

## Recovery of Harvard Variables: Light Elements for 41 Mira Type Stars

[E. V. Kazarovets](#), [E. N. Pastukhova](#)

*Institute of Astronomy, Russian Academy of Sciences, Moscow, Russia*

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(E-mail for contact: [helene@inasan.ru](mailto:helene@inasan.ru), [pastukhova@sai.msu.ru](mailto:pastukhova@sai.msu.ru))

#	Name	Other	Coord (J2000)	Type	Max	Min	System	Period	Epoch (JD)	type	Sp	Comment	L.Curve	Find.Chart	Data
1	NSV 10055	HV 9204	18 03 11.37, -32 54 38.9	M	13.1	< 14.9	V	373	2454675	max			<a href="#">10055lc.jpg</a>	<a href="#">10055ch.jpg</a>	<a href="#">ASAS 180311-3254.6</a>
2	NSV 10053	HV 9203	18 03 14.49, -31 27 03.7	M	12.4	< 16.5	V	201	2454698	max		<a href="#">Comm. 2</a>	<a href="#">10053lc.jpg</a>	<a href="#">10053ch.jpg</a>	<a href="#">ASAS 180314-3126.9</a>
3	NSV 10131	HV 9220	18 04 41.41, -31 33 52.7	M:	13.1	< 17	V	234 :	2454965	max			<a href="#">10131lc.jpg</a>	<a href="#">10131ch.jpg</a>	<a href="#">ASAS 180441-3133.9</a>
4	NSV 10165	HV 9231	18 05 39.64, -34 06 31.1	M	12.8	< 17	V	316	2454623	max		<a href="#">Comm. 4</a>	<a href="#">10165lc.jpg</a>	<a href="#">10165ch.jpg</a>	<a href="#">ASAS 180540-3406.5</a>
5	NSV 10171	HV 9228	18 06 23.62, -49 07 16.9	M	12.6	< 14.6	V	213	2454542	max		<a href="#">Comm. 5</a>	<a href="#">10171lc.jpg</a>	<a href="#">10171ch.jpg</a>	<a href="#">ASAS 180624-4907.3</a>
6	NSV 10210		18 06 42.87, -08 13 12.1	M	11.6	< 15.0	V	396	2454718	max	M8	<a href="#">Comm. 6</a>	<a href="#">10210lc.jpg</a>	<a href="#">10210ch.jpg</a>	<a href="#">ASAS 180643-0813.2</a>
7	NSV 10207	HV 9244	18 07 05.16, -31 38 00.0	M	12.8	< 16	V	195	2454515	max			<a href="#">10207lc.jpg</a>	<a href="#">10207ch.jpg</a>	<a href="#">ASAS 180705-3138.0</a>
8	NSV 10235	HV 9256	18 08 22.95, -33 20 28.3	M:	12.8	< 15.5	V	283	2454176	max		<a href="#">Comm. 8</a>	<a href="#">10235lc.jpg</a>	<a href="#">10235ch.jpg</a>	<a href="#">ASAS 180823-3320.5</a>
9	NSV 10239	HV 9260	18 08 23.23, -31 20 00.8	M	12.9	< 16.9	V	232	2454607	max			<a href="#">10239lc.jpg</a>	<a href="#">10239ch.jpg</a>	<a href="#">ASAS 180823-3120.0</a>
10	NSV 10236	HV 9257	18 08 25.67, -34 17 19.9	M	12.1	< 14.2	V	172.5	2454722	max		<a href="#">Comm. 10</a>	<a href="#">10236lc.jpg</a>	<a href="#">10236ch.jpg</a>	<a href="#">ASAS 180827-3417.6</a>
11	NSV 10228	HV 9247	18 08 26.42, -47 53 40.7	M	11.4	< 14.8	V	197	2454995	max	Me		<a href="#">10228lc.jpg</a>	<a href="#">10228ch.jpg</a>	<a href="#">ASAS 180826-4753.7</a>
12	NSV 10234	HV 9252	18 08 47.75, -44 09 37.6	M	12.3	< 15.0	V	299	2454895	max			<a href="#">10234lc.jpg</a>	<a href="#">10234ch.jpg</a>	<a href="#">ASAS 180848-4409.6</a>
13	NSV 10252	HV 9259	18 09 31.91, -49 02 31.6	M	11.8	< 14.4	V	229.5	2455095	max		<a href="#">Comm. 13</a>	<a href="#">10252lc.jpg</a>	<a href="#">10252ch.jpg</a>	<a href="#">ASAS 180932-4902.5</a>
14	NSV 10276	Rosino 11	18 09 43.12, -31 55 47.0	M	12.5	< 14.4	V	267	2454318	max			<a href="#">10276lc.jpg</a>	<a href="#">10276ch.jpg</a>	<a href="#">ASAS 180943-3155.8</a>
15	NSV 10306		18 10 24.82, -10 34 16.1	M	9.6	11.8	*		2451320	max	M7S	<a href="#">Comm. 15</a>	<a href="#">10306lc.jpg</a>	<a href="#">10306ch.jpg</a>	<a href="#">10306dat.txt</a>
16	NSV 10319	HV 9286	18 11 14.17, -28 07 40.9	M	12.6	< 17.5	V	261	2454349	max			<a href="#">10319lc.jpg</a>	<a href="#">10319ch.jpg</a>	<a href="#">ASAS 181114-2807.7</a>
17	NSV 10305	HV 9276	18 11 18.73, -46 08 42.3	M	12.4	< 15	V	228	2454705	max			<a href="#">10305lc.jpg</a>	<a href="#">10305ch.jpg</a>	<a href="#">ASAS 181119-4608.7</a>
18	NSV 10322	HV 9285	18 11 21.53, -34 07 51.4	M	13.3	< 17.	V	211	2454641	max			<a href="#">10322lc.jpg</a>	<a href="#">10322ch.jpg</a>	<a href="#">ASAS 181122-3407.9</a>
19	NSV 10318	HV 9279	18 11 43.47, -46 38 13.6	M	12.0	< 15.5	V	187	2454902	max			<a href="#">10318lc.jpg</a>	<a href="#">10318ch.jpg</a>	<a href="#">ASAS 181143-4638.2</a>
20	NSV 10337	HV 9288	18 12 07.28, -32 42 08.8	M	12.4	< 17.	V	207	2454873	max			<a href="#">10337lc.jpg</a>	<a href="#">10337ch.jpg</a>	<a href="#">ASAS 181207-3242.1</a>
21	NSV 10359	HV 9304	18 12 58.89, -27 38 20.4	M	12.1	< 16.	V	297	2455120	max		<a href="#">Comm. 21</a>	<a href="#">10359lc.jpg</a>	<a href="#">10359ch.jpg</a>	<a href="#">ASAS 181259-2738.3</a>

22	NSV 10360	HV 9306	18 12 59.15, -28 38 46.4	M	11.7	< 15.5	V	306	2454198	max		<a href="#">Comm. 22</a>	<a href="#">10360lc.jpg</a>	<a href="#">10360ch.jpg</a>	<a href="#">ASAS 181259-2838.8</a>
23	NSV 10386	HV 9298	18 15 15.74, -61 13 47.9	M	11.4	< 15.0	V	327	2454893	max		<a href="#">Comm. 23</a>	<a href="#">10386lc.jpg</a>	<a href="#">10386ch.jpg</a>	<a href="#">ASAS 181516-6113.8</a>
24	NSV 10451	HV 9336	18 16 30.10, -30 28 43.3	M	13.1	< 16.0	V	260	2453881	max			<a href="#">10451lc.jpg</a>	<a href="#">10451ch.jpg</a>	<a href="#">ASAS 181630-3028.7</a>
25	NSV 10491	HV 9353	18 17 29.38, -25 32 36.0	M	13.0	< 16	V	246	2454555	max			<a href="#">10491lc.jpg</a>	<a href="#">10491ch.jpg</a>	<a href="#">ASAS 181729-2532.6</a>
26	NSV 10489	HV 9351	18 17 46.69, -32 15 38.4	M:	12.7	< 14.5	V	368	2454246	max		<a href="#">Comm. 26</a>	<a href="#">10489lc.jpg</a>	<a href="#">10489ch.jpg</a>	<a href="#">ASAS 181747-3215.6</a>
27	NSV 10509	HV 9365	18 18 23.59, -27 23 49.6	M	12.6	< 16.9	V	165	2455030	max			<a href="#">10509lc.jpg</a>	<a href="#">10509ch.jpg</a>	<a href="#">ASAS 181824-2723.8</a>
28	NSV 10519	HV 9368	18 18 34.21, -25 09 19.9	M	12.5	< 16.5	V	274	2455102	max		<a href="#">Comm. 28</a>	<a href="#">10519lc.jpg</a>	<a href="#">10519ch.jpg</a>	<a href="#">ASAS 181834-2509.3</a>
29	NSV 10510	HV 9362	18 18 35.03, -31 04 03.2	M	12.0	< 14.2	V	226	2454619	max		<a href="#">Comm. 29</a>	<a href="#">10510lc.jpg</a>	<a href="#">10510ch.jpg</a>	<a href="#">ASAS 181835-3104.0</a>
30	NSV 10527	HV 9369	18 18 51.91, -30 53 53.6	M	12.3	< 16.5	V	295	2455083	max			<a href="#">10527lc.jpg</a>	<a href="#">10527ch.jpg</a>	<a href="#">ASAS 181852-3053.9</a>
31	NSV 10515	HV 9357	18 19 01.05, -47 52 25.7	M	12.8	< 15.7	V	268	2454933	max			<a href="#">10515lc.jpg</a>	<a href="#">10515ch.jpg</a>	<a href="#">ASAS 181901-4752.4</a>
32	NSV 10581		18 19 07.37, -24 37 17.8	M:	13.4	< 14.3	V	410	2454597	max	M7		<a href="#">10581lc.jpg</a>	<a href="#">10581ch.jpg</a>	<a href="#">ASAS 181907-2437.3</a>
33	NSV 10627	HV 9386	18 20 13.31, -28 21 58.7	M	13.1	< 17.1	V	267	2453131	max			<a href="#">10627lc.jpg</a>	<a href="#">10627ch.jpg</a>	<a href="#">ASAS 182013-2822.0</a>
34	NSV 10641	HV 9391	18 20 20.04, -29 00 09.1	M	13.1	< 16.	V	212.5	2454964	max			<a href="#">10641lc.jpg</a>	<a href="#">10641ch.jpg</a>	<a href="#">ASAS 182020-2900.2</a>
35	NSV 10640		18 20 24.01, -23 56 43.5	M	13.0	< 16.	V	251	2454550	max	M		<a href="#">10640lc.jpg</a>	<a href="#">10640ch.jpg</a>	<a href="#">ASAS 182024-2356.7</a>
36	NSV 10639	HV 9390	18 20 39.20, -31 06 02.7	M	12.7	< 15.6	V	459	2454670	max			<a href="#">10639lc.jpg</a>	<a href="#">10639ch.jpg</a>	<a href="#">ASAS 182039-3106.1</a>
37	NSV 10779	S 7366	18 26 36.84, -41 46 34.4	M	13.2:	< 14.8	V	364 :	2454820	max			<a href="#">10779lc.jpg</a>	<a href="#">10779ch.jpg</a>	<a href="#">ASAS 182637-4146.6</a>
38	NSV 10836	P 4684	18 27 30.00, +15 41 29.9	M	12.0	< 15.0	V	342	2454596	max			<a href="#">10836lc.jpg</a>	<a href="#">10836ch.jpg</a>	<a href="#">ASAS 182730+1541.5</a>
39	NSV 10920	S 7382	18 31 05.02, -41 50 18.1	M	13.2	< 15.1	V	310	2454876	max		<a href="#">Comm. 39</a>	<a href="#">10920lc.jpg</a>	<a href="#">10920ch.jpg</a>	<a href="#">ASAS 183105-4150.3</a>
40	NSV 10924	HV 9446	18 31 19.59, -48 14 14.6	M	13.5	< 15.5	V	312	2454596	max	Me		<a href="#">10924lc.jpg</a>	<a href="#">10924ch.jpg</a>	<a href="#">ASAS 183120-4814.3</a>
41	NSV 11384	HV 9540	18 50 32.93, -35 12 10.1	M:	12.3	<13.5	V	240	2455041	max			<a href="#">11384lc.jpg</a>	<a href="#">11384ch.jpg</a>	<a href="#">ASAS 185033-3512.2</a>

**Comments:**

2. Variability of the star was discovered in the ASAS-3 survey. It enters their variable-star catalog as a MISC-type star with a wrong period of 210<sup>d</sup>.3. The ASAS-3 range is for the combined brightness of the Mira and its neighbor.

4. The ASAS-3 range is for the combined brightness of the Mira and its neighbor. HV 9231 was found, upon our request, by D. Williams on Harvard plates.

5. The ASAS-3 range is for the combined brightness of the Mira and its neighbor.

6. Variability of the star was discovered in the ASAS-3 survey. It enters their variable-star catalog as a MISC-type star with a wrong period of 150<sup>d</sup>.6.

8. The ASAS-3 range is for the combined brightness of the Mira and its neighbor.

10. Variability of the star was discovered in the ASAS-3 survey. It enters their variable-star catalog as a Mira-type star with a wrong period of 354<sup>d</sup>.2.

13. The ASAS-3 range is for the combined brightness of the Mira and its neighbor.

15. We have found only one maximum of the star in ASAS-3, on HJD 2452760. Provisionally, we suggest  $P = 480^d$ .
21. Note from the editors: the star's light elements were independently determined in the AAVSO [Variable Star Index](#)(VSX), but, as of April 15, 2016, the AAVSO coordinates were wrong by 3' in declination.
22. Note from the editors: S.A. Otero solved the star independently on March 25, 2016 (see VSX).
23. Sitek & Pojmanski (2014) solved the star independently using I-band observations. Our V-band light curve based on ASAS-3 data covers a larger number of maxima.
26. The ASAS-3 range is for the combined brightness of the Mira and its neighbor.
28. The Mira type, with a wrong period ( $157^d.8$ ), was announced for this variable in the VSX (March 23, 2012) by S.A. Otero.
29. The ASAS-3 range is for the combined brightness of the Mira and its neighbor.
39. The star was discovered by Woźniak et al. (2004b). The VSX mentions it as an SRA variable with the period of  $129^d$ .

### Remarks:

In the process of improving coordinates of variable stars in the NSV catalog (Samus et al. 2007–2015), we determined light elements for 41 Mira type stars. We recovered the following variables suspected by W.J. Luyten: HV 9298 (Luyten 1933a); HV 9203, 9204, 9220, 9244, 9256, 9257, 9260, 9285, 9288, 9336, 9351, 9362, 9369, 9390 (Luyten 1933b); HV 9540 (Luyten 1935); HV 9228, 9247, 9252, 9259, 9276, 9279, 9357, 9446 (Luyten 1936); HV 9306, 9365 (Luyten 1937a); HV 9286, 9304, 9353, 9368, 9386, 9391 (Luyten 1937b). Finding charts for these variables have never been published before. We measured minimal brightness for many Mira variables using Digitized Sky Survey images (R-band). The study of the variables was made using the publicly available electronic archives of CCD observations of the [ASAS-3](#) project (Pojmanski 2002) and images of the STScI and [US Naval Observatory Image and Catalog Archive](#). We studied the variability of NSV 10306 in the [Northern Sky Variability Survey \(NSVS\)](#) data (Woźniak et al. 2004a).

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### References:

- Luyten, W.J., 1933a, *Astron. Nachr.*, 249, 395  
Luyten, W.J., 1933b, *Astron. Nachr.*, 250, 259  
Luyten, W.J., 1935, *Astron. Nachr.*, 256, 325  
Luyten, W.J., 1936, *Astron. Nachr.*, 258, 121  
Luyten, W.J., 1937a, *Astron. Nachr.*, 263, 181  
Luyten, W.J., 1937b, *Astron. Nachr.*, 264, 63  
Pojmanski, G., 2002, *Acta Astron.*, 52, 397  
Samus, N.N., Durlevich, O.V., Goranskij, V.P., Kazarovets, E.V., Kireeva, N.N., Pastukhova, E.N., Zharova, A.V., 2007–2015, [General Catalogue of Variable Stars](#), Centre de Données Astronomiques de Strasbourg, B/gcvs  
Sitek, M., Pojmanski G., 2014, *Acta Astron.*, 64, 115  
Woźniak, P. R., Vestrand, W. T., Akerlof, C. W., et al., 2004a, *Astron. J.*, 127, 2436  
Woźniak, P.R., Williams, S.J., Vestrand, W.T. et al., 2004b, *Astron. J.*, 128, 2965