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9 New Variable Stars in Exoplanetary Transit Fields Observed at the Caucasus Mountain Observatory

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#	Name	Other	Coord (J2000)	Type	Max	Min	System	Period	Epoch (JD)	type	Sp	Comment	L.Curve	Find.Chart	Data
1		Gaia DR3 518038309346130816	01 55 59.344 +64 27 55.66	EW	17.85	18.25	zr	0.4369	2458741.721	min		Comm. 1	4021_3486LC.png	4021_3486FC.png	4021_3486_TESS.dat 4021_3486_ztf.dat
2		Gaia DR3 47834223303321344	04 18 13.391 +19 06 19.76	EW	17.75	17.87	zr	0.6591	2459479.540	min		Comm. 2	4634_768LC.png	4634_768FC.png	4634_768_TESS.dat 4634_768_ztf.dat
3		Gaia DR3 2194846077739758592	20 36 05.571 +61 06 14.43	EW	15.43	15.69	zr	0.49866	2459381.525	min		Comm. 3	3923_1698LC.png	3923_1698FC.png	3923_1698_TESS.dat 3923_1698_ztf.dat
4		Gaia DR3 2194847898805996672	20 36 42.724 +61 09 56.11	EW	16.08	16.22	zr	0.48505	2458353.678	min		Comm. 4	3923_2714LC.png	3923_2714FC.png	3923_2714_TESS.dat 3923_2714_ztf.dat
5		Gaia DR3 1871025987680298624	20 47 25.729 +37 14 10.06	EB	15.13	15.25	zr	0.8648	2459422.821	min		Comm. 5	3528_1752LC.png	3528_1752FC.png	3528_1752_TESS.dat 3528_1752_ztf.dat
6		Gaia DR3 1871338764374677632	20 57 45.439 +36 26 04.29	BY:	16.55	16.64	zr	0.62171	2458854.755	max		Comm. 6	3558_5669LC.png	3558_5669FC.png	3558_5669_TESS.dat 3558_5669_ztf.dat
7		Gaia DR3 1871319660359975808	20 58 39.213 +36 14 11.41	EB	16.82	16.97	TESS	0.33725	2458632.893	min		Comm. 7	3558_3575LC.png	3558_3575FC.png	3558_3575_TESS.dat 3558_3575_ztf.dat
8		Gaia DR3 1951230825428871296	21 30 34.840 +34 54 13.00	EA	16.56	17.27	zr	0.50547	2459099.685	min		Comm. 8	3568_209LC.png	3568_209FC.png	3568_209_TESS.dat 3568_209_ztf.dat
9		Gaia DR3 1950473055761063552	21 31 09.334 +34 41 43.03	DSCT	14.34	14.38	zr	0.12418	2458449.569	max		Comm. 9	3568_2741LC.png	3568_2741FC.png	3568_2741_TESS.dat 3568_2741_ztf.dat

Comments:

1. MinII = $18^m.15$. Detected in the field of exoplanetary transit TOI 4021.01; observed by NM and AT on 2022-09-17. TESS photometry from sectors 52 and 58.

2. MinII = $17^m.86$. Detected in the field of TOI 4634.01; observed by AT on 2022-12-16 and by NM on 2021-12-04 and 2022-01-20. TESS photometry from sectors 43 and 44.

3. MinII = $15^m.68$. Detected in the field of TOI 3923.01; observed by NM on 2021-12-29 and 2022-04-07. TESS photometry from sectors 15, 17, 24, 55, 56, and 57.

4. MinII = $16^m.20$. Detected in the field of TOI 3923.01; observed by NM on 2021-12-29 and 2022-04-07. TESS photometry from sectors 15, 17, 24, 55, 56, and 57.

5. MinII = $15^m.19$. Detected in the field of TOI 3528.01; observed by NM on 2022-12-06. TESS photometry from sectors 41 and 55.

6. Detected in the field of TOI 3558.01; observed by NM and AT on 2022-07-31. TESS photometry from sectors 15, 41, and 55.

7. MinII = $16^{m}.94$. Detected in the field of TOI 3558.01; observed by NM and AT on 2022-07-31. TESS photometry from sectors 15, 41, and 55.

8. MinII = $16^{m}.75$. D = 0.23 P. Detected in the field of TOI 3568.01; observed by AT on 2022-12-31. TESS photometry from sector 15. Mentioned as eclipsing binary candidate ATO J322.6451+34.9036 in the ATLAS variable stars catalog (Heinze et al., 2018).

9. Detected in the field of TOI 3568.01; observed by AT on 2022-12-31. TESS photometry from sectors 15, 55, and 56.

Remarks:

We report the discovery of nine new variable stars as a by-product of high-precision photometry of exoplanetary transits. The initial datasets were obtained with the RC600 telescope of the Caucasus Mountain Observatory of the Sternberg Astronomical Institute, equipped with an Andor iKon-L CCD camera (Berdnikov et al., 2020). For each field we used time series of transit observations to detect variable objects by means of the VaST software package (Sokolovsky and Lebedev, 2018). Suspected targets not listed as known variables in the VSX database were selected for further study. Unfortunately, the lenght of the time intervals of the RC600 data was enough only to pick potentially interesting stars, but not to derive their light elements. To overcome this, we collected ZTF photometry (Bellm et al., 2019; Masci et al., 2019) using the SNAD ZTF viewer (Malanchev et al., 2023) and TESS data (Ricker et al., 2014), that were processed using the Lightkurve library algorithms (Lightkurve Collaboration, 2018). In total, we discovered nine variable stars showing identical periods according to ZTF and TESS data. Each of them are identified with sources from Gaia DR3 (Gaia Collaboration, 2023). We derived periods with the help of the WinEfk tool developed by Dr. V. P. Goranskij.

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