COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5233

Konkoly Observatory
Budapest
31 January 2002

HU ISSN 0374 – 0676

PERIOD AND PROPER MOTION OF 1RXS J232953.9+062814

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Early in November 2001 an outburst of this dwarf nova system was reported (Uemura et al. 2001). These authors also report the detection of superhumps with a period of $0\overset{d}{.}046311(12)$ and estimate a proper motion of $0\overset{''}{.}1$/year. The latter is of special interest, as it gives a hint that this object might be one of the nearest symbiotic binary systems. We have investigated the object to improve those values. CCD photometry was obtained at the Innsbruck 60-cm RC telescope during two runs on November 15, 2001 and December 10, 2001 using a Johnson R filter. Data reduction and source extraction were performed as described in Bacher et al. (2001). We obtained differential photometry relative to the star USNO 0900-20419578. Weak cirrus clouds during the first run did not allow an absolute calibration at that time. During the other run 12 exposures of the nearby standard star HD 220954 were taken. They have an rms of $0\overset{m}{.}024$ (and thus $0\overset{m}{.}017$ for the zero point error). Using this calibration we were able to calibrate the comparison star to $13\overset{m}{.}76\pm0\overset{m}{.}03$. This is in good agreement with the photographic red magnitude of $13\overset{m}{.}6$ given in USNO A2 and GSC2. Stacks of all images of a night were used to check the comparison star for long term stability by means of weak stars in the field. The photometry of 1RXS J232953.9+062814 (means of a night) yields

$$\text{JD } 2452229.301 \text{ (Nov. 15, 2001):} \quad m_{\rm R} = 15\overset{m}{.}57\pm0\overset{m}{.}04$$
$$\text{JD } 2452254.258 \text{ (Dec. 10, 2001):} \quad m_{\rm R} = 15\overset{m}{.}80\pm0\overset{m}{.}03$$

Although the decline clearly indicates a remnant of the outburst activity during the first night, we were unable to find the superhumps of up to $0\overset{m}{.}3$ as reported during the earlier phase (Uemura et al. 2001). A frequency analysis using the PDM method (Stellingwerf 1978) shows only a very low probability of a period at $0\overset{d}{.}046$. A better solution is found with $0\overset{d}{.}022584$. Visual inspection (Figs. 1 and 2) shows indeed that the latter period is more likely. It is clearly visible during the second night too, when the object had already declined to quiescence. The amplitudes are comparable for both nights.

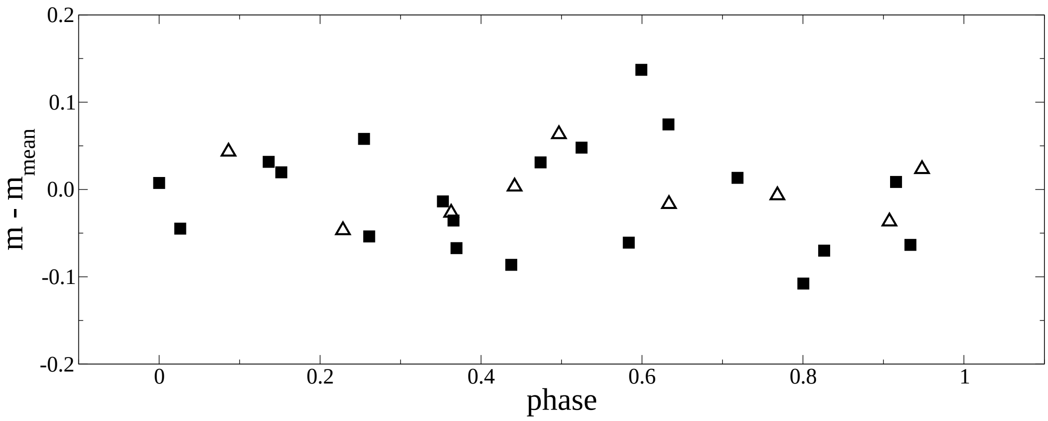

Figure 1. The photometry derived during the two nights folded with the period of $0\overset{d}{.}04631112$ (Uemura et al. 2001) and the first of our observations as zero point. The squares indicate the observations of November, the triangles those of December. No indications of this period are found.

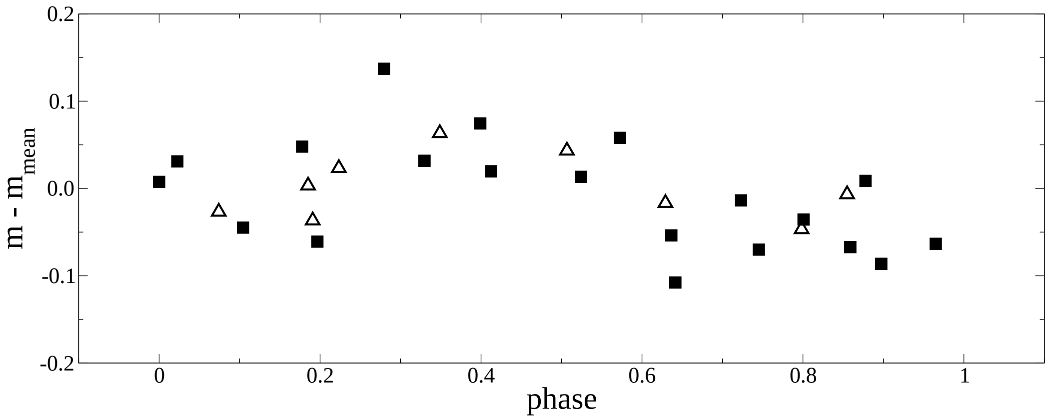

Figure 2. The same as above but folded with a period of $0\overset{d}{.}022584$. There is a clear sign of periodicity. As the two observations are 110 periods apart, the quality of the period is very good.

Accurate astrometry based on 18 stars with $R < 18\overset{m}{.}5$ surrounding the target within 12 arcminutes was derived on 7 digitized survey plates. The epochs of the plates are given in Table 1. The stars include the astrometric calibration stars AC2000 2052132 (= TYCHO-2 125895) and AC2000 2052114.

Table 1. The epochs of the plates used for the astrometry.

Type	Description	Plate Number	Epoch
DSS-1	POSS-E Red Plate	XE582	1951.607
DSS-1	Quick-V Northern	N582	1983.612
DSS-1	Quick-V Northern	N612	1983.683
DSS-2	POSS-II Red	XP822	1986.77
DSS-2	POSS-II Blue	XJ821	1992.572
DSS-2	POSS-II Blue	XJ822	1992.747
DSS-2	POSS-II Red	XP821	1993.639

The rms of the reference frame stars is 0.″15 for the DSS-1 plate and less than 0.″09 for the other plates. This allows us to derive the position from the combination of the 7 plates to an accuracy of 0.″04 and of the proper motion to an accuracy of 0.″005/year (alpha) and 0.″003/year (delta). The total proper motion is 0.″056±0.″005/year and thus about a factor of two below that estimated by Uemura et al. (2001).

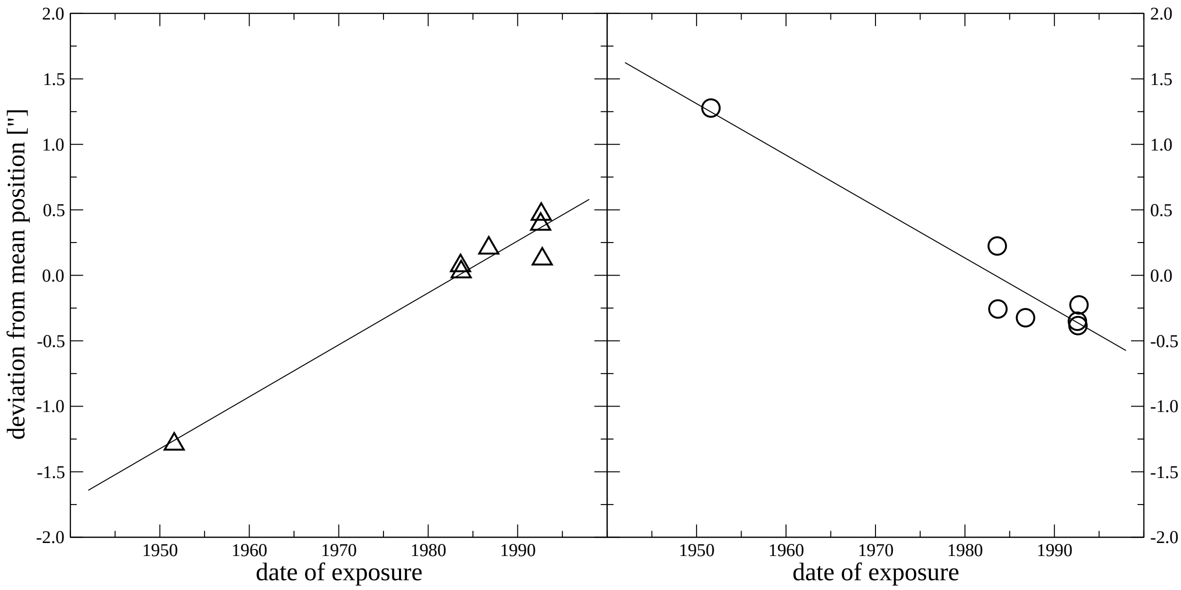

Figure 3. The positions of 1RXS J232953.9+062814 relative to the mean position on all 7 frames; left: declination; right: right ascension.

The coordinates below are calculated for epoch and equinox J2000.0, using the mean position using all plates (epoch 1981.859) and the obtained proper motion.

$$\alpha_{\mathrm{J2000.0}} = 23^{\mathrm{h}}29^{\mathrm{m}}54\overset{\mathrm{s}}{.}402 \pm 0\overset{\mathrm{s}}{.}04 \qquad \mathrm{PM}_\alpha = -0\farcs039 \pm 0\farcs005/\mathrm{year}$$
$$\delta_{\mathrm{J2000.0}} = 06^\circ 28' 07\farcs89 \pm 0\farcs04 \qquad \mathrm{PM}_\delta = +0\farcs040 \pm 0\farcs003/\mathrm{year}$$

References:

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Stellingwerf, R.F., 1978, *ApJ*, **224**, 953.
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