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WR 140 IN "ECLIPSE" AGAIN

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WR 140 = HD 193793 (WC7 + O4-5) attracted much attention during recent years as a periodic dust maker. Brightenings in the IR in 1977, 1985, and in 1993 were reported by Williams et al. (1978, 1987a, 1987b, 1990) and Williams (1997), and which were attributed to the building of dust grains in the WR 140 wind. The re-occurrence of dust follows exactly the 7.94-yr orbital period and coincides with the periastron passage (PP), where the wind-wind interaction is strongest ($e = 0.84$). In 1993, several months after the PP, it was first observed a dip in the UBV with an amplitude of $\sim 0\overset{\mathrm{m}}{.}03$ (Panov et al. 2000).

The "eclipse" was probably caused by the carbon dust envelope, triggered at the PP by the colliding winds. After 1993, the dust envelope was gradually dispersed and light in UBV gradually increased to reach the "pre-eclipse" level in 1998. Here we present photometry of WR 140 after the recent PP in 2001.14. The observations were taken in June–August, 2001, with the 60-cm telescope and the UBV-photoelectric photometer of the Rozhen National Astronomical Observatory.

In Fig. 1 the differential light curve of WR 140 (comparison star = HD 193888, check star = HD193926) is shown in the sense HD 193888 − WR 140, for the 1991–2000 (squares, Panov et al. 2000) and the 2001 observations (crosses). The June 2001 observations show light minimum with an amplitude of about $0\overset{\mathrm{m}}{.}13$ in V, $0\overset{\mathrm{m}}{.}14$ in B, and $0\overset{\mathrm{m}}{.}20$ in U, much deeper than the "eclipse" at the previous PP in 1993. However, in 1993 we observed WR 140 at orbital phases 0.052–0.06 while in 2001 we were able to cover the phases 0.037–0.068. It is interesting to note, that the June 2001 dust was rapidly dispersed, and the UBV light of WR 140 in July increased and almost reached the "pre-eclipse" level (Fig. 2). The observations in August are consistent with the normal WR 140 light. Thus, the June "dust episode" was very brief, compared to the respective dust grain building in 1993. Fig. 2 shows clearly the difference in the light behaviour in the phase interval 0.055–0.058. The reason for the different photometric behaviour of the dust after the 2001.14 PP is not yet clear.

From the present observations, the deepest light minimum of WR 140 so far observed occurred at orbital phases 0.038–0.046, if we assume a smooth trend of the light curves between these orbital phases. The orbital phases are calculated with $T_0 = 2446160$ (periastron passage) and $P_{\mathrm{orb}} = 2900$ d. Our observations confirm the build-up of dust in the wind of WR 140, probably triggered by the interacting winds of the two stars by the 2001.14 PP.

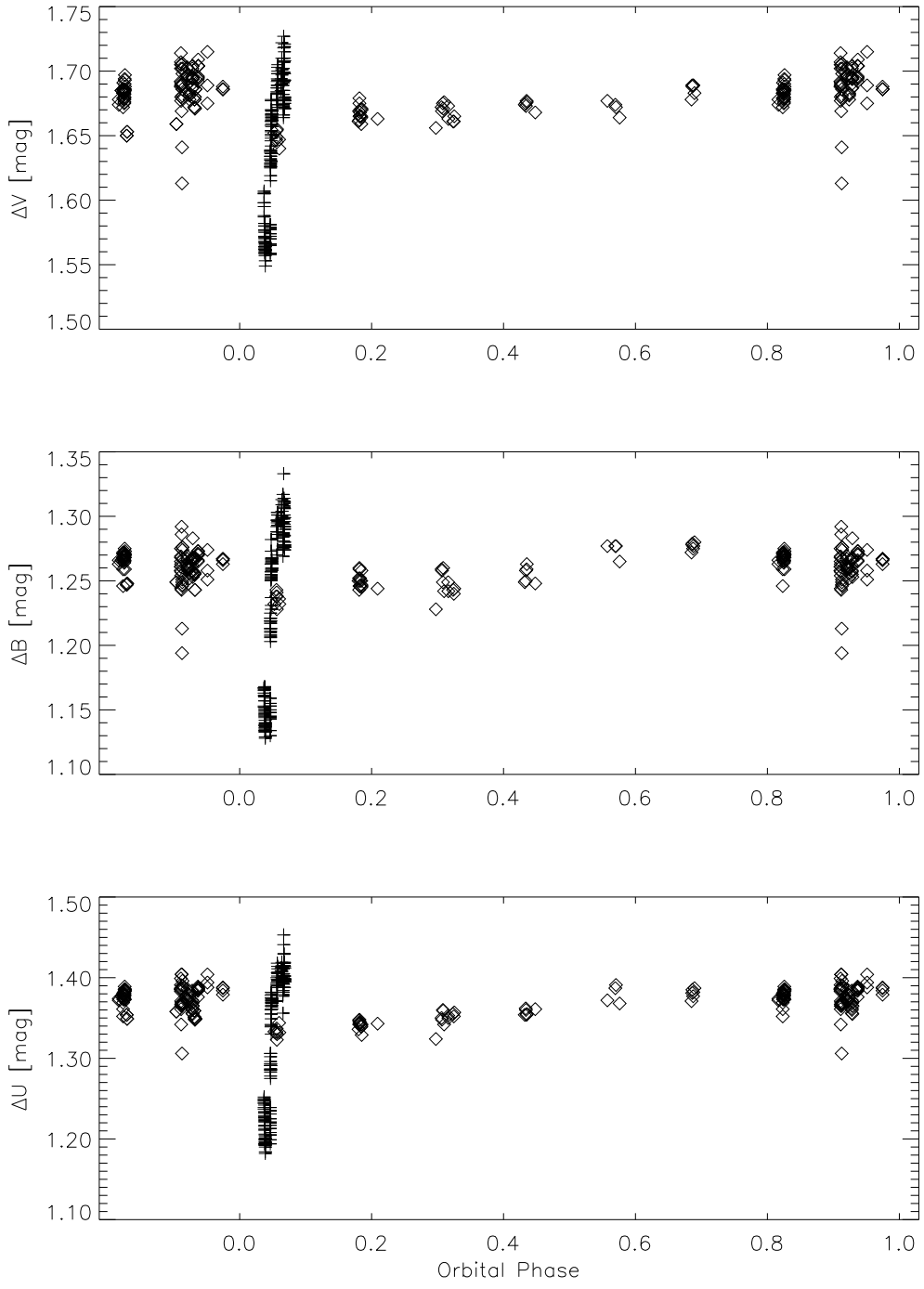

Figure 1. WR 140 light curve for 1991–2001. Squares: observations from 1991–2000. Crosses: 2001 observations

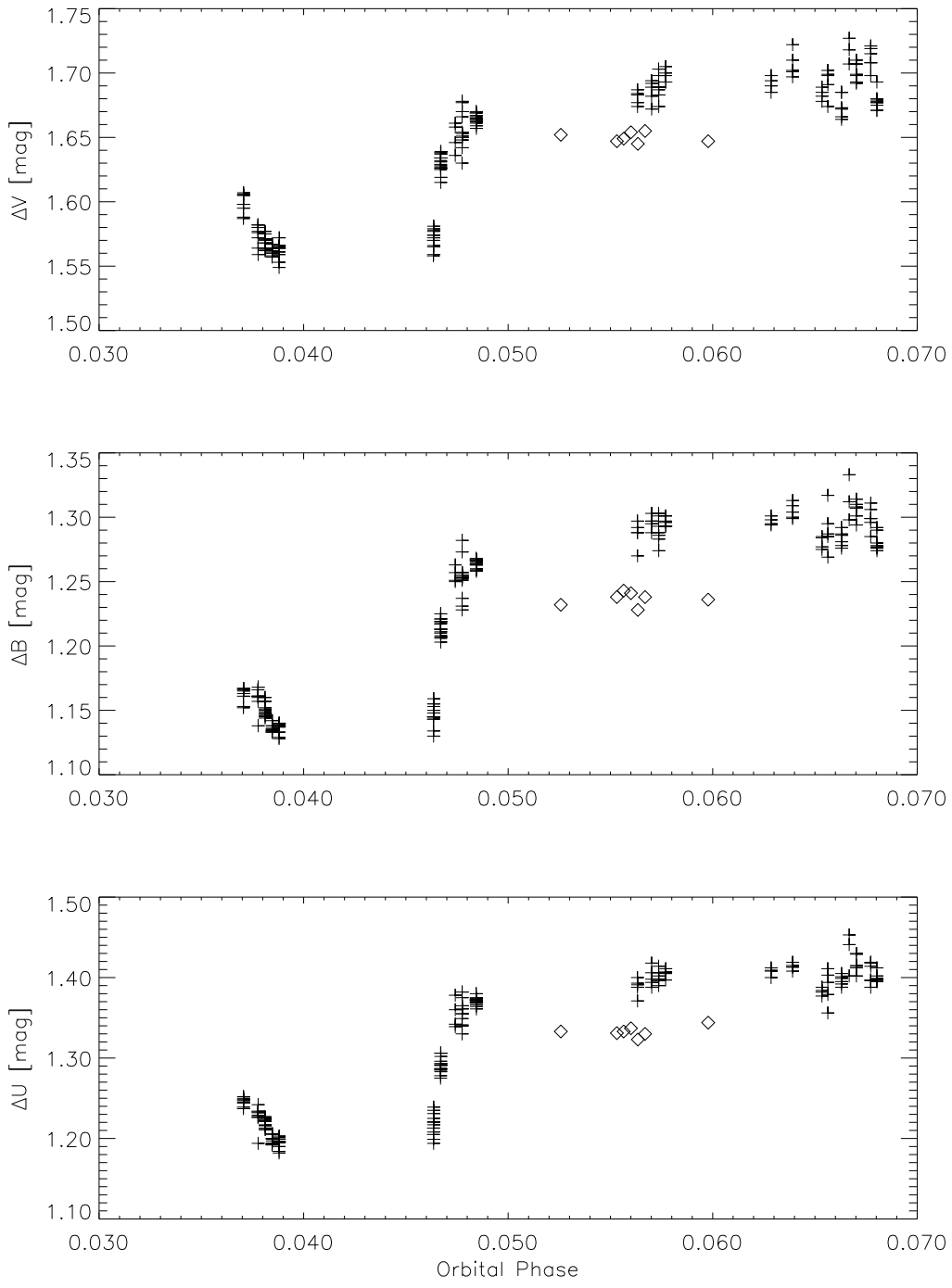

Figure 2. WR 140 light near periastron passages in 1993 (squares) and 2001 (crosses)

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