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THE ACCELERATION OF THE ROTATION OF DQ Her

In addition to irregular intensity variations on timescales of minutes, DQ Her shows fluctuations of its 71-s-phase from night to night and from month to month which make it difficult to count the number of elapsed periods if the observing seasons are shorter than the gaps between them. The published data as well as observations made at the 60-cm-refractor and (1977 only) the 1-m-reflector at Hamburg-Bergedorf lack the continuity which would be necessary to evaluate the basic properties of this long-term phase noise, they are, however, sufficient to establish a consistent period count from 1967 to 1977.

Fig. 1 shows the residuals

$$O-C = \varphi_o + (t-t_o)\nu_o + (t-t_o)^2\dot{\nu}_o/2 + (t-t_o)^3\ddot{\nu}_o/6 - N,$$

where t is the heliocentric ephemeris time of the light maximum, φ_o the phase constant, ν_o the frequency, $\dot{\nu}_o$ ($\ddot{\nu}_o$) its first (second) time derivative at $t=t_o$, and N the integer number of elapsed periods. The elements used for plotting the observations are given in Table 1, column "initial".

Three least-squares fits to the residuals are shown in Fig.1 and Table 1:

"Q 67-77" (short dashes): second order polynomial for 1967-1977,

"C 56-77" (long dashes) : thirs order polyn.for 1956-1977,

"Q 56-77" (dash-dots) : second order polyn. for 1956-1977.

Weight 1.0 has been assigned to observations of about two hours, weight 3.0 to observations of six hours or more. For both second order solutions adding a $\ddot{\nu}$-term did not reduce the residuals significantly.Both the smaller standard deviation of C 56-77 and

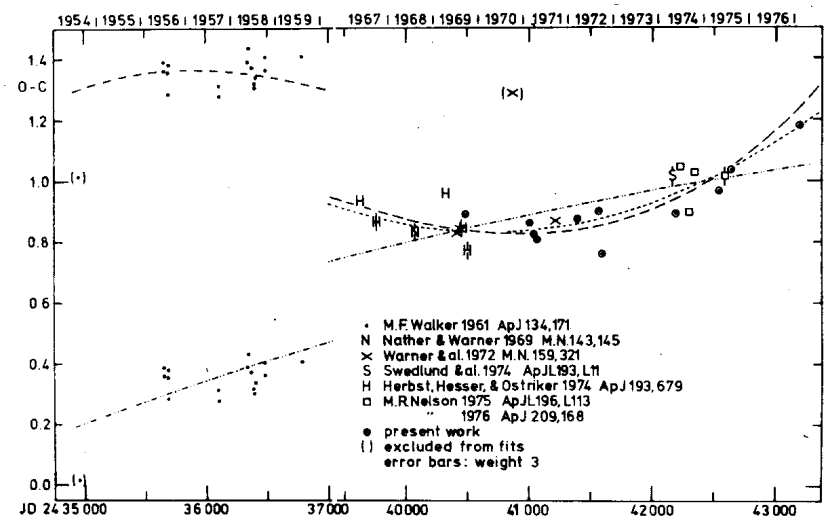
the agreement with Q 67-77 within the internal error limits indicate that C 56-77 should be preferred to Q 56-77, but we cannot rule out Q 56-77 completely. Only another five years of continued observation or data between 1959 and 1967 can remove the ambiguity.

The short timescale $\dot{\nu}_o/\ddot{\nu}_o \approx -50$ years of C 56-77 compares well with the time since the nova outburst (1934-1969=-35y) and suggests that the acceleration of the rotation is a shortlived phenomenon associated with this outburst.

Table 1: Elements

t_o=2440 322.87022 $JED_\odot$ (Herbst, Hesser, and Ostriker 1974, ApJ 193, 679)

	initial	Q 67-77	C 56-77	Q 56-77	
φ_o	0.0	-0.839 ± 11	-0.849 ± 11	-0.829 ± 15	(periods)
ν_o	1215.779	.779039	.779068	.778909	(d^{-1})
		±20	±11	± 7	
$\dot{\nu}_o/2$	0.500	0.445 ± 10	0.453 ± 3	0.505 ± 2	($10^{-6} d^{-2}$)
$\ddot{\nu}_o/6$	0	0	-8.3 ± 1.1	0	($10^{-12} d^{-3}$)
standard deviation		0.049	0.053	0.069	(periods)
		3.5	3.7	4.9	(s)



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