Gaia Science Alerts for Outreach: publication and follow-up

Anna Hourihane et al.

http://gaia.ac.uk
Science with the Gaia data

Gaia data policy: no proprietary data rights - but have to wait for data: first intermediate catalogue Summer 2016 (final ~2022)

Photometric transients a.k.a. Gaia Science Alerts (GSA)
Fresh, near real-time data → exotic new objects every day!

Opportunity for schools/amateurs to get involved
Photometric transients with Gaia

Gaia will cover 1000 sq. deg. per day with high spatial resolution and well known (but non-optimal) cadence.
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Alerts: from validation to automation

> 52 million alerts found by automatic detection software during validation

112 classified

Rate is tuneable: want few (10?) per day for outreach

Currently paused for system updates: plan to go live with automated alerts late Jan. 2016
Gaia Photometric Science Alerts: Validation Phase

107/2015 update: The Gaia Alerts Validation Phase is now complete. Alerts are currently causing publication of Gaia Alerts. The full Gaia alerts system is operational by mid January 2016.

Alerts

The table can be sorted by Name, UTC timestamp, RA, Dec, AlertMag, HistMag, HistStdDev, Class, Comment and Published.

### Essential data

<table>
<thead>
<tr>
<th>Name</th>
<th>UTC timestamp</th>
<th>RA</th>
<th>Dec</th>
<th>AlertMag</th>
<th>HistMag</th>
<th>HistStdDev</th>
<th>Class</th>
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Last alert posted: Tuesday, June 9, 2015 - 12:31

Gaia's first supernova!
Enhanced per-Alert publisher pages to come: see presentation of A. Delgado (this meeting, Friday)

SDSS sky stamp

Gaia light curve (+ data)

Enhanced data

Gaia's first Supernova!

BP/RP spectra
Validation: follow-up observations (professionals)

Observatorio de la Roque de los Muchachos, La Palma, Canary Islands

La Silla observatory, Chile

Mercator 1.2m, La Palma

NTT 3.6m, Chile

William Herschel Telescope, 4.2m, La Palma
Validation: follow-up observations (professionals)

Datasets for outreach - High-quality:

- Template light curves
- Template spectra

for educational materials (e.g. classroom activities of S. Bartlett)
Gaia14aae: Amateurs Help Discover Rare Eclipsing Binary

By: David Dickinson | September 1, 2015

Amateurs and professional astronomers worked together to discover a rare eclipsing binary system — and a chance to study a supernova before it happens.

A collaboration of amateur and professional astronomers has uncovered a rare variety of eclipsing binaries. The European Space Agency’s Gaia satellite first imaged the eclipsing pair, named Gaia14aae, in August 2014. Researchers took notice of Gaia14aae when it suddenly flared five-fold within a single day.

The Gaia14aae system is composed of a white dwarf in a tight orbital embrace with a larger (by volume) companion. The tilt of orbit is along our line of sight, so observers on and near Earth — such as the Gaia mission in space — see an eclipse of the pair once every 50 minutes.

A worldwide pro-am collaboration carried out follow-up observations of Gaia14aae, cinching its nature as an eclipsing binary star. This effort included the Centre for Backyard Astrophysics (CBA), a group of amateurs who monitor cataclysmic variables using small telescopes in backyards around the world. CBA members kept eyes on the system after Gaia’s initial sighting of its outburst, as did a collaboration of 86 professionals based at facilities including the Catalina Real-time Transient Survey, PanSTARRS-1, and ASAS-SN based in Chile and Hawaii.

The initial determination that Gaia14aae was eclipsing was made by the “Centre for Backyard Astrophysics” project (Skillman & Patterson 1993); who established a preliminary period for Gaia14aae of 49.7 min (de Miguel 2014). Following this, an intensive photometric monitoring campaign was undertaken for Gaia14aae at a number of telescopes, as detailed in Table 1. In addition, there was a dedicated observing run of the Catalina Real-time Transient Survey that concluded August 30th.

See presentation of H. Campbell (this meeting, tomorrow morning)
Gaia in the UK
Taking the Galactic Census

Hosts all of our GSA outreach content:

- Published alerts
- Context
- Educational materials + multimedia
- “Useful tools” to come

Educational resources and teacher training funded by STFC.
Proposal to develop further materials to deliver GSA schools outreach programme
Alerts Gateway

Will lead schools to objects requiring data

Will provide supporting information on how to observe with LCOGT

And how to analyse the data (provided by the Faulkes Telescope Project)
Photometric followup with robotic telescopes

Gaia sampling is sparse (not designed as transient survey): need follow-up → schools/amateurs: interface through gaia.ac.uk

Robotic facilities:
- Faulkes Telescope/LCOGT (EU schools)
- National Schools' Observatory/LivTel 5% of time for schools (UK/Ireland)
- Bradford telescope
- PIRATE Telescope
Further activities and dissemination

Hands-on follow-up with selected schools during validation phase (mostly through FTP) – now we have the first set of resources showing how to do the follow-up (FTP/S. Bartlett): teacher training (CPD) to start 2016

Advertise through educational networks in UK (IoP, National STEM Centre, ESERO-UK...) and through science fairs

Proposal for a series of smartphone apps in the pipeline: need funding!
Gaia outreach UK acknowledgments

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