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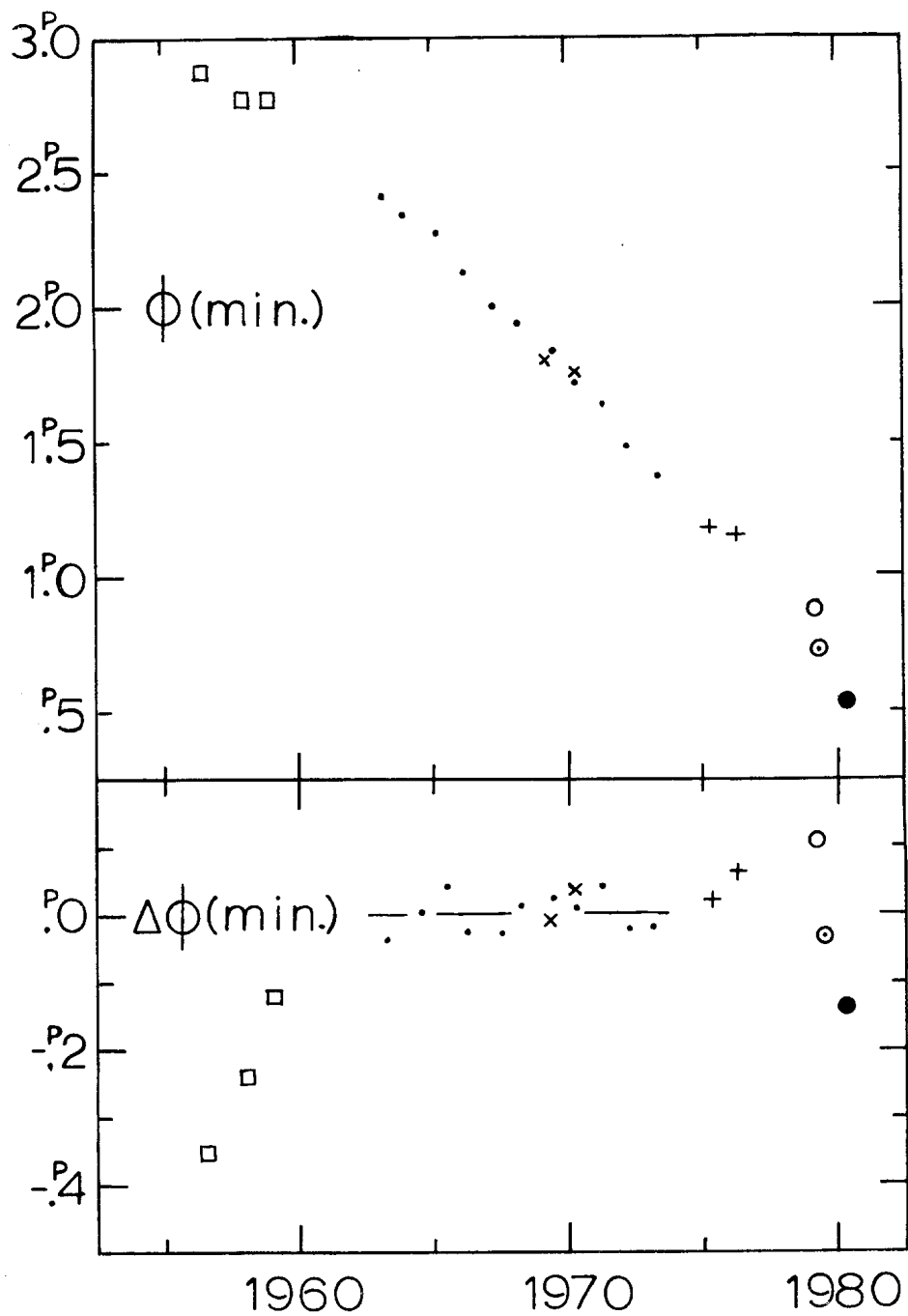
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A SUDDEN ACCELERATION IN THE MIGRATION RATE OF RS CVn

The purpose of this note is to show that our recent photometry of the wave in RS CVn, along with previously published values of the phase of wave minimum, seems to indicate a recent sharp acceleration in the migration rate and a simultaneous decrease in the amplitude of the wave.

Eaton obtained observations in V only with the 24-inch reflector at the Pennsylvania State University Observatory between JD 2443945.74 and 2444001.66. Fourier analysis of his light curve outside eclipse yielded $\Delta V = 0^m.189 \pm 0^m.020$ for the wave amplitude and $\phi(\text{min.}) = 0^P.871 \pm 0^P.017$ for the phase of its minimum. Henry obtained observations in V and B with the No. 4 16-inch at Kitt Peak National Observatory and the 24-inch at Dyer Observatory between JD 2444316.86 and 2444425.64. Fourier analysis of his light curves outside eclipse yielded $\Delta V = 0^m.116 \pm 0^m.009$ and $\Delta B = 0^m.097 \pm 0^m.007$ for the wave amplitude and $0^P.510 \pm 0^P.009$ and $0^P.511 \pm 0^P.008$ for the phase of the wave minimum in V and B, respectively. In this Fourier analysis, phases were computed with the ephemeris of Evren et al. (1980). The equipment and observing technique used by Eaton and Henry have been described already by Burke et al. (1980).

In the Figure below, the top part is the migration curve between 1956 and 1980, with the ordinate $\phi(\text{min.})$ being the phase of wave minimum. The three squares are from Popper (Hall 1972); the eleven points are from Catania (Catalano et al. 1980); the two crosses are from Oliver (1975); the two plusses are from Ludington (1978); the one open circle is from Eaton (this paper); the



one circled point is from Evren et al. (1980); and the one filled circle is from Henry (this paper). In the bottom part, each symbol is the corresponding residual

$$\Delta\phi(\text{min.}) = \phi(\text{min.}) - \phi'(\text{min.}),$$

where $\phi'(\text{min.})$ is the phase of wave minimum computed with the 9.48-year migration period determined by Catalano et al. from the **Catanian** observations between 1963 and 1973. Specifically

$$\phi'(\text{min.}) = 0^{\text{P}}45 - (T - 1963.32)/9.48,$$

where T is the mean epoch of each light curve.

In the $\Delta\phi(\text{min.})$ plot we see that a migration period of 9.48 years does indeed fit the observations very well between 1963 and 1973, the horizontal straight line segment. On the other hand, the migration rate was much slower in the late 1950's and now, as of 1980, is apparently much faster. A fit to the earliest three symbols would indicate $P(\text{migr.}) \sim 20$ years whereas a fit to the latest three symbols would indicate $P(\text{migr.}) \sim 3$ years.

Because another point or two in the figure is needed to define the recent trend better, it would be premature to speculate now on physical interpretations. We should, however, issue the following warning immediately. If the migration rate really has accelerated recently, then we are in danger of losing continuity in the migration curve, which has been maintained now for the 24 years since 1956. Anytime the wave migrates an appreciable fraction of one cycle between one light curve and the next, $\geq 0^{\text{P}}4$ for example, we cannot know with confidence whether it moved towards increasing or towards decreasing phase. Therefore we urge observers of RS CVn binaries (and observers of RS CVn itself in particular) to begin observing RS CVn as soon as it becomes available in the eastern sky and continue photometry throughout the observing season, thereby obtaining not just one but rather two or perhaps three light curves for the year 1981.

It is of additional interest to note that, whereas the wave amplitude (max. to min.) has remained around $0^m.2$ in V throughout the 1960's and 1970's, the most recent three light curves show it decreasing to about half that during the course of only one year. Eaton found $\Delta V = 0^m.19 \pm 0^m.02$ in 1979.27, Evren et al. found $\Delta V = 0^m.14$ in 1979.41, and Henry found $\Delta V = 0^m.12 \pm 0^m.01$ in 1980.36. It would be very interesting if we are seeing the beginning of a decline from a spot cycle maximum to spot cycle minimum.

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JOEL A. EATON
DOUGLAS S. HALL
GREGORY W. HENRY*
Dyer Observatory
Vanderbilt University
Nashville, Tennessee 37235

References:

- Burke et al. 1980, A. J. 85, 744.
Catalano, S., Frisina, A., Rodono, M. 1980, I.A.U. Symposium No. 88, 406.
Evren, S. et al. 1980, I.B.V.S. No. 1732.
Hall, D. S. 1972, P.A.S.P. 84, 323.
Ludington, E. W. 1978, Ph.D. Thesis, University of Florida, Gainesville, Florida.
Oliver, J. P. 1975, P.A.S.P. 87, 695.

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