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UBVR PHOTOMETRY OF THE ZZ CETI STAR G185-32

We observed the ZZ Ceti variable white dwarf star G185-32 (= GR277 = PG1935+276) during eight nights between 11 June 1989 and 31 July 1989, U.T. Our observations were made with the 24-inch (0.6 m) Cassegrain telescope at Jet Propulsion Lab's Table Mountain Observatory in the San Gabriel Mountains, near Wrightwood, California, U.S.A. A light curve for this star was constructed with the unfiltered measurements obtained from a single-channel photometer containing a dry-ice cooled (-78°C) RCA 1P-21 photomultiplier tube. The measurements of U, B, V, and R were made using the same photometer with a dry-ice cooled Hamamatsu 943-02 photomultiplier tube. Each of our measurements of program star, comparison stars, and sky brightness was made with a ten-second integration. We used either a 16" or 20" diameter aperture, depending on nightly seeing conditions.

The extinction of a large sample of standard stars was measured with the Hamamatsu 943-02 tube in early June of 1989. From this data we calculated transformation coefficients to convert our results to the Johnson magnitude scale, using the methods outlined in Henden and Kaitchuck (1).

A light curve for G185-32 was obtained in 1981 by McGraw, et al. (2). Our curve is a composite obtained from data taken on three nights of observing: 12 June, 10 July, and 11 July. Figure (1) shows the difference in the magnitudes of G185-32 and comparison star SAO 087458, plotted against an arbitrary time

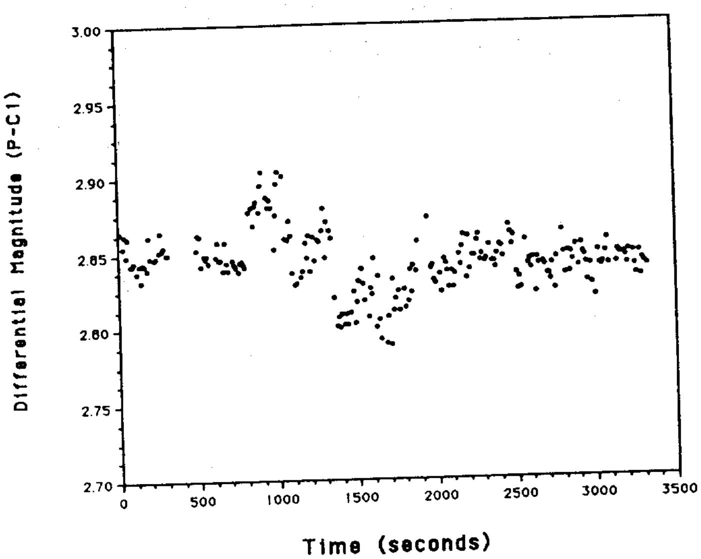

Figure 1 - Light curve for G185-32 from unfiltered measurements.

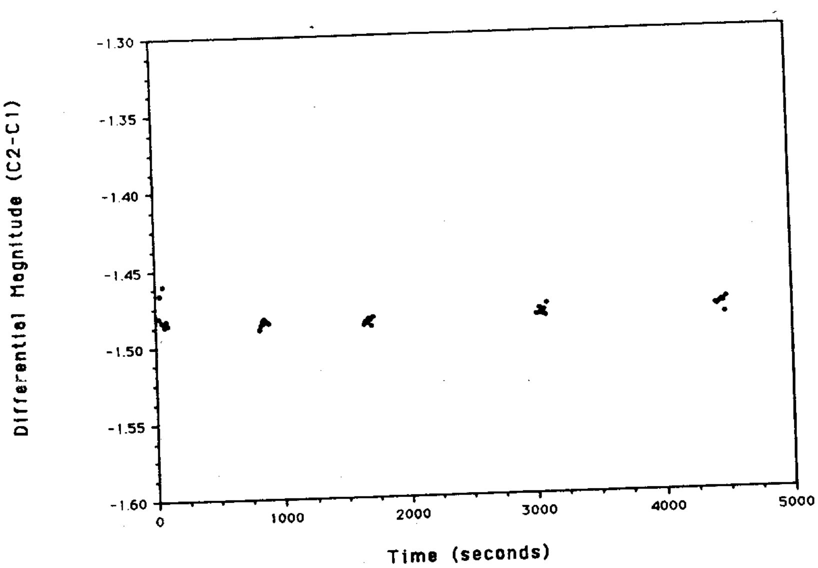

Figure 2 - System noise level from unfiltered measurements.

scale. Figure (2) shows the difference in the magnitudes of SAO 087458 and our second comparison star, SAO 087405. The fluctuations in the curve of Figure (1) are well above the noise level determined by Figure (2).

Our light curve for G185-32 does not show substantial differences from that of McGraw. Both the erratic 200-second quasi-period and 0.02 to 0.05 magnitude change seen by McGraw are apparent in Figure (1).

Our first two nights of observing were dedicated to obtaining accurate color magnitudes of G185-32. The values of U, B, V, and R were calculated by averaging two sets of 16 continuous measurements of each color from each night. The instrumental magnitudes were then transformed to the Johnson system. The value of the experimental uncertainty is the standard deviation of each set of 32 color measurements, carried through our transformation equations.

The colors of G185-32 are as follow:

$$U = 13.26 \pm 0.23$$
$$B = 13.50 \pm 0.10$$
$$V = 13.21 \pm 0.03$$
$$R = 13.18 \pm 0.10$$
$$(U-B) = -0.24 \pm 0.13$$
$$(B-V) = +0.29 \pm 0.07$$
$$(V-R) = +0.03 \pm 0.07$$

G185-32 was observed in 1967 by Eggen (3), as part of a survey of 500 faint, blue stars. Our results show that this star has become dimmer over the last 22 years. Eggen established a value of V = 13.00 for G185-32; this is brighter by a factor of approximately 1.2 than our measurements indicated. We also notice that while our value for (B-V) does not show a significant change, within our experimental uncertainty, from Eggen's value of (B-V) = +0.17, our value for (U-B) shows a definite increase from the 1967 value of (U-B) = -0.57. This would seem to indicate that while the effective temperature of G185-32 has remained relatively unchanged, there has been a change in the structure of its outer atmosphere. Such an alteration in the nondegenerate stellar exterior could also account for the decreased brightness of this star.

Because of the small amplitude and erratic behavior of the light curve of G185-32, further observations are needed to determine whether the changes in the color magnitudes have affected the white dwarf's oscillation behavior.

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