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GLIESE 559.1 - A YOUNG SPOTTED SINGLE STAR

An interesting group of spotted single stars belonging to the Local Association has been picked out by Chugainov (1991) and Chugainov et al. (1991). This paper contains the results of photoelectric observations of the single star Gl 559.1 = HD 129333 belonging to the Local Association according to its space velocity vector as given by Gliese (1969). Observations of Soderblom (1981) have shown that this GOV star possesses very intense CaII emission lines. According to the relation found by Noyes et al. (1984) between CaII H and K emission level, spectral type and rotation period, the latter is about 2 days for Gl 559.1.

We have found the light variability of Gl 559.1 from photoelectric observations obtained in the period of March-August 1991 with the 125-cm telescope of the Crimean Astrophysical Observatory and the 60-cm telescope of the Southern Station State Sternberg Astronomical Institute in UBVRI and UBV systems respectively. The results have been analysed for the presence of periodicities by means of Scargle's (1982) method. The highest probability peak corresponds to $1/P_1=0.357$ day^{-1} but we cannot exclude the periodicity of $1/P_2=0.642$ day^{-1}. It seems likely that the latter is an alias due

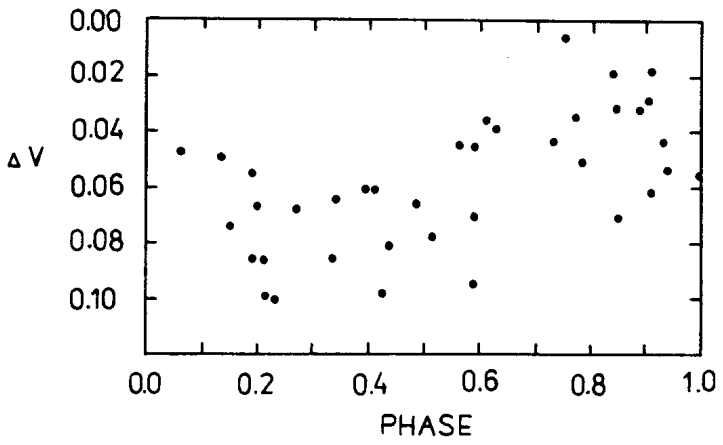

Figure 1

to the one-day repetition of observations, i.e. $1/P_2=1-1/P_1$. If the rotation period is $P_1=2^d.801$ then the equatorial velocity of the star is $v=2\pi R/P_1=18$ km/s supposing that the radius R corresponds to the main sequence. The projected velocity vsini of Gl 559.1 is not known. The value of vsini has to be also determined from observations in order to verify the adopted values of period and radius.

Figure 1 shows the light curve of Gl 559.1 folded with the period of $2^d.801$. ΔV is the magnitude difference with respect to the comparison star BD+64^{o}1018. We can derive the amplitudes of brightness and colour variations from our observations only approximately. Their values are equal to $0^m.05$ for the V magnitude and $0^m.01$ for each of colour indices U-B, B-V, V-R and R-I. The variations of colour indices show the star to become redder at light minima. Thus the observed variability may be attributed to the presence of cool spots. The observed brightness and colour amplitudes would correspond to the maximum fraction of the stellar disk covered by spots, f=0.2, and the difference between the spot and photospheric temperatures $\Delta T=300$ K. This estimate ignores limb darkening and inclination of the star.

The spectral type of Gl 559.1 is the earliest in the group of 24 spotted single stars belonging to the Local Association. The stars FK Com and V1794 Cyg are the nearest to it by spectral types and rotation periods but they differ from it showing luminosities to be larger. V368 Cep, LQ Hya and V838 Cen have rotation periods similar to that of Gl 559.1 but their spectral types are later. Periods of rapidly rotating early G-stars in young stellar clusters are $0^d.60$ for HeII 520 in α Per cluster (Stauffer et al. 1985) and $1^d.26$ for HII 996 in Pleiades (Panov and Geyer 1991). In general, for G-M main-sequence stars rotation periods range from 0.2-0.6 days to 20-70 days and this range is independent of the spectral type as Soderblom (1991) has concluded. However the scarcity of observational data for early spotted single G stars is worth noting. New observations are needed to improve the relation between rotation periods and CaII emission strengths, to have independent determinations of the rotation periods and projection velocities vsini, and to study stars with different luminosities and lithium abundances. Spotted main-sequence stars with rotation periods of $0^d.2$-$0^d.4$ are now known only in the G8-M1 interval of spectral types but not in early G stars. This difference, if confirmed, may be considered as a consequence of a dependence of the spinning-up phenomenon on the stellar mass. One can

suppose that early G stars increase their rotational velocity during the evolution to the main sequence not as strongly as G8-M1 stars do.

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