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A NEW VARIABLE STAR (No. 218) NEAR
THE GLOBULAR CLUSTER NGC 6401 *

Recent collaboration with W. and A. Wehlau (University of Western Ontario), to determine the periods of some of the 217 variable stars previously identified in and around the globular cluster NGC 6401 (Terzan and Rutily, 1971, 1973) led me to make further photometric measurements of the 52 R plates (Eastman Kodak 103 aE + Ilford filter 204, $\lambda_{\text{eff}} \approx 6500 \text{ \AA}$) which I had obtained from 1968 to 1977 at the Newtonian foci of the 80 and 193 cm telescopes of the Observatoire de Haute-Provence. Results on the periods found will be published in the near future.

However, in the course of those photometric measurements (using the iris-diaphragm photometer Sartorius), I found a new variable, the 218th, which was previously unknown (Kholopoy, 1983). Its equatorial and galactic coordinates for the equinox 1950.0 are :

$$\begin{array}{ll} \alpha = 17^{\text{h}} 36^{\text{m}}.89 & l = 3^{\circ}49 \\ \delta = -24^{\circ}01'.84 & b = 3^{\circ}64 \end{array}$$

This star is located about 20' southeast of the cluster NGC 6401 (Figure 1), which places it outside the field of the plates taken with 193 cm telescope. It is, however, clearly visible on Palomar Observatory Sky Survey charts, 0-172 and E-172. Since the plates for these charts were taken on the same night, they have been used to estimate the color index, $CI_{B-R} \geq 3 \text{ mag.}$

* based on observations collected at the Observatoire de Haute-Provence and Observatoire de Calern

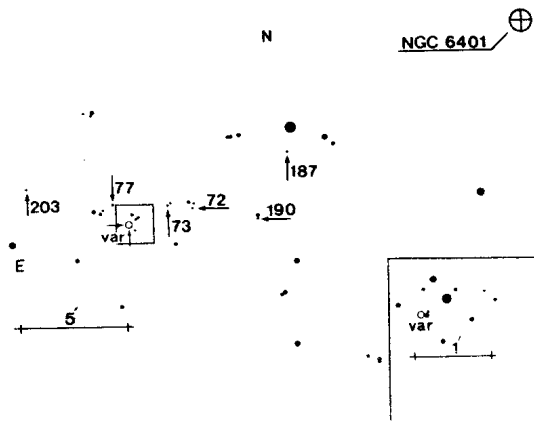


Figure 1. Finding chart (in R) for the variable star No. 218

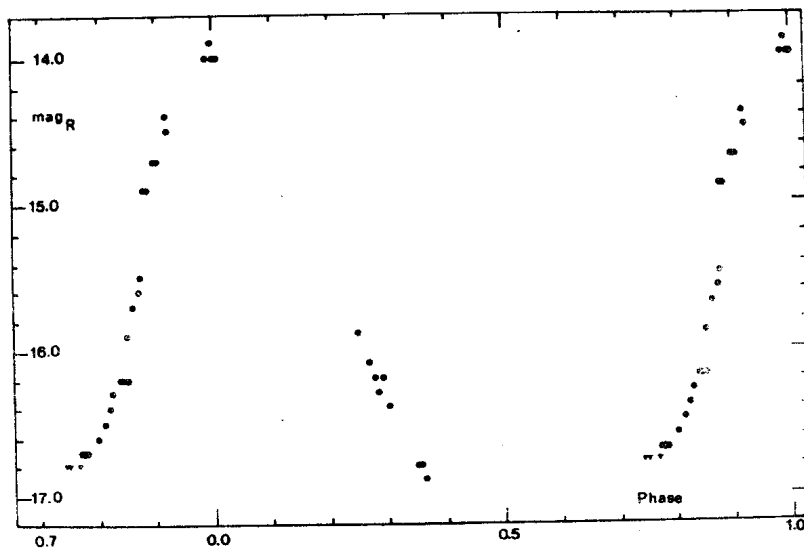


Figure 2. Light curve for the variable star No. 218

Table I

Observations Number	Plate No	J.D. (+2 439 500.00)	m_R
1	1320	471.55	16.8
2	1329	472.58	16.8
3	1341	476.53	16.8
4	1345	477.52	16.7
5	1346	478.55	16.7
6	1347	478.58	16.7
7	1350	479.59	16.7
8	1572	1205.57	16.8
9	1582	1206.57	16.8
10	1592	1208.58	16.9
11	1740	1590.55	15.9
12	1744	1594.61	16.1
13	1751	1596.62	16.2
14	1754	1597.50	16.3
15	1756	1599.55	16.2
16	1773	1601.57	16.4
17	1875	1944.61	14.0
18	1883	1945.64	13.9
19	1891	1946.60	14.0
20	1919	1951.58	14.0
21	1978	2329.48	14.9
22	1981	2329.57	14.9
23	1987	2332.49	14.7
24	1990	2332.58	14.7
25	2002	2336.49	14.4
26	2290	2720.50	16.6
27	2573	3745.63	15.9
28	2588	3747.62	15.7
29	2596	3748.62	15.6
30	2605	3749.61	15.5
31	2644	3759.62	14.5
32	CE 1072	6379.49	16.5
33	CE 1077	6380.51	16.4
34	CE 1085	6381.48	16.3
35	CE 1088	6384.45	16.2
36	CE 1092	6385.38	16.2
37	CE 1096	6385.51	16.2

The light curve shown in Figure 2 was derived from measurements of 31 good plates taken with the 80 cm telescope and from 6 plates obtained this summer with the CALERN/Schmidt telescope (INAG - CERGA). The values of mag_R with the corresponding Julian dates are given in Table I. The prefix CE (CERGA) in front of the numbers of the last six plates indicates their origin.

The amplitude, $A \approx 2.9 \text{ mag}_R$, suggests that this star is a long period variable with epochs of maximum given by :

$$T_{\text{max}} = 2,439,618 + 203.2 E \\ \pm 0.1$$

While the period is well determined, it is difficult to estimate the accuracy of the epoch of maximum light because of the lack of points on the light curve between 0.6 and 0.8.

The interstellar absorption in V and B to the cluster NGC 6401 may be estimated using

$$A_V = 3E_{B-V} \quad \text{and} \quad A_B = 4E_{B-V}$$

with the following values :

Woltjer, 1975	$E_{B-V} = 0.5$	a relatively low value	
Bernard, 1976	$E_{B-V} = 0.85$	$A_V = 2.55 \text{ mag}$	$A_B = 3.4 \text{ mag}$
Harris, 1976	$E_{B-V} = 0.79$	$A_V = 2.47 \text{ mag}$	$A_B = 3.16 \text{ mag}$

So, adopting $\bar{A}_B = 3.25 \text{ mag}$ (a value comparable to $\bar{A}_{pg} = 5.5 \text{ mag}$, Terzan, 1965, in front of the bright cloud B of Sagittarius, in the direction of the star 45 Oph, which is one of the most observed zones in B) one could derive the spectral type of the star and use it as an argument to test our hypothesis that star No. 218 is a long period variable if the colour index (B-V) were available.

Consequently, in the near future, I plan to establish B and V magnitude sequences ($\text{mag}_B \approx 20, \text{mag}_V \approx 19$) in the field of the globular cluster NGC 6401 and to determine the B - V color of this variable, taking into account the interstellar absorption in this direction towards the center of our galaxy.

I express my thanks to Mr. and Mrs. A. Wehlau for discussion of this work.

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References:

- Bernard, A., 1976: Astron. Astrophys. Suppl. Ser., 25, 281.
 Harris, W.E., 1976: Astron. J., 81, 1095.
 Kholopov, P.N., 1983: private communication
 Terzan, A., 1965: Ann. Astrophys., 28, 935.
 Terzan; A., and Rutily, B., 1971: Astron. Astrophys., 16, 408.
 Terzan, A., and Rutily, B., 1973: Variable Stars in Globular Clusters and in Related Systems, p. 68, ed. J.D. Fernie.
 Woltjer, L., 1975: Astron. Astrophys., 42, 109.