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PHOTOMETRIC VARIATIONS OF THE MARGINAL Am STAR HD 143232

HD 143232 (SAO 207224, $m_V = 7.1$) was chosen as comparison star for a survey to detect variability in λ Bootis stars (Paunzen et al., 1995) because of its classification as Am star (Houk, 1982). The photometric observations were done with the ESO 50cm telescope at La Silla (observer: E. Paunzen) during the nights of 25/26 and 27/28 July 1994. An integration time of 15 seconds in Strömgren v and b was chosen. HD 143181 (SAO 207215, $m_V = 7.3$, B9V) was used as comparison star. In addition, spectroscopic observations (observer: B. Duffee) were performed with the 24-inch Helen-Sawyer-Hogg telescope located at Las Campanas.

We classify HD 143232 as kA7hA5mF2 which corresponds according to Jaschek & Jaschek (1987) to a marginal Am star. Figure 1 shows the spectrum with a resolution of 109 Å/mm. We performed the basic CCD reduction steps (correcting for bias and flat field) and normalization with standard IRAF-routines.

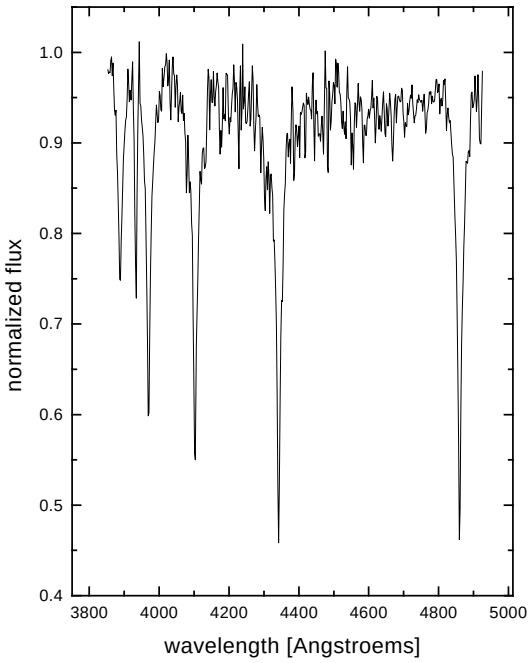

Figure 1. Classification spectrum of HD 143232

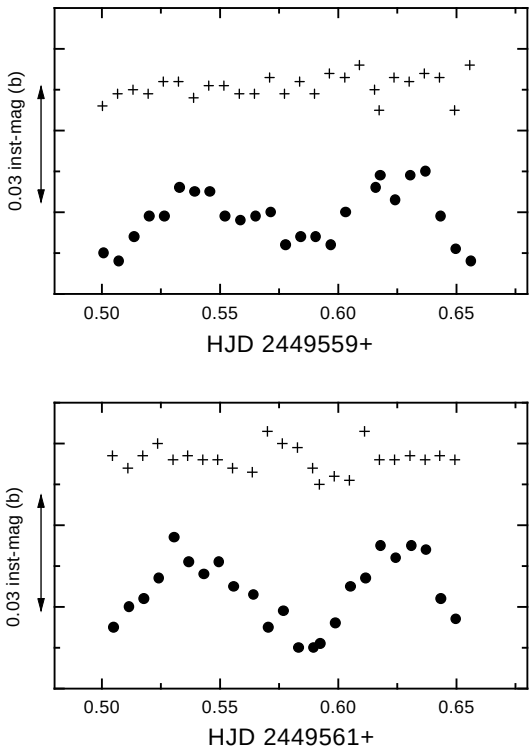

Figure 2. The lightcurves of HD 143181 (+) and HD 143232 (•) for both nights in Strömgren b

The following photometric indices were found in the literature (Hauck & Mermilliod, 1990 and Rufener, 1988):

b − y	m_1	c_1	β
0.142	0.199	0.951	2.815
B2 − V1	m_2	d	g
0.033	−0.476	1.306	0.104

The dereddening procedure and calibration in the Strömgren system uses the results of Moon & Dworetsky (1985), comprises calibrations given by Crawford (1979) and the iteration procedure described by Hilditch et al. (1983). The bolometric correction was calculated with the values given by Balona (1994). It results in B.C. = 0.04, $M_V = 1.49$, $T_{eff} = 7800\,\mathrm{K}$, $\log g = 3.82$ and E(b−y) = 0.025. In the Geneva photometric system we applied the calibration of Hauck & North (1993) and get $T_{eff} = 7700\,\mathrm{K}$. Both results are comparable within the error bars. Stellingwerf (1979) derived a PLC-relation for stars at the MS:

$$\log P = -0.29\,M_B - 3.23\log T_{eff} + 11.96$$

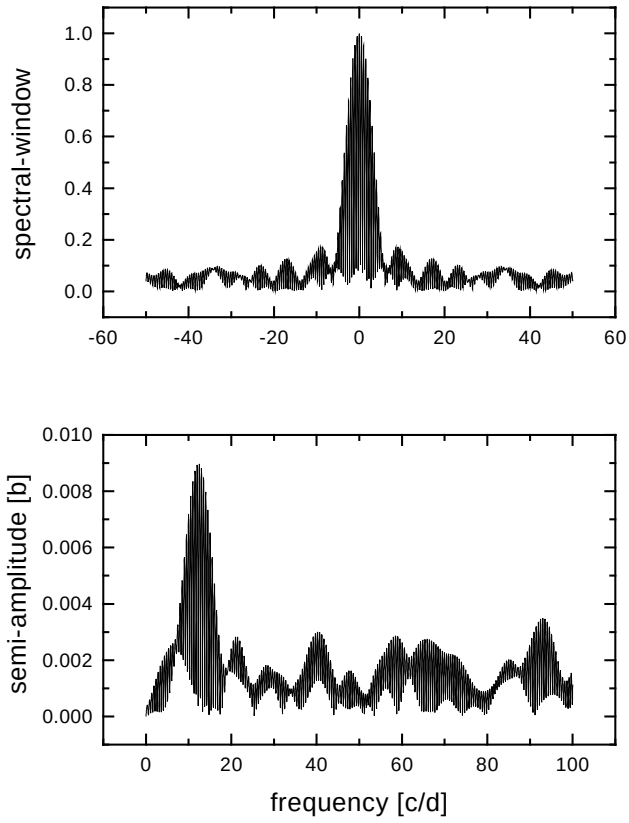

Figure 3. Amplitude spectrum and spectral window for the merged data of both nights in Strömgren b

With the calibrated values for HD 143232 we get a theoretical period of $P_{th} = 130$ minutes. Figure 2 shows the lightcurves of HD 143232 and HD 143181 for both nights in Strömgren b. We computed an amplitude spectrum with a standard Fourier technique (Breger, 1990) resulting in a period of $P_{obs} = 115$ minutes and a semi-amplitude of 9 mmag in Strömgren b (Figure 3).
Variability in marginal Am stars has been found before (Kurtz, 1984). The controversy of variability in Am stars is still not settled (Wolff, 1983). The absence of pulsation in classical Am stars is usually attributed to diffusion. The helium content in the HeII ioniziation zone, which is the primary mechanism for the pulsation, may be reduced to the point that the star becomes stable against pulsation. At the same time, other elements that are strongly supported by radiation pressure may be concentrated in the outer portion of the atmosphere, thus producing the abundance anomalies characteristics of Am stars. The tools of asteroseismology would be very powerful to understand the interior and physical processes of Am stars.

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References:

Balona, L.A., 1994, *MNRAS*, **268**, 119
Breger, M., 1990, *Communications in Asteroseismology*, **20**, 1
Crawford, D.L., 1979, *AJ*, **84**, 1858
Hauck, B., Mermilliod, M., 1990, *A&AS*, **86**, 107
Hauck, B., North, P., 1993, *A&A*, **269**, 403
Hilditch, R.W., Hill, G., Barnes, J.V., 1983, *MNRAS*, **204**, 241
Houk, N., 1982, University of Michigan Catalogue of Two-Dimensional Spectral Types for the HD Stars, Volume III, Astronomy Dept., Univ. Mich., Ann Arbor, Michigan
Jaschek, C., Jaschek, M., 1987, The classification of stars, Cambridge University Press
Kurtz, D.W., 1984, *MNRAS*, **206**, 253
Moon, T.T., Dworetsky, M.M., 1985, *MNRAS*, **217**, 305
Paunzen, E., Heiter, U., Weiss, W.W., 1995, *IBVS*, No. 4191
Rufener, F., 1988, Catalogue of stars measured in the Geneva Observatory Photometric System, 4th ed., Geneva Observatory
Stellingwerf, R.F., 1979, *ApJ*, **227**, 935
Wolff, S.C., 1983, The A-type stars: Problems and perspectives, NASA SP-463