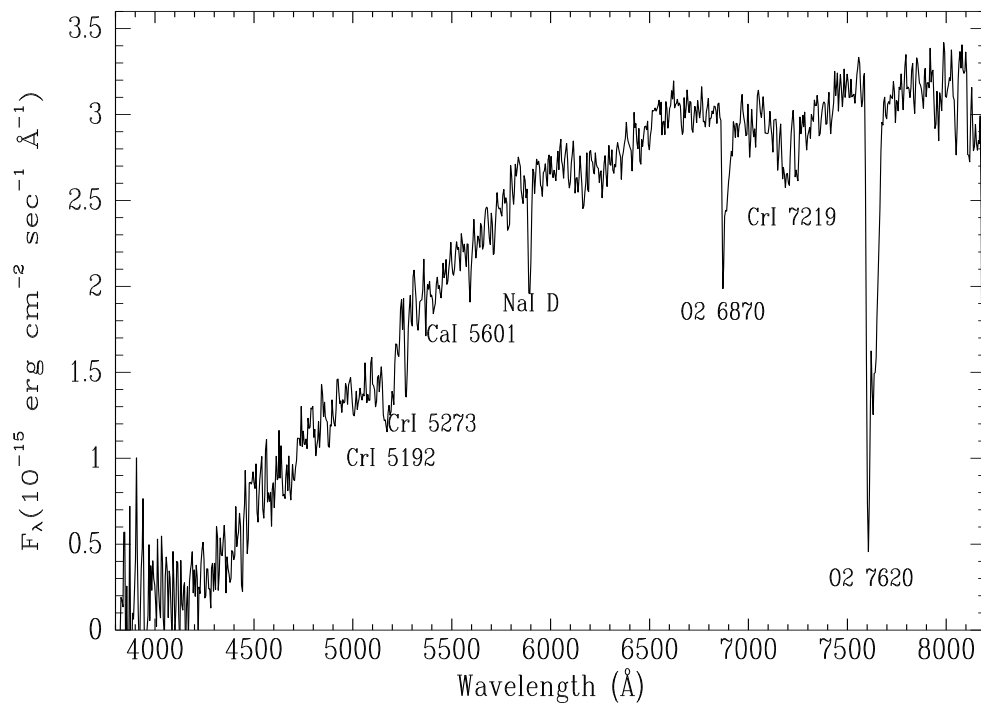


Figure 3. Spectrum of GSC 2293-1021 obtained on March 11, 2000. The ordinate is relative intensity

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