



TIME DOMAIN ASTRONOMY

FP7/WP11

2012-2016

Łukasz Wyrzykowski

Warsaw University Astronomical Observatory, Poland

Gaia Alerts Workshop, Utrecht, 8th December 2016



gaia



UNIVERSITY OF
CAMBRIDGE



EUROPEAN
SCIENCE
FOUNDATION
SETTING SCIENCE AGENDAS FOR EUROPE

PEOPLE 2013-2016

Warsaw University

Dr hab. Łukasz Wyrzykowski

- ✗ Dr Krzysztof Ulaczyk (part-time PDRA) - observations (Warsaw, Loiano), data reductions, automatization, calibrations, technical support to the observatories in the network.
- ✗ Dr Zuzanna Kostrzewa-Rutkowska - visualisations, data analysis, data maintenance
- ✗ Michał Pawlak (PhD stud)- observations (Warsaw, Loiano, OHP, LCOGT), data reductions
- undegraduate students from Warsaw - observations in Warsaw and Loiano

Liverpool John Moores University

Prof. Iain Steele

- ✗ Dr Robert Barnsley (PDRA) - generic pipeline for spectroscopic time domain data via web browser for professional and amateur astronomers.

Mr Andrzej Piascik (PhD student) - designing and building of SPRAT spectrograph for LT and possibly other telescopes

ACHIEVEMENTS

- network of small telescopes (~20 active)
- automated system for crude photometric data reductions
- central repository of follow-up data (>30000 observations)
- developed efficient and low cost spectrograph SPRAT (Liverpool)
- 4 workshop to connect observers to science (Gaia Alerts-related)
- your lunches in Utrecht :)



MARIE CURIE ACTIONS

[illegible]

OPTICON



Gaia Science Alerts Workshop 2015
Liverpool John Moores University (UK)
10-13 November 2015

The poster features a central orange circle with a white line connecting it to three other circles: a satellite in the top left, a binary star system in the top right, and a city skyline with the Milky Way in the bottom left. To the right of the bottom-left circle is a list of workshop topics.

- Follow-up observations
- Automated classification
- Gaia Alerts Publisher
- Science cases
- Robotic telescopes
- Outreach
- Transient surveys
- Hands-on sessions

Details: www.ljmu.ac.uk/ljmu/physics/gaiaalerts/index.php/Workshop2015/index
Contact: gaiaalerts@liverpool.ac.uk
Hashtag: #GaiaAlerts

At the bottom right, there are logos for the University of Liverpool, the European Space Agency (ESA), and the Gaia mission.



<http://www.ast.cam.ac.uk/ioa/wikis/gsawgwiki>

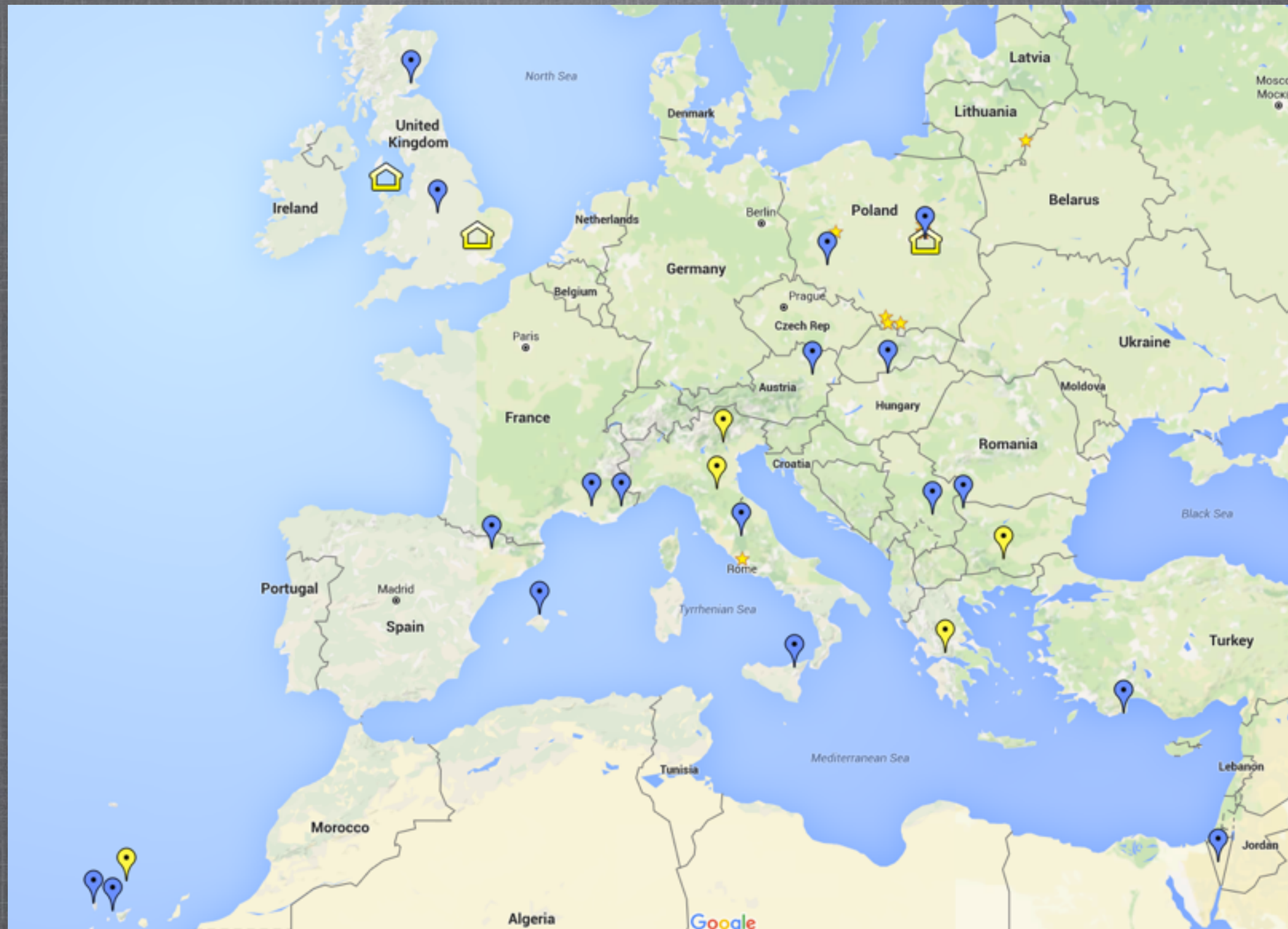
OPTICON FOLLOW-UP NETWORK

~20 active partners, ~30000 data points collected 2014-2016



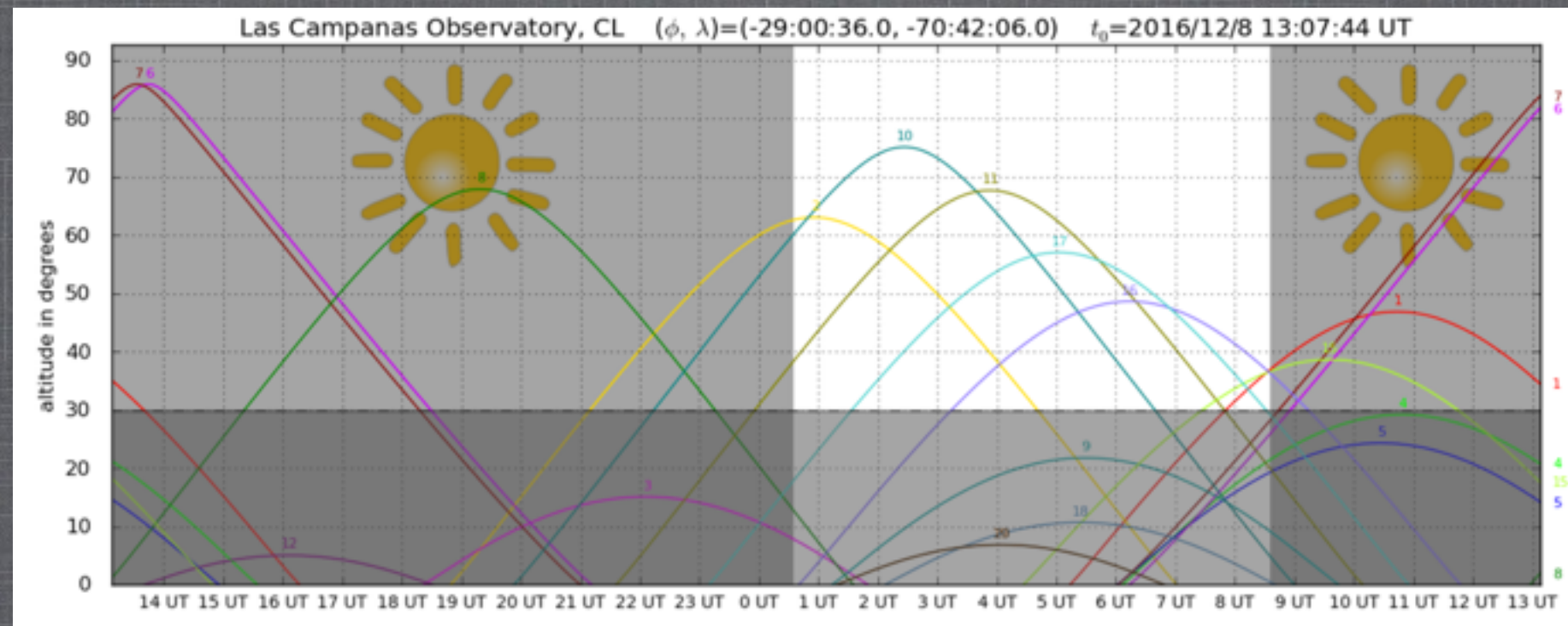
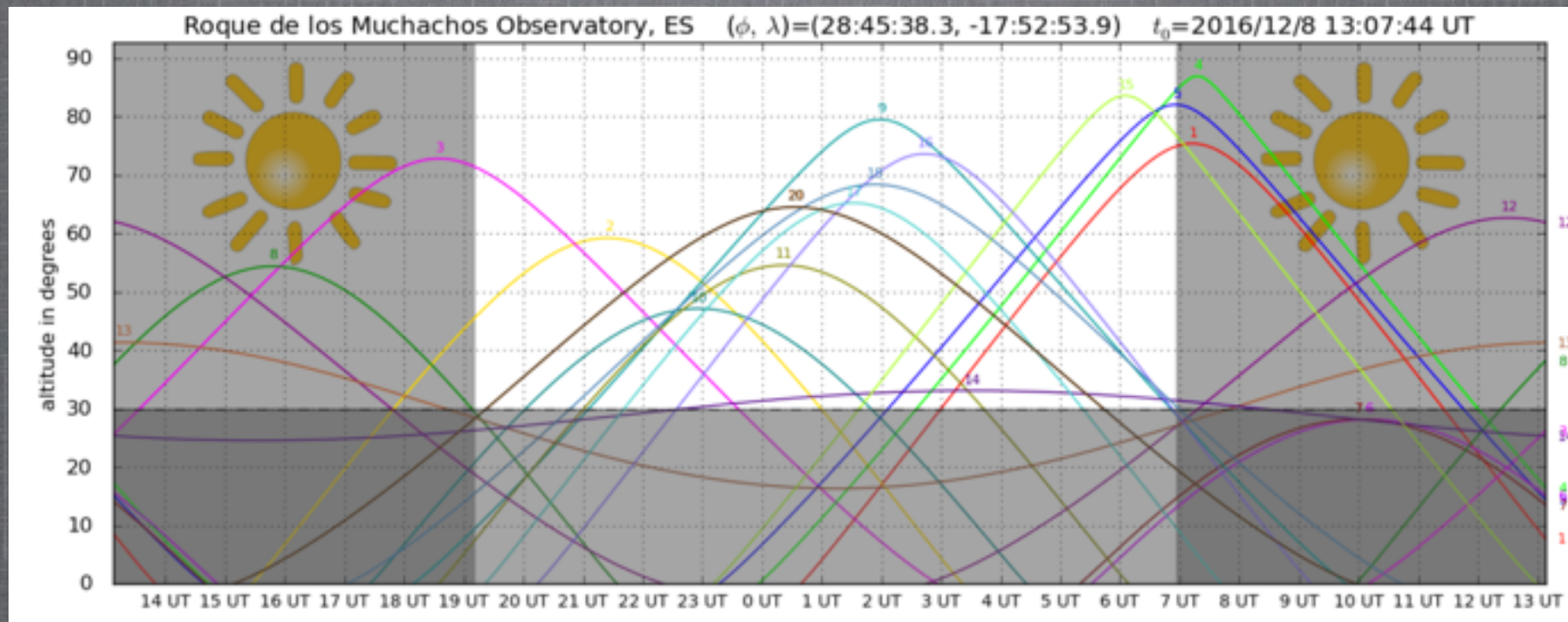
OPTICON FOLLOW-UP NETWORK

~20 active partners, ~30000 data points collected 2014-2016



OBSERVATION PLANNING TOOL

www.astro.uw.edu.pl/~kulaczyk/ephem



designed by Krzysztof Ulaczyk and LW

FOLLOW-UP CALIBRATION SERVER

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

Welcome to the Cambridge Photometry Calibration Server (CPCS)

Logged as admin

[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

Admin stuff

[Add](#) a new user into the system
[Update](#) the coordinates of an alert

Last data upload was done on Thu Aug 14 15:47:16 2014 for ivo://asassn/ASASSN-14bb

[Logout](#)

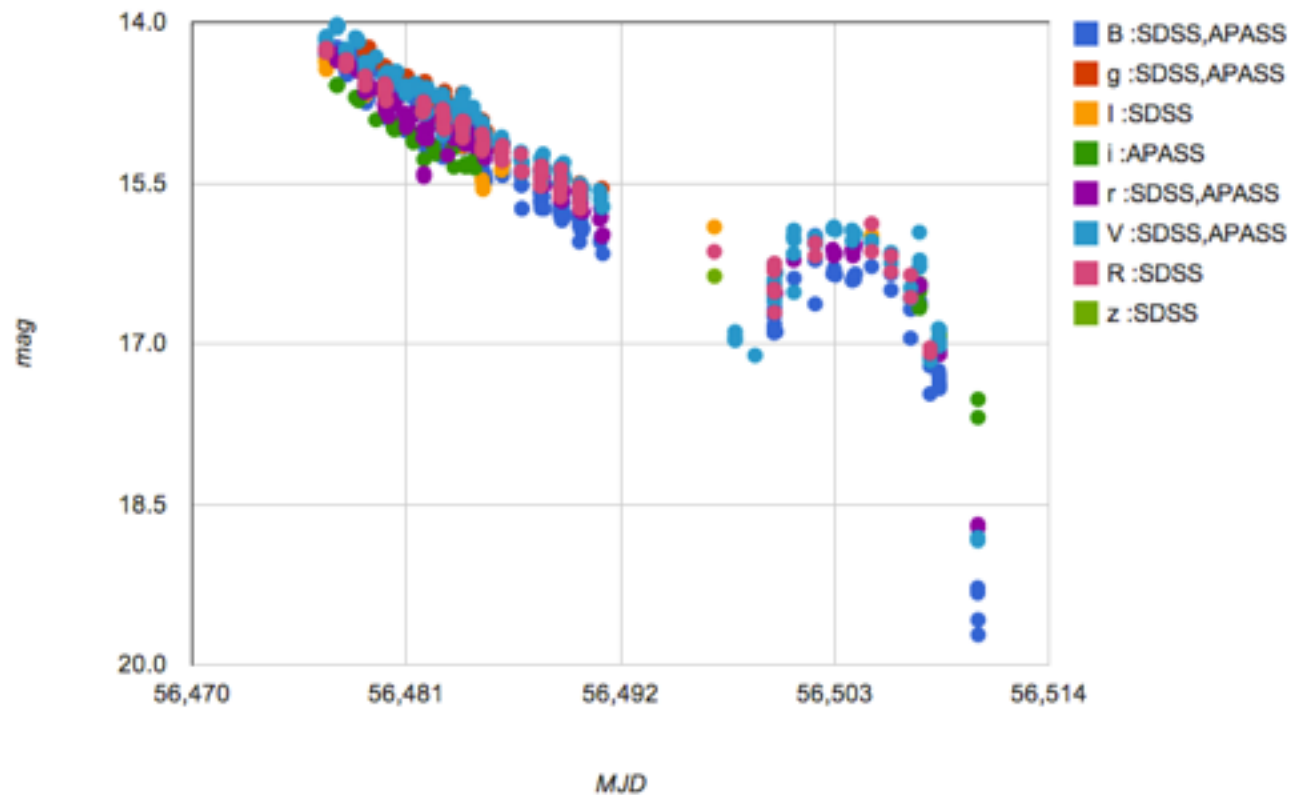
[Manual](#)

designed by Sergey Koposov and LW

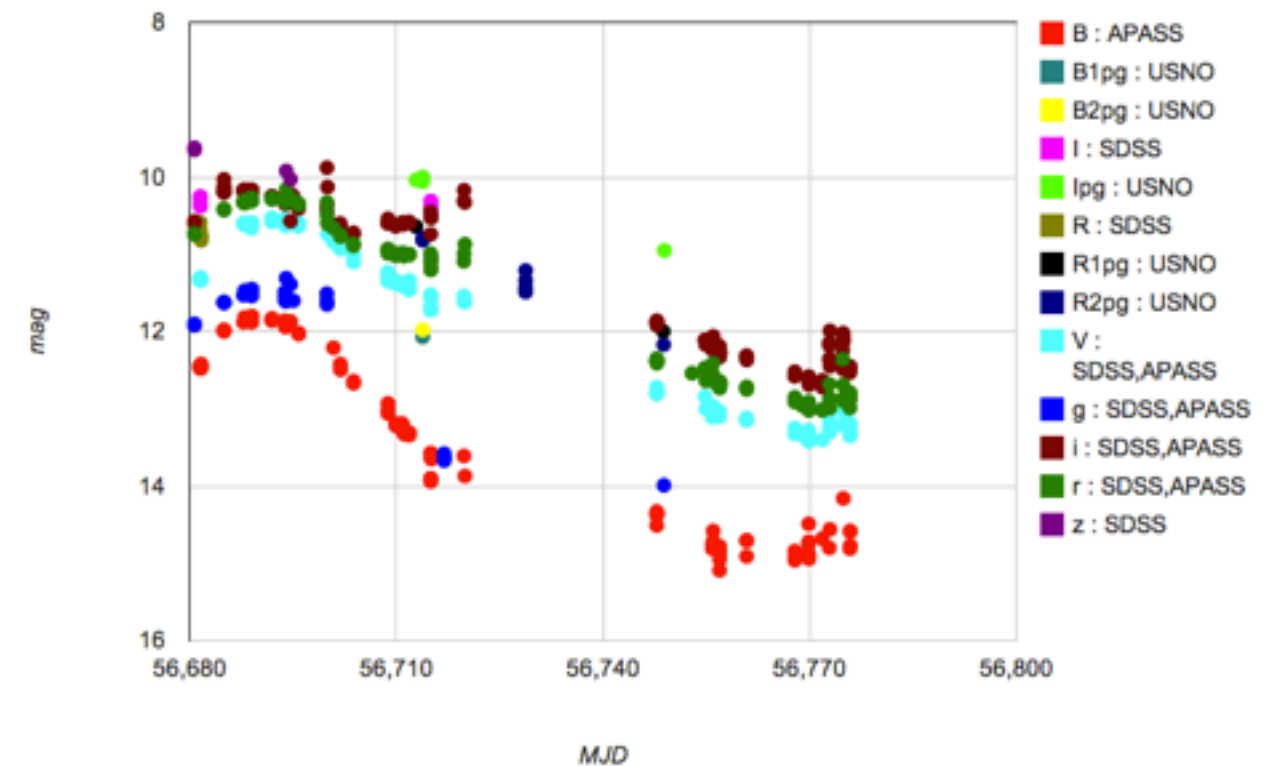
FOLLOW-UP CALIBRATION SERVER

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

Light curve of ivo://asassn/ASASSN-13ax

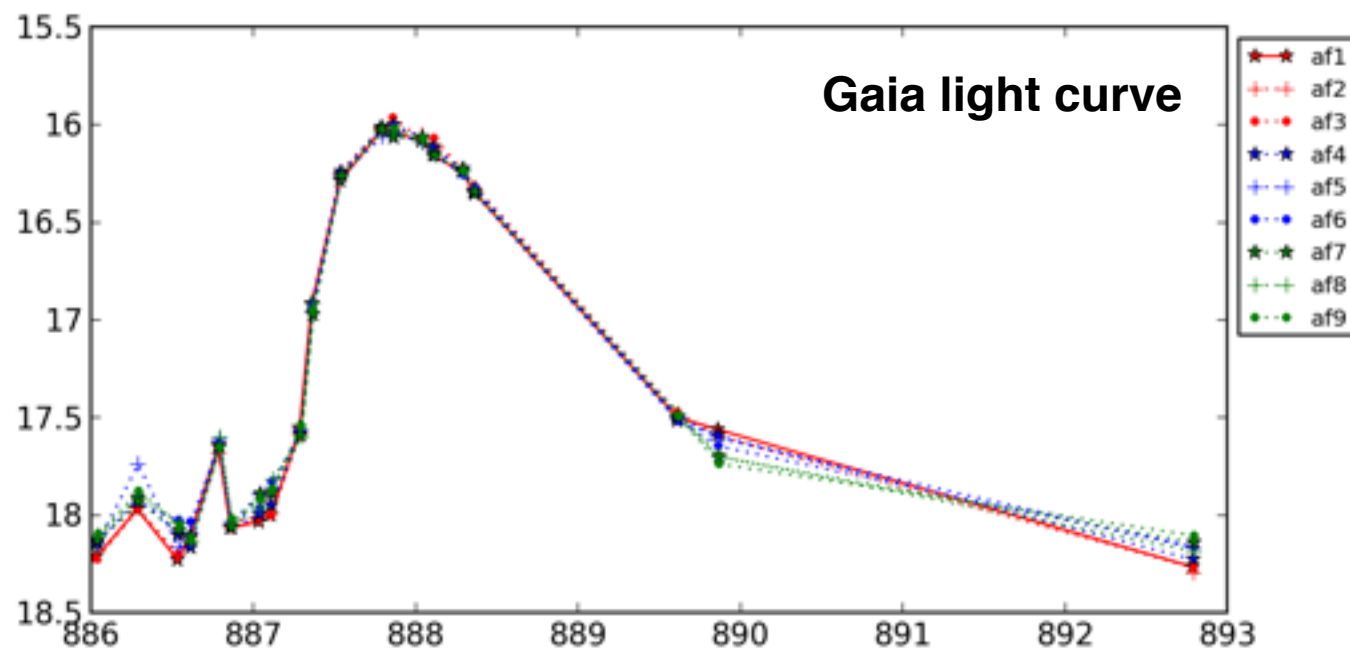


Light curve of ivo://2014J



AM CVN-TYPE TRANSIENT

Gaia14aae

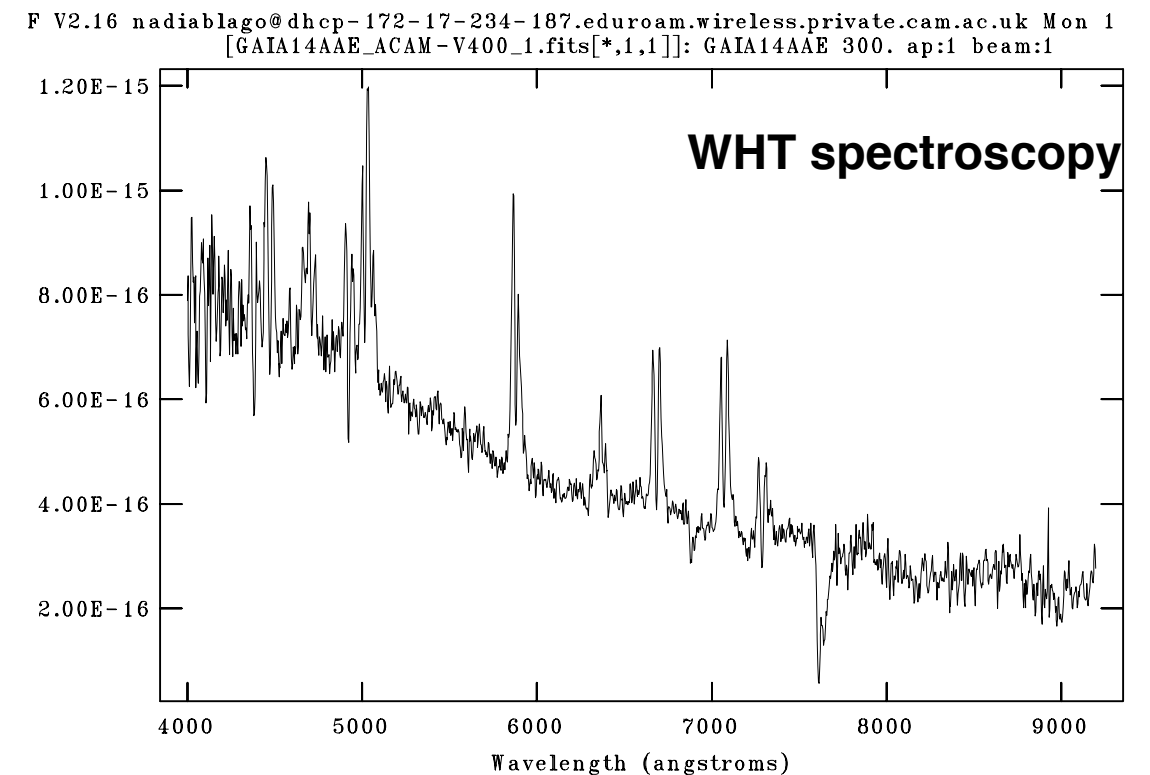
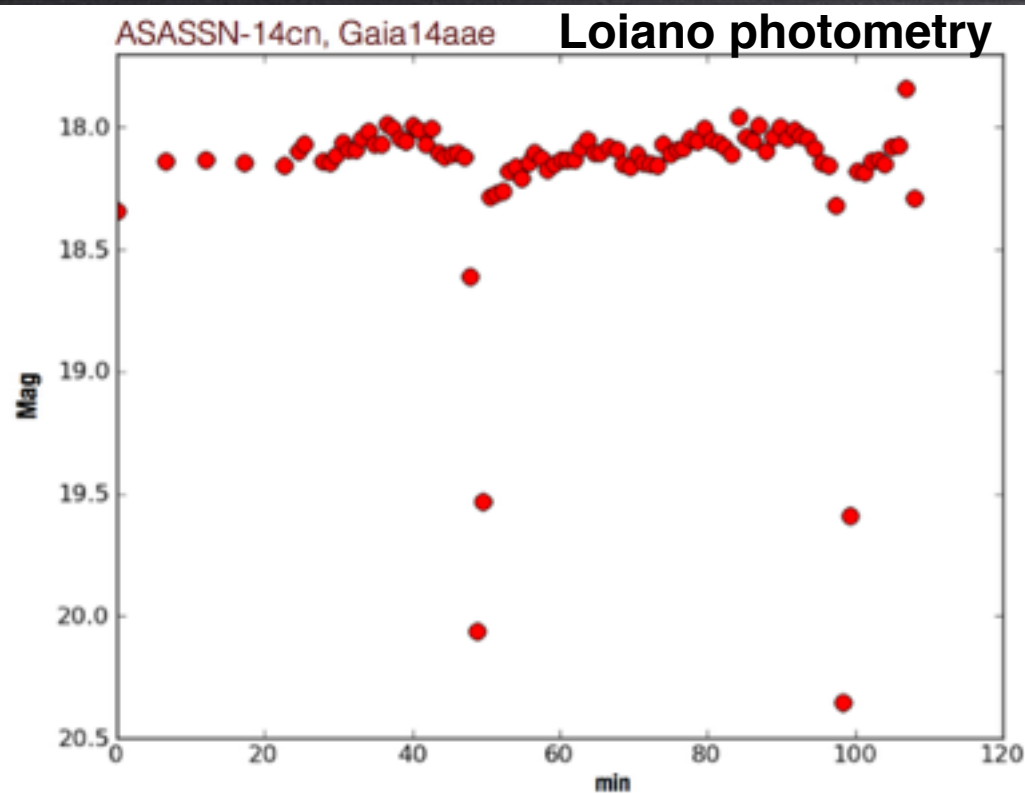


- very rare class of CVs (3rd!)
- candidate SN Ia progenitor
- WD accretes He material from another WD

Period 49.71 min

$M1 \geq 0.782 \text{ M}_{\text{Sun}}$, $T1=13000$

$M2 \geq 0.015 \text{ M}_{\text{Sun}}$

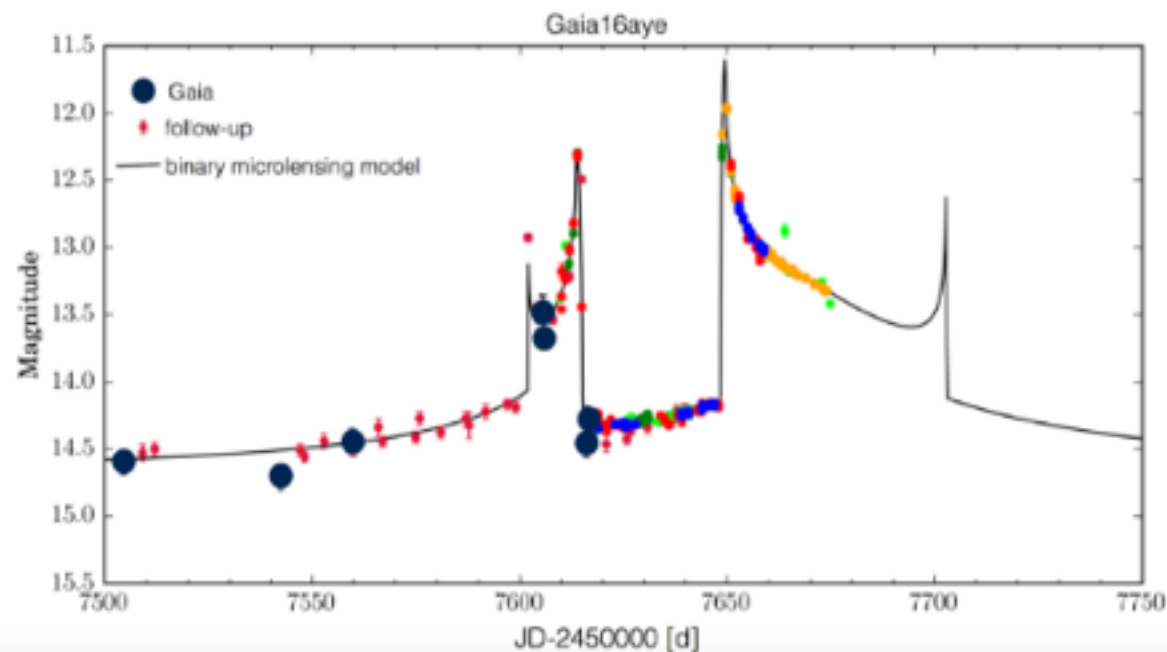


GAIA16AYE (AYERS ROCK)

First binary microlensing event outside of the Galactic Bulge
Follow-up was essential!

IMAGE OF THE WEEK

FOLLOW-UP OPPORTUNITY OF A RARE MICROLENSING EVENT



Light curve of the microlensing event Gaia16aye, composed by data from Gaia (dark spots) and supported by data from ground-based follow-up telescopes (each colour indicates a different observatory). The solid black line shows the current best microlensing model computed by Przemek Mróz. The sharp rises are called caustic crossings as explained in the text below.

http://www.cosmos.esa.int/web/gaia/loW_20161027

The screenshot shows the ESA Gaia website. The header includes the European Space Agency logo and navigation links. The main article is titled 'GAIA SPIES TWO TEMPORARILY MAGNIFIED STARS' and is dated 27 October 2016. The article text states: 'While scanning the sky to measure the position of over one billion stars in our Galaxy, ESA's Gaia satellite has detected two rare instances of stars whose light was temporarily boosted by other celestial objects passing across their lines of sight. One of these stars is expected to brighten again soon. Gaia's measurements will be instrumental to learn more about the nature of these 'cosmic magnifying glasses'.' Below the text is a smaller version of the light curve plot for Gaia 16aye. The right sidebar contains links for 'Missions', 'Mission Home', 'A History of Astrometry', 'Mission Science', 'Spacecraft', 'Images And Videos', and 'Related Links'.

<http://sci.esa.int/gaia/58546-gaia-spies-two-temporarily-magnified-stars/>

Involves AAVSO (US), amateurs from Italy, schools via LCOGT/Cardiff.
Will add German amateurs associations.

will be published as a scientific paper soon

H2020

TDA WP13 WORKFORCE

Warsaw University

Dr hab. Łukasz Wyrzykowski

+PDRA 4yrs

Liverpool John Moores University

Prof. Iain Steele

+PDRA 2yrs

Cambridge University

Prof. Gerry Gilmore

+PDRA 3yrs

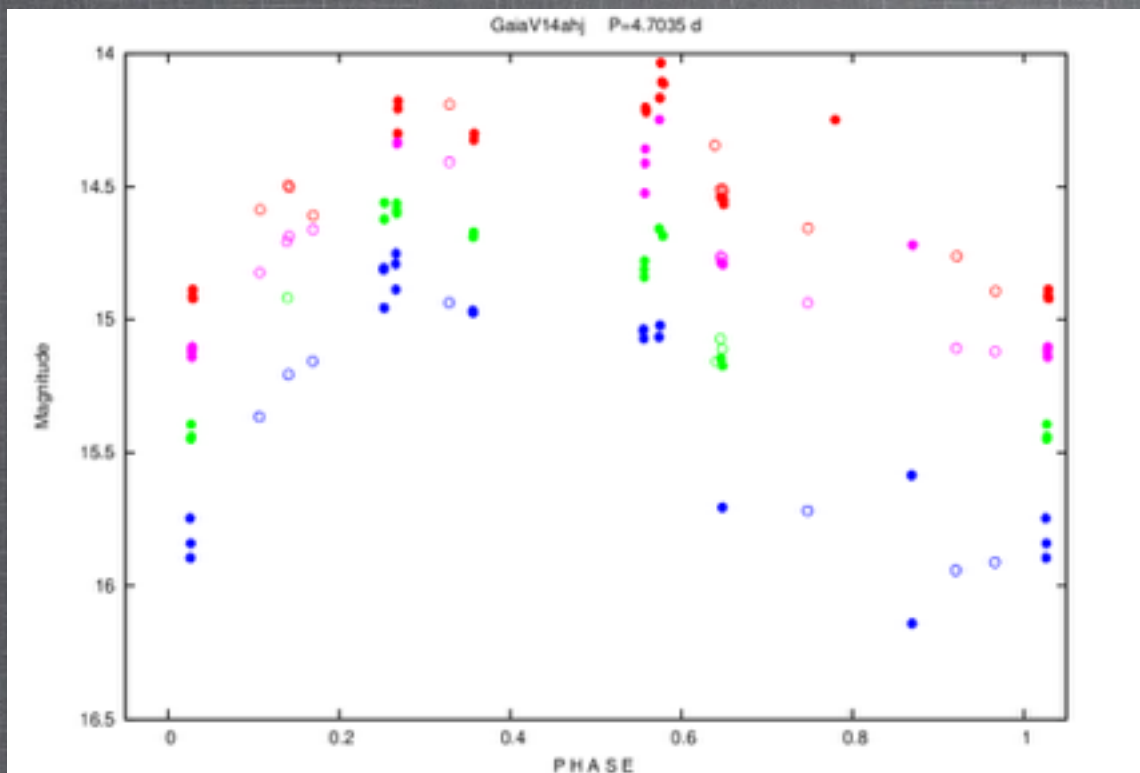
SRON, NL

Dr Peter Jonker

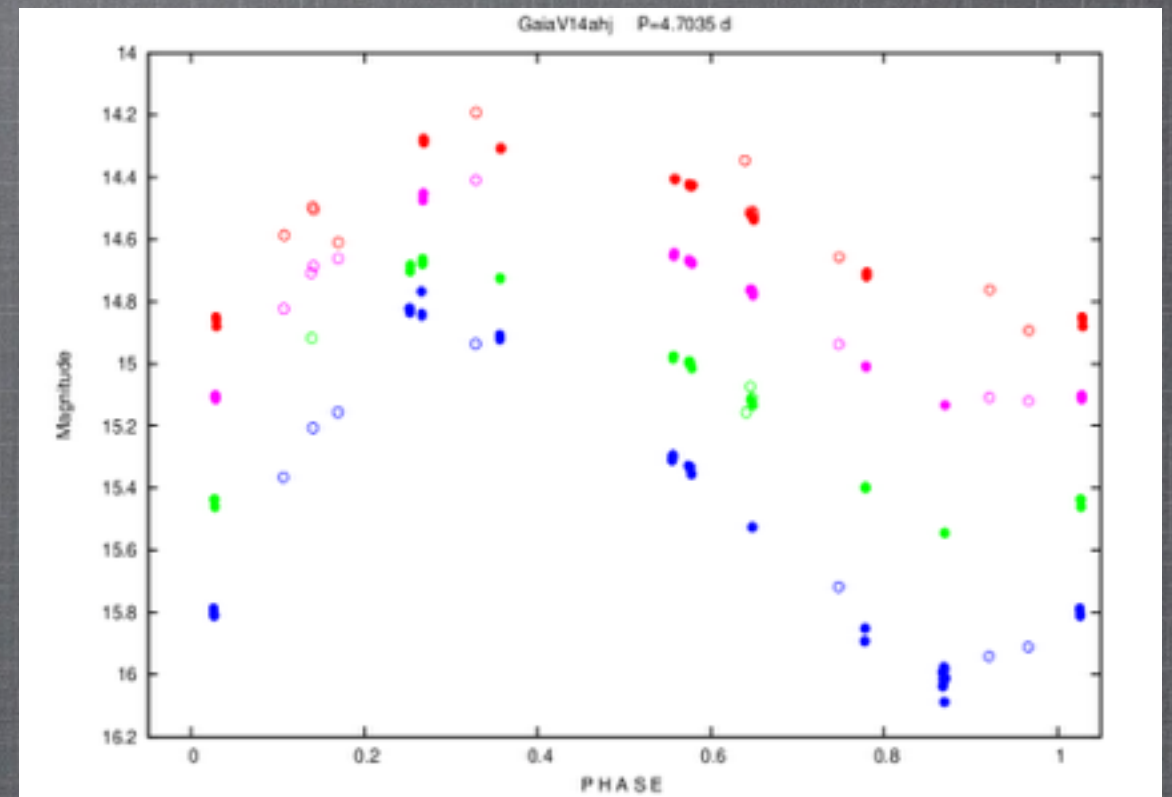
CALIBRATION SERVER 2.0

from image to science ready light curves!

current reductions



new reductions



H2020 TASKS

- network management (webpages, mailing groups, workshops)
- integrate network to a “single observatory” with centralised open access data
- manage observing time on robotic telescopes in TNA
- coordinate science goals: recognise interesting targets for time-domain, provide platform between scientists and the network
- develop fully automated clever data reduction system: from an image to science-ready light curve/spectrum
- encourage robotisation of European small telescopes
- design SPRAT-lite spectrograph: cheaper, modular to fit any 1-2m class telescope



THANK YOU!

Łukasz Wyrzykowski
(pron: Woocash Vizhikovsky)

Warsaw University Astronomical Observatory, Poland



gaia



UNIVERSITY OF
CAMBRIDGE



EUROPEAN
SCIENCE
FOUNDATION
SETTING SCIENCE AGENDAS FOR EUROPE