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Research Note

The Short-term Light Variations of HD 160529

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Summary. New observations confirm that the A2Ia-O star HD 160529 shows light variations of irregular nature and small amplitude on time scales of a few hours.

Key words: A-supergiant — variable stars

I. Introduction

In an earlier paper (Wolf *et al.*, 1974) it was pointed out that the action of very pronounced time- and depth-dependent non thermal photospheric velocity fields in the peculiar high luminosity star HD 160529 causes considerable intensity variations of the absorption lines, and also irregular photometric variations on a time scale of several days or weeks. However there was some evidence that the scatter among the differences between the comparison star observations and the program star observations during some nights was larger than the scatter associated with the differences between both comparison stars. But more systematic observations during entire nights were required to be sure about the existence of short-term fluctuations. Therefore additional observations have now been collected for this object.

II. The Observations

The new observations were obtained during an observing run in April and May 1974 at the European Southern Observatory at La Silla, Chile. The observations were carried out using the Danisch National 50 cm telescope, in the Strömgren *uvby* photometric system.
The stars C1 = HD 160461 (V = 7.47, A0) and C2 = HD 160575 (V = 7.55, B8), already used in a previous run, were taken again as comparison stars. The individual nightly extinction coefficient was calculated from extinction measurements during each night, and after correction for atmospheric absorption the measurements were transformed to the standard system of Crawford *et al.* (1970).
Only nights of good quality and with at least five observations in the sequence Cl, S, C2 (S = program star) are considered.

Table 1. Number of absolute deviations from the nightly mean that exceed three mean errors. C1–C2 denotes the differences between the comparison star measurements, while S-C1 and S-C2 refer to the differential measurements with respect to the first and second comparison star

	y	*b–y*	*v–b*	*u–v*
S–C1	0	0	0	17
S–C2	0	0	0	16
C1–C2	0	0	0	0

III. Results

142 measurements, distributed over 18 good-quality nights were tested for significant deviations from the nightly means. The statistical mean error on one measurement was determined from the differences C1–C2, and this value was used for testing the deviations during the corresponding night. It turned out that the mean error was generally $\lesssim 0^{m}.005$ in *y* as well as in *b–y*, *v–b* and *u–v*. From Table 1 one can see that more than 10% of the *u–v* measurements deviate more than three mean errors from the corresponding nightly mean. Hence there seems to be little doubt that, besides of considerable variations on a time scale of several days (Wolf *et al.*, 1974) nightly variations of small amplitude are sometimes present in this star. The variations look more like small irregular sudden jumps than monotonous increasing or decreasing deviations. The amplitudes greatly differ from night to night, with no detectable variations in some nights. Table 2 gives the amplitudes (absolute maximum deviations of the individual observations of one night from the corresponding nightly mean) of the *u–v* variations, and also the integer ratio between this amplitude and the corresponding nightly mean error (determined from the differences C1–C2). Variability in *u–v* is definitely present during 8 nights.

Table 2. Julian Heliocentric Date of the night, number of measurements, amplitude in u–v and integer ratio of the amplitude to the nightly mean error deduced from the differences between consecutive comparison star measurements

J. D. Hel.	n	a	r	Remark
24418 26	6	0.019	4	variability present
27	6	0.015	3	only one deviation significant
28	5	0.009	3	variability
29	5	0.009	2	no variability
44	6	0.010	2	no variability
64	8	0.019	2	no variability
75	9	0.028	3	variability
76	8	0.016	3	variability
89	7	0.007	1	no variability
24421 60	8	0.017	4	variability
61	8	0.012	2	no variability
62	11	0.012	2	no variability
64	10	0.013	2	no variability
65	8	0.020	5	variability
66	6	0.004	1	no variability
74	7	0.012	1	no variability
75	7	0.015	4	variability
80	15	0.017	4	variability

IV. Conclusions

The new observations confirm that HD 160529 shows detectable light variations on time scales of a few hours. From Table 2 it is evident that the fluctuations in u–v are present during about 40% of the observing nights. Similar short-term variations of small amplitude have been found in earlier investigations. Fath (1935) already mentioned variations during a single night amounting to 10 probable errors in the case of α Cygni. Magalashvili and Kharadze (1967) pointed out that the short-term light variations of P Cygni were not completely erratic, but showed a semi-periodicity of approximatively half a day. Alexander and Wallerstein (1967) on the other hand found no variations during five consecutive nights of observation. Appenzeller (1974) found similar variations in HD 35343 and HD 37836 in the Large Magellanic Cloud.

All the reported short-term and small amplitude variations have this in common that the light curves have an irregular shape and that the amplitudes differ from night to night. The fact that easily detectable

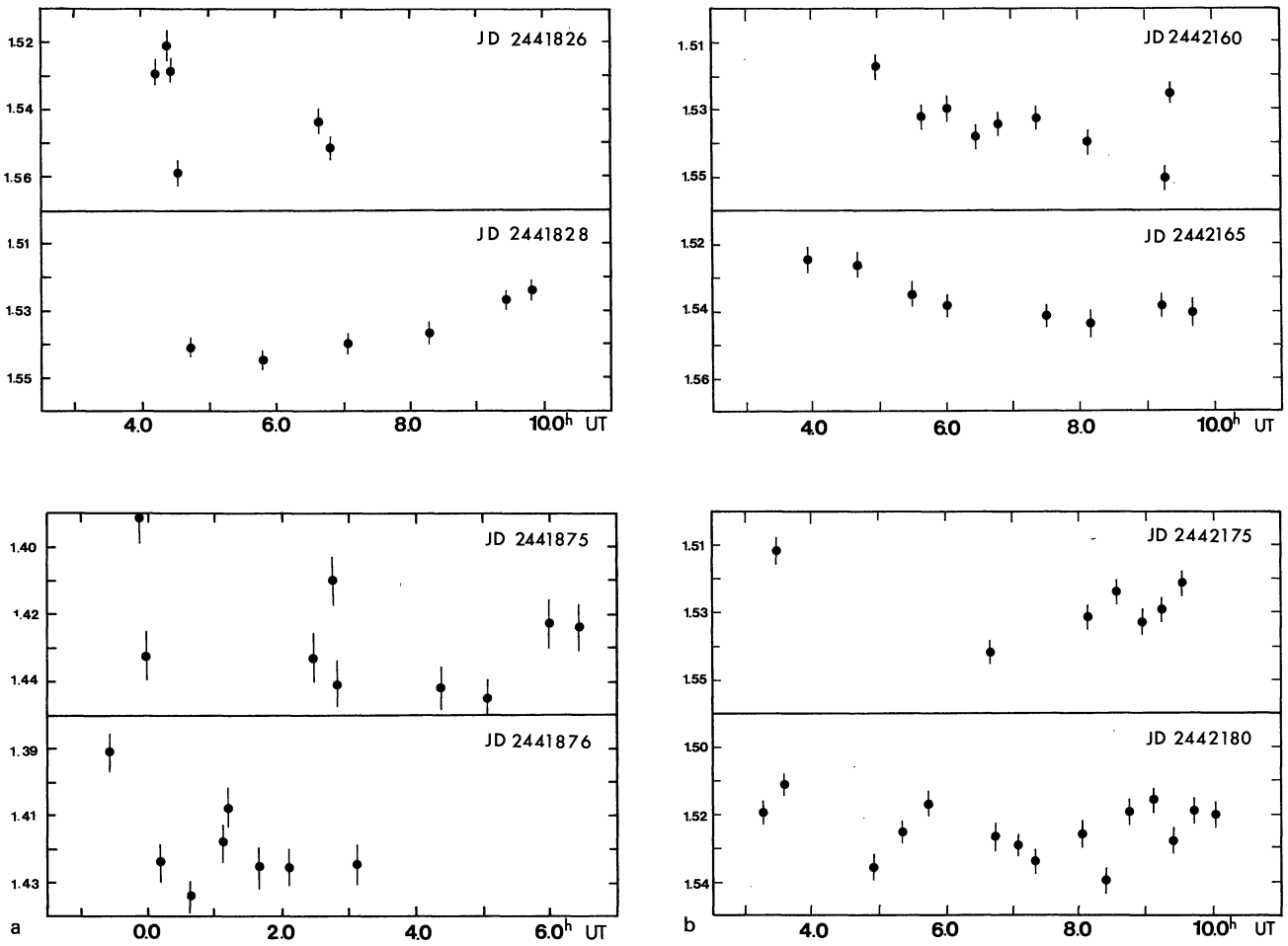

Fig. 1. Observed short-term variations in u–v for HD 160529. The error bars denote statistical mean errors

variations are only present during a limited number of nights in HD 160529 illustrates why they are so ill-known up to the present, and probably why for example the results of Magalashvili and Kharadze (1967) were contradictory to those of Alexander and Wallerstein (1967).

The absence of periodicities and the frequent irregularities in this star furthermore supports the idea that this extreme luminous early type star, similar to its LMC counterparts, shows no direct evidence for vibrational instability.

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