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New Variable Stars in Ophiuchus II

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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 0675-20378892	17 34 57.50, -18 37 31.2	RRC	15.68	16.30		0.374800	2454968.553	Max		Comm. 1	01_PC-R.png	01_chart.jpg	01_data.txt
2		USNO-A2.0 0675-20387968	17 35 00.64, -18 21 09.1	EA	15.47	16.25		0.952759	2455342.5086	Min		Comm. 2	02_PC-R.png	02_chart.jpg	02_data.txt
3		USNO-A2.0 0675-20422717	17 35 12.43, -17 46 18.8	EW	13.80	14.53		0.468144	2455284.559	Min		Comm. 3	03_PC-R.png	03_chart.jpg	03_data.txt
4		USNO-A2.0 0675-20435399	17 35 16.76, -17 58 48.8	RRC	15.07	15.48		0.264632	2455342.4444	Max		Comm. 4	04_PC-R.png	04_chart.jpg	04_data.txt
5		USNO-A2.0 0675-20455670	17 35 23.88, -18 08 30.1	RRAB	15.34	16.40		0.444859	2455352.367	Max		Comm. 5	05_PC-R.png	05_chart.jpg	05_data.txt
6		USNO-A2.0 0675-20458568	17 35 24.90, -18 02 23.8	RRC	15.35	15.92		0.325442	2454969.457	Max		Comm. 6	06_PC-R.png	06_chart.jpg	06_data.txt
7		USNO-A2.0 0675-20484187	17 35 33.96, -18 19 53.1	SR:	13.62	14.58		166	2455308.8	Max		Comm. 7	07_PC-R.png	07_chart.jpg	07_data.txt
8		USNO-A2.0 0675-20500572	17 35 39.60, -18 35 36.4	SR:	14.00	15.53		124	2455361.7	Max		Comm. 8	08_PC-R.png	08_chart.jpg	08_data.txt
9		2MASS 17354166-1750151	17 35 41.67, -17 50 15.2	RRAB	15.00	16.22		0.513033	2455279.5889	Max		Comm. 9	09_PC-R.png	09_chart.jpg	09_data.txt
10		2MASS 17354422-1807140	17 35 44.22, -18 07 14.1	RRAB	14.31	15.35		0.494919	2455280.020	Max		Comm. 10	10_PC-R.png	10_chart.jpg	10_data.txt
11		USNO-A2.0 0675-20517638	17 35 45.13, -17 59 28.9	RRAB	16.18	17.22		0.647374	2454968.866	Max			11_PC-R.png	11_chart.jpg	11_data.txt
12		USNO-A2.0 0675-20565076	17 36 01.02, -18 00 35.0	EB	16.24	17.10		0.421634	2455351.4569	Min		Comm. 12	12_PC-R.png	12_chart.jpg	12_data.txt
13		USNO-A2.0 0675-20565832	17 36 01.30, -18 32 05.1	RRAB	15.08	16.12		0.440615	2455023.3909	Max		Comm. 13	13_PC-R.png	13_chart.jpg	13_data.txt
14		2MASS 17360290-1826260	17 36 02.91, -18 26 26.0	RRC	15.62	16.16		0.279881	2455769.3212	Max		Comm. 14	14_PC-R.png	14_chart.jpg	14_data.txt
15		USNO-A2.0 0675-20583633	17 36 07.04, -18 37 40.8	EA	14.68	15.69		0.751022	2455398.3820	Min		Comm. 15	15_PC-R.png	15_chart.jpg	15_data.txt
16		USNO-A2.0 0675-20584868	17 36 07.47, -18 08 27.9	SR	12.84	14.41		153	2455735.5	Max		Comm. 16	16_PC-R.png	16_chart.jpg	16_data.txt
17		USNO-A2.0 0675-20586706	17 36 08.16, -18 02 40.6	SR:	13.29	15.08		95.8	2455363.6	Max		Comm. 17	17_PC-R.png	17_chart.jpg	17_data.txt
18		USNO-A2.0 0675-20590087	17 36 09.25, -18 16 35.8	RRAB	15.05	16.16		0.499795	2454968.514	Max		Comm. 18	18_PC-R.png	18_chart.jpg	18_data.txt
19		USNO-A2.0 0675-20606326	17 36 14.72, -18 20 16.4	SR:	13.44	14.50		137.8	2455398.4	Max		Comm. 19	19_PC-R.png	19_chart.jpg	19_data.txt
20		USNO-A2.0 0675-20621234	17 36 19.86, -18 37 33.1	EB	15.44	15.93		0.579333	2455352.3550	Min		Comm. 20	20_PC-R.png	20_chart.jpg	20_data.txt

21		2MASS 17362037-1806086	17 36 20.37, -18 06 08.7	EA	14.21	15.08		0.982705	2455712.4801	Min		Comm. 21	21_PC-R.png	21_chart.jpg	21_data.txt
22		USNO-A2.0 0675-20634968	17 36 24.55, -18 16 34.9	RRC	15.12	15.44		0.432244	2454968.575	Max			22_PC-R.png	22_chart.jpg	22_data.txt
23		USNO-A2.0 0675-20658826	17 36 32.94, -18 14 50.7	RRAB	16.02	17.31		0.503642	2454969.4772	Max		Comm. 23	23_PC-R.png	23_chart.jpg	23_data.txt
24		USNO-A2.0 0675-20662099	17 36 34.21, -18 33 06.4	SR	12.58	12.97		45.4	2455761.0	Max		Comm. 24	24_PC-R.png	24_chart.jpg	24_data.txt
25		USNO-A2.0 0675-20676980	17 36 39.28, -17 50 40.5	SR:	13.56	14.95		185	2455002	Max		Comm. 25	25_PC-R.png	25_chart.jpg	25_data.txt
26		USNO-A2.0 0675-20677511	17 36 39.49, -18 29 17.9	EW	16.04	16.70		0.303338	2455283.5590	Min		Comm. 26	26_PC-R.png	26_chart.jpg	26_data.txt
27		USNO-A2.0 0675-20699541	17 36 47.35, -18 14 55.9	RRC	15.35	15.85		0.304942	2455342.4026	Max		Comm. 27	27_PC-R.png	27_chart.jpg	27_data.txt
28		USNO-A2.0 0675-20702192	17 36 48.31, -18 08 44.4	RRAB	14.96	16.45		0.448607	2455302.533	Max		Comm. 28	28_PC-R.png	28_chart.jpg	28_data.txt
29		USNO-A2.0 0675-20705060	17 36 49.27, -17 50 26.2	RRC	15.81	16.50		0.356820	2454968.593	Max		Comm. 29	29_PC-R.png	29_chart.jpg	29_data.txt
30		2MASS 17364943-1828094	17 36 49.44, -18 28 09.5	RRAB	15.35	16.22		0.556579	2455279.5689	Max		Comm. 30	30_PC-R.png	30_chart.jpg	30_data.txt
31		USNO-A2.0 0675-20733989	17 36 59.41, -18 06 26.4	SR:	11.95	13.40		141	2455333	Max		Comm. 31	31_PC-R.png	31_chart.jpg	31_data.txt
32		USNO-A2.0 0675-20766282	17 37 10.49, -18 31 10.5	RRAB	15.10	15.80		0.583814	2455713.454	Max		Comm. 32	32_PC-R.png	32_chart.jpg	32_data.txt
33		USNO-A2.0 0675-20767067	17 37 10.69, -17 48 07.9	RRAB	16.10	17.31		0.506936	2454968.5345	Max			33_PC-R.png	33_chart.jpg	33_data.txt
34		USNO-A2.0 0675-20775428	17 37 13.68, -18 05 59.2	RRAB	15.20	16.09		0.589293	2455367.4638	Max		Comm. 34	34_PC-R.png	34_chart.jpg	34_data.txt
35		USNO-A2.0 0675-20826046	17 37 31.61, -18 10 07.7	SR:	14.70	16.30		153.5	2455745.9	Max		Comm. 35	35_PC-R.png	35_chart.jpg	35_data.txt
36		USNO-A2.0 0675-20839879	17 37 36.90, -17 46 31.8	EB	15.68	16.58		0.835298	2454968.9593	Min		Comm. 36	36_PC-R.png	36_chart.jpg	36_data.txt
37		USNO-A2.0 0675-20847151	17 37 39.81, -18 21 16.2	RRC	14.57	14.84		0.454497	2455279.521	Max		Comm. 37	37_PC-R.png	37_chart.jpg	37_data.txt
38		2MASS 17374620-1752201	17 37 46.21, -17 52 20.1	RRAB	14.97	15.65		0.590549	2455713.986	Max		Comm. 38	38_PC-R.png	38_chart.jpg	38_data.txt
39		USNO-A2.0 0675-20905112	17 38 02.64, -18 17 46.6	RRAB	13.93	14.44		0.891947	2454970.370	Max			39_PC-R.png	39_chart.jpg	39_data.txt
40		USNO-A2.0 0675-20908064	17 38 03.75, -17 50 01.2	RRAB	15.05	16.20		0.507167	2455713.4253	Max		Comm. 40	40_PC-R.png	40_chart.jpg	40_data.txt
41		USNO-A2.0 0675-20908434	17 38 03.89, -18 28 58.5	RRAB	15.39	16.67		0.488525	2455378.419	Max		Comm. 41	41_PC-R.png	41_chart.jpg	41_data.txt
42		USNO-A2.0 0675-20920037	17 38 08.50, -17 51 42.6	RRAB	15.82	16.77		0.539078	2455713.511	Max		Comm. 42	42_PC-R.png	42_chart.jpg	42_data.txt
43		USNO-A2.0 0675-20936678	17 38 15.08, -18 01 28.8	RRAB	15.04	15.42		0.708329	2455713.3820	Max		Comm. 43	43_PC-R.png	43_chart.jpg	43_data.txt
44		USNO-A2.0 0675-20944176	17 38 17.88, -18 32 08.6	M:	13.23	15.85		163	2455334	Max		Comm. 44	44_PC-R.png	44_chart.jpg	44_data.txt
45		USNO-A2.0 0675-20944968	17 38 18.16, -18 20 01.0	RRC	15.82	16.35		0.270744	2455378.414	Max		Comm. 45	45_PC-R.png	45_chart.jpg	45_data.txt
46		USNO-A2.0 0675-20946393	17 38 18.66, -18 36 13.3	RRAB	16.45	17.60		0.631648	2455352.3857	Max		Comm. 46	46_PC-R.png	46_chart.jpg	46_data.txt
47		2MASS 17382196-1814533	17 38 21.97, -18 14 53.4	RRAB	15.20	16.20		0.655850	2455342.4095	Max		Comm. 47	47_PC-R.png	47_chart.jpg	47_data.txt
48		USNO-A2.0 0675-20969406	17 38 27.38, -18 23 03.3	RRAB	15.76	16.91		0.511135	2455279.5690	Max		Comm. 48	48_PC-R.png	48_chart.jpg	48_data.txt
49		USNO-A2.0 0675-20998540	17 38 38.20, -17 46 15.2	RRAB	15.40	16.48		0.669145	2455713.3739	Max		Comm. 49	49_PC-R.png	49_chart.jpg	49_data.txt
50		USNO-A2.0 0675-21003301	17 38 39.76, -18 07 45.9	RRAB	15.16	15.91		0.519999	2455713.4329	Max		Comm. 50	50_PC-R.png	50_chart.jpg	50_data.txt

Comments:

1. Type EB with period $0^d.749593$ is not excluded.

2. Primary minimum: HJD(TT) 2455342.5086 ±0.0005. $Min_{II} = 15^m.69$.

3. Primary minima:

HJD(TT)	±
2455284.559	0.002
2455398.314	0.001
2455713.3760	0.0003

$Min_{II} = 14^m.52$.

4. A close pair of two stars, not separated in major catalogues.
Maxima:

HJD(TT)	±
2455342.4444	0.0005
2455351.4345	0.0004
2455378.4291	0.0008
2455713.4591	0.0006
2455769.306	0.001

5. The star shows Blazhko effect with the period 36^d, resulting from beating of two oscillations: with the tabulated period and with a close period, $0^d.470509$.
Maxima:

HJD(TT)	±
2455302.490	0.002
2455352.367	0.003
2455367.463	0.003
2455760.293	0.004

6. Maxima:

HJD(TT)	±
2454969.457	0.005
2455284.516	0.004
2455342.448	0.008
2455711.474	0.004
2455713.431	0.005

7. Infrared colors J–H = 1.041, H–K = 0.340, J–K = 1.381 (2MASS) are consistent with the M spectral type (Bessell and Brett 1988) and SR: classification.
Maximum: HJD(TT) 2455308.8.

8. Infrared colors J–H = 0.891, H–K = 0.314, J–K = 1.205 (2MASS) are consistent with the M spectral type (Bessell and Brett 1988) and SR: classification.
Maximum: HJD(TT) 2455356.5.

9. A close pair of two stars: 2MASS 17354166-1750151 and 2MASS 17354195-1750175. 2MASS 17354166-1750151 varies.
Maxima:

HJD(TT)	±
2455279.5889	0.0010
2455351.4341	0.0008

10. A close pair of two stars: 2MASS 17354422-1807140 and 2MASS 17354406-1807193. 2MASS 17354422-1807140 varies.
Maximum: HJD(TT) 2455279.535±0.004.

12. Primary minima:

HJD(TT)	±
2455351.457	0.004
2455769.294	0.001

$Min_{II} = 16^{m}.47$.

13. Maxima:

HJD(TT)	±
2455023.3909	0.0001
2455342.4033	0.0009
2455398.3579	0.0009
2455713.3971	0.0007

14. Maximum: HJD(TT) 2455769.3212±0.0006.

15. Primary minimum: HJD(TT) 2455398.3820±0.0003. $Min_{II} = 14^{m}.96$.

16. Infrared colors J–H = 1.000, H–K = 0.384, J–K = 1.384 (2MASS) are consistent with the M spectral type (Bessell and Brett 1988) and SR classification.
Maximum: HJD(TT) 2455735.5.

17. A close pair of two stars, not separated in major catalogues. Infrared colors J–H = 0.950, H–K = 0.392, J–K = 1.342 (2MASS) are consistent with the M spectral type (Bessell and Brett 1988) and SR: classification.
Maximum: HJD(TT) 2455363.6.

18. Maxima:

HJD(TT)	±

2454968.514	0.003
2455352.349	0.003
2455398.346	0.004

19. Infrared colors J–H = 0.946, H–K = 0.402, J–K = 1.348 (2MASS) are consistent with the M spectral type (Bessell and Brett 1988) and SR: classification.
Maxima: HJD(TT) 2455019.0; 2455398.4.

20. Primary minima:

HJD(TT)	±
2455352.3550	0.0008
2455378.427	0.002

$Min_{II} = 15^{m}.93$.

21. Primary minima:

HJD(TT)	±
2455712.480	0.004
2455713.4672	0.0006

$Min_{II} = 14^{m}.44$.

23. Maxima:

HJD(TT)	±
2454969.4772	0.0009
2455023.3698	0.0009
2455378.4368	0.0006

24. Infrared colors J–H = 0.717, H–K = 0.237, J–K = 0.954 (2MASS) are consistent with the M spectral type (Bessell and Brett 1988) and SR classification.
Maxima: HJD(TT) 2455349.7; 2455761.0.

25. Infrared colors J–H = 0.988, H–K = 0.506, J–K = 1.494 (2MASS) are consistent with the M spectral type (Bessell and Brett 1988) and SR: classification.
Maxima: HJD(TT) 2455374.8, 2455002.0, 2455744.0.

26. Primary minima:

HJD(TT)	±
2455283.5590	0.0007
2455342.403	0.001
2455699.4369	0.0007
2455713.3894	0.0005

$Min_{II} = 16^{m}.70$.

27. Maxima:

HJD(TT)	±
2454969.455	0.001
2455342.4026	0.0007
2455769.313	0.002

28. The star shows Blazhko effect with the period $28^{d}.58$, resulting from beating of two oscillation: with the tabulated period and with a close period, $0^{d}.455761$.
Maxima:

HJD(TT)	±
2455302.5150	0.0006
2455351.4348	0.0007
2455713.463	0.001

29. Type EB with period $0^{d}.713648$ is not excluded.

30. Maxima:

HJD(TT)	±
2455279.5689	0.0009
2455342.472	0.005

31. Infrared colors J–H = 0.814, H–K = 0.359, J–K = 1.173 (2MASS) are consistent with the M spectral type (Bessell and Brett 1988) and SR: classification.
Maxima: HJD(TT) 2455333; 2455756.

32. Maxima:

HJD(TT)	±
2455699.455	0.001
2455713.454	0.004

34. Maxima:

HJD(TT)	±
2455367.4638	0.0008
2455713.3778	0.0005
2455772.3096	0.0008

35. Infrared colors J–H = 1.025, H–K = 0.383, J–K = 1.408 (2MASS) are consistent with the M spectral type (Bessell and Brett 1988) and SR: classification.
Maximum: HJD(TT) 2455745.9.

36. $Min_{II} = 16^{m}.19$.

37. Maximum: HJD(TT) 2455279.521± 0.001.

38. A close triplet of stars 2MASS 17374620-1752201, 2MASS 17374599-1752169 and 2MASS 17374592-1752206. 2MASS 17374620-1752201 varies.

40. A close pair of two stars: USNO-A2.0 0675-20908064 and 2MASS 17380400-1750036. USNO-A2.0 0675-20908064 varies. Blazhko effect, available observations are insufficient to determine the Blazhko period.
Maxima:

HJD(TT)	±
2455367.493	0.002
2455713.4253	0.0008

41. Maximum HJD(TT) 2455378.419±0.002.

42. Maxima:

HJD(TT)	±
2455699.498	0.002
2455713.495	0.001

43. Maxima:

HJD(TT)	±
2455351.441	0.007
2455713.382	0.008

44. A close pair of two stars, not separated in major catalogues. Infrared colors J–H = 0.924, H–K = 0.394, J–K = 1.318 (2MASS) are consistent with the M spectral type (Bessell and Brett 1988) and M classification.
Maxima: HJD(TT) 2454999.0; 2455334.0.

45. Maxima:

HJD(TT)	±
2455342.407	0.009
2455378.414	0.001

46. Maxima:

HJD(TT)	±
2455283.539	0.005
2455352.3857	0.0004

47. Maximum: HJD(TT) 2455342.4095±0.0050.

48. Maxima:

HJD(TT)	±
2455279.5690	0.0009
2455342.441	0.002
2455367.4850	0.0009

49. Blazhko effect, available observations are insufficient to determine the Blazhko period.
Maximum: HJD(TT) 2455713.3739±0.0008.

50. Maximum: HJD(TT) 2455713.4329±0.0020.

Remarks:

During observations of a field in Ophiuchus, we discovered 50 new variable stars. Our observations were carried out at the Astrotel-Caucasus observatory, located at the Astronomical station of the Kazan Federal university, using the 300-mm Ritchey-Chretien telescope, equipped with an unfiltered Apogee Alta U9000 CCD camera. A total of 648 images with 5-minute exposures were obtained on JD 2454968–2455772. For basic reductions for dark current, flat fields and bias, we used IRAF routines. For search and photometry of new variable stars, we applied VaST software by Sokolovsky and Lebedev (2005). The comparison star was USNO-A2.0 0675-20424709 = USNO-B1.0 0719-0588525 ($\alpha=17^h35^m13^s.23$, $\delta= -18°03' 24''.0$ (J2000, 2MASS)), $R_1=12^m.93$, $R_2=13^m.72$ (USNO-B1.0). Unfiltered magnitudes were calibrated using the comparison star, assuming $R_{comp}=13^m.325$. The coordinates of the variable stars in the table were drawn from the 2MASS catalogue (Skrutskie et al. 2006). For search for periods and epochs of extrema, we use Peranso software (www.peranso.com); in order to find Blazhko-effect periods for USNO-A2.0 0675-20455670 and USNO-A2.0 0675-20702192, we used WinEfk software, developed by Dr. V. P. Goranskij.

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