COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 1986

Konkoly Observatory
Budapest
1981 July 6

HU ISSN 0374-0676

RAPID OSCILLATIONS IN RR PICTORIS *

Novae are very rare among the cataclysmic variables which show ultra short light variations with periods around 30s and $Q = 1/|dP/dt| \sim 10^4 - 10^5$. The oscillations in dwarf novae seem to be strongly correlated to eruptions. Two nova like objects UX UMa and V3885 Sgr presumably in continuous outburst stage, are also known to show rapid oscillations, and there was RR Pic already mentioned by Warner (1976, 1981) who found periods between 20 and 40s.
Simultaneous photometric and spectroscopic observations have been performed during two nights in Dec., 1980. Table I gives a summary of the photometric observations and results.

Table I.

Start HJD-2444500	Stop	Oscillation Period P(s) at Start	$dP/dt \cdot 10^5$
76.70976	76.84133	31.54	1.2
77.69081	77.77000	31.31	0
77.77000	77.84014	31.42	0

Telescope: 1.5m Time resolution: 1s Filter: B

While in the first night a single slowly increasing period of initially 31.5s prevailed, two different quasiconstant periods of 31.3s and 41.4s existed separately with a sudden changeover about in the middle of run 2. Figures 1a, b, c and 2a, b, c show light curve, relative amplitude and phase variation of the

*Based on observations collected at the European Southern Observatory, Veröffentlichungen der Sternwarte München, Bd. 7 Nr. 33

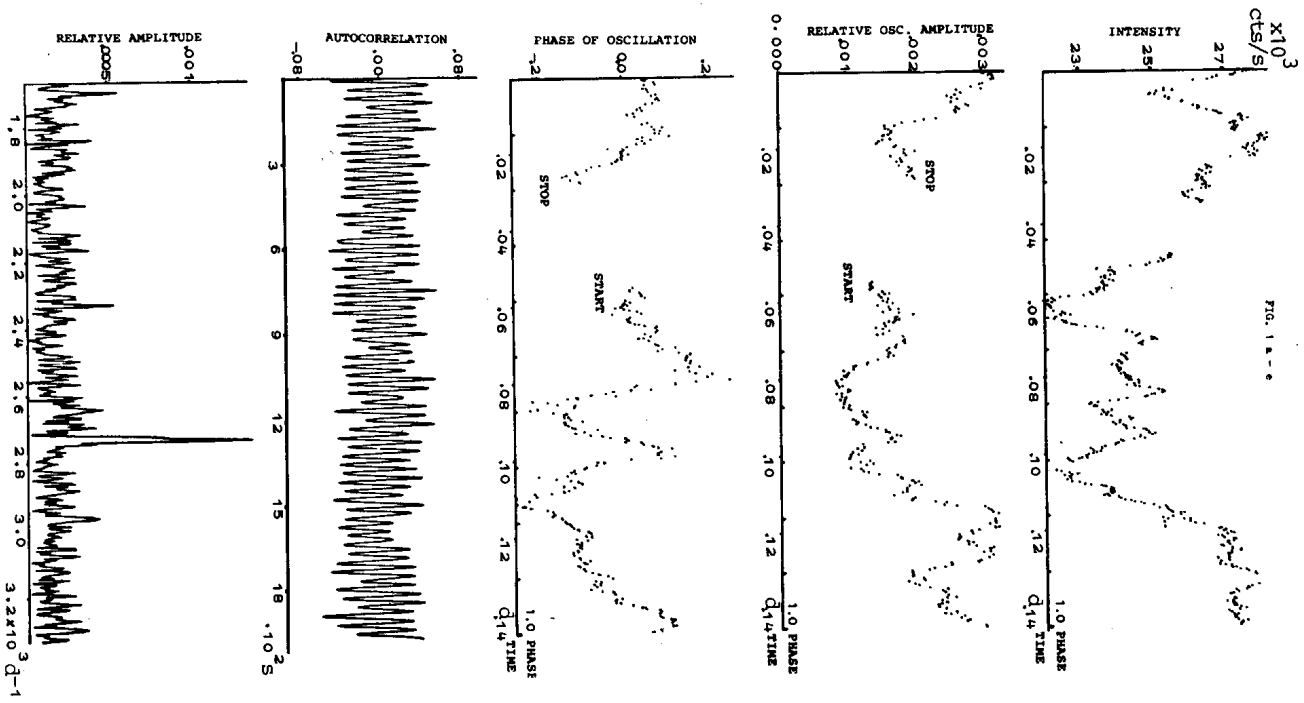

Fig. 1a,b,c Run 1. Light curve of RR Pic, relative amplitude of oscillation and phase variation of oscillation versus orbital phase.

Fig. 1d Run 1. Autocorrelation function (slow intensity variations subtracted, value of zero delay omitted)

Fig. 1e Run 1. Periodogram. Relative amplitude versus periods per day.

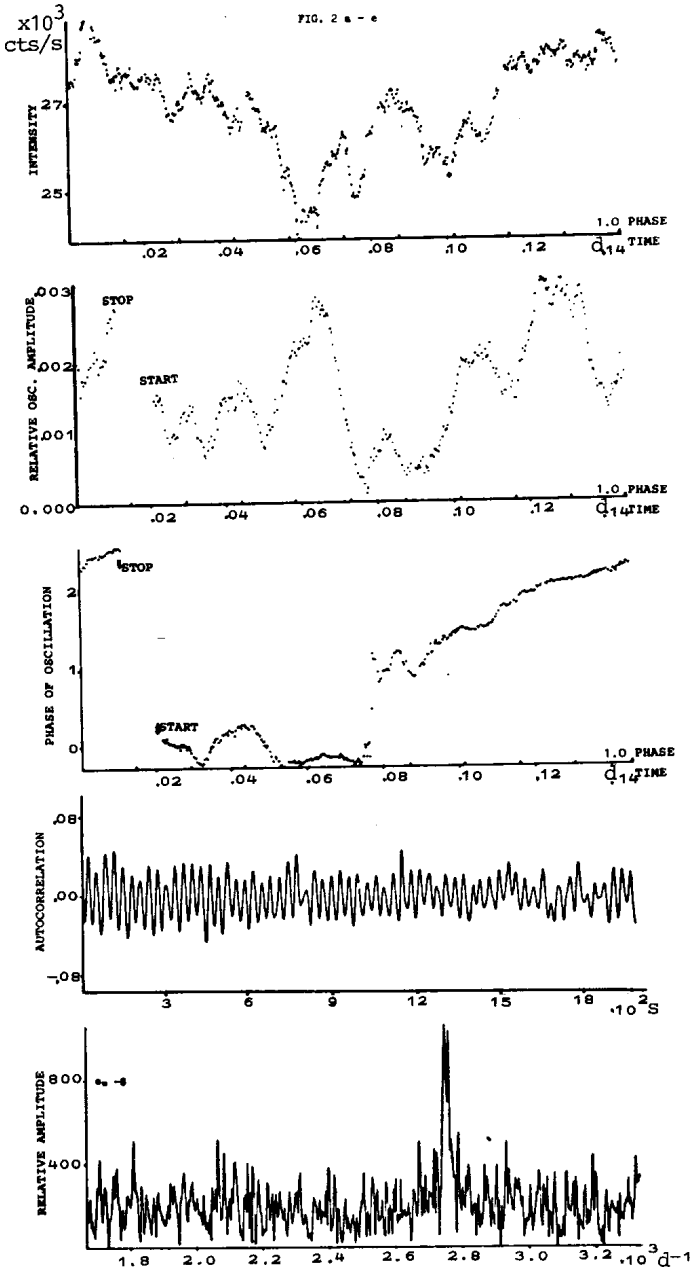

Fig. 2a-e Run 2. Same as Fig. 1a-e

oscillation versus orbital phase for the two nights respectively. The orbital phase is according to Vogt (1975) who defined $\varphi = 0$ for the main brightness maximum: HJD (MAX) = 2438815.379 + .1450255·E. Primary eclipse occurs at $\varphi = .75$ (Haefner et al, 1981). The oscillation amplitude in both nights is small around orbital phase .6 before primary eclipse. However no strong phase shift of the oscillation during eclipse occurs, as was found by Nather (1974) for UX UMa and Patterson (1979) for HT Cas. The oscillations maintained phase stability as long as they were detectable, with a phase-jitter of approx. $\pm 50^{o}$ for a fitted sine track of 40 periods. From the autocorrelation functions (Fig. 1d, 2d) Q was determined to $Q \gtrsim 10^5$ (run 1) and $Q \sim 10^4$ (run 2). These values coincide quite well with those known for dwarf novae. In run 2 during phase $.2 \pm .1$ a broad minimum of the oscillation amplitude is seen and both runs show a steep increase to maximum ($\varphi \sim .85$) just after eclipse. Fig. 1e and 2e show a periodogram in the range of 25-50s demonstrating the signal to noise ratio. The double peak of Fig. 2e is produced by the two oscillation periods. The fact that no phase shift during eclipse is observed (Fig. 1c, 2c) may be interpreted by a partial eclipse which does not affect the oscillating source. The orbital inclination of RR Pic according to Haefner et al. (1981) is 65^{o} and they claim that only the outer rim of the disc is eclipsed by the secondary. This confirms the central location of the oscillation source. The low oscillation amplitude around orbital phase .2 (run 2) and .6 (run 1, 2) could be due to veiling of the centre by the disc itself which may have an increased z-dimension at such areas which are between primary and observer during the relevant phases. In the model of Haefner et al. these areas coincide with the normal hot spot and a hot area on the outer disc.

R. SCHOEMBS, B. STOLZ
Universitäts-Sternwarte München
Scheinerstr. 1
D-8000 München 80

References:

Haefner, R., Metz, K. 1981, submitted to Astron. Astrophys.
Nather, E.R., Robinson, E.L. 1974, APJ 190, 637
Patterson, J. 1979, Ph. D. Dissert.,The Univ. of Texas,Austin
Vogt, N. 1975, Astron. Astrophys., 41, 15
Warner, B. 1981, Mon. Not. R. Astr. Soc. 195, 101