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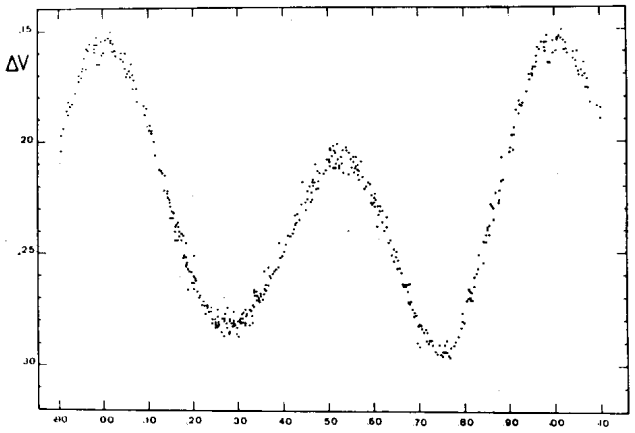
THE VARIABILITY OF HR 1081 = TU Hor

The variability of HR 1081 (HD 21981, A2V) was discussed by Stobie (1971) during a search for δ Scuti stars. His data did not allow him to decide whether it was a δ Scuti variable or an eclipsing system. As the radial velocity of this star is noted "variable" in the Yale Catalogue of Bright Stars, he adopted the second possibility. The star was named TU Hor in the second supplement of the General Catalogue of Variable Stars (Kukarkin et al, 1974).

The variability of TU Hor was rediscovered with the photometer of the Geneva Observatory at La Silla, Chile, at Julian Day 2443434, when it showed a range of about 0.08 magnitude in V. The photometric variability of this star has been studied in more detail during November and December, 1980, with the same equipment at La Silla. HR 1075 (HD 21882) proved to be an excellent comparison star, as it is fairly near to HR 1081, has about the same spectral type (A5V) and remains remarkably constant. The total variation range in V is about 0.14 magnitude, and a period of 0.936 days could be estimated. The magnitude difference HR 1081-HR 1075 is displayed in Figure 1 as a function of the phase computed with this period. An epoch of maximum light is Julian Day 2444542.132.



The V magnitude difference HR 1081-HR 1075 as a function of the phase computed with the 0.936 day period.

The striking feature of this light curve is that not only the minima are of unequal depth (they differ by about 0.015 magnitude), but that also two consecutive maxima are very distinct, as they differ by as much as 0.05 magnitude. The light curve is also asymmetric, in the sense that, when phase 0 corresponds to the main maximum, the second maximum is at phase 0.52, and the minima are at phases 0.28 and 0.76 respectively.

The extreme regularity with which the light curve repeats itself with each cycle suggests a geometrical origin of the variability. However, in normal eclipsing binaries, both maxima are equal. There are some known cases (Frolov et al., 1980) of eclipsing binaries where one component is also a pulsating star, but it seems almost impossible that some "synchronization" mechanism between the pulsation of the component and the orbital movement could impose the pulsation period of 0.936 days necessary to match the observations of this A2V star. Moreover, this spectral type places TU Hor at the very hottest end of the instability strip for δ Scuti stars, where the pulsation amplitudes can be expected to be small.

It is unlikely that the variability of TU Hor could be attributed to the Ap phenomenon. None of the published MK types indicates any peculiarity. Also the Z-index, the peculiarity index for early-type stars in the Geneva photometric system (Cramer and Maeder, 1979), for this star (Z = -0.010) does not indicate a pronounced Ap character. Finally, a rotation period of 0.936 days for an A2V star corresponds to an equatorial rotational velocity of about 120 km/s, while the Ap stars are known to be slow rotators.

Additional information is obviously needed to clarify the problem of the variability of HR 1081. Spectra have been taken at different phases and also the variation of the photometric colours will be useful in this context. These results will be presented elsewhere.

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