A NEW PERIOD AND PERIOD TREND OF IZ PERSEI

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Abstract. A new period \( P = 3.687664 \) of the eclipsing binary system IZ Persei is given, based on 16 observed times of the minima. O–C diagrams of IZ Per have been presented for the first time, and the period variations have been estimated in different portions of the O–C diagram. Significant period changes do not appear to have occurred in IZ Per. The O–C diagrams suggest that the period of the system is continuously increasing at a rate of \( 25 \text{ s yr}^{-1} \). Period variations of the order of \( 10^{-5} \text{ d} \) appear to have occurred around the years 1969, 1972, and 1978. The period increases are stronger than the period decreases; but these are yet to be confirmed. The overall picture of IZ Per suggests that strong period changes are not present in the system; however, slow increase of period is apparent in IZ Per. The total period change \( (3 \times 10^{-6} \text{ d}) \) till the last epoch is in agreement with the newly derived period of IZ Per.

1. Introduction

The eclipsing binary IZ Persei (= BD + 53° 323 = HD 9234) was discovered to be a variable by Strohmeier (1958) photographically. The system was announced to be apparently of the Algol type.

Yavuz (1969) presented spectroscopic observations of IZ Per and stated that only one component was spectroscopically perceptible. The mass function, mass ratio, and \( a \sin i \) values of the individual components are not given. Srivastava and Padalia (1970) presented first photoelectric observations of IZ Per in \( U, B, \) and \( V \) filters and gave orbital elements of the system for the first time. Kizilirmak and Pohl (1974), Pohl and Kizilirmak (1975, 1976), and Mallama et al. (1977) gave times of primary minimum. Wolf and Baker (1977) have reportedly analysed the system in \( B \) and \( V \) colours, whose details are not available to us. Locher (1976), Poretti (1978a, b, 1981), Braune (1984), Hübscher (1984), Klaas (1985), and Ringe (1985) also obtained times of minima. Mardirossian et al. (1980) reanalysed our observations (cf. Srivastava and Padalia, 1970) and gave revised orbital elements. Since our work, no \( U, B, V \) observations have appeared in the literature.

2. Analysis of IZ Per

Subsequent to our analysis of IZ Per (cf. Srivastava and Padalia, 1970), Wolf and Baker (1977) presented \( B \) and \( V \) photoelectric observations, and derived the orbital elements of the system by taking into account the interaction effects, using the Wilson and Devinney method. They indicated it to be a semi-detached system. However, their results are not available in the literature.

Mardirossian et al. (1980) have reanalysed our \( U, B, \) and \( V \) observations employing Wood’s model and have found a different set of elements. They have pointed out that the binary is likely to be a semi-detached system.
3. Epoch and Period

Strohmeier (1958), Srivastava and Padalia (1970), Kizilirmak and Pohl (1974), Pohl and Kizilirmak (1975, 1976), Locher (1976), Mallama et al. (1977), Poretti (1978a, b, 1981), Braune (1984), Hübscher (1984), Klaas (1985), and Ringe (1985) presented the epochs of minima and/or the period of the system IZ Per. The periods given by the various authors are presented in Table I.

<table>
<thead>
<tr>
<th>Author</th>
<th>Epoch and period</th>
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<tr>
<td>Strohmeier (1958)</td>
<td>J.D. 2425571.360 + 3.687663E</td>
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<tr>
<td>Srivastava (present work)</td>
<td>J.D. 2425571.360 + 3.6876639E</td>
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4. New Period

The author collected sixteen times of minima of IZ Per, which are available in the literature. Out of these, 7 minima are photoelectric, 8 minima are visual, and one minimum is photographic. From all these minima, a new period of IZ Per has been obtained after several trials using the method of least squares. The new period comes out to be 3.6876639 (~ 3.687664), and is listed in Table I.

5. O–C Diagram and Period Variations

All available primary and secondary minima of IZ Per have been collected, which have been observed between 1928 and 1983, and O–C diagrams have been constructed from the O–C values calculated from the ephemeris:

Primary Minimum = J.D. 2425571.360 + 3.687663E.

The epoch is of Strohmeier (1958) and the period belongs to Srivastava and Padalia (1970). Two O–C diagrams (Figures 1 and 2) have been constructed. In Figure 1, O–C values of all the individual points are shown. Mean O–C values at some points have been obtained to reduce the scatter, and are shown by the crosses. In order to differentiate between different types of observation, arbitrary weights of 1, 2, and 3 are, respectively, given to the visual, the photographic, and the photoelectric observations in the absence of the availability of all the observations and the errors of individual minima. The weighted O–C values have been plotted in Figure 2. Arrowed solid thick lines in the figures indicate the continuously increasing trend of the period, while the dashed lines indicate the period variations (or fluctuations).