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PERIOD CHANGES IN R Leo

R Leo is one of the best known Mira-variables. Since its discovery in 1782 this star was continuously observed by thousands of observers.

Irregularities in the period of R Leo were first discussed by Argelander (1869). Since then some other authors (e.g. Turner and Blagg, 1915) reported changes in the period. Later instantaneous elements were introduced in order to satisfy the observer's needs (for a short review on instantaneous elements, see Hoffmeister et al., 1984). During the last few years molecules, such as SiO, OH and H<sub>2</sub>O, have been found in the circumstellar shell (see e.g. Hjalmarsen and Olofsson, 1979) and the interrelations with the period (Ukita, 1982) and light variations (Le Squeren and Sivagnanam, 1985) were discussed. Recently Wood (1979) and Wood and Zarro (1981) studied the general problem of period changes in Miras in the context of stellar evolution.

Because of the comprehensive material published on R Leo (see Hoeppe, 1986), this star was chosen to prepare a study of its long-term variations. Due to the topical significance first results are given here.

The author collected all the literature on R Leo available to him (see Hoeppe, 1986).

The resulting (O-C)-diagram which covers 201 years of observation (1782-1983) is shown in Figure 1. In obtaining the O-C residuals, the elements as described by Kukarkin et al. (1969) were used in the slightly modified form

$$\text{Max.} = \text{J.D. } 2362947 + 312^{\text{d}}.57 \text{ E.}$$

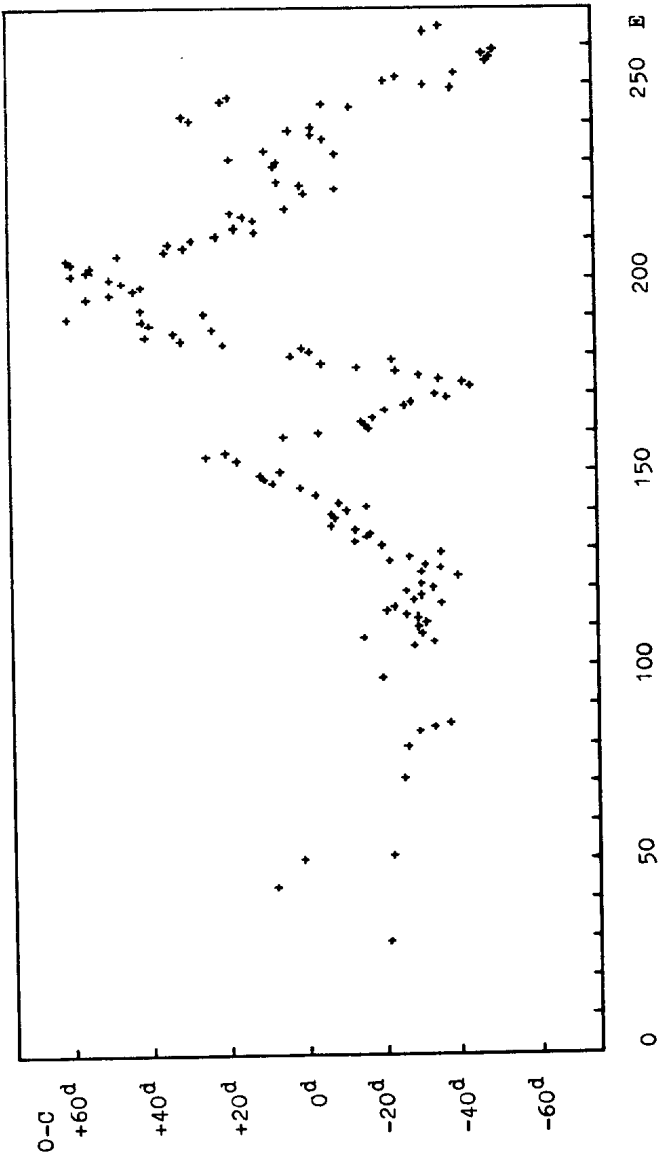


Figure 1

The residuals' large variations are clearly visible. As S Her, which was studied by Wood and Zarro (1981), R Leo shows abrupt period changes, although the amplitude of the O-C residuals is increasing in R Leo and is smaller than in S Her. The graph seems to be nearly linear between the residuals maxima (at epochs 153 and 206) and minima (at epochs 123 and 172).

In addition to Figure 1 some other results were derived from the data. These are given in the following compilation:

mean max. brightness	=	$5^m.76 \pm 0^m.44$	(n = 116)
mean min. brightness	=	$9^m.96 \pm 0^m.34$	(n = 81)
mean amplitude	=	$4^m.14 \pm 0^m.54$	(n = 51)
mean period	=	$312^d.96 \pm 15^d.86$	(n = 112)
mean M-m	=	$138^d.23 \pm 13^d.05$	(n = 64)

In this list the second value in each row indicates the standard deviation.

In regard to the current research on helium-shell flashes in Miras (see Wood and Zarro, 1981) extensive and continuous (O-C)-diagrams will provide a useful basis for further studies.

More data and a more extensive discussion including a study of some other long-term variations and the complete list of references to Figure 1 will be given in a forthcoming paper (Hoepe, 1986).

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