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THE VARIABILITY OF HD 126246=ADS 9251

HD 126246=BD+11°2673=ADS 9251 was chosen in 1984 as a comparison star for a program seeking long-term luminosity variations in a set of sun-like stars (Radick et al., 1989, Lockwood et al., 1992). The pair turned out to be somewhat active on both short (night-to-night) and long (season-to-season) timescales. I report here briefly on its variations during the years 1984-1992.

The star was included in a trio involving HD 124570=HR 5323=14 Boo (the program star) and HD 125451=HR 5365=18 Boo (a second comparison star). The stars were observed using the Lowell 53 cm photometric telescope, which is fitted with a single-channel photoelectric photometer containing Strömgren b and y filters. On each night all three stars were measured twice in each filter using either a 29-arcsec or 49-arcsec diaphragm. Each measure consisted of six ten-second integrations on 'star' and two ten-second integration on 'sky'. The data were reduced to instrumental magnitudes, accounting for differential extinction using mean monthly extinction coefficients (cf. Lockwood & Thompson, 1986). During episodes of volcanically-induced enhancements, the extinction values were adjusted to compensate at least approximately for this on a nightly basis. Basic data for all the stars is given in Table 1, extracted from the SIMBAD database. The combined V magnitude for HD 126246 is derived from the mean differential y magnitudes of the present observations combined with the published V for HD 125451, compensating for the small color term in transforming from y to V using the published b−y colors.

Table 1
Basic Data for the Variable and Comparison Stars

Star	V	b−y	MK
HD 124570	5.536	0.343	F6IV
HD 125451	5.386	0.267	F5IV
HD 126246	6.780	0.371	F8V+G1V

Over the course of nine seasons – and 161 observations – the two comparison stars were nearly constant. Their seasonal mean differential magnitudes differed on average by 0.1323±0.0012 (sigma) in the y filter and 0.2062±0.0015 (sigma) in the b filter. The averaged Δy does not closely match the implied ΔV listed in the Table, but is within the range expected from the uncertainties in the variety of sources of V magnitudes given in SIMBAD. The Δ(b−y) is in very close agreement with the color difference implied in Table 1, which is based on data given by Perry (1969). HD 124570, incidentally, is suspected variable NSV 6579. But this appears to be based solely on the range of reported V magnitudes (0.06) in the USNO Photoelectric Catalogue (Blanco et al., 1968), and is almost certainly spurious.

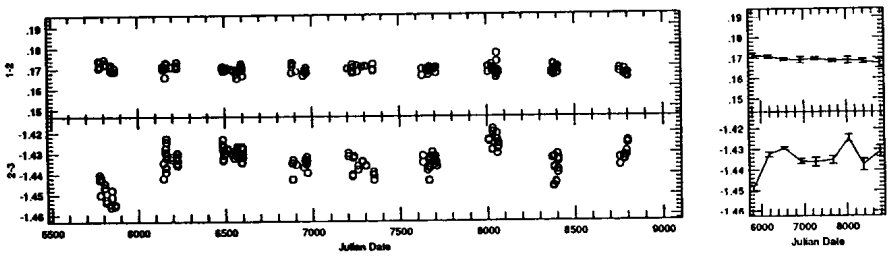

Figure 1. (upper) Differential magnitudes and seasonal means for the comparison stars HD 124570 minus HD 125451. (lower) Differential magnitudes and seasonal means for HD 125451 minus HD 126246, showing the variability in HD 126246.

The variable star is a wide pair, ADS 9251, whose separation is about 9 arcseconds. They appear to be a common-proper-motion pair (Halbwachs 1986). Both stars were always included in the photometer diaphragm. The magnitude difference was measured on five nights using a 12-arcsec diaphragm, and found to be $\Delta y=0.19\pm0.03$. The relatively large uncertainty is attributable to observational error at least as much as intrinsic variation in the two stars. V magnitudes of 7.44 and 7.63 are inferred from this measurement and the combined magnitude given in Table 1.

Figure 1 shows a plot of the nightly differential magnitudes (the two nightly pairs of b and y cycles averaged as b+y/2) for the comparison pair and for HD 125451 minus HD 126246. To the right of each data string are shown the seasonal means; the error bars are 95-percent confidence intervals. There is a slight drift in the mean magnitude for the comparison pair, amounting to about 0.004 magnitudes during the interval. This is most likely due to a change in one of the stars rather than an instrumental effect. A fourth star (HD 123845) was added to the group in 1988, which over five season shows the drift to be due to HD 124570.

The rather larger changes in HD 126246 are evident in the lower panel of Figure 1. Not only has the mean brightness varied over a range of about 0.024 magnitudes during the interval, but the dispersion in the seasonal groups indicates night-to-night variability as well. There are, unfortunately, not enough data in any one season to obtain reliable light curves, such as might be caused by rotation of spotted stars. This explanation for the variability is in fact the most likely, suggested by the small amplitude of the variations and spectral types of the stars. Assuming both stars to be contributing to the observed variability, the light curve would be complex in any case, since the two stars are always included in the diaphragm. The larger season-to-season shifts would be caused in this scenario by changes in the overall spottedness and chromospheric-activity level in the two stars.

Since the pair of stars is well separated, they are good candidates for spectroscopic study to examine their chromospheric activity in detail. However, untangling the short-term photometric variations in the individual stars, which appear to have full amplitudes less than 0.015 mag., will be a challenge observationally. We have dropped this variable pair from our program, but continue to monitor HD 124570 using the two remaining stable comparison stars.

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