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FURTHER OBSERVATIONS OF THE RECENTLY DISCOVERED NOVA Aql 1985

LLOYD, CHRISTOPHER[1]; GUILBAULT, PETER R.[2]

[1] Space Science & Technology Department, Rutherford Appleton Laboratory, Chilton, Didcot, Oxon. OX11 0QX, UK, e-mail: cl@astro1.bnsc.rl.ac.uk

[2] P.O. Box 287, Chepachet, Rhode Island 02814, USA, e-mail: pete1199@aol.com

Antipin et al. (2002) recently reported the discovery of a nova in Aquila in 1985 on Moscow and Sonneberg plates at $19^{\rm h}02^{\rm m}14^{\rm s}.5$ $+13^\circ03'04''$. The nova peaked at $m_{\rm pg} \sim 10.6$ on $JD = 2446266$ (1985 July 19) and faded by three magnitudes in about 80 days. The pre-cursor to the nova is not visible on the Palomar Observatory Sky Survey (POSS) plates taken in 1952, but a post-outburst object is visible on the POSS II plates taken in 1987 and 1990, with $r = 18.6 \pm 0.2$ and $b = 20.0 \pm 0.2$.

Plates from around the time of outburst from the Harvard College Observatory have been examined and further estimates of the brightness of the nova have been made. All but one the plates come from the Harvard Damon Patrol series with blue sensitive emulsions. One deep plate from the MC series taken before the outburst was examined to clearly identify the field and standards. The magnitude of the nova has been estimated by eye relative to comparison stars using the B magnitudes given by Antipin et al. or b magnitudes from the USNO A2.0. The comparisons used, and the magnitudes adopted were the most appropriate for these plates and are given in Table 1. The estimates are given in Table 2 and subsets are plotted in Figure 1, showing the 100 days around maximum, and the extended light curve in Figure 2.

The new data closely follow the light curve of Antipin et al. from a few days after the maximum until it becomes invisible at $m_{\rm pg} \sim 14.2$ after 80 days. Maximum occurred between the two upper limits near 2446264.7 and the observations at 2446266.5. The general agreement with Antipin et al. is good but around 30 days after maximum there is

Table 1: Adopted comparison magnitudes

Name	B/b	Source	Name	B/b	Source
GSC1048-1591	11.10	Antipin et al.	GSC1048-0259	14.8	USNO A2.0
GSC1047-0749	11.35	Antipin et al.	0975-13930192	15.1	USNO A2.0
GSC1048-0076	12.5	USNO A2.0	0975-13931248	15.4	USNO A2.0
GSC1048-0106	13.0	USNO A2.0	0975-13928199	16.5	USNO A2.0
GSC1048-0223	13.9	USNO A2.0	0975-13930036	16.9	USNO A2.0
GSC1052.0042	14.05	Antipin et al.			

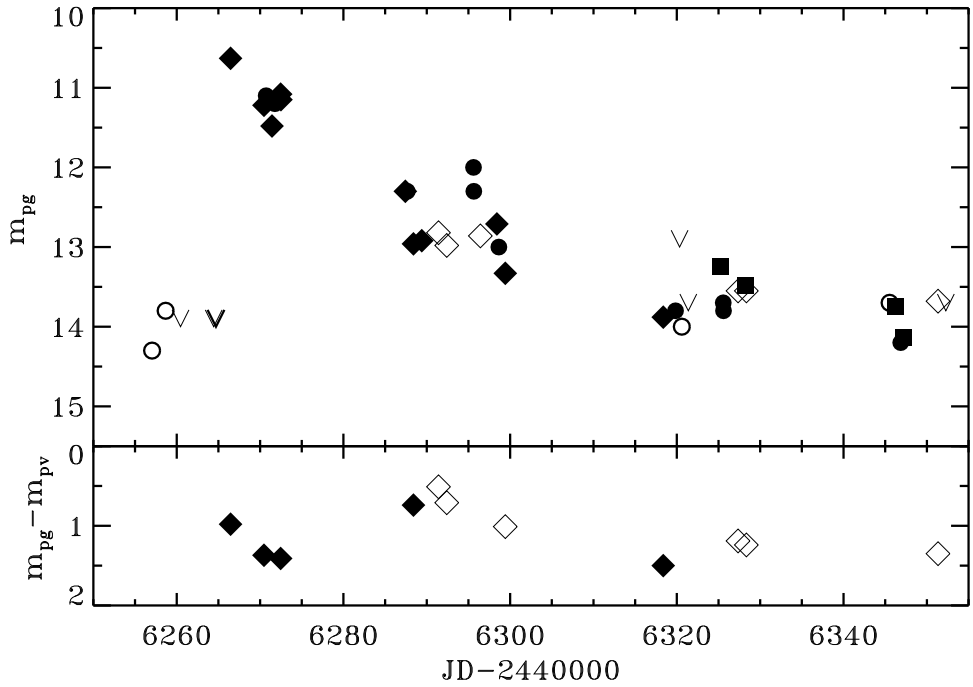

Figure 1. (Above) Detail of the light curve for 100 days around maximum. Filled and open circles, and heavy upper limits, this paper; filled and open diamonds, and light upper limits, Sonneberg data, and filled squares Moscow data, from Antipin et al. (Below) Approximate $B-V$ from the Sonneberg data.

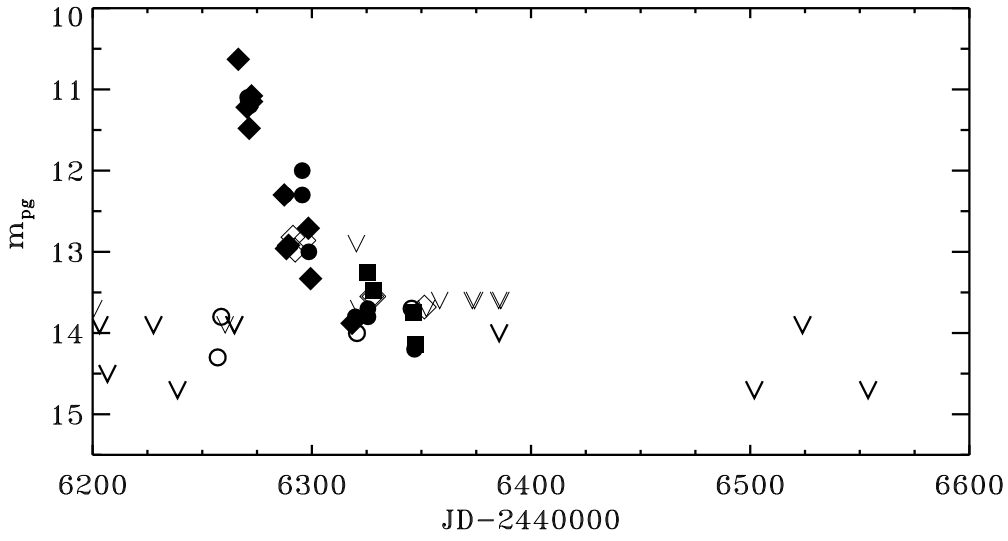

Figure 2. The extended light curve of the N Aql 1985 outburst. The symbols are the same as in Figure 1.

Table 2: Magnitude estimates of N Aql 1985

JD	$m_{\rm pg}$	JD	$m_{\rm pg}$	JD	$m_{\rm pg}$
2433096.000	>16.9	2446270.727	11.1	2446346.861	14.2
2446112.915	>14.0	2446271.780	11.2	2446385.470	>14.1
2446139.892	>14.0	2446287.663	12.3	2446501.891	>14.8
2446173.832	>14.8	2446295.608	12.0	2446523.856	>14.0
2446203.159	>14.0	2446295.642	12.3	2446553.792	>14.8
2446206.759	>14.6	2446298.648	13.0	2446652.684	>13.7
2446227.747	>14.0	2446319.843	13.8	2447376.637	>13.0
2446238.716	>14.8	2446320.601	14.0:	2447378.587	>14.0
2446257.042	14.3::	2446325.567	13.7	2447406.573	>12.9
2446258.670	13.8:	2446325.598	13.8	2447716.710	>14.0
2446264.704	>14.0	2446345.531	13.7:	2447763.578	>14.0

additional variation that may be due to oscillations associated with the transition stage (see Figure 1).

The nova is also positively seen about 7 days prior to maximum at $m_{\rm pg} \sim 14.0$, and is placed well below this a few days previously. Pre-maximum halts are rarely observed but have been seen in fast and slow novae. The statistics of these events are poor but the halt seen here is possibly fainter and earlier than the accepted norm. Two faint limits in the tail of the light curve place the nova below $m_{\rm pg} \sim 15$ about 230 days after maximum (see Figure 2).

Figure 1 also shows the $m_{\rm pg} - m_{\rm pv}$ colour from the Sonneberg data. The colour appears to be quite red around maximum and then becomes bluer, consistent with the behaviour seen in smoothly varying novae (van den Bergh & Younger 1987). At maximum novae typically have $(B-V)_0 = 0.25$ and $(B-V)_0 = 0.0$ when two magnitudes below maximum (van den Bergh & Younger 1987, Downes & Duerbeck 2000). Assuming that $B - V = m_{\rm pg} - m_{\rm pv} + 0.1$ then N Aql 1985 has $B - V \approx 1.4$ and $B - V \approx 0.8$ at maximum and two magnitudes below, respectively. These implying significant reddening of, $E_{B-V} \approx 1.0$ and $A_V \approx 3.5$ magnitudes.

The average rate of decline has been measured over the periods JD 2446266 to 2446305 and 2446330 to derive $T_2 = 31$ days and $T_3 = 66$ days respectively. Using the absolute magnitude to rate-of-decline calibration of Downes & Duerbeck (2000) the absolute magnitude at maximum, $M_{\rm V} = -7.5$ and $M_{\rm V} = -7.4$ for T_2 and T_3 respectively. Also the absolute magnitude after 15 days, $M_{\rm V,15} = -6.6$ The absolute magnitude of novae at quiescence is, $M_{\rm V} \sim 5$ implying a brightening in this case of some 12 magnitudes. Given $m_{\rm pv} = 9.7$ and $m_{\rm pg} = 10.6$ at maximum this implies quiescent magnitudes of $V \sim 22$ and $B \sim 23$, both well below the limit of the POSS plates, and consistent with the negative result of Antipin et al.

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