HY Com REVISITED

The variable star HY Com (BD $+16°2356$, R.A. $= 12^h18^m16^s$), Decl. $+16°09'16''$, 2000.0, according to the HIPPARCOS Input Catalogue (1992)) was discovered during routine UBV observation at the Kvistaberg Observatory in 1977. It was found to be an RRc variable with the unusually long period 0.448614 days (Oja, 1981). Variations of the period were observed, but during at least three years the shape of the light-curve remained the same within accuracy of the observations. Later Kurochkin (1982) determined 16 epochs of maximum during the years 1904-1929 and 1950-1975 from the Moscow plate archives; he suggests an abrupt increase of the period with about 0.9 second at about 1950 (from 0.4485955 days to 0.4486055 days).

The star was observed again (in UBV) in the springs of 1994 and 1995 with the 60 cm Cassegrain telescope of the Royal Swedish Academy of Sciences at Observatorio Astrofisico del Roque de los Muchachos, La Palma, mainly to see what possible changes of the period or light-curve might have taken place since the last observations in 1980. Between April 11th and April 15th 1994, 51 observations were obtained, and 29 observations between March 30th and April 4th 1995. The observations have been sent to the I.A.U. Archives of Unpublished Variable Star Observations (file No 309E; this file also contains the photoelectric Kvistaberg observations from the years 1977-80, giving corrected Julian Dates for those – the dates published earlier (Oja, 1981) have to be corrected by +.007 days).
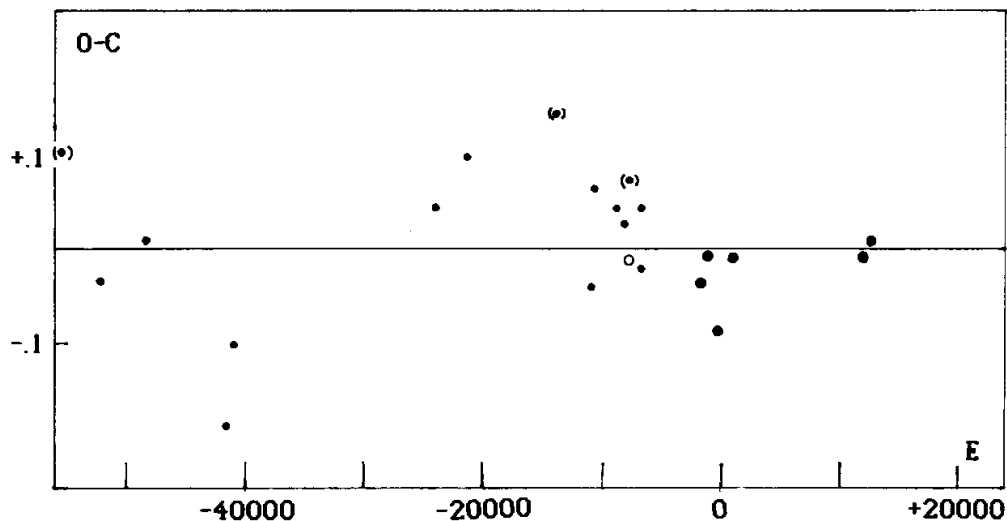

Figure 1. Observed epoch of maximum minus calculated according to eq. (1). Small points represent photographic determinations by Kurochkin (1982), large points the maxima determined photoelectrically in this paper.

Table 1. Epochs of maximum of HY Com

Year	HJD	E
1970	2 440 664.83:	-7560
1977	2 443 329.094±.011	-1621
1978	2 443 613.091±.004	-988
1979	2 443 962.031±.001	-210
1980	2 444 294.976±.001	$+532$
1994	2 449 456.221±.001	$+12037$
1995	2 449 809.294±.001	$+12824$

Table 2. The light-curve of HY Com
(The phase (p) is counted from maximum.)

p	V	B−V	U−B	p	V	B−V	U−B
.000	10.253	.192	.117	.500	10.672	.323	.045
.025	10.256	.192	.118	.525	10.675	.322	.046
.050	10.267	.194	.110	.550	10.671	.319	.046
.075	10.281	.200	.103	.575	10.661	.316	.046
.100	10.295	.210	.098	.600	10.647	.312	.047
.125	10.319	.221	.097	.625	10.619	.301	.048
.150	10.344	.229	.094	.650	10.557	.283	.049
.175	10.375	.238	.092	.675	10.486	.267	.050
.200	10.411	.247	.090	.700	10.448	.256	.051
.225	10.448	.256	.088	.725	10.418	.250	.052
.250	10.483	.265	.084	.750	10.398	.244	.053
.275	10.515	.276	.079	.775	10.387	.238	.054
.300	10.543	.285	.072	.800	10.378	.231	.056
.325	10.573	.295	.065	.825	10.370	.224	.059
.350	10.597	.303	.059	.850	10.362	.218	.063
.375	10.620	.311	.055	.875	10.345	.212	.070
.400	10.636	.318	.050	.900	10.324	.207	.080
.425	10.647	.322	.046	.925	10.289	.201	.090
.450	10.656	.324	.045	.950	10.268	.197	.099
.475	10.666	.324	.045	.975	10.256	.194	.110

From the observations in 1994 a master light-curve was drawn, using the period of 0.448614 days determined in 1981. Light-curves were also drawn individually for the observations of every other year. Within the errors of the measurements the shape of the light-curve is the same for all the years (1977, 1978, 1979, 1980, 1994, and 1995). Phase differences are, however, present, and from those an epoch of maximum, representing the observations of each year, was derived, see Table 1 (E is the number of periods counted from the same zero-point as in Kurochkin's (1982) table; the sign is reversed). The maximum of 1970 is supported by one single measurement by Häggkvist at the Lowell Observatory (Häggkvist and Oja, 1973) the magnitude of which happens to be close to the magnitude at maximum as found later.

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The data in Table 1 combined with Kurochkin's data cover a time interval of about 90 years and allow some conclusions. The two most recent observations have positive O−C residuals when using Kurochkin's eq. (2). This means that a parabolic formula could be used to represent the observations, the period would be increasing with time. This is, however, not the only possibility. A rather nice linear fit to the observations is possible, if one adds 1 to the epochs (taken with a negative sign) of Kurochkin's first five observations (N.B. that the J.D. of Kurochkin's third observation very probably should read 22455.36). A least-squares solution gives (when giving weight 3 to the photoelectrically determined maxima 1977-95, 0.5 to Kurochkin's uncertain maxima, and 1 to the others)

$$\mathrm{HJD(max)} = 2\,444\,056.322 + 0.4486090 \times \mathrm{E} \qquad (1)$$
$$\pm.009 \quad \pm.0000006$$

The result is rather insensitive to the weighting procedure. The O−C's are shown in Figure 1. The dispersion corresponding to unit weight is 0.0073, a value appreciably larger than the observational error, at least for the photoelectric data (the mean errors of Kurochkin's data are not known). This clearly demonstrates that there are short-term variations of the period, the nature of which is still unknown.

All photoelectric observations of the years 1977-1995 have been combined into one light-curve that is tabulated in Table 2. The phase is counted from maximum. The accuracy of the entries is estimated to be about 0.002-0.003 in V and B−V, about 0.005 in U−B.

T. OJA
Astronomical Observatory,
Box 515,
S-751 20 Uppsala,
Sweden

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