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THE PHASE BEHAVIOUR OF THE GENEVA Z AND Δ(V1-G) PARAMETERS FOR 41 Tau, 56 Tau AND 49 Cnc

In the Geneva seven-colour system there are two parameters distinguishing magnetic from nonmagnetic stars:

Δ(V1-G) defined by Steiger (1974)

$$\Delta(V1-G) = (V1-G) - 0.289(B2-G) - 0^{m}.302$$

and reddening-free parameter proposed by Cramer and Maeder (1979, 1980)

$$Z = 0.0255U - 0.1740B1 + 0.4696B2 - 1.1205V1 + 0.7994G - 0^{m}.4572$$

which, however, is not valid for spectral types later than A3. They both, like Ap-sensitive parameters in other photometric systems, measure the depth of a broad absorption structure centred about 5200 Å. Its origin is not yet clear and this is the first reason why the phase behaviour of Z and Δ(V1-G) is important for understanding of the Ap phenomenon. The other one is that Δ(V1-G) and Z are fairly well correlated with the mean surface magnetic field H_s if one considers the hotter Ap stars with H_s not exceeding 5 kGauss.

So far the phase dependence of the strength of 5200 Å structure has been investigated for several stars (cf. e.g. Buchholz and Maitzen 1979, Gertner, Muciek and Mikołajewski 1983, Pyper and Adelman 1983, Maitzen and Vogt 1983).

Here we present the plots of Z and Δ(V1-G) versus phase for other three stars. In each case a sinusoid is fitted by least-squares method. The errors have been calculated for each point separately according to the definitions of Rufener (1981) and vary from $0^{m}.004$ to $0^{m}.01$. The clearly erroneous points (marked by crosses) are omitted.

41 Tauri = HD 25823 (Figure 1)

The phases are computed with ephemeris determined by Abt and Snowden (1973):

$$T(\text{periastron passage}) = 2421944.74 + 7^{d}.227424\ E$$

The best fits are:

$$Z = -0^{m}.0348 - 0^{m}.0092\cos(2\pi\varphi + 1.57)$$

and

$$\Delta(V1-G) = 0^{m}.0262 + 0^{m}.0078\cos(2\pi\varphi + 1.61)$$

This star was also studied by Adelman (1983) who did not see any variability of the Δa index which is also connected with the strength of the 5200 Å structure.

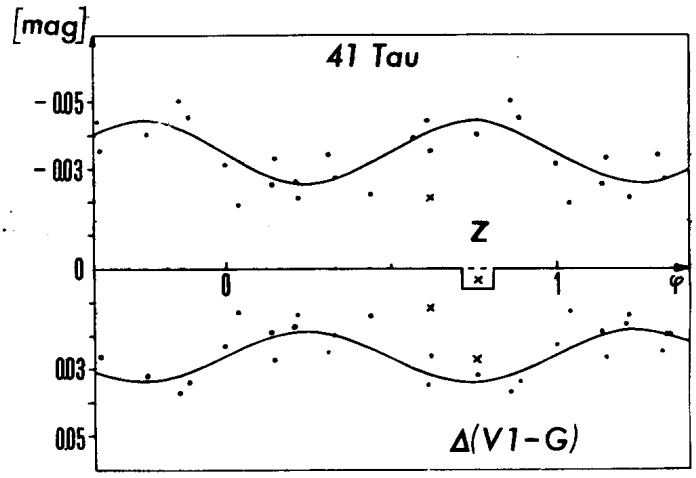

Figure 1

The single-wave fits to Z and $\Delta(V1-G)$ for 41 Tau. The observations marked by crosses are excluded

56 Tauri = HD 27309 (Figure 2)

The ephemeris used is that of Musielok et al. (1980):

$$JD(U_{max}) = 2442299.51 + 1^{d}.56896\ E$$

The following curves are obtained:

$$Z = -0^{m}.0632 - 0^{m}.0106\cos(2\pi\varphi - 0.44)$$

and

$$\Delta(V1-G) = 0^{m}.0478 + 0^{m}.0078\cos(2\pi\varphi - 0.41)$$

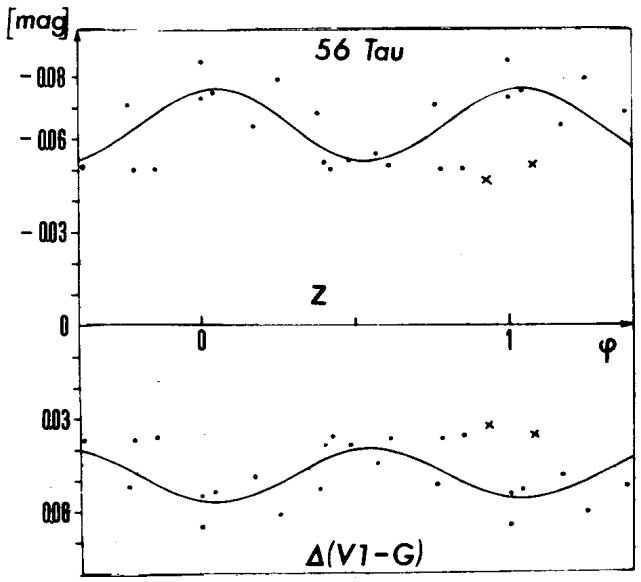

Figure 2

The single-wave fits to Z and Δ(V1-G) for 56 Tau. The observations marked by crosses are excluded

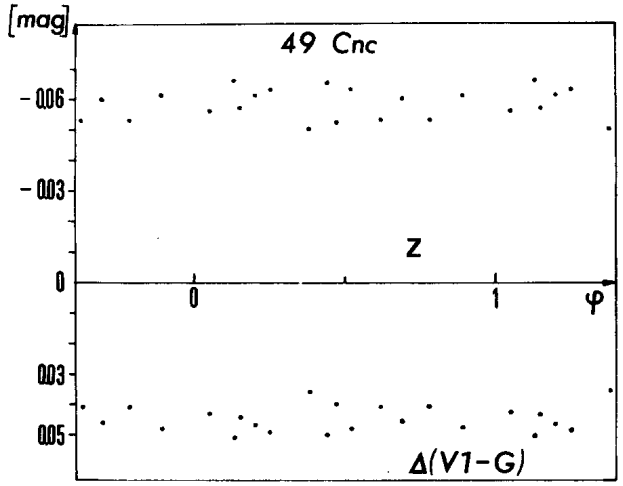

Figure 3

The phase dependence of Z and Δ(V1-G) for 49 Cnc

49 Cancri = HD 74521 (Figure 3)

For phase computations the elements of Winzer (1974) are used:

$$JD(U_{max}) = 2441616.50 + 4^{d}.2359\ E$$

Both parameters seem to be invariable for this star so we did not make any fitting. However, Adelman and Pyper (1979) suggest a possible variability of the Δa index.

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