

New Variable Stars in Cepheus: Area of $2^{\circ}.3 \times 2^{\circ}.3$, Centered at $\alpha=22^{\text{h}}00^{\text{m}}$, $\delta=60^{\circ}00'$ (2000.0). Part I

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#	Name	Other	Coord (J2000)	Type	Max	Min	System	Period	Epoch (JD)	type	Sp	Comment	L.Curve	Find.Chart	Data
1		USNO-A2.0 1425-12426157	21 51 29.94, +59 23 50.0	EA	13.99	14.15		5.159:	2456547.690	min		Comm. 1	lc10493.png	10493.png	out10493.txt
2		USNO-A2.0 1425-12439848	21 52 05.97, +59 28 47.1	EA	14.40	14.63		1.95767	2456566.741	min		Comm. 2	lc12098.png	12098.png	out12098.txt
3		USNO-A2.0 1425-12440914	21 52 08.80, +59 04 35.8	EA	14.68	15.10		2.5569	2456559.986	min		Comm. 3	lc04318.png	04318.png	out04318.txt
4		USNO-A2.0 1425-12447142	21 52 25.26, +59 11 43.1	EW	14.77	15.05		0.70903	2456554.141	min		Comm. 4	lc06325.png	06325.png	out06325.txt
5		USNO-A2.0 1425-12448658	21 52 29.29, +59 11 53.2	DSCTC	12.83	12.86		0.207168	2456528.209	max			lc06284.png	06284.png	out06284.txt
6		USNO-A2.0 1425-12463509	21 53 08.70, +59 12 01.2	DSCTC	12.56	12.60		0.1018073	2456560.119	max			lc06060.png	06060.png	out06060.txt
7		USNO-A2.0 1425-12478111	21 53 45.46, +59 05 58.1	LB	12.20	12.55				other		Comm. 7	lc04336.png	04336.png	out04336.txt
8		USNO-A2.0 1425-12491479	21 54 19.65, +59 24 53.6	SR:	13.27	13.33		32.3:	2455212	max		Comm. 8	lc10220.png	10220.png	out10220.txt
9		USNO-A2.0 1425-12491947	21 54 20.73, +59 13 55.7	BY	13.68	13.80		0.74929	2456545.247	max		Comm. 9	lc06459.png	06459.png	out06459.txt
10	NSV 13961	USNO-A2.0 1425-12497371	21 54 34.68, +59 07 18.0	DCEP:	13.64:	14.16		3.7598	2456560:	max			lc04541.png	04541.png	out04541.txt
11		USNO-A2.0 1425-12505831	21 54 55.56, +58 57 14.0	EA	13.84	13.94		1.47294	2456559.959	min		Comm. 11	lc02009.png	02009.png	out02009.txt
12		USNO-A2.0 1425-12508138	21 55 01.05, +59 29 00.6	SR:	14.15	14.32		45.6	2456183	max		Comm. 12	lc11545.png	11545.png	out11545.txt
13		USNO-A2.0 1425-12508879	21 55 02.82, +59 14 07.7	SR:	14.08	14.25		40.1	2456557.5	max		Comm. 13	lc06618.png	06618.png	out06618.txt
14		USNO-A2.0 1425-12512363	21 55 11.04, +59 25 02.6	LB:	13.54	13.75				other		Comm. 14	lc10119.png	10119.png	out10119.txt
15		USNO-A2.0 1425-12517144	21 55 22.01, +59 17 19.6	LB	14.06	14.28				other		Comm. 15	lc07586.png	07586.png	out07586.txt
16		USNO-A2.0 1425-12520441	21 55 29.51, +59 08 09.4	EA	14.19	14.53		2.6403:	2456182.525	min		Comm. 16	lc04613.png	04613.png	out04613.txt
17		USNO-A2.0 1425-12549174	21 56 35.79, +59 01 40.6	EB	15.41	15.94		0.77738	2456528.019	min		Comm. 17	lc03012.png	03012.png	out03012.txt
18		USNO-A2.0 1425-12549449	21 56 36.43, +58 57 03.4	EW	15.40	15.79		0.43857	2456560.159	min		Comm. 18	lc01821.png	01821.png	out01821.txt
19		USNO-A2.0 1425-12550216	21 56 38.14, +59 01 18.6	LB	13.05	13.20				other		Comm. 19	lc02776.png	02776.png	out02776.txt
20		USNO-A2.0 1425-12551884	21 56 42.00, +59 15 13.8	EA	14.73	14.89		1.12157	2456560.137	min		Comm. 20	lc06722.png	06722.png	out06722.txt
21		USNO-A2.0 1425-12554456	21 56 47.50, +59 25 21.2	EW	15.52	15.88		0.90271	2456559.946	min		Comm. 21	lc10123.png	10123.png	out10123.txt
22		USNO-A2.0 1425-12582005	21 57 48.97, +58 52 52.2	DCEP:	14.44	14.69		2.01193	2456567.115	max			lc00717.png	00717.png	out00717.txt

23		USNO-B1.0 1490-0335637	21 58 22.60, +59 01 11.2	LB	12.65	12.84				other		Comm. 23	lc02395.png	02395.png	out02395.txt
24		USNO-B1.0 1494-0329803	21 58 30.53, +59 24 53.2	LB:	12.28	12.45				other		Comm. 24	lc09447.png	09447.png	out09447.txt
25		USNO-A2.0 1425-12609704	21 58 51.04, +58 57 33.8	LB	13.62	13.82				other		Comm. 25	lc01672.png	01672.png	out01672.txt
26		USNO-A2.0 1425-12616926	21 59 07.46, +59 20 47.7	EA	12.83	13.13		1.5843	2456554.130	min		Comm. 26	lc08102.png	08102.png	out08102.txt
27		USNO-A2.0 1425-12617201	21 59 08.17, +59 13 16.1	EA	13.59	13.99		5.756:	2456183.243	min		Comm. 27	lc05793.png	05793.png	out05793.txt
28		USNO-A2.0 1425-12618564	21 59 11.31, +59 20 29.9	LB:	13.06	13.33				other		Comm. 28	lc07945.png	07945.png	out07945.txt
29	V0722 Cep	USNO-A2.0 1425-12618981	21 59 12.37, +58 58 51.8	SR	13.16	13.54		87.8	2456589	max		Comm. 29	lc01887.png	01887.png	out01887.txt
30		USNO-A2.0 1425-12619392	21 59 13.27, +59 28 19.3	EW	15.67	16.07		0.42501	2456182.459	min		Comm. 30	lc10790.png	10790.png	out10790.txt
31		USNO-A2.0 1425-12623576	21 59 23.24, +59 24 56.9	HADS	14.33	14.72		0.1027306	2456205.228	max		Comm. 31	lc09514.png	09514.png	out09514.txt
32		USNO-A2.0 1425-12628124	21 59 34.09, +59 09 20.1	EA	13.57	13.93		4.9338	2456182.113	min		Comm. 32	lc04600.png	04600.png	out04600.txt
33		USNO-A2.0 1425-12631046	21 59 41.42, +58 51 27.0	LB	14.05	14.31				other		Comm. 33	lc00221.png	00221.png	out00221.txt
34		USNO-A2.0 1425-12648489	22 00 26.53, +59 14 17.8	LB	12.84	12.94				other		Comm. 34	lc05836.png	05836.png	out05836.txt
35		USNO-A2.0 1425-12651039	22 00 33.53, +59 18 30.1	LB:	13.44	13.58				other		Comm. 35	lc07170.png	07170.png	out07170.txt
36		USNO-A2.0 1425-12666784	22 01 13.59, +59 32 37.2	EA	14.15	14.60		0.97515	2456197.327	min		Comm. 36	lc12012.png	12012.png	out12012.txt
37		USNO-A2.0 1425-12668500	22 01 17.94, +59 05 21.5	BY:	12.74	12.81		0.49760:	2456545.731	max		Comm. 37	lc03330.png	03330.png	out03330.txt
38		USNO-A2.0 1425-12693782	22 02 17.30, +59 19 47.8	EA	13.25	13.66		3.1287	2456546.087	min		Comm. 38	lc07363.png	07363.png	out07363.txt
39		USNO-A2.0 1425-12698985	22 02 28.59, +59 27 06.9	LB:	12.88	13.01				other		Comm. 39	lc09826.png	09826.png	out09826.txt
40		USNO-B1.0 1495-0333338	22 02 53.87, +59 31 26.3	LB	14.15	14.61				other		Comm. 40	lc11367.png	11367.png	out11367.txt
41		USNO-A2.0 1425-12716047	22 03 05.26, +59 25 58.7	LB:	12.15	12.22				other		Comm. 41	lc09286.png	09286.png	out09286.txt
42		USNO-B1.0 1494-0333059	22 03 09.94, +59 28 44.0	LB	13.41	13.78				other		Comm. 42	lc10350.png	10350.png	out10350.txt
43		USNO-A2.0 1425-12719544	22 03 12.38, +59 11 52.9	LB	14.69	14.96				other		Comm. 43	lc04992.png	04992.png	out04992.txt
44		USNO-A2.0 1425-12797393	22 05 52.39, +59 03 46.4	LB	13.66	13.88				other		Comm. 44	lc02632.png	02632.png	out02632.txt
45		USNO-A2.0 1425-12817454	22 06 34.84, +58 56 51.1	BY	15.01	15.31		2.2647	2456552.839	max			lc01039.png	01039.png	out01039.txt
46		USNO-B1.0 1489-0339950	22 07 11.28, +58 57 00.5	LB	14.36	14.50				other		Comm. 46	lc01049.png	01049.png	out01049.txt

Comments:

1. MinII = 14^m.14.

2. MinII = 14^m.47.

3. MinII = 15^m.05:.

4. MinII = 14^m.93.

7. J = 7.006, H = 5 .903, K = 5.415.

The star in the NSVS database: [NSVS ID 3421021](#). The NSVS data confirm the star's type.

8. J = 9.355, H = 8.224, K = 7.845.

9. $M-m = 0.2$; $J = 11.706$, $H = 11.128$, $K = 10.995$.
11. $\text{MinII} = 13^{\text{m}}.93$.
12. $J = 9.579$, $H = 8.435$, $K = 7.957$.
13. $J = 9.609$, $H = 8.379$, $K = 7.839$.
14. $J = 9.386$, $H = 8.093$, $K = 7.556$.
15. $J = 9.152$, $H = 7.803$, $K = 7.276$.
16. $\text{MinII} = 14^{\text{m}}.5$. We observed two minima only. A twice shorter period is also possible.
17. $\text{MinII} = 15^{\text{m}}.7$.
18. $\text{MinII} = 15^{\text{m}}.78$.
19. $J = 8.055$, $H = 6.901$, $K = 6.391$.
The star in the NSVS database: [NSVS ID 3423007](#). The NSVS data confirm the star's type.
20. $\text{MinII} = 14^{\text{m}}.83$.
21. $\text{MinII} = 15^{\text{m}}.84$.
23. $J = 7.640$, $H = 6.502$, $K = 5.876$.
The star in the NSVS database: [NSVS ID 3424319](#). The NSVS data confirm the star's type.
24. $J = 8.143$, $H = 6.770$, $K = 6.017$.
25. $J = 9.050$, $H = 7.688$, $K = 6.936$.
26. $\text{MinII} = 12^{\text{m}}.97$.
27. $\text{MinII} = 13^{\text{m}}.91$. Our observations covered two minima only. Periods of $11^{\text{d}}.601$, $8^{\text{d}}.668$ or $8^{\text{d}}.287$ are also possible.
28. $J = 8.438$, $H = 7.224$, $K = 6.717$.
29. $J = 8.551$, $H = 7.327$, $K = 6.871$.
The star in the NSVS database: [NSVS ID 3424943](#). The NSVS data confirm the star's type.
30. $\text{MinII} = 16^{\text{m}}.00$.
31. The first-overtone periodicity of the star: $P_1 = 0^{\text{d}}.079165$. $P_1/P_0 = 0.771$.
32. $\text{MinII} = 13^{\text{m}}.78$.
33. $J = 9.227$, $H = 8.024$, $K = 7.482$.
34. $J = 7.963$, $H = 6.766$, $K = 6.273$.

The star in the NSVS database: [NSVS ID 3425981](#). The NSVS data confirm the star's type.

35. J = 8.937, H = 7.748, K = 7.290.

The star in the NSVS database: [NSVS ID 3426123](#). The NSVS data confirm the star's type.

36. MinII = 14^m.26. D = 0.16.

37. J = 10.586, H = 10.180, K = 9.854.

38. MinII = 13^m.64.

39. J = 8.688, H = 7.383, K = 6.685.

The star in the NSVS database: [NSVS ID 3427572](#). The NSVS data confirm the star's type.

40. J = 9.119, H = 7.806, K = 7.238.

41. J = 7.766, H = 6.495, K = 5.948.

The star in the NSVS database: [NSVS ID 3428004](#). The NSVS data confirm the star's type.

42. J = 8.908, H = 7.339, K = 6.512.

43. J = 9.172, H = 7.764, K = 7.138.

44. J = 8.850, H = 7.428, K = 6.927.

46. J = 8.463, H = 6.919, K = 6.274.

The star in the NSVS database: [NSVS ID 3430795](#). The NSVS data confirm the star's type.

Remarks:

Our observations of an area in Cepheus were performed at the observatory of the Siberian State Aerospace University with a Hamilton telescope (D = 400 mm, F = 915 mm) equipped with a FLI ML9000 CCD camera (3056 × 3056 pixels, pixel size 12 μm). We obtained unfiltered CCD observations during two time intervals from September to October 2012 and from August to November 2013. Exposure times were 30 seconds for all frames. The size of the field is 2°.3 × 2°.3. The magnitudes were referred to red magnitudes of comparison stars from the USNO-A2.0 catalogue (Monet et al. 1998).

The J, H, K magnitudes are from the 2MASS catalog (Skrutskie et al. 2006). For most of the stars, the 2MASS catalog is also the source of positions. In some other cases, the positions are from the USNO-B1.0 catalog (Monet et al. 2003). We used [VaST](#) (Sokolovsky & Lebedev 2005) software to search for new variable stars. To find periods, we applied WinEfk software provided by Dr. V.P. Goranskij. Observations for several stars can also be found in the ROTSE-I/NSVS survey (Woźniak et al. 2004). For two previously known variables, NSV 13961 and V722 Cep, we present new light elements.

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References:

- Monet, D.G., Bird, A., Canzian, B., et al., 1998, USNO-A2.0, A Catalogue of Astrometric Standards (U.S. Naval Observatory, Washington, DC), Centre de Données Astronomiques de Strasbourg, I/252
- Monet, D.G., Levine, S.E., Casian, B., et al., 2003, USNO-B1.0, A Catalog of Astrometric Standards (U.S. Naval Observatory, Washington, DC), Centre de Données Astronomiques de Strasbourg, I/284
- Skrutskie, M.F., Cutri, R.M., Stiening, R., et al., 2006, *Astron. J.*, 131, 1163
- Sokolovsky, K., Lebedev, A., 2005, in 12th Young Scientists' Conference on Astronomy and Space Physics, Kyiv, Ukraine, April 19–23, 2005, eds.: Simon, A.; Golovin, A., p.79
- Woźniak, P.R., Vestrand, W.T., Akerlof, C.W., et al., 2004, *Astron. J.*, 127, 2436