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TWO NEW VARIABLE STARS NEAR THE VARIABLE WR 7 (= HD 56925) AND THE CONSTANT WR 18 (= HD 89358)

During our search for variability among Wolf-Rayet (WR) stars on a timescale of minutes to days, we discovered two variable stars in the field of view of WR 7 (= HD 56925, WN4, van der Hucht et al., 1981) and of WR 18 (=HD 89358, WN5). The variability of WR 7 will be reported elsewhere (Veen et al., 1997), while WR 18 appeared to be stable.

The observations were obtained using the Dutch 90-cm telescope at ESO (La Silla, Chile) equipped with a CCD-camera (ESO#29) and a Bessel B-filter (ESO #419). The observations were performed during two consecutive nights in December 1993 and three nights in January 1994. On each of these nights CCD-images were obtained for 3 to 4 hours continuously, which resulted in a rate of about one frame per two minutes.

Ten stars in the field were picked to see whether they were suitable as comparison stars. Because of different pointings not all stars were recorded in each night. Figure 1 displays a CCD-image of the region around WR 7 (star 1), in which the position of the stars 2, 3, 5, 7, 8, 9, and 10 are indicated. During the analysis star 10 turned out to be variable itself. Stars 5 and 8 varied in brightness probably because of differential atmospheric extinction. Therefore, the differential magnitudes as presented in Figure 3 are computed with respect to the total flux of the stars 2, 3, 7, and 9. Figure 2 displays the field of WR 18. Observations in the night of January 3, 1994 showed star k to be variable. Stars d (=GSC 8608_693), i (=GSC 8608_1711), and j showed marginal photometric variability. Therefore, the differential magnitudes were calculated with respect to stars b (=GSC 8608_799), c, e, f, g, and h (=GSC 8608_1993). We notice that the stars near WR 7 are not listed in the Guide Star Catalogue (=GSC, Lasker et al. 1990, Russell et al. 1990 and Jenkner et al., 1990), probably because of light contamination by the ring nebula NGC 2359 around WR 7.

Table 1 lists the coordinates of the WR objects and of the variable stars. The mean magnitudes (dB_B) are determined with respect either to WR 7 or to WR 18, since they are the only stars in the field for which the B_J magnitude is known (Moffat et al., 1979 and Denoyelle 1977, respectively). However, WR 7 itself is variable at a level of $0\overset{m}{.}03$ (Veen et al. 1997). The stars near WR 7 have also been investigated by Moffat et al. (1979) from photographic plates. That program was not intended to detect possible variability. Column 6 of Table 1 lists the Johnson B magnitude that they determined.

Table 1. Particulars of the variable stars around WR 7 and WR 18. The numbers and letters in the first column correspond to those in Figures 1 and 2. The positions are determined from the CCD-frames relative to the WR star.

number	name	RA(2000)	Dec(2000)	dB_B	B_J	variability
1	WR 7	07 18 29.0	−13 13 02		$11\overset{m}{.}68$	$0\overset{m}{.}01$–$0\overset{m}{.}03$
10		07 18 32.7	−13 13 54	$15\overset{m}{.}17$		$0\overset{m}{.}5$
a	WR 18	10 17 02.3	−57 54 47		$11\overset{m}{.}26$	$< 0\overset{m}{.}005$
k		10 17 13.6	−57 56 33	$14\overset{m}{.}8$		$0\overset{m}{.}025$

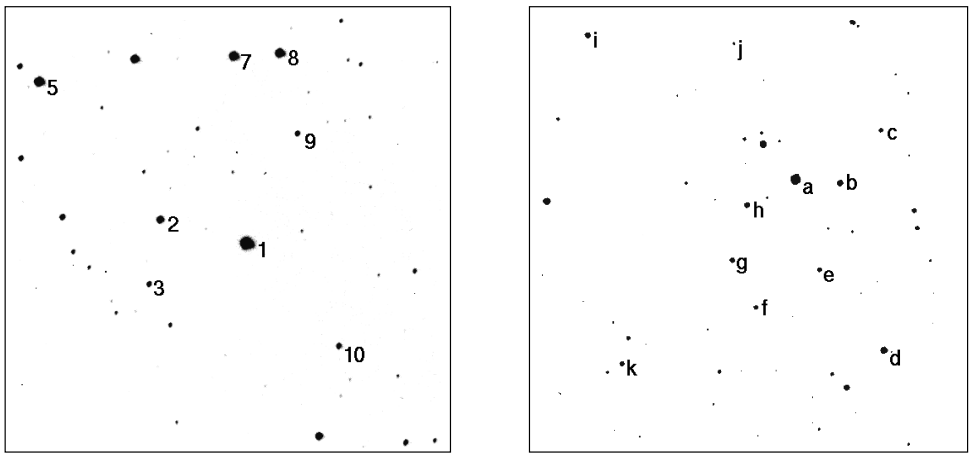

Figure 1 (left). CCD image of WR 7 (star 1). Star 5, 8, and 10 are variable. They are listed in Table 1. East is to the left and north is up. The size of the field is about 3′.7 x 3′.7. Finding charts with a larger field can be found in van der Hucht et al. (1981).
Figure 2 (right). CCD image of WR 18 (star a). Star k showed a clear variability.

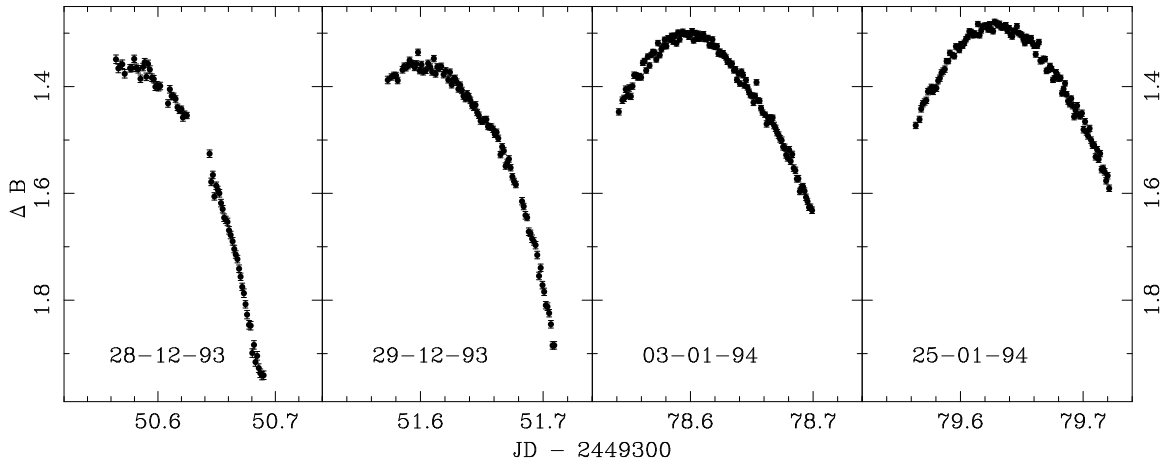

Figure 3. The lightcurves of star 10 near WR 7.

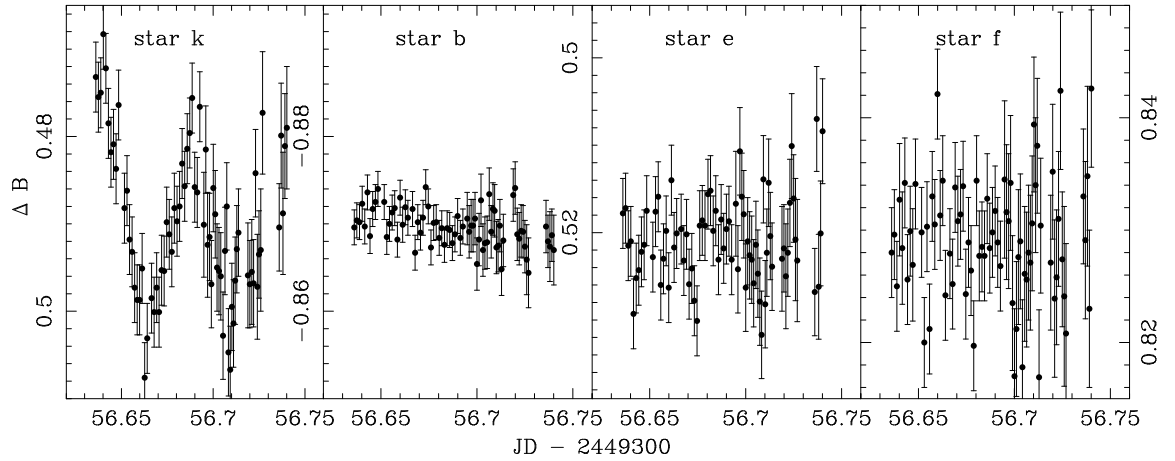

Figure 4. Light variations of star k near WR 18 at 03-01-94. Because of a different pointing star k was not observed at other dates. As a comparison the other diagrams show from left to right the constant light curves of a brighter, an equally bright, and a fainter star in the field.

Figure 3 shows the impressive light variations of star 10 near WR 7. It shows a range not less than $0\overset{m}{.}5$ each night. Our very tentative opinion is that star 10 is a β Lyrae or W UMa type eclipsing binary. In the nights in December we may have observed the ingress to the deep minimum and 27 days later we observed a less steep ingress, possibly to the secondary minimum, half a period later. Note the difference of $0\overset{m}{.}05$ in the height of the two pairs of maxima. We suggest that 52.5 cycles elapsed between the observations in December and January. The period would then be $P = 0.514$ day.

Figure 4 displays the lightcurve of star k near WR 18 together with light curves of a few comparison stars at the same date to illustrate the quality of the data. A cyclicity is suggested amounting to somewhat more than one hour. The increase of scatter of the data points in the course of the night is attributed to increasing cirrus.

Both of these objects need further photometric and spectroscopic investigation to determine the type of variability and their astrophysical characteristics.

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P.M. VEEN
A.M. van GENDEREN
Leiden Observatory
PO-box 9513
2300 RA Leiden, The Netherlands
email: veen@strw.leidenuniv.nl

J. de JONG
Astr. Inst.'Anton Pannekoek'
University of Amsterdam
Kruislaan 403
1098 SJ Amsterdam
The Netherlands

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