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The rotation period of the A0p star HD 133652

The A0pSi star HD 133652 (= HR 5619 = CD $-30°$ 11960) is a very probable member of the Scorpius-Centaurus OB association (Thompson et al. 1987). Although HD 133652 was suspected for a long time to be a magnetic star (Babcock 1957), it was only very recently that Bohlender & Landstreet (1991, to be submitted to ApJS) discovered a strong reversing longitudinal magnetic field from Hβ polarimetric observations. Within the framework of the Oblique Rotator Model, it indicates that the two magnetic poles are visible during a whole rotation cycle. This star therefore deserves special interest, because it is a quite young ApSi star ($1 - 2 \cdot 10^7$ years) with very favourable conditions for surface mapping. Before any further study of the spectrum variations, we need to determine precisely the rotation period, which could be done most efficiently with new photometric observations.

In March 1991, we obtained 25 new measurements of HD 133652 in the Geneva seven-color photometric system with the photometer P7 attached to the 0.7 m Swiss telescope located at La Silla (Chile). They were reduced in the general reduction frame at Geneva Observatory. The accuracy of the data for several nights appears to be somewhat lower due to poor weather. Accordingly low weights were assigned to these measurements. We discarded from further analysis only the measurements with a null weight, for a total set of 34 observations when combined with several previous observations recorded in 1981-82.

HD 133652 exhibits typical variations for a magnetic Ap star, with $\Delta U \simeq 0.07$ mag and $\Delta V \simeq 0.03$ mag. The phase dispersion method (Stellingwerf 1978) and Renson's (1978) θ_1 test were applied separately to U, B and V magnitudes to determine the period P. Then least-squares fits of the observations were computed with a modified Newton method, with the assumption that the model function is a sine wave and its first harmonic. The ultimate accuracy on the period was achieved by varying P slightly and looking for the minimum

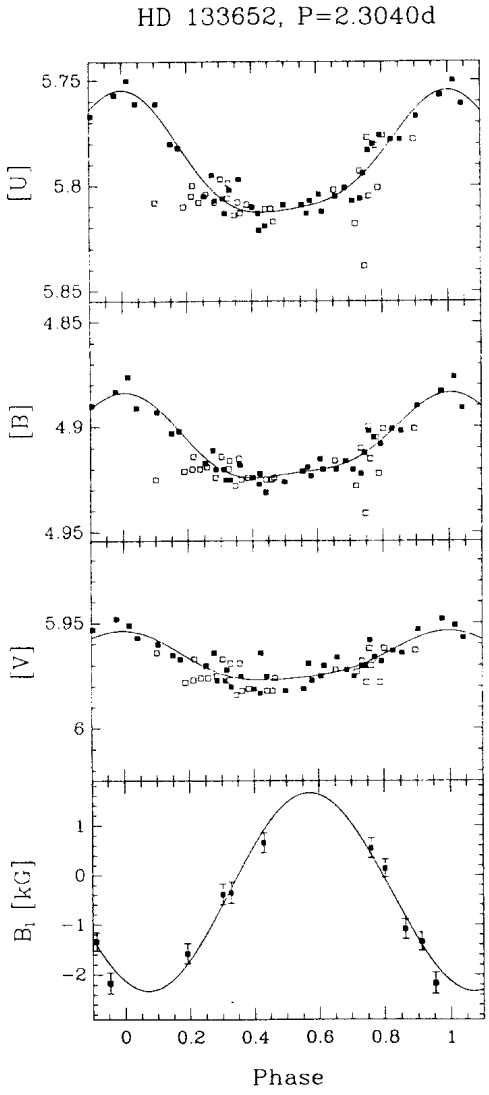

Figure 1: Photometric and longitudinal magnetic field variations of HD 133652. The phase origin is HJD 2448344.652. Open squares are data excluded from the period analysis and from the least-squares fits.

of the least-squares fit standard deviation for the three magnitudes. The resulting best period obtained in this manner from the photometry is $P = 2.3040$ days.

Bohlender & Landstreet obtained 7 polarimetric measurements of the star in 1988 and two more in 1990. These data are best fitted by a sine wave with $P = 2.3042$ days, which fully supports the period derived from the photometry. Therefore we adopt the following rotation period for HD 133652:

$$P = 2.3040 \pm 0.0003 \text{ days}$$

A minimum of U occurred at HJD 2448344.652. The figure shows the photometric and magnetic variations, and the least-squares fits with the adopted period.

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