VARIABLE STARS NEAR V1333 Aql (= Aql X-1)

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We monitored V1333 Aql (Aql X-1) in the I-band between 1997 June 19 and 25 using the 1.3-m telescope at MDM observatory, obtaining 178 usable 600-second exposures. Results for Aql X-1 itself were reported by Shahbaz et al. (1998); we refer the reader to that paper for further instrumental detail. Here we report on variable stars serendipitously detected in our 8.7 arcmin square field.

Using the DAOPHOT implementation in IRAF, we selected 6104 stars on one of our best images, and measured magnitudes through point-spread function fitting on all the images. We used observations of Landolt (1992) standard star fields to transform the magnitudes to approximate Kron-Cousins I, to an estimated accuracy of ± 0.05 mag. The measured stars ranged from $12.32 \leq I \leq 20.65$. Not all stars were measurable on all images, because of variations in centering and seeing. After collating the measurements automatically and adjusting the instrumental magnitudes to a common differential scale, we searched for variables by plotting the standard deviation σ of each star's measurements against the mean magnitude. At $I = 13.5$ we examined stars with $\sigma > 0.07$; this degraded to $\sigma = 0.10$ at $I = 17.5$ and finally to $\sigma = 0.33$ near our limit of $I = 20.5$. Light curves of ~ 105 candidate variables were examined by eye and correlated with the direct

Table 1: Variable Stars

number	RA[a]	Dec[a]	I_{max}	I_{min}	P (d)	Type
1	$19^h 11^m 05^s.88$	$+00°39'06''.1$	17.6	18.1	0.347	EW
2	$19^h 11^m 18^s.34$	$+00°37'12''.0$	16.6	17.1	0.385	EW
3	$19^h 11^m 23^s.54$	$+00°36'05''.0$	16.2	16.6	0.300	EW
4	$19^h 11^m 14^s.15$	$+00°34'45''.9$	15.2	15.6	0.533	EW
5	$19^h 11^m 28^s.82$	$+00°32'48''.5$	16.9	17.7	0.317	EW
6	$19^h 11^m 09^s.24$	$+00°31'54''.0$	15.5	15.7	0.342	EW
7	$19^h 11^m 02^s.97$	$+00°39'38''.0$	17.3	17.7	0.388	EW
8	$19^h 11^m 24^s.76$	$+00°38'20''.2$	18.5	19.1	0.308	EW
9	$19^h 11^m 17^s.66$	$+00°33'34''.5$	17.5	18.1	...	EA

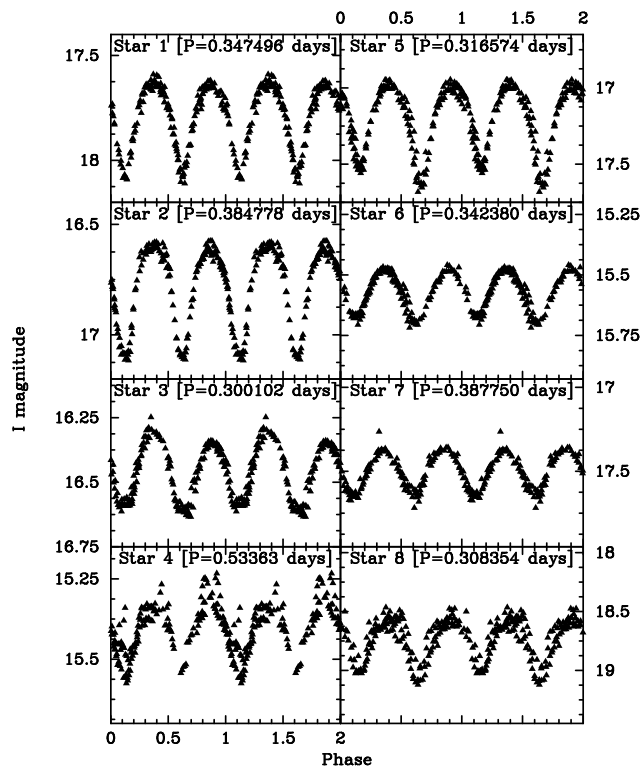[a]: ICRS (essentially J2000), Referred to USNO A2.0
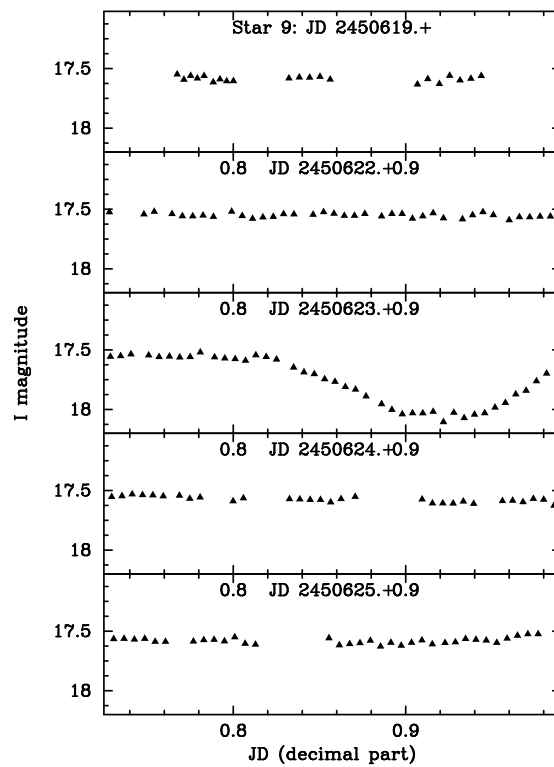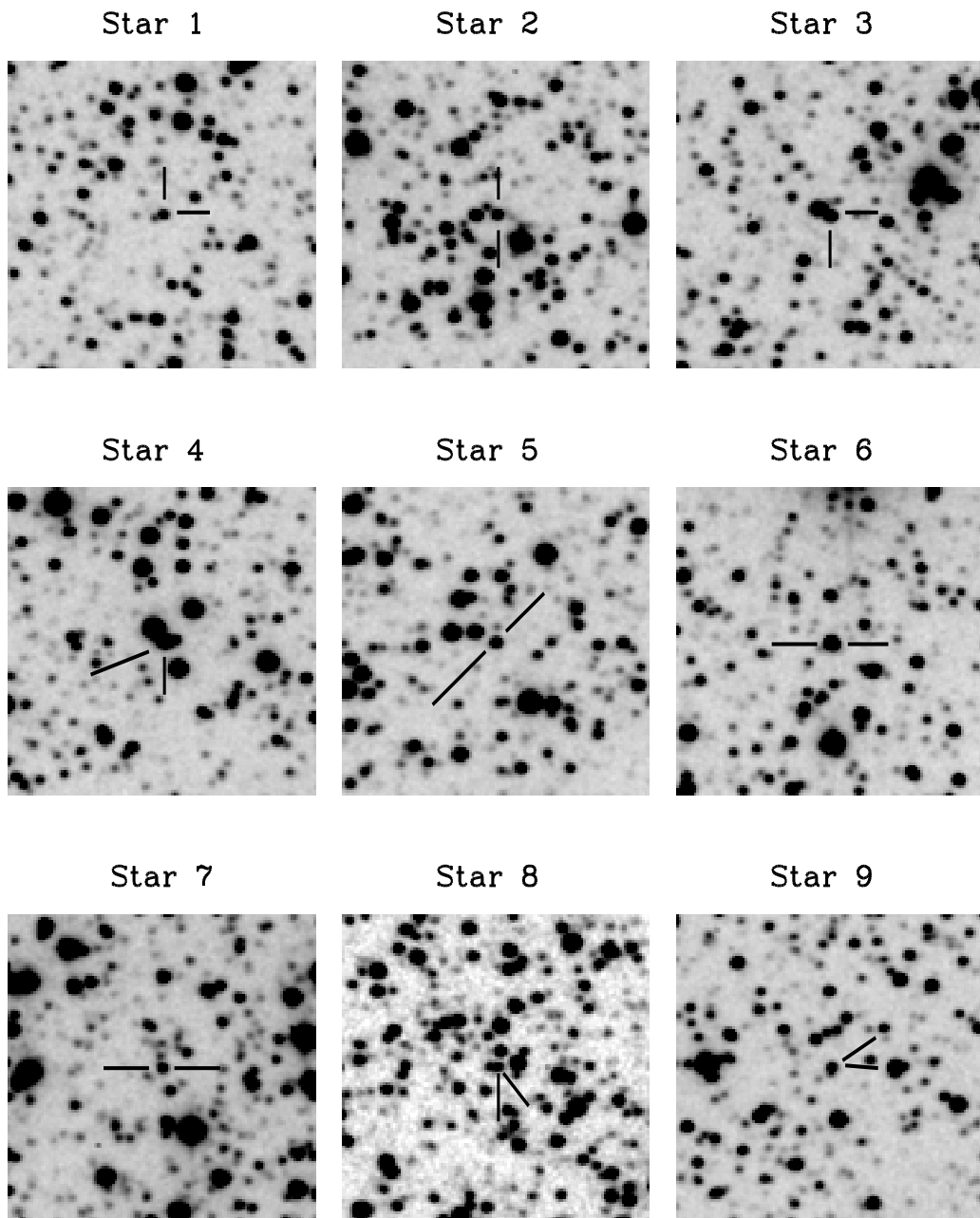
Figure 1. Light curves.

Figure 2. Nightly light curves of the eclipsing variable (Number 9).

Figure 3. *I*-band finding charts for the nine variable stars. Each panel is 61″ square with north at the top and east to the left.

image; in most cases the variations were found to be spurious, largely because of varying contributions from very bright stars or proximity to the edge of the field.

Nine variables proved to be genuine, and none of these appear to be catalogued. In eight of the nine stars the variations are periodic. Their light curves are shown in Fig. 1. Because the light curves appear consistent with W UMa stars, the plots and periods are constructed assuming two minima per orbit. The remaining variable star showed a single dip consistent with an eclipse, and Fig. 2 shows its light curve during four nights. Table 1 summarizes the information about these variables; the celestial coordinates are derived from a fit to numerous USNO A2.0 catalog stars (Monet et al. 1996), and are estimated accurate to $\sim 0\overset{''}{.}3$. The periods in Table 1 should typically be accurate to ~ 0.001 d, given the length of the data stream. Fig. 3 shows finding charts.

We are clearly not sensitive to variable stars with periods much longer than our week-long observation window, but our census should be fairly complete for shorter-period variations.

References:

Landolt, A. 1992, *AJ*, 104, 340

Monet, D., et al., 1996, *USNO-SA2.0*, (U.S. Naval Observatory, Washington, D.C.)

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