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PHOTOMETRIC STABILITY OF THE OXYGEN-RICH WOLF-RAYET STAR

ST 3 (= WR 142)

The star ST 3 is a key object for the observational test of radial or non-radial pulsations in Wolf-Rayet (WR) stars. The star ($V = 12.98$ mag, $RA = 20^h 19^m 52^s$, $DEC = +37^\circ 19' 53''$ (1950), and number WR 142 in the catalogue of van der Hucht et al., 1981) was discovered by Stephenson (1966) as a carbon-type WR star. Sanduleak (1971) drew attention to the strong O IV 3811, 3834 Å emission lines in its spectrum. In 1982 Barlow and Hummer introduced a sequence of oxygen-rich WR stars, WO1 to WO4, defined mainly by the relative strengths of O IV, O V, O VI. They attributed the spectral type WO2 to ST 3 and suggested that the star is in a late stage of core helium burning where α -particle capture by carbon enhances the oxygen abundance. - ST 3 is a probable member of the young open cluster Berkeley 87.

Maeder (1985) has tested numerically the stability of massive star models and found that WR stars should be vibrationally unstable, even in the WC and WO stages. Stimulated by these findings, Lamontagne and Moffat (1986) carried out high-speed photometric observations of ST 3. Their search for periodicities in the data did not reveal any signal above the noise, i.e. the star was found to be constant on time-scales of 1 - 70 minutes.

To further look for variability in ST 3, we started photometric observations with the two-channel photometer attached to the 1 m telescope of Hoher List Observatory. During the nights of 1984 August 21/22 and 22/23 we obtained 37 and 29 data points, respectively, in the Johnson V band. These data are plotted in Fig. 1, where the magnitude difference ΔV is in the sense: comparison star minus ST 3. For comparison we used the star c1 (see the finding chart, Fig. 2). Each point is the mean of three subsequent one-minute integrations. The mean error of each point is ~ 0.006 mag. Given the observational error, no real light variability can be found on time-scales of 18 - 300 minutes (Fig. 1). During 1985 - 1987 sporadic photoelectric observations were obtained with a photometer attached to the 60 cm telescope of the Rozhen National Astronomical Observatory in Bulgaria. Table I contains the magnitude differences in the sense: c1 minus ST 3 in the V band. The mean error of each measurement is 0.02 mag. No light variation is found in the data on time-scales of days or months with amplitude greater than 0.06 mag.

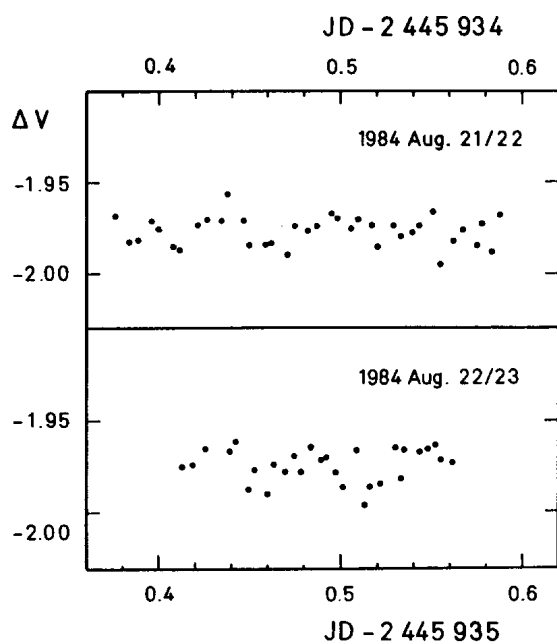


Fig. 1. Magnitude differences ΔV in the sense: comparison star minus ST 3

Table I. Journal of observations at Rozhen Observatory

Date	JD - 2400000	ΔV
1985 October 9/10	46348.3236	-2.00
1985 November 11/12	46381.2313	-1.95
1985 November 12/13	46382.2521	-1.88
1986 September 11/12	46685.3236	-1.98
1987 July 22/23	46999.5007	-2.06
1987 July 23/24	47000.5104	-1.94
1987 September 12/13	47051.3035	-1.96
1987 September 13/14	47052.2785	-2.00
1987 September 15/16	47054.2792	-2.00
1987 September 16/17	47055.2799	-2.00
1987 September 17/18	47056.2813	-1.99
1987 September 18/19	47057.2913	-1.95



Fig. 2. Finding chart for the comparison star c1 taken from Stephenson (1966). The field dimension is 30'x 30'. The arrow indicates star BD +30°4027.

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