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IS HR 6754 A δ SCUTI STAR AFTER ALL?

HR 6754 (HD 165373, V = 6.64, SpT F0 IV-V) is a star which Breger (1969) found to be located in the δ Sct instability strip but which he also found to be non-variable. This conclusion was based on the star being constant to within 0.002 mag over 2.7 hours.

By chance I subseqently used HR 6754 as a check star while studying the variability of 89 Her, and Table 1 of Fernie (1981a) reported ten sporadic observations of HR 6754 over three months which showed constancy to better than 0.02 mag.

However, I have continued to use the star as a check star for 89 Her in an on-going APT Service program, and in a recent routine examination of the data I noticed the HR 6754 results seemed less stable than those of check stars for other variables.

Figure 1 shows the V magnitudes of HR 6754 in 1988 as open circles, while the plusses represent the V magnitudes of HR 6641, the check star for HD 161796. The two stars are fairly close together on the sky and so are measured within minutes of each other on each night, yet it is clear there is significantly more scatter in the HR 6754 data.

No significant periodicites were revealed when these data were subjected to a Discrete Fourier Transform analysis, but of course the star's spectral type suggests any likely period would be a fraction of a day, *i.e.* at frequencies much above the Nyquist frequency of these once-a-day observations.

I therefore observed HR 6754 over about two hours on August 24/25 1989, using HR 6697 as a comparison star. Figure 2 illustrates the results, and variability is clearly present. A DFT analysis yields a period of 0.072 ± 0.008 days and amplitude 0.035 mag, although the unequal heights of the maxima in Figure 2 suggest that a much longer datastring would likely reveal other periods as well. In any case, the result is consistent with δ Sct variability.

The evidence is much against HR 6697 being the variable. Its spectral type of G2 V militates against detectable pulsation, and its period is much too short and its lightcurve too shallow for a W UMa system. (The Bright Star Catalog indicates it to be a spectroscopic binary with components resolved at about 0.1 arcseconds, which leads to a period ≥ 2 years.) Moreover, plotting the magnitudes of the two stars separately over the two hour run indicates greater variability in HR 6754. Finally, if HR 6697 were the variable the puzzle of Figure 1 would remain unanswered since this star is not involved there.

Why the star should have appeared constant at the 0.002 mag level when Breger observed it is difficult to say. (My own 1981 data are not precise enough to be more than marginally inconsistent with the present results.) One might argue that in a multiperiodic variable destructive interference may at times flatten the lightcurve, but it seems unlikely this could result in constancy to two millimagnitudes for 2.7 hours. Another possibility, dis-

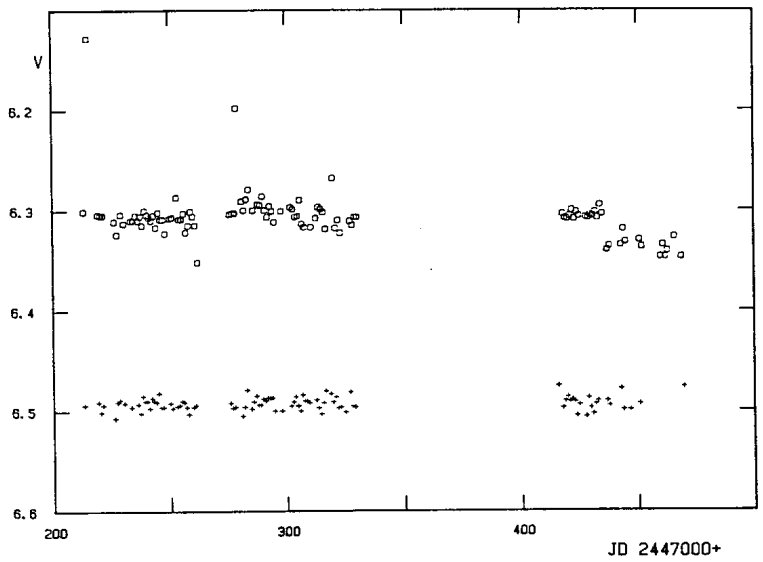

Fig. 1. Absolute photometry of HR 6754 (circles) and of HR 6641 (plusses) in 1988.

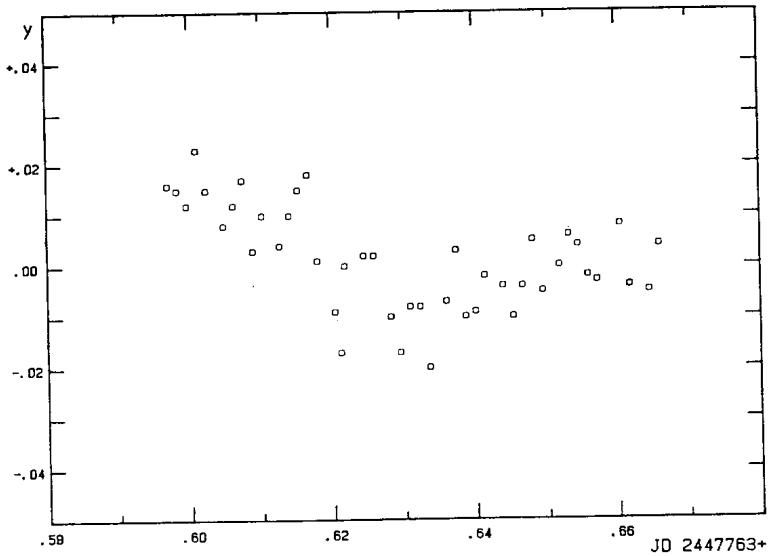

Fig. 2. Differential photometry, HR 6754 – HR 6697, during two hours on August 24/25, 1989.

cussed in Fernie (1981b), is that some stars in this region of the HR diagram are not continuously variable. The star would clearly repay further observation.

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