

The Cambridge Photometric Calibration Server 2.0

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Gaia Science Alerts Team (University of Cambridge) OPTICON follow-up network





OPTICON – Time Domain Astronomy

Networking Activity WP13: Time Domain Astronomy

- networking (workshops)
- coordination of scientific goals in time domain
- support in observations and data processing
- observing trips
- robotic telescopes in TNA support

10th Gaia Science Alerts Workshop 2019, Catania, Sicily, 18-20 December 2019

9th Gaia Science Alerts Workshop 2018, Vipava - archive of presentations 8th Gaia Science Alerts Workshop 2017, Warsaw - archive of presentations 7th Gaia Science Alerts Workshop 2016, Utrecht - archive of presentations 6th Gaia Science Alerts Workshop 2015, Liverpool - archive of presentations 5th Gaia Science Alerts Workshop 2014, Warsaw - archive of presentations 4th Gaia Science Alerts Workshop 2013, Paris - archive of presentations Gaia Science Alerts Workshop 2012, Bologna - archive of presentations Gaia Science Alerts Workshop 2011, Cambridge - archive of presentations

Cambridge Photometric Calibration Server (CPCS)



OPTICON follow-up network



Cambridge Photometric Calibration Server (current version)

Welcome to the Cambridge Photometry Calibration Server (CPCS)

Not logged in

Login into the system List of alerts (observed only) List of followup data List of observatories Upload new followup data Enter new event Delete a followup point from the system Logout

gsaweb.ast.cam.ac.uk/followup/

Manual

CPCS - result of calibration

Upload done from IP 37.249.110.19

EventId : ivo://Gaia18bmt

Ra: 214.01478

Dec : -56.9134

Filter: APASS / r

Magnitude: 15.47 +/- 0.01 mag

ZP: -1.78 mag

Scatter: 0.12 mag

Number of datapoints used for calibration: 79

Outlier fraction: 0.15



Dry run: True

USNO R1pg ZP = -1.52 σ = 0.44 f_{outl} = 0.02APASS V ZP = -2.16 σ = 0.29 f_{outl} = 0.07 APASS r ZP = -1.78 σ = 0.12 f_{outl} = 0.15 APASS i ZP = -1.13 σ = 0.36 f_{outl} = 0.12 GAIA G ZP = -1.84 σ = 0.38 10.0 12.5 15.0 17.5 20.0 22.5 Time spend calibrating 2.48750901222 s

 Photometric standardisation from instrumental magnitudes

 Calibration plot for each filter with data found in catalogues

CPCS - example light curves



MJD

Light curve of ivo://Gaia18arn

mag







CPCS - example light curves



MJD



mag





MJD



http://gsaweb.ast.cam.ac.uk/followup/list_of_alerts

CPCS - List of alerts

id	ivorn	published	ra	dec	nfollowup	LC	data
27149	ivo://Gaia18cnx	2018-09-19 06:44:42	85.7320833333	18.9288888889	12	LC	data
27148	ivo://Gaia18com	2018-09-19 05:43:05	71.7457916667	17.0438055556	10	LC	data
27147	ivo://Gaia18cnj	2018-09-19 04:27:02	41.4972083333	12.5415	12	LC	data
27146	ivo://Gaia18cos	2018-09-19 04:07-07	39.4684166667	28.8025	12	LC	data
27145	ivo://Gaia18con	2018-09-19 03:25:54	9.120625	39.1703888889	7	LC	data
27144	ivo://Gaia18cof	2018-09-19 03:05:57	11.0825	41.4905	9	LC	data
27143	ivo://Gaia18cow	2018-09-17 04:49:14	28.3395	34.1488888889	77	LC	data
27142	ivo://Gaia18cor	2018-09-17 01:41:10	313.158	30.553	79	LC	data
27141	ivo://Gaia18coz	2018-09-16 22:30:38	300.56	31.6096111111	7	LC	data
27137	ivo://Gaia18cnz	2018-09-14 13:19:58	281.78935	1.46838	6	LC	data
27136	ivo://Gaia18coj	2018-09-12 00:12:20	275.394	2.0519444444	118	LC	data
27135	ivo://Gaia17asr	2018-09-11 18:46:15	290.33233	8.37824	14	LC	data
27134	ivo://Gaia18cnp	2018-09-11 04:05:36	31.2515833333	46.0938888889	83	LC	data
27133	ivo://Gaia18cjb	2018-09-10 06:28:20	99.7814166667	0.148472222222	3	LC	data
27132	ivo://Gaia18cdg	2018-09-10 05:58:10	109.33	52.3066111111	3	LC	data
27131	ivo://Gaia18cjv	2018-09-10 01:50:02	289.885	35.3788055556	6	LC	data
27130	ivo://Gaia18cju	2018-09-10 01:29:04	290.356	34.2413055556	6	LC	data
27129	ivo://Gaia18cmk	2018-09-09 22:08:11	307.14938	22.83047	149	LC	data
27128	ivo://Gaia18cik	2018-09-09 22:04:59	278.37988	-3.40325	22	LC	data
27127	ivo://Gaia18ckn	2018-09-09 06:41:45	104.596	35.8406944444	3	LC	data

only alerts in the database can be calibrated

light curve with all data for a given object, visible for everyone



all data in JSON format available only after login

Statistics from CPCS

Total number of observatories (sites): **143**

Total number of follow-up data points uploaded on CPCS: **148,408**

Name	Observations
pt5m Liam Hardy	51687
ObsMontsec Umut Burgaz	16289
PIRATE Meredith Morrell	14986
Heather Campbell	7781
OndrejovD50 Martin Jelinek	4749
PROMPT8-0.6 Supachai Awipan	4663
PIRATE Ulrich Kolb	3259
LCOGT1m Kris Rybicki	3105
Beacon17 Dirk Froebrich	2609
Bialkow0.6 Z.Kolaczkowski	2590
Pt5m Stuart Littlefair	2186
REM Pawel Zielinski	1874
Krakow28 Sebastian Kurowski	1872
APT2 Catania Giuseppe Leto	1791
T60 Umut Burgaz	1544
TRT-GAO70 Supachai Awipan	1461
DEMONEXT Matthew Penny	1448
ASV-Serbia Goran Damljanovic	1305
UBT60 Volkan Bakis	1304
LT Andreja Gomboc	1282
OmicronC2PU JPRivet	1073

How does it work?

- data from Gaia, ASAS-SN, ATLAS arrives,
- alert candidates published
- interesting targets identified (microlensing, TDEs, SNe, YSOs, etc.)
- information on the mailing list
 Gaia Science Alerts Working Group #10 Photometric Follow-up and on Gaia MARSHALL https://gsaweb.ast.cam.ac.uk/alerts/marshall/login
- observers monitor the targets
- follow-up observations going to the CPCS as ASCII data

CPCS input data

• ASCII file with four columns (at least):

#	1 MA	G_AUTO	Kron-like elliptical aperture magnitude	[mag]
#	2 MA	GERR_AUTO	RMS error for AUTO magnitude	[mag]
#	3 AL	PHA_J2000	Right ascension of barycenter (J2000)	[deg]
#	4 DE	LTA_J2000	Declination of barycenter (J2000)	[deg]
-14	.2907	0.0003	325.6035146 +51.9122644	
-12	.0728	0.0019	325.5894087 +51.8924851	
-9	.7046	0.0154	325.5918575 +51.8896327	
-10	.1498	0.0101	325.5648192 +51.8609128	
-8	.2235	0.0559	325.5152907 +51.8053484	
-9	.7797	0.0135	325.6361863 +51.9352485	
-9	.7847	0.0140	325.5468315 +51.8389083	
-9	.1697	0.0229	325.5310027 +51.8215640	
-8	.8297	0.0370	325.6532435 +51.9505019	
-9	.9542	0.0129	325.6462307 +51.9427111	
-10	.0418	0.0124	325.6488064 +51.9446188	
-8	.5810	0.0391	325.6020599 +51.8959788	
-8	.9307	0.0298	325.6036233 +51.8948840	
-9	.6886	0.0178	325.5191266 +51.8071578	
-8	.2394	0.0664	325.5206616 +51.8090629	
-8	.2067	0.0489	325.5806719 +51.8720249	
-7	.5896	0.0825	325.5699074 +51.8609005	
-9	.8822	0.0157	325.5694490 +51.8593358	
-9	.1381	0.0284	325.6057468 +51.8976997	
-8	.0386	0.0546	325.5675362 +51.8577268	
-8	.8905	0.0329	325.6142234 +51.9059920	
-7	.2577	0.1022	325.6111716 +51.9033982	
-6	.9919	0.1136	325.5630499 +51.8526784	
-9	.4338	0.0174	325.5768518 +51.8657967	
-8	.1909	0.0471	325.5544825 +51.8425328	
-9	.9461	0.0087	325.5566753 +51.8414693	

Cambridge Photometric Calibration Server 2.0



Cambridge Photometric Calibration Server 2.0

Web-based tool to get photometric and astrometric solutions from FITS images

- Precision of photometric measurements ~0.01 mag, astrometric measurements ~0.01 arcsec
- CCDPhot as a kernel of CPCS 2.0 it uses DAOPHOT, WCStools, IRAF/PyRAF, SEXtractor, SCAMP, astropy
- Scripts for standardisation of FITS headers
- Scripts for automatic selection of PSF stars
- Scripts for transformation of instrumental magnitudes to standard system, reference catalogues: APASS, SDSS, PS1, DES, 2MASS
- Astrometric references: URAT-1, UCAC-4, USNOB1 and Gaia-DR2
- Automatic uploading of the data possible

Summary

- CPCS 1.0 is used currently by many researchers gsaweb.ast.cam.ac.uk/followup/
- CPCS 2.0 tested on various data from different telescopes and instruments, website rebuilt, implementing to BHTOM, work in progress (Zieliński et al. *in prep.*)
- Feel invited to cooperation in the follow-up network!
- Join our mailing list GSAWG#10 Photometric Follow-up contact Łukasz Wyrzykowski: lw@astrouw.edu.pl
- You can use it for your own research independently!



Thank you!

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