

# Observational Facilities of Sternberg Astronomical Institute for Ground-Based Photometric Study of Newly Identified GAIA Objects, — CV-candidates.

Irina Voloshina and Valerian Sementsov

Sternberg Astronomical Institute, Lomonosov Moscow State University,  
Moscow, 119991, Russia, Universitetsky prospekt, 13  
email: voloshina.ira@gmail.com

**Abstract.** The extended observational program for study of cataclysmic variables is realized in Sternberg Astronomical Institute during the last years. A few telescopes of Crimean Observational Station equipped with a different devices, — UBV photometer and two CCD camera, are used for observations. Among the close binary systems (CBS), cataclysmic variables are the most interesting objects because of the outburst activity and variety of their observational features. They could serve a good laboratory for study of physical processes in CBS. GAIA provides astronomers with a new ample opportunity for investigation of cataclysmic variables. Though the relative faintness of detected objects it is still possible to carry out a high accuracy ground-based observations with our equipment. Obtained ground-based data permit us to confirm classification of detected CV-candidates, to determine the physical characteristics with a sample of new cods and improve the current understanding of their nature.

**Keywords.** binaries: close, cataclysmic variables, techniques: photometric

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Cataclysmic variables are low-mass CBS in the late evolutionary stages, where the primary is a WD and the secondary is a late-type star. It fills its Roche Lobe and transfers mass to the WD. The gas stream flows from the secondary to the WD forming an accretion disk around it. Both components, along with the accretion disk and the gaseous flow from the optical star contribute to the total system brightness. Most of CVs have orbital periods from  $80^m$  to  $15^h$ . The geometry of the satellite and the scanning law determine the sets of allocated frequencies in GAIA data (with periods in the neighborhood of  $106.5^m$ ,  $6^h$  and  $63^d$ ). Continuous ground-based observations will provide an opportunity to seriously clarify the data on the variability of irregular objects such as CV.

We will carry out the long-term observations of the objects discovered recently in GAIA project using CCD photometers installed at telescopes of the Sternberg Astronomical Institute in Crimea. The light detector on the 50-cm telescope is an Apogee Alta U8300 ( $3326 \times 2504$  pel, 1 pel =  $5.4 \mu\text{m}$ ) and an Apogee 47 ( $528 \times 512$  pel, 1 pel =  $12 \mu\text{m}$ ) on the 60-cm telescope. We performed observations mostly in the  $R$  or  $R_c$  bands, because the sensitivity of these CCD detectors is highest in the red (5800-6600 Å). The duration of observational sets is about 5–6 hours, on average. The uncertainty of a single measurement depended on the star brightness, and is approximately the same for both telescopes,  $\sigma \sim 0.01 - 0.05^m$ . The new 2.5-m telescope near Kislovodsk (KGO) with CCD photometer could be used for particularly faint objects from our program.

*Acknowledgments.* This study has been supported via grant of the RFBR N 17-52-53200. We acknowledge ESA Gaia, DPAC and the Photometric Science Alerts Team (<http://gsaweb.ast.cam.ac.uk/alerts>).

**Table 1.** List of CV candidates in the Northern Hemisphere from GAIA releases ( $< 18^m$ )

#Name	$\alpha_{J2000}$	$\delta_{J2000}$	G	SIMBAD identification
Gaia17ayu	18 <sup>h</sup> 57 <sup>m</sup> 36.90 <sup>s</sup>	+32° 08' 35.95''	16.5 <sup>m</sup>	
Gaia17ayl	19 13 34.4472	+37 23 22.272	16.9	
Gaia17ayi	20 33 35.9952	+24 27 05.472	17.6	
Gaia17asx	20 49 26.4480	+19 45 05.544	17.69	
Gaia17asw	02 36 27.6072	+50 44 34.224	17.63	
Gaia17asc	20 20 51.2424	+22 10 20.532	15.41	
Gaia17arj	20 52 27.2280	+31 50 26.880	17.97	
Gaia17aqx	18 04 19.3416	+13 21 37.800	17.29	
Gaia17aqj	19 41 45.4992	+33 54 01.296	17.5	
Gaia17apr	19 25 00.0768	+43 00 07.956	16.47	
Gaia17aop	22 10 18.0600	+53 08 35.484	17.86	
Gaia17ahf	05 03 32.8392	+69 09 47.160	16.56	
Gaia17agc	03 50 35.00	+35 32 47.0	16.48	(1.7'') CRTS J035034.9+353247 CV?
Gaia17afs	17 35 17.2776	+01 32 49.488	16.42	
Gaia17afq	22 57 39.6816	+50 43 04.080	17.91	
Gaia17afp	21 17 21.0120	+45 58 47.568	17.83	
Gaia17ade	22 29 00.3	+26 37 07	16.1	(0.65'') GALEX J222900.3+263707
Gaia17abv	18 02 31.3488	+30 58 29.1	16.84	
Gaia17aaz	18 35 12.82	+38 20 04.4	13.62	(0.07'') V* LL Lyr
Gaia16cfx	10 29 37.749	+41 40 46.35	17.67	(0.08'') SDSS J102937.74+414046.3 CV*
Gaia16cft	21 12 04.5408	+36 35 29.508	16.34	
Gaia16cba	01 39 26.7264	+49 40 53.580	17.69	
Gaia16caf	00 43 04.2024	+53 17 15.936	17.4	
Gaia16bzy	00 46 25.8720	+38 20 23.820	17.86	
Gaia16bzo	23 33 21.6000	+55 03 41.976	17.53	
Gaia16bzc	22 24 52.0968	+52 05 38.112	17.91	
Gaia16bxc	20 12 40.0296	+25 10 26.472	17.93	
Gaia16bww	16 36 33.1200	+39 33 13.140	15.31	
Gaia16buu	18 32 05.0448	+09 22 21.684	16.55	
Gaia16bos	22 24 52.9560	+53 30 01.512	17.79	
Gaia16bno	21 01 40.49	+21 57 30.9	17.62	(1.10'') MASTER OT J210140.49+215730.9 ev
Gaia16blu	22 28 33.4392	+50 40 16.068	17.72	
Gaia16bln	21 46 39.94	+09 21 19.3	17.79	(0.62'') CRTS CSS110613 J214640+092119 CV?
Gaia16ble	21 26 24.16	+25 38 27.2	16.52	(0.57'') MASTER OT J212624.16+253827.2 CV*
Gaia16bis	07 49 28.013	+19 04 52.10	16.53	(0.15'') SDSS J074928.01+190452.1 DN*
Gaia16bhk	05 05 15.0000	+06 17 07.800	16.75	
Gaia16bbf	05 43 29.0760	+77 20 24.576	16.8	
Gaia16bbz	19 16 39.4344	+46 21 07.236	17.69	
Gaia16bbf	16 47 05.087	+19 33 34.98	17.98	(0.16'') SDSS J164705.08+193334.9 CV?
Gaia16baw	19 49 11.6736	+29 06 41.256	17.88	
Gaia16azk	05 32 20.9592	+03 57 31.536	15.35	
Gaia16azd	20 51 59.2392	+34 49 46.128	16.71	
Gaia16ayw	04 59 55.09	+20 48 51.1	17.82	(0.13'') CRTS MLS101225 J045955+204851 CV?
Gaia16awq	14 47 47.6592	+66 08 47.616	14.85	
Gaia16aue	13 05 25.5816	+05 43 24.996	17.68	
Gaia16asd	19 31 49.5024	+09 49 39.216	17	
Gaia16art	20 31 36.8472	+08 48 30.204	14.97	
Gaia16apa	00 15 38.213	+26 36 57.45	13.89	(1.15'') 2MASS J00153821+2636574 CV*
Gaia16amd	20 35 29.77	+06 36 53.3	16.49	(0.56'') MASTER OT J203529.80+063652.8 DN*
Gaia16aid	08 10 57.4536	+27 15 12.492	14.07	
Gaia16aht	21 07 21.5352	+27 31 11.604	17.9	
Gaia16ahk	23 00 25.1160	+41 31 18.732	16.92	
Gaia16ahi	23 27 16.2360	+41 31 48.612	16.78	
Gaia16agx	20 36 48.8040	+29 31 27.192	17.51	
Gaia16agl	17 34 29.6568	+14 34 38.532	17.59	
Gaia16afh	18 58 38.706	+46 02 07.83	17.16	(0.68'') GALEX J185838.7+460207 CV*
Gaia16aeb	20 49 12.7896	+65 01 08.472	17.65	
Gaia16adh	00 38 27.0480	+25 09 25.020	16.43	
Gaia16adb	12 09 30.2592	+76 09 11.916	16.94	
Gaia16acz	01 46 44.6544	+48 26 49.668	15.9	
Gaia16abv	06 04 24.7584	+54 07 28.740	17.62	
Gaia16abj	21 44 08.5464	+82 12 34.092	17.75	
Gaia15adf	08 19 36.06	+19 15 40.1	16.2	(0.57'') CRTS J081936.1+191540 CV?
Gaia15abx	23 19 09.18	+33 15 39.8	17.88	(0.20'') 1RXS J231909.9+331544 CV*
Gaia15abh	22 18 29.5584	+39 48 37.476	16.32	
Gaia15abg	00 22 53.2	+13 40 41	16.88	(0.43'') GALEX J002253.2+134041 UV
Gaia15aan	16 05 47.996	+24 05 31.06	13.03	(0.04'') NAME 400d J160547.5+240524 CV*
Gaia14adn	09 59 08.7336	+81 53 35.592	15.95	
Gaia14ade	23 50 52.01	+28 58 59.5	17.78	