PERIOD STUDY OF GH PEGASI

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Abstract. The period study of the eclipsing binary system GH Pegasi has been presented for the first time. A new period ($P = 2^d.556135$) of GH Peg, based on all available times of minima, has been given. O–C diagrams of the system have also been presented for the first time, and the period changes present in the system have been analysed. The period shows changes around the years 1972 and 1981. The total period change in different portions of the O–C diagram, based on the corrected period, ranges from 5.2×10^{-6} d to 7.0×10^{-5} d. The photoelectric minima show sufficiently large scatter in the system.

1. Introduction

Strohmeier and Knigge (1960a, b) discovered the eclipsing binary system GH Pegasi (= BD + 14°4684). The system was also observed by Filatov (1961). Strohmeier (1962) presented the photographic light curve of GH Peg and gave its period. Srivastava and Padalia (1974) secured its first *UBV* observations in 1972 and analysed the system. Diethelm (1981) and Braune (1985) gave times of minima of GH Peg.

2. Epoch and Period

Strohmeier (1962) gave the first period of the system GH Peg as $2^d.556138$. Since 1931 to the date of Srivastava and Padalia's (1974) communication, i.e., till the observations of 1972, the system remained totally neglected from the observations. Srivastava and Padalia (1974) gave an improved period of GH Peg as $2^d.556134$. Diethelm (1981) and Braune (1985) gave the epochs, but not the periods.

3. New Periods

The author collected all (10) times of minima available in the literature. Out of these 7 minima are primary and 3 minima are secondary. We have derived two new periods: one based on all available times of minima, and the other based on only photoelectric times of minima. The corrected and photoelectric periods of GH Peg are obtained after trials using the method of least-squares, and these come out to be $2^d.556135$ ($\pm 0^d.000001$) and $2^d.556145$ ($\pm 0^d.000003$), respectively. The epochs and periods, given by different authors, are listed in Table I.

4. O–C Diagram and Period Changes

All available (10) minima of the eclipsing binary system GH Peg have been collected, which have been observed between 1931 and 1984. Out of these minima, only first

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TABLE I

Epoch and period of GH Pegasi

Sl. No.	Author	Epoch and period
1	Strohmeier (1962)	J.D. 2426647.345 + $2^d.556138E$
2	Srivastava and Padalia (1974)	J.D. 2426647.345 + $2^d.556136E$
3	Srivastava (1986) (period from all minima)	J.D. 2426647.345 + $2^d.556135E$
4	Srivastava (1986) (period from photoelectric minima only)	J.D. 2426647.345 + $2^d.556145E$

minimum is photographic, while the remaining minima are photoelectric. In all 7 primary and 3 secondary minima are observed in nearly 53 years time-interval. An O–C diagram has been constructed using the ephemeris:

Primary minimum = J.D. 2426647.345 + $2^d.556135E$.

(Strohmeier, 1962) (present work)

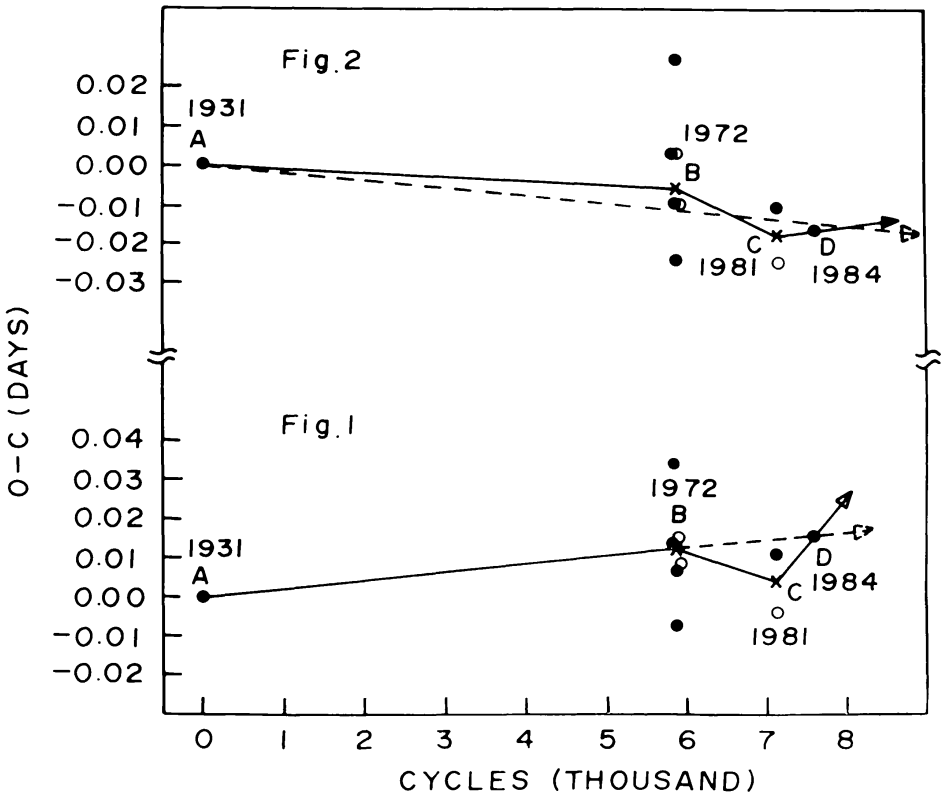

Fig. 1. O–C diagram based on the corrected period of GH Peg. Filled circles, open circles, and crosses, respectively, denote the primary, secondary, and mean O–C values.

Fig. 2. O–C diagram based on the Strohmeier's (1962) period. Filled circles, open circles, and crosses, respectively, represent the primary, secondary, and mean O–C values.

The O–C values alongwith the cycles have been listed in Table I. The O–C values of the individual minima alongwith some mean values have been plotted in Figure 1. The filled and open circles represent the primary and the secondary minima, respectively, while the crosses indicate the mean O–C values of some points.

The O–C values have also been calculated from the original period of Strohmeier (1962) and are listed in Table II as $(O-C)_I$, and are plotted in Figure 2. The O–C values obtained from the corrected (present) period are also listed as $(O-C)_{II}$ in the same table. Figures 1 and 2 reflect rising and declining tendencies of the period. The O–C values obtained using Strohmeier's (1962) epoch and the photoelectric period, which are not listed, show large scatter, which is unusual for the photoelectric measurements. This point is quite important for future investigations.

Sudden jump of the orbital period of GH Peg are noted around the years 1972 and 1981. Since, there is only one point around 1984 the trend appears incomplete. There is a complete absence of minima between the period of 1931 and 1972 observations,

TABLE II

Minima of GH Pegasi

J.D.$_\odot$	Min.	Observations	Cycles	Mean of cycles	$(O-C)_I$	Mean of $(O-C)_I$	$(O-C)_{II}$	Reference
2426647.345	I	pg	0		0^d.000		0^d.000	Strohmeier (1962)
41603.284	I	pe	5851		−0.024		−0.007	Srivastava and Padalia (1974)
16.106	I	pe	5856		+0.017		+0.034	Srivastava and Padalia (1974)
21.198	I	pe	5858	5860	−0.003	−0.010	+0.014	Srivastava and Padalia (1974)
30.145	II	pe	5861.5		−0.003		+0.015	Srivastava and Padalia (1974)
39.084	I	pe	5865		−0.010		+0.007	Srivastava and Padalia (1974)
53.143	II	pe	5870.5		−0.010		+0.008	Srivastava and Padalia (1974)
4885.379	I	pe	7135	7141	−0.011	−0.018	+0.011	Diethelm (1981)
917.316	II	pe	7174.5		−0.025		−0.004	Diethelm (1981)
5933.399	I	pe	7545		−0.017		+0.015	Braune (1985)

I = primary minimum; II = secondary minimum.

TABLE III

Period changes of GH Pegasi

Between points	Interval of cycles	Total change in period, ΔP (days)
A, *B*	$E = 0$ to $E = 5860$	5.23×10^{-6}
B, *C*	$E = 5860$ to $E = 7141$	1.59×10^{-5}
C, *D*	$E = 7141$ to $E = 7545$	6.96×10^{-5}
	Mean	2.69×10^{-5}

hence, nothing can be said about the behaviour of the period in this time-interval. The points *B* and *C* are pretty well defined and, thus period changes (or fluctuations) of the order of 10^{-5} d (Table III) are apparent from the O–C diagram (Figure 1).

5. Summary

It is strange to note that GH Pegasi, a sufficiently bright eclipsing binary system, remained almost observationally neglected. Only 10 times of primary and secondary minima are available in the time-interval of 53 years. Moreover, only Srivastava and Padalia's (1974) photoelectric light curves are available in the literature. It is also strange to note that the photoelectric times of primary minima show appreciable scatter in the O–C diagrams than the photoelectric times of secondary minima. All these facts desire to look for further minima observations in the future.

Although, the data is scanty, and there is nothing much to comment on the period behaviour of GH Peg, yet it is apparent that the period changes (or fluctuations) of the order 10^{-5} d, on the average are present in the system.

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