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PERIOD CHANGES OF AC And

The method of the envelopes was successfully used for the investigation of the multiperiodic variable star AC And (Guman, 1982). Since 1926 a dozen of observation sequences are available which make possible to find the period variations of this unique star. The results are collected in Table I. For each series of observations, from the envelopes we obtained virtual maximum moments ($\bar{O}$) for a mean Julian Date, $\overline{J.D.}$, for each of the three periods. From these $\bar{O}$ dates the following linear elements have been calculated by the method of least squares for the three periods:

$$\text{J.D. } 2424708.058 + 0^{d}.71121566 \times E_{0.7}$$

$$\text{J.D. } 2424708.143 + 0^{d}.52512765 \times E_{0.5}$$

$$\text{J.D. } 2424708.110 + 0^{d}.42105993 \times E_{0.4}$$

The $\bar{O}$-C residuals from these linear elements are presented in the columns headed ($\bar{O}$-C). According to the deviations from the linear elements the periods vary. Namely, the $0.^{d}711$ period has been first increasing, and after J.D. 2433400 decreasing, the other two periods have been continuously increasing (supposing continuous variation). These variations are fitted in with the following cubic and parabolic elements, respectively:

TABLE I.

	$0^d.711$ Period				$0^d.525$ Period				$0^d.421$ Period					
J.D.	$\bar{O}$	E	$(\bar{O}-C)$	$[\bar{O}-C]$	$\bar{O}$	E	$(\bar{O}-C)$	$[\bar{O}-C]$	$\bar{O}$	E	$(\bar{O}-C)$	$[\bar{O}-C]$	Typ	Reference
2424833	$^d.296$	176	$+^d.064$	$+^d.008$	$^d.189$	238	$+^d.066$	$+^d.010$	$^d.206$	297	$+^d.042$	$+^d.009$	pg.	Guthnick,Prager (1927)
2425596	.376	1249	+.010	-.011	.166	1691	+.032	-.003	.557	2110	+.011	-.009	vis.	Lause (1937)
2426693	.749	2792	-.023	-.008	.155	3780	+.030	+.020	.402	4715	-.005	-.011	vis.	Lause (1932)
2426955	.475	3160	-.024	-.003	.159	4274	-.005	-.009	.330	5337	+.024	+.021	vis.	Florja (1937)
2426968	.279	3178	-.022	-.001	.285	4304	-.007	-.011	.381	5368	+.022	+.019	vis.	Lause (1933)
2428392	.122	5180	-.033	+.009	.403	7016	-.036	-.013	.362	8750	-.022	-.009	pg.	Lurje (1950)
2428485	.286	5311	-.038	+.005	.366	7193	-.020	+.004	.398	8971	-.040	-.027	vis.	Lause (1937)
2433183	.589	11957	-.024	-.020	.640	16140	-.063	-.005	.588	20129	-.037	-.003	pg.	Guman (1982)
2435383	.446	15010	+.041	+.010	.414	20329	-.049	-.001	.197	25353	-.045	-.017	pe.	Guman (1982)
2436811	.524	17032	+.041	-.007	.235	23067	-.027	+.005	.139	28768	-.023	-.003	pe.	Notni (1963)
2437000	.055	17283	+.057	+.008	.318	23408	-.013	+.017	.133	29193	+.021	+.039	pe.	Fitch,Szeidl (1976) *
2442702	.465	25301	-.060	-.001	.791	34267	+.099	-.007	.157	42735	+.051	-.009	pe.	Jakate (1978)
Mean error			$\pm^d.044$	$\pm^d.010$			$\pm^d.050$	$\pm^d.012$			$\pm^d.035$	$\pm^d.020$		

*The $\bar{O}$ dates calculated from the five noncoupled elements.

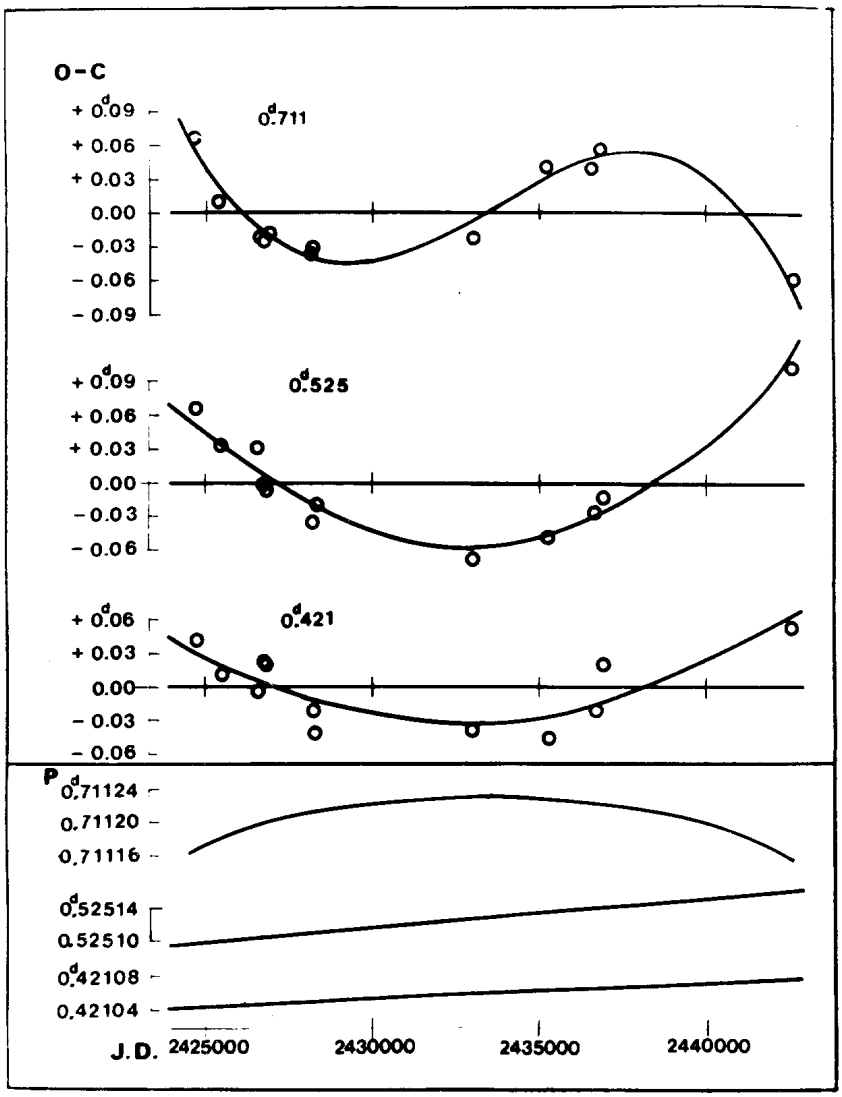
O-C
+ 0.09
+ 0.06
+ 0.03
0.00
- 0.03
- 0.06
- 0.09
0d.711
+ 0.09
+ 0.06
+ 0.03
0.00
- 0.03
- 0.06
0d.525
+ 0.06
+ 0.03
0.00
- 0.03
- 0.06
0d.421
P
0d.71124
0.71120
0.71116
0d.52514
0.52510
0d.42108
0.42104
J.D. 2425000
2430000
2435000
2440000

Figure 1

$$[+1^{d}.191\times10^{-5}(E_{o.7}-12266) + 1^{d}.020\times10^{-10}(E_{o.7}-12266)^{2} - 0^{d}.046\times10^{-13}(E_{o.7}-12266)^{3}]$$

$$[-0^{d}.058 + 4^{d}.760\times10^{-10}(E_{o.5}-15705)^{2}]$$

$$[-0^{d}.034 + 1^{d}.769\times10^{-10}(E_{o.4}-19720)^{2}]$$

The $\bar{O}$-C residuals computed with the formulae extended with the above presented elements of higher order are listed in the columns headed $[\bar{O}-C]$.

These results are also represented in Figure 1. In the upper part we have plotted the $\bar{O}$-C residuals from the linear elements and the cubic and parabolic fittings, respectively. The changes of the periods, derived from the higher fittings, are plotted in the lower part of the figure.

The variations of the periods, particularly the variation of the $0^{d}.711$ period, are very exciting. If this last variation has not been secular, but periodic, the period can be estimated as roughly 44 years. Therefore the photoelectric observation of this star is very desirable.

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