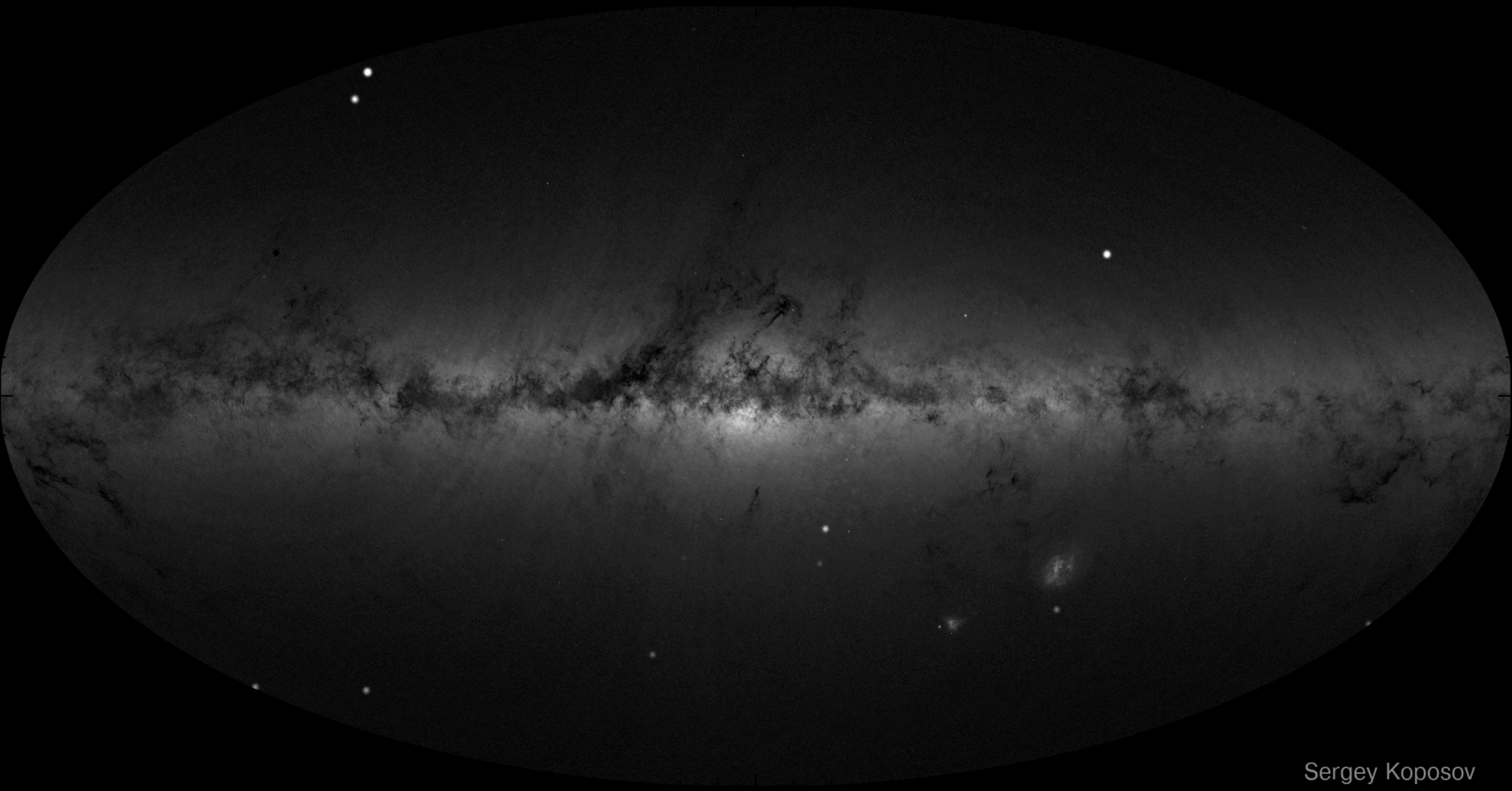
Year 1985.000



Sergey Koposov

www.youtube.com/watch?v=lv8HtH-O3uQ

Acknowledgements: concepts and design

- Giuseppe Altavilla
- Vasily Belokurov
- Josh Bloom
- Ross Burgon
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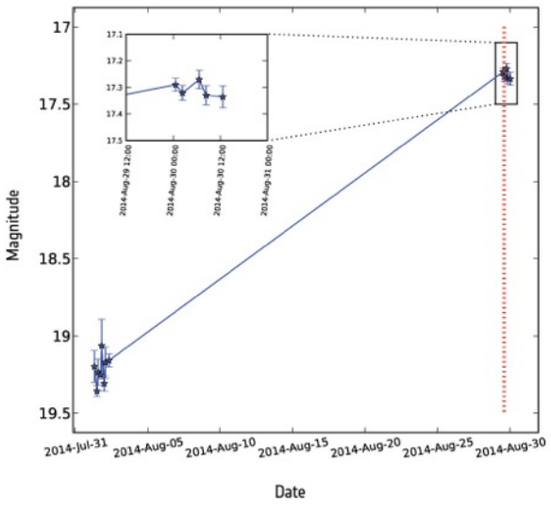
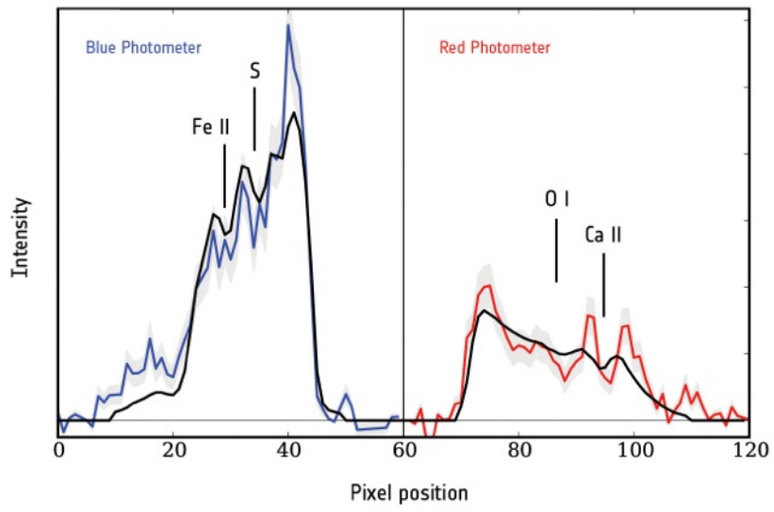
- Michel Dennefeld
- Andrew Drake
- **Morgan Fraser**
- Gerry Gilmore
- **Jorge Fernandez Hernandez**
- Anna Hourihane
- Peter Jonker
- **Sergey Koposov**
- **Floor van Leeuwen**
- Goska van Leeuwen
- Ashish Mahabal
- Francois Mignard
- Timo Prusti
- **Guy Rixon**
- Iain Steele
- Rachel Street
- Yiannis Tsapras
- Massimo Turatto
- Nic Walton
- Sjoert van Velzen
- Patricia Whitelock
- Roy Williams
- **Lukasz Wyrzykowski**
- **Abdullah Yoldas**

1.5-2.5 FTE until start October

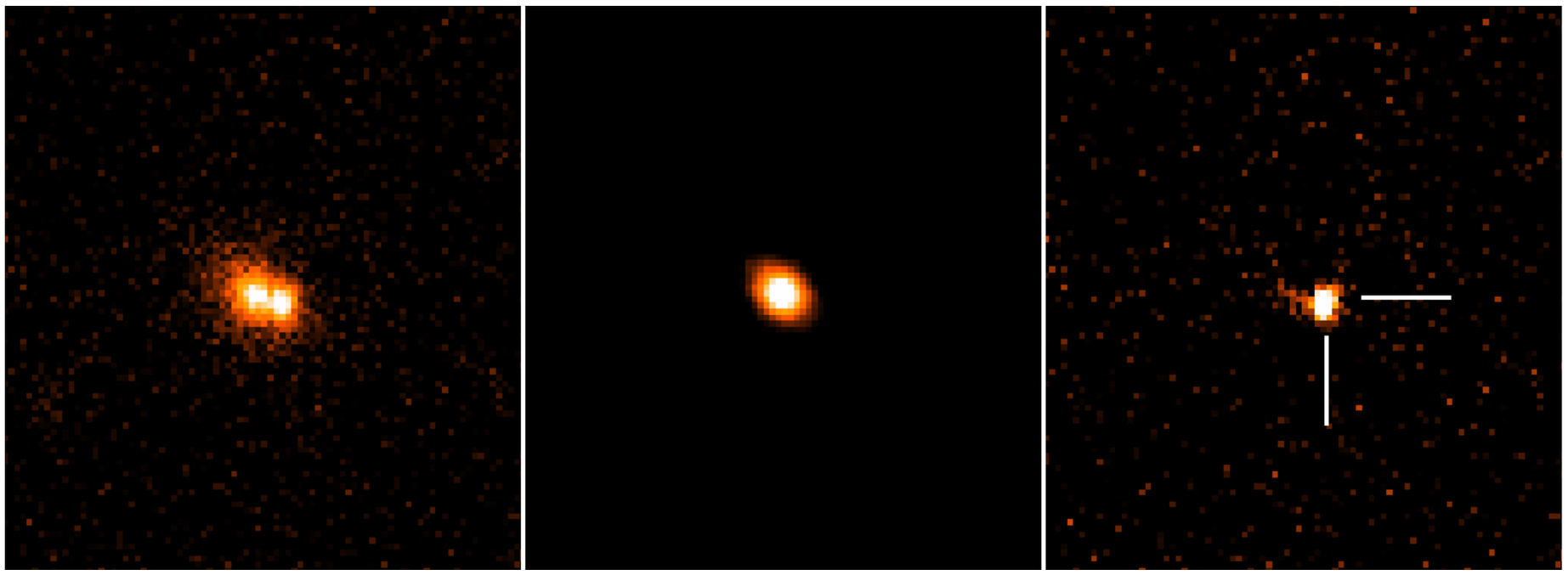
Now 4 FTE

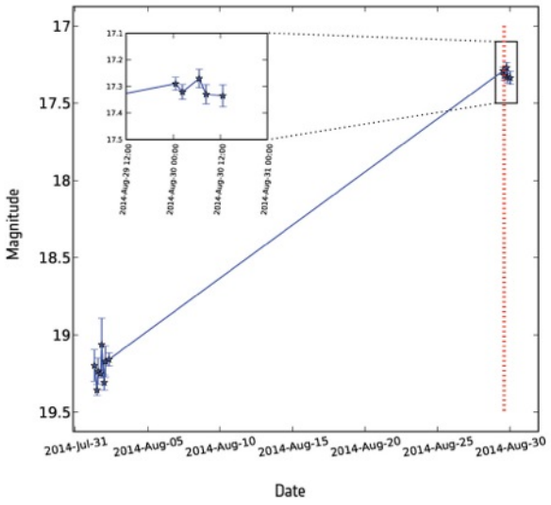


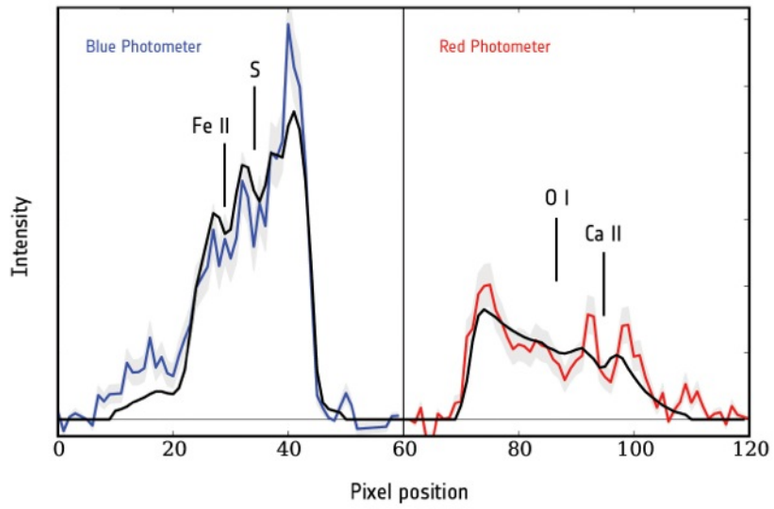


Making Progress with the Photometric Science Alerts

CU5:du17 Manager, Simon Hodgkin

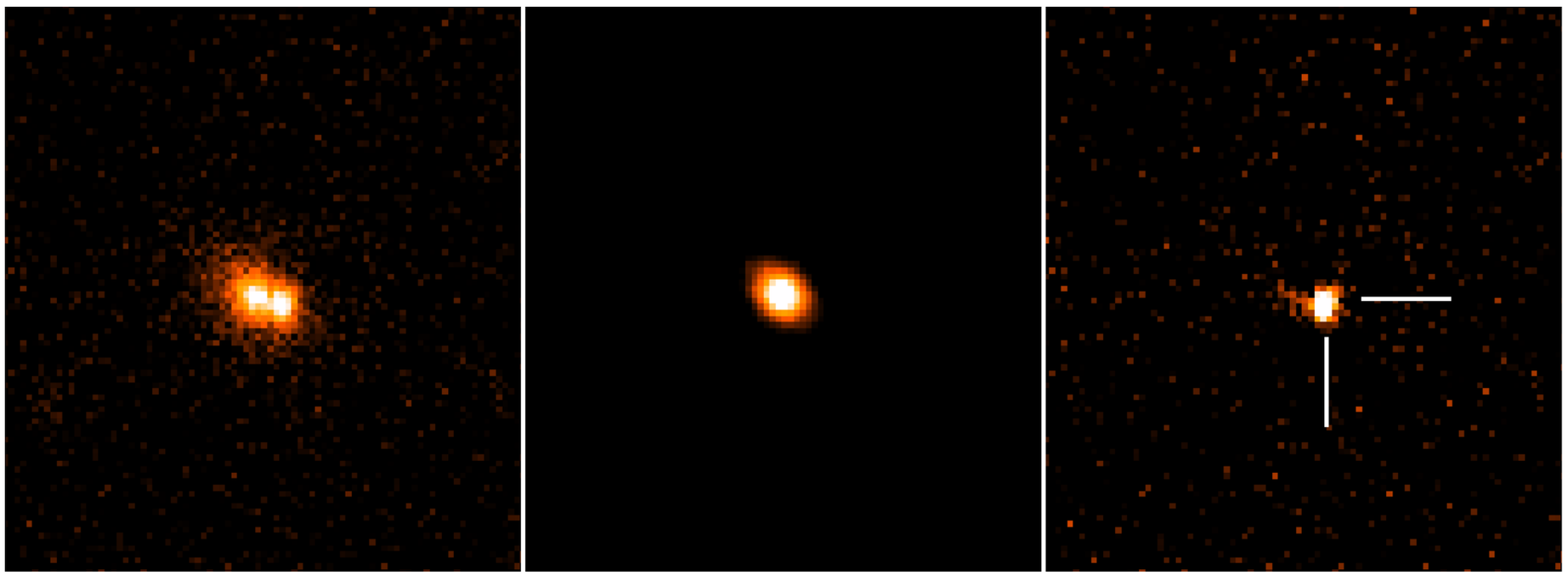




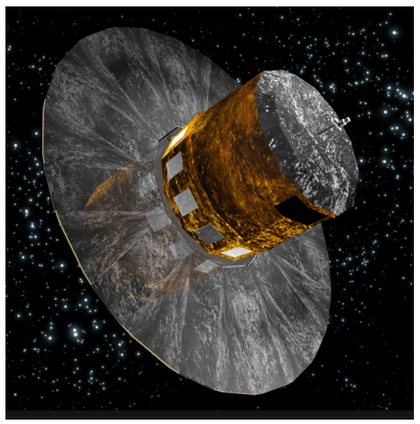


No Pain, No Gain

CU5:du17 Manager, Simon Hodgkin



Data flow to SA



Up to ~10 hours delay

Raw data

Initial Data Treatment (at ESAC) ~15 hours processing

Reduced fluxes + OGA1 positions

Science Alerts (at Cambridge) < 6 hours processing

IDT data

Calibrations (later)

DPCI (at Cambridge)

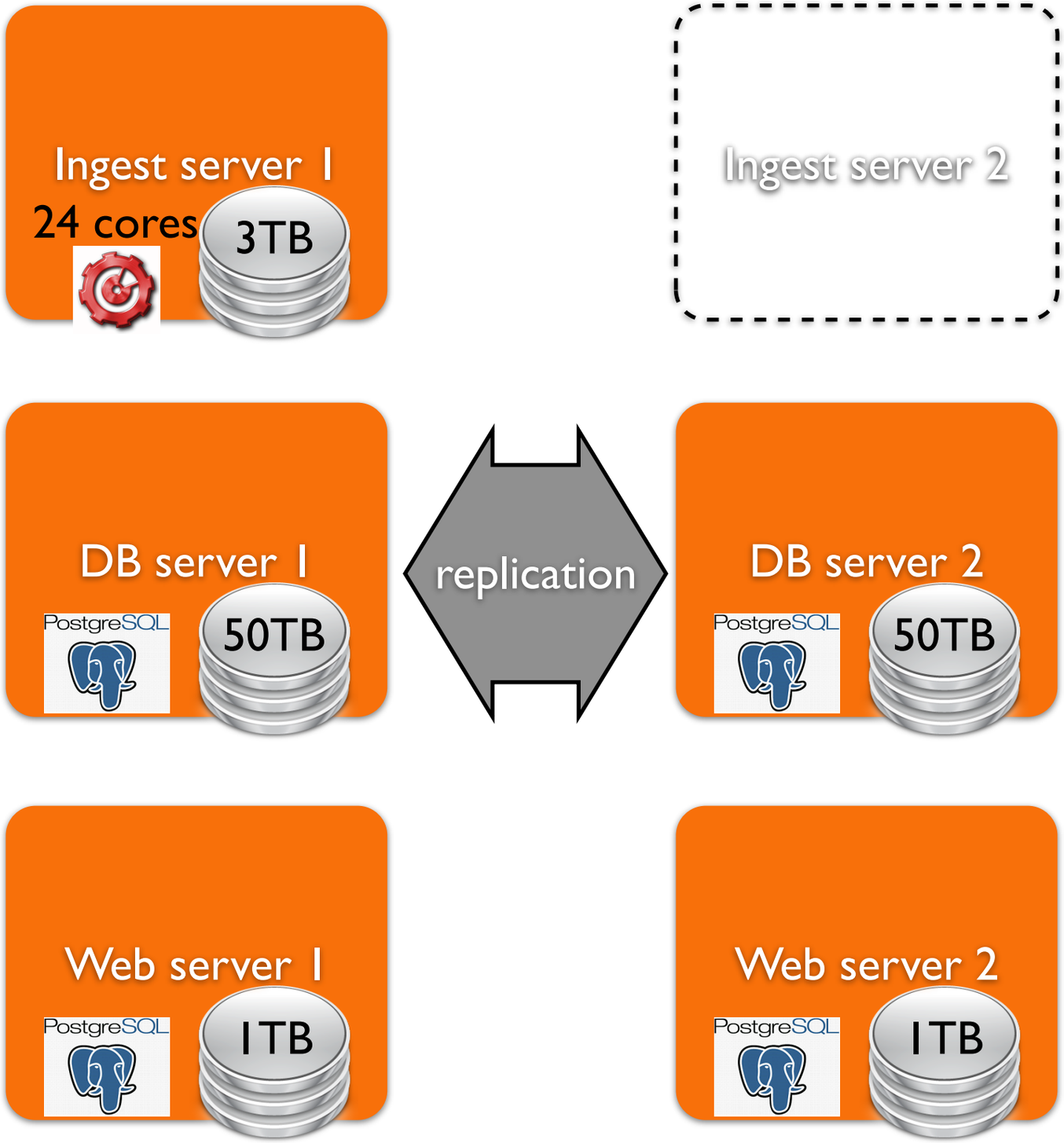
OGA2 positions + data assessment

First Look 1-2 days processing

Minimum latency ~30 hours

Rixon: *Technical challenges and solutions for Science Alerts:* 5th Gaia Science Alerts workshop, Warsaw, September 2014

SA computers at Cambridge



Rixon: *Technical challenges and solutions for Science Alerts:* 5th Gaia Science Alerts workshop, Warsaw, September 2014

Overview

- We have been operating Science Alerts continuously* since mid-July (the start of Gaia Science Operations).

- We automatically ingest IDT astrometry, photometry, and spectrophotometry from Gaia into a large database.

- Then we try to detect objects which have changed brightness significantly, and new sources.

- However, at the moment we are struggling with a number of issues that have forced us to rewrite our detection, classification, publication methods, and to operate in a much more manual mode.

*more-or-less

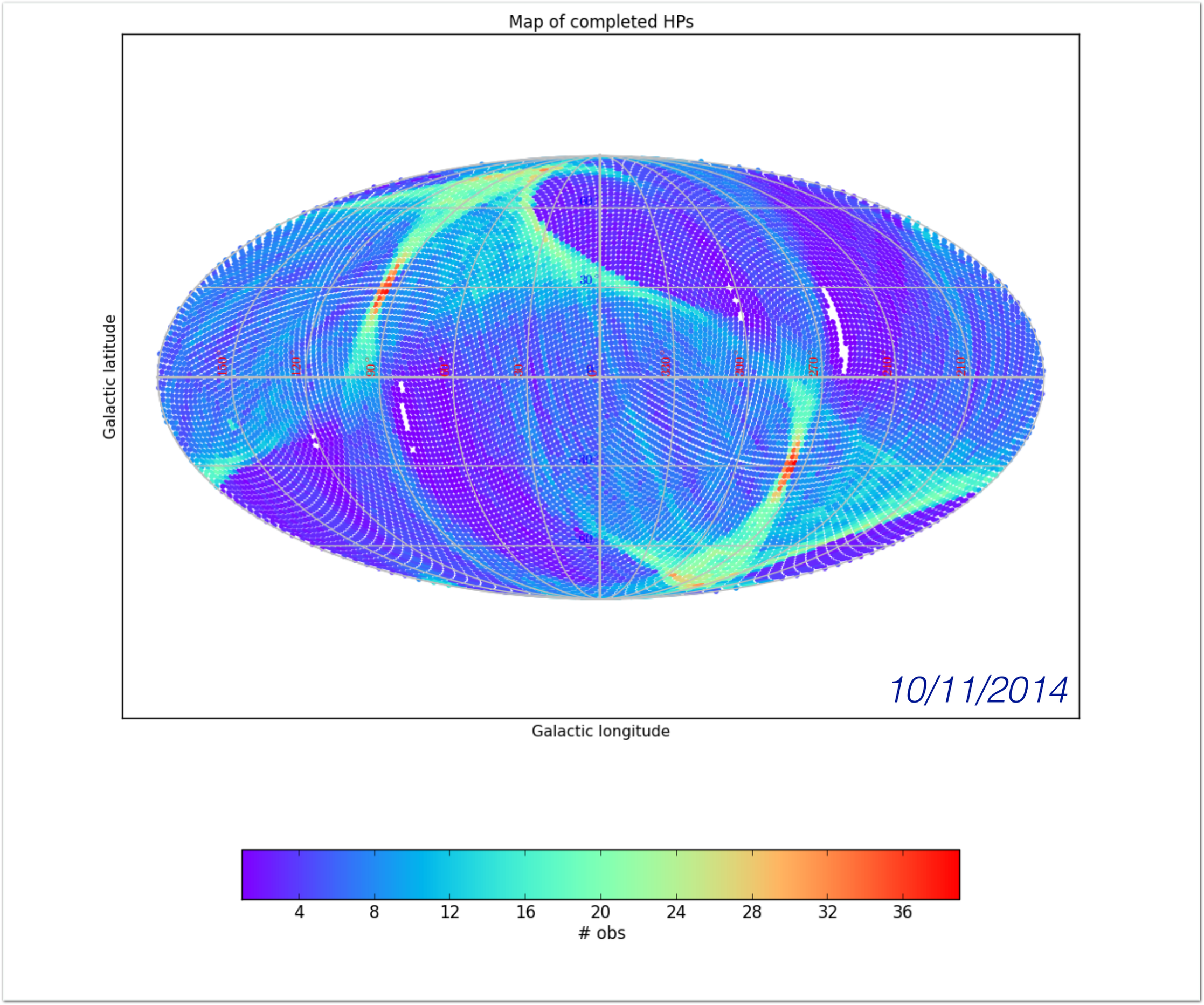
First Impressions

- The data were much messier than we expected.

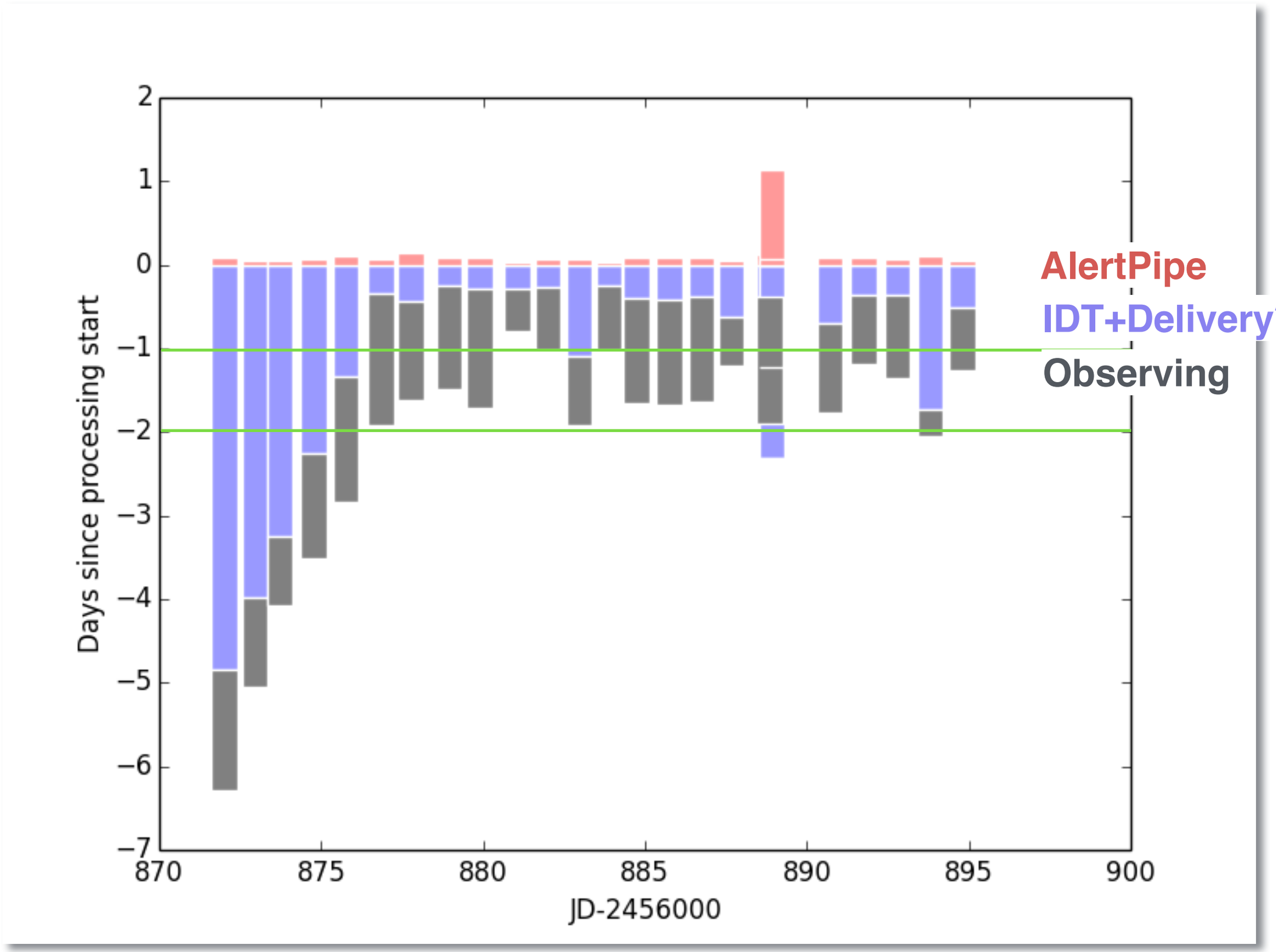
- We had made naive assumptions about low contamination and ready-to-wear calibration.

- But the interfaces worked beautifully, and automagically. And our database proved to be the (a) right way to approach the problem.

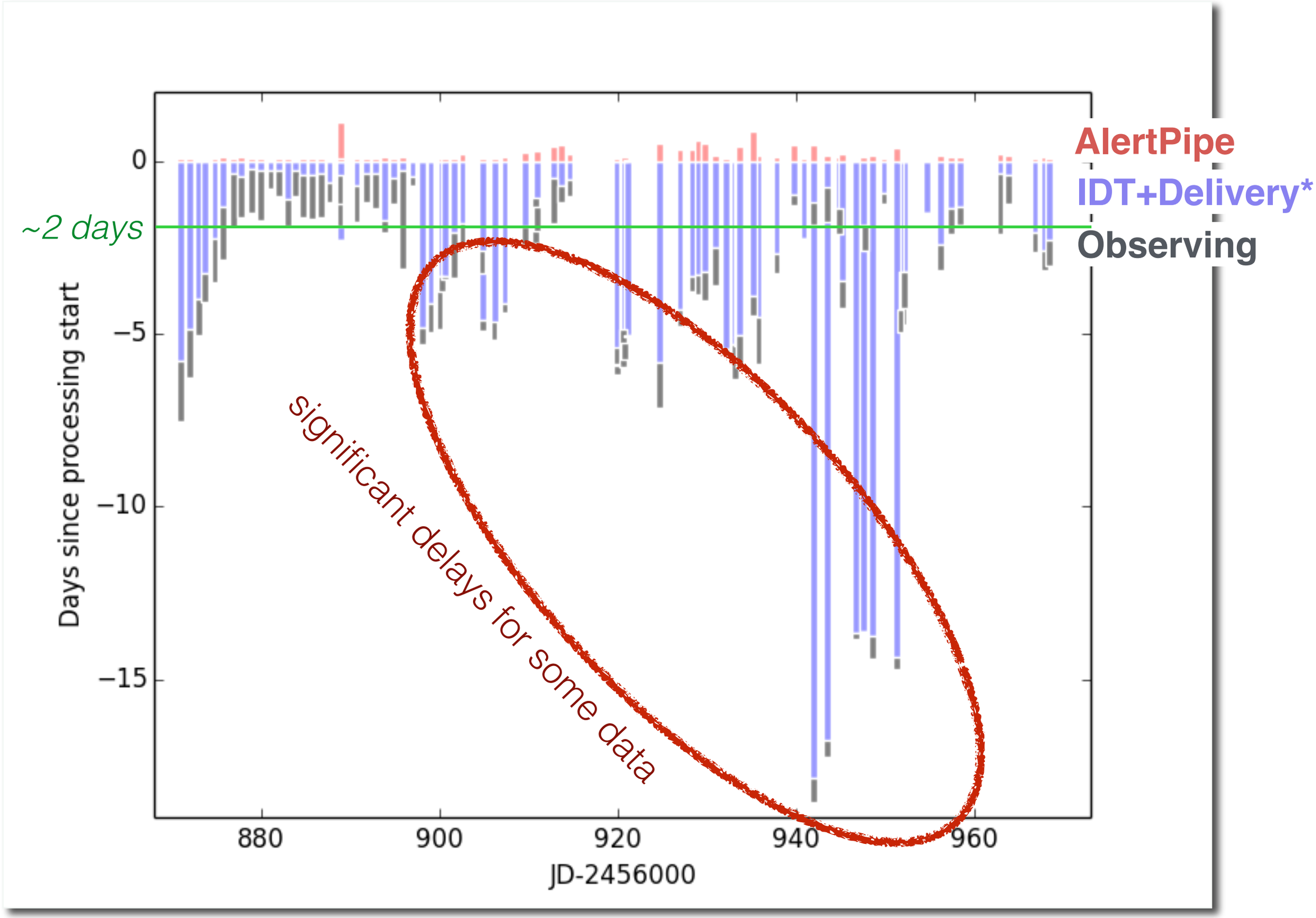
- This is a huge credit to the data flow system ahead of us and in particular IDT.


Map of completed HPs
Galactic latitude
Galactic longitude
10/11/2014
4
8
12
16
20
24
28
32
36
obs

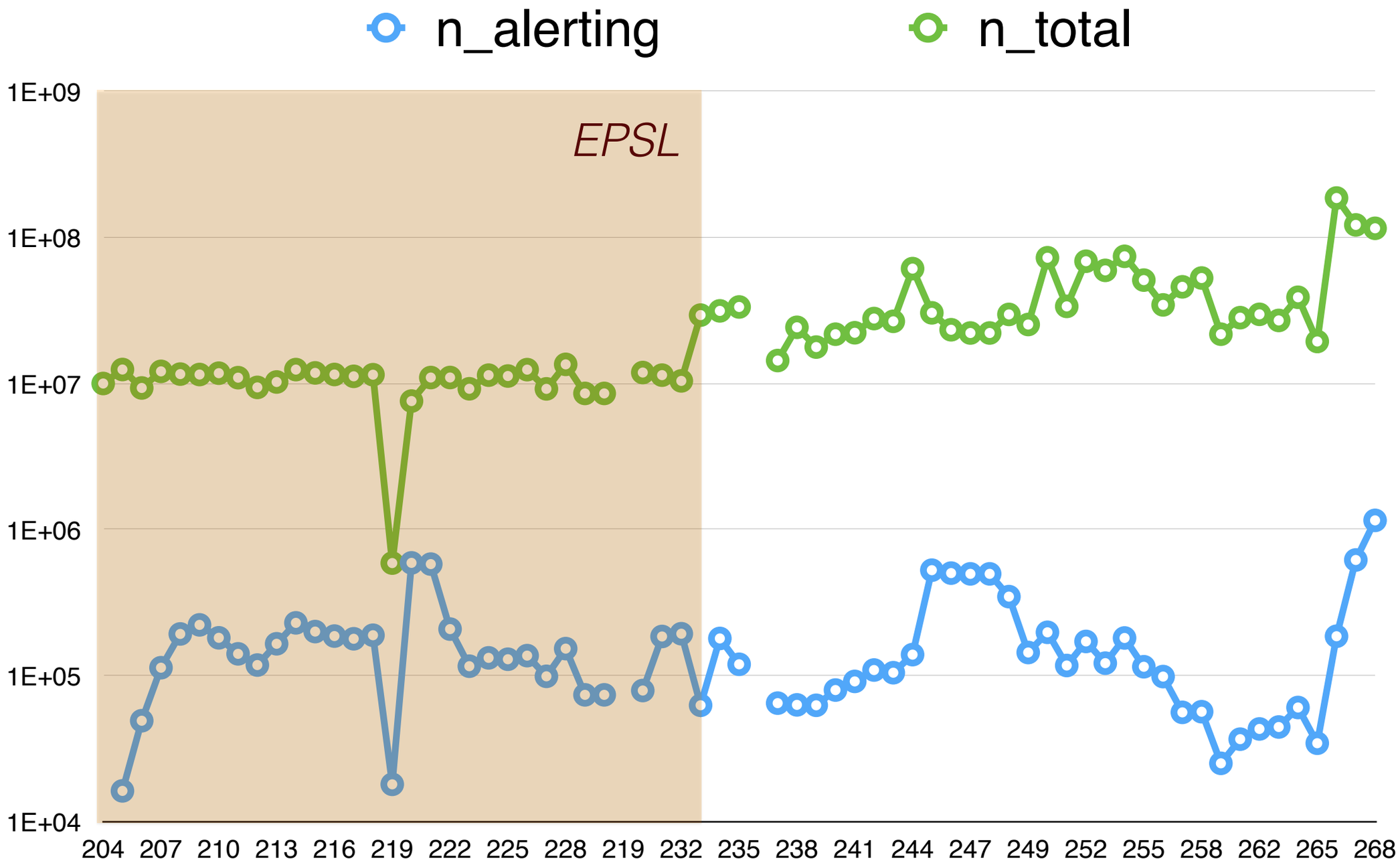
Software: performance



Software: performance

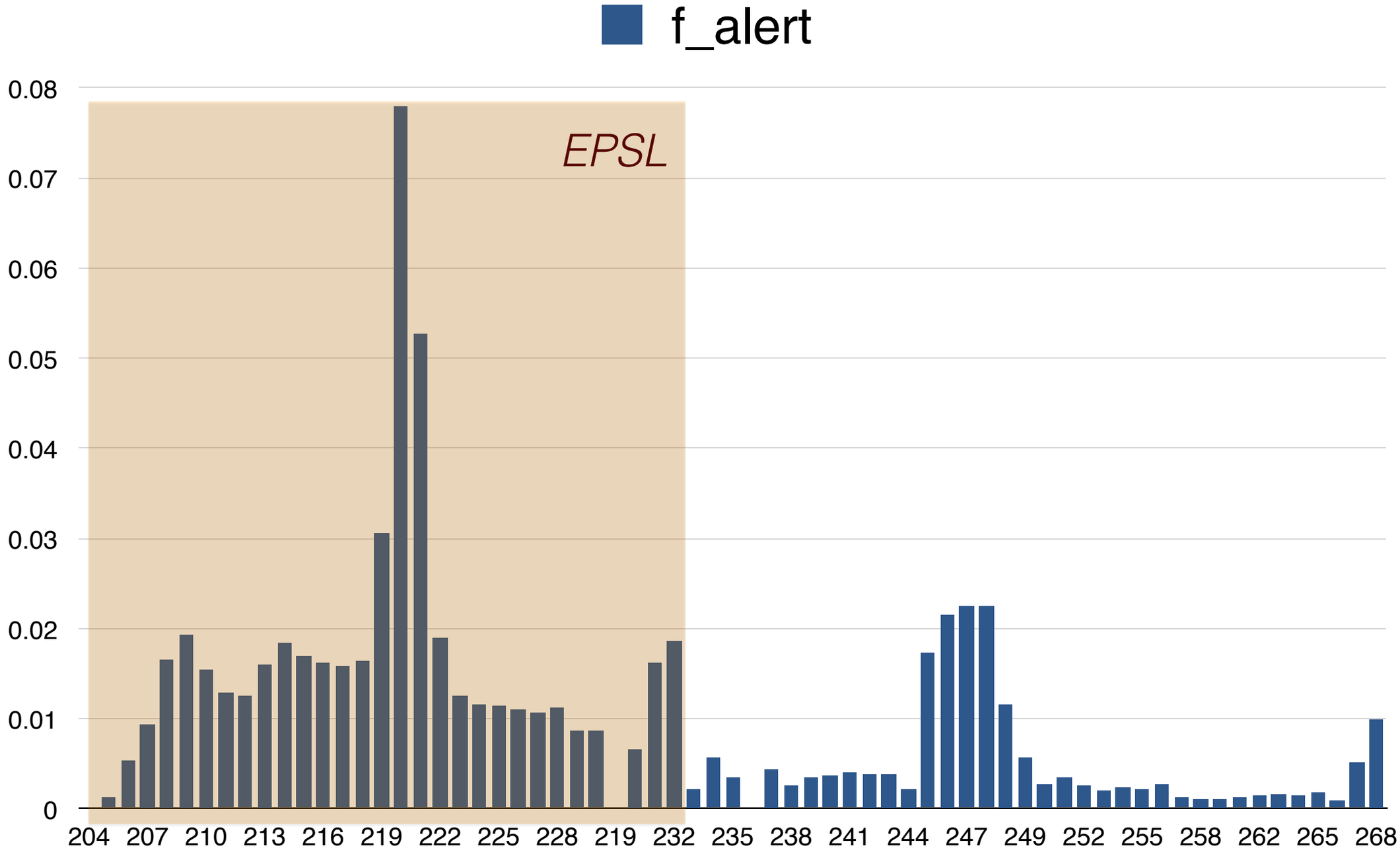


Processing up to 180 million transits/day



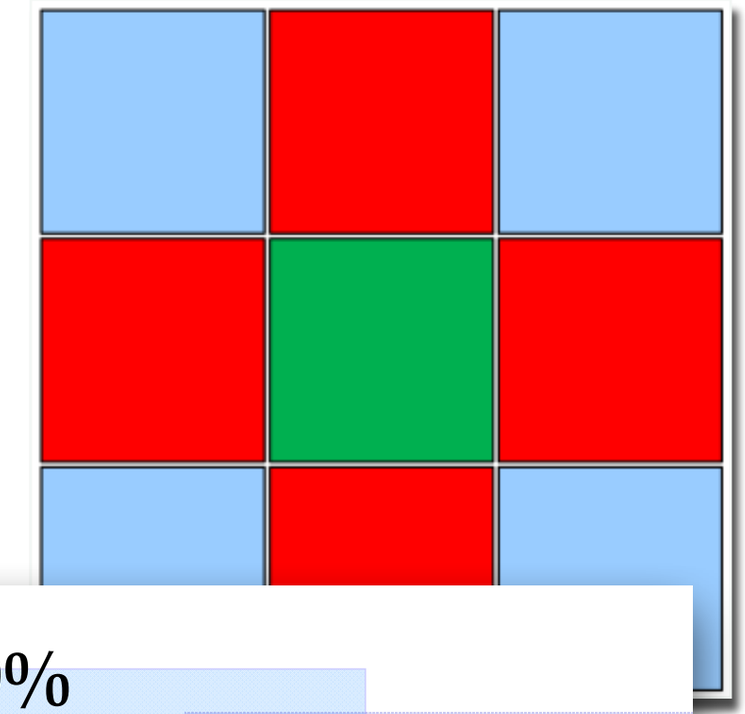
Contamination is high

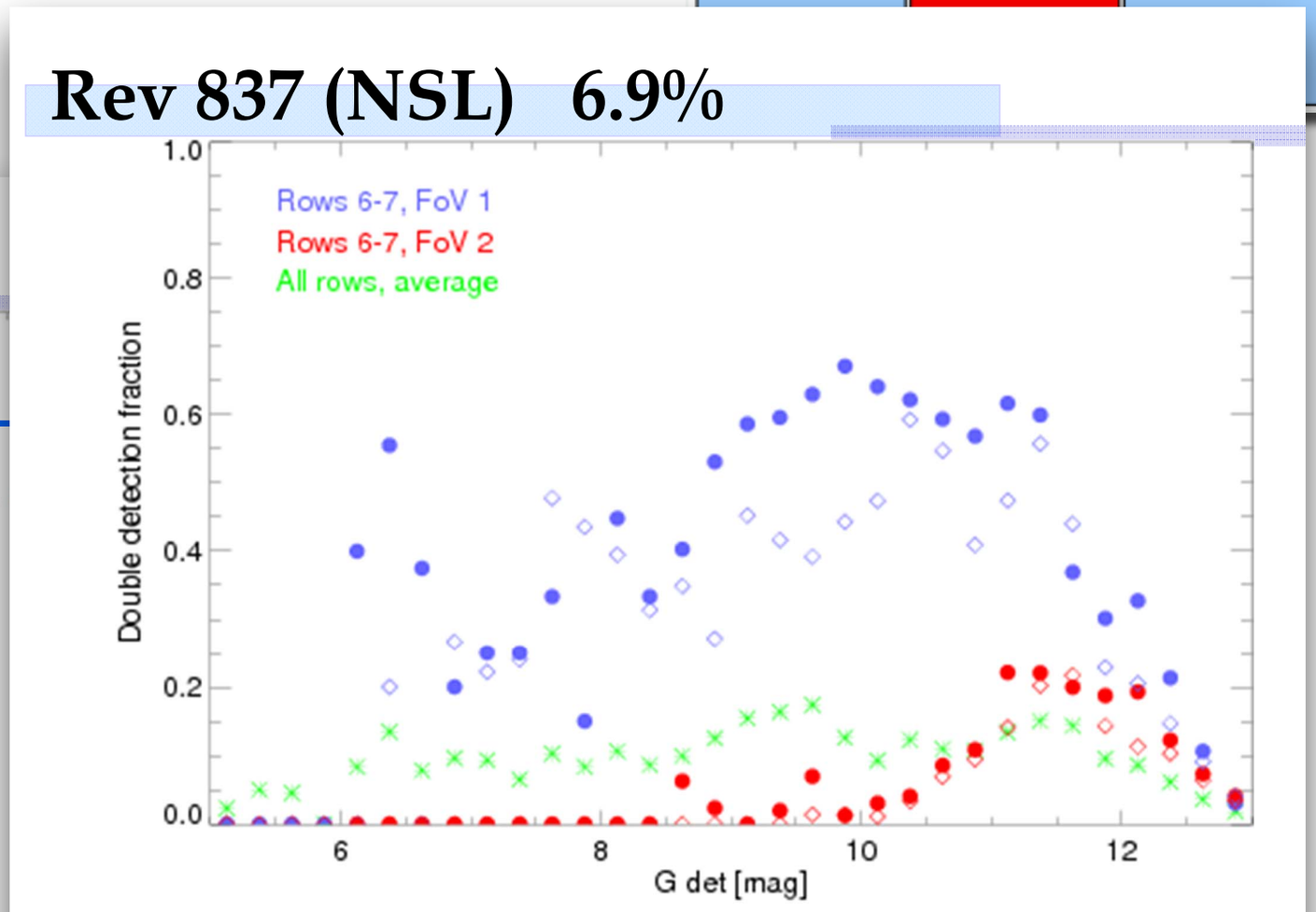
Around 0.5% of Gaia measurements are new source Alerts



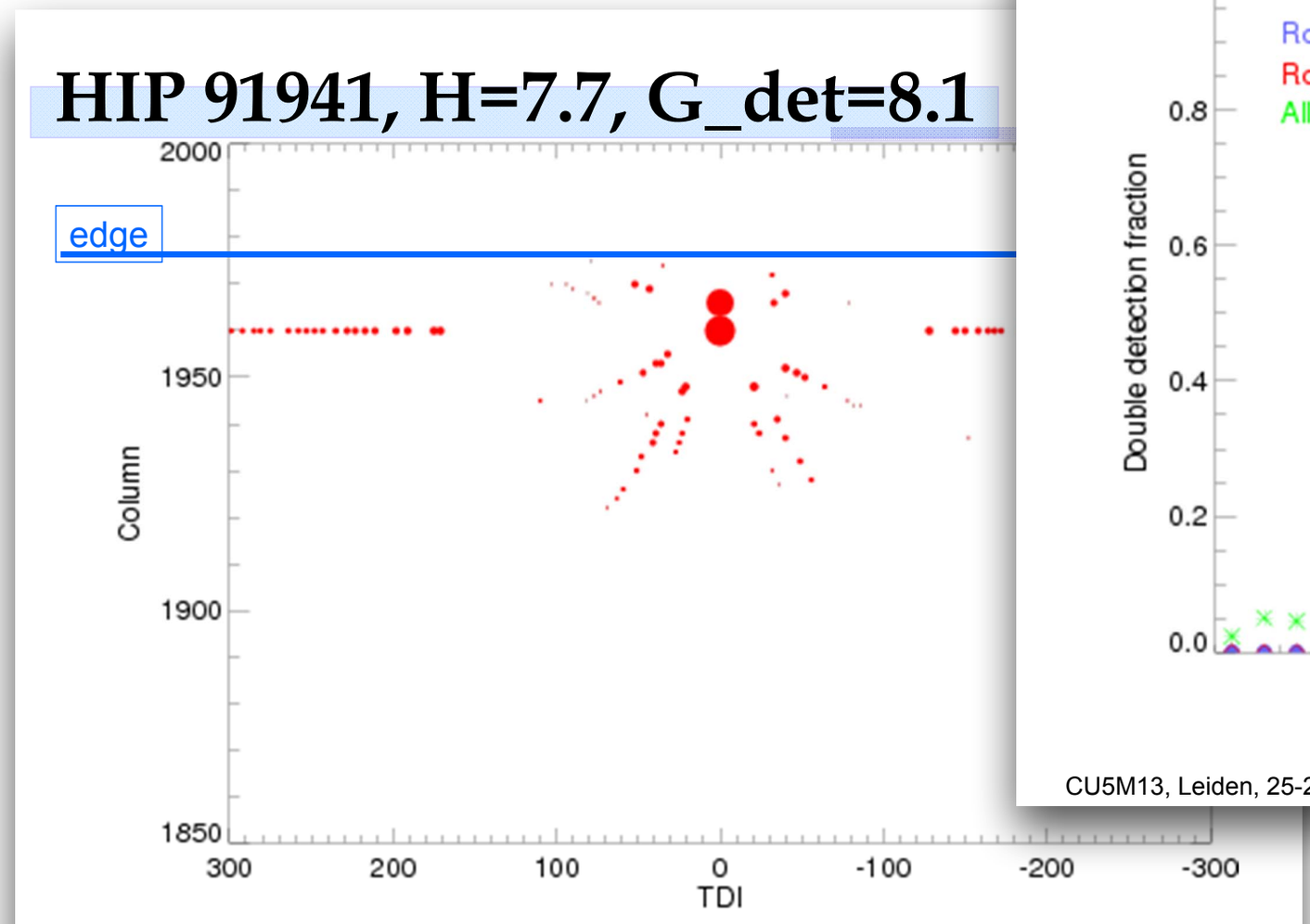
Problem arising from Initial Data Treatment, fix expected end November

XM issues (spikes and double detections)





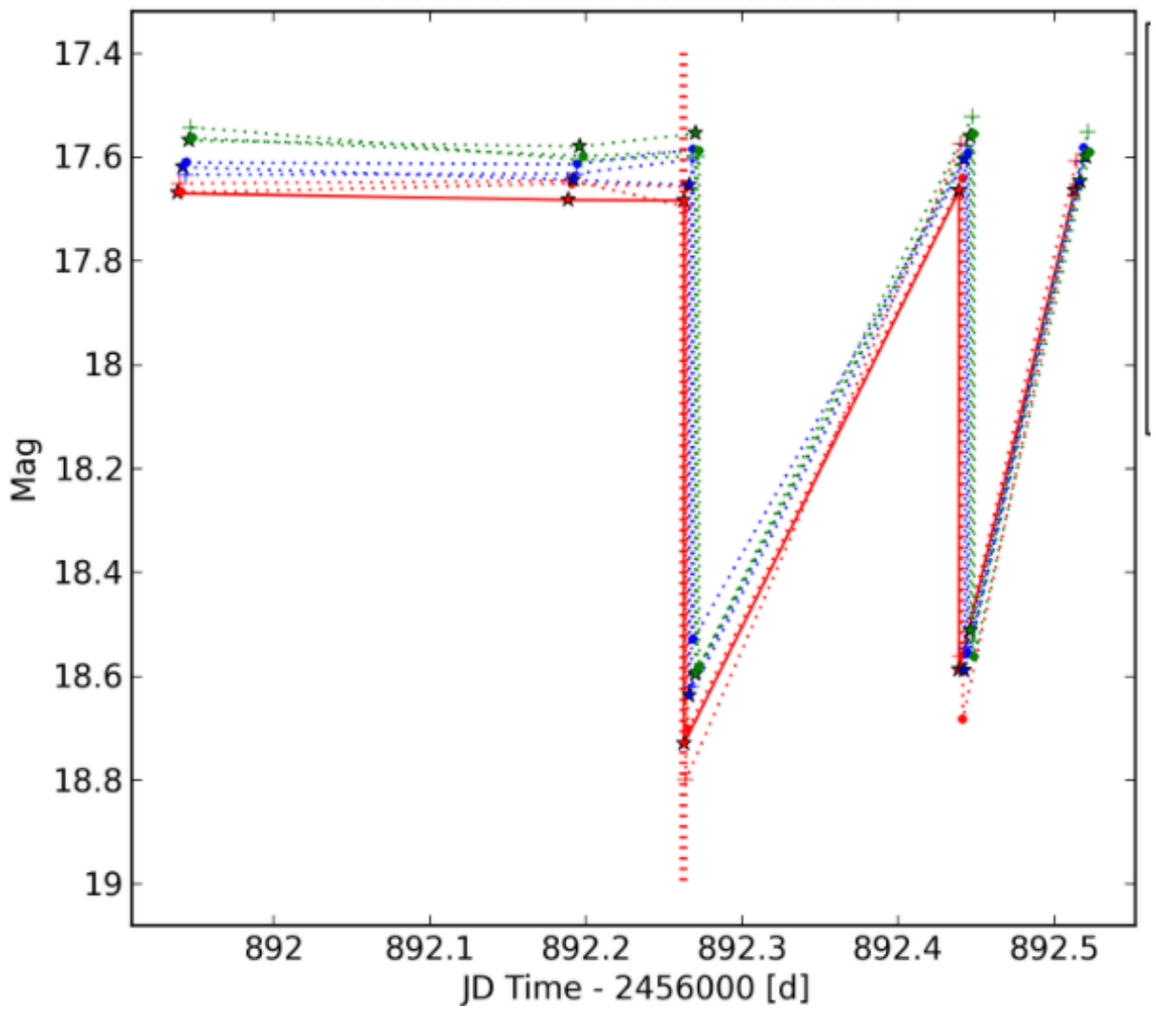
CU5M13, Leiden, 25-27 June 2014 Slide 24 of 45

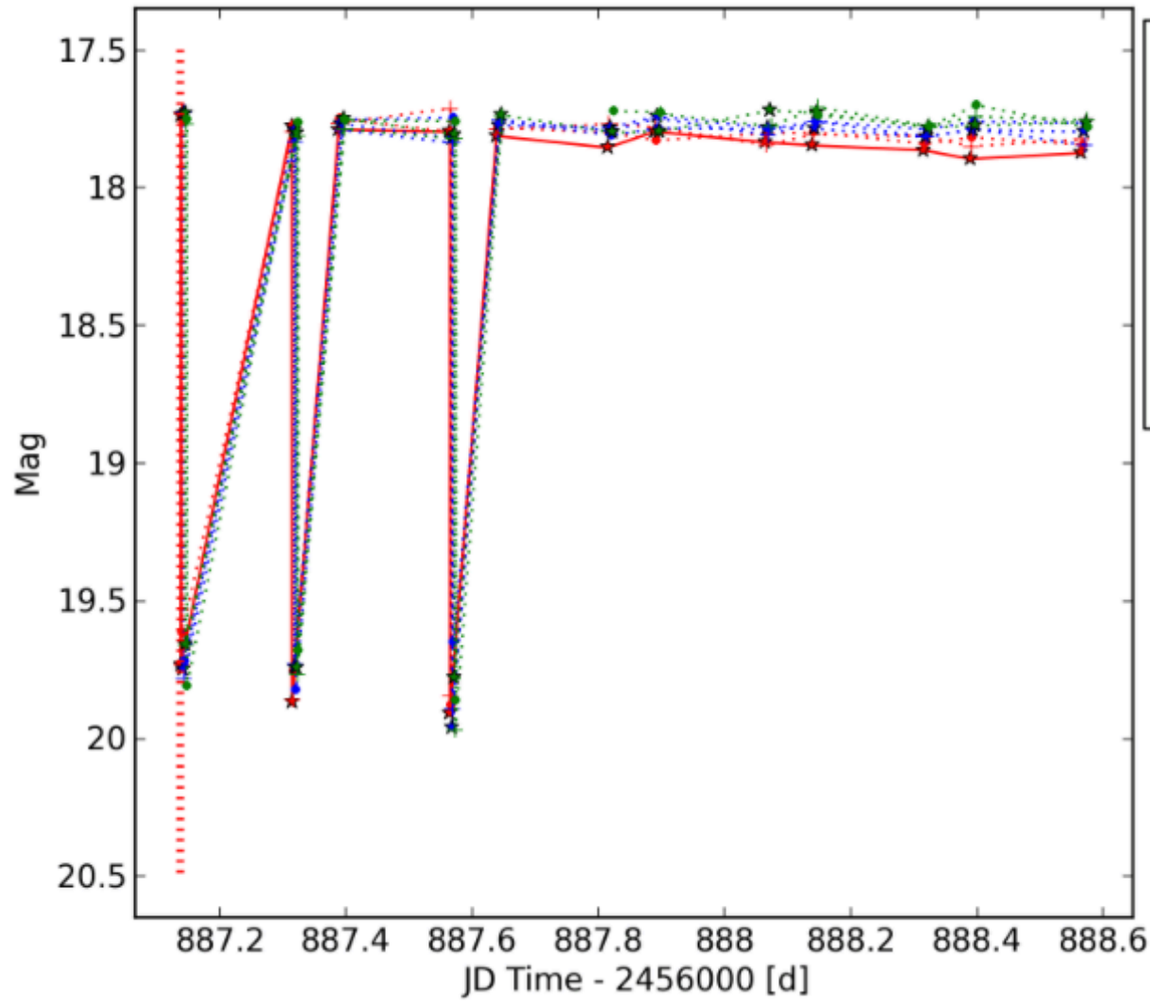


CU5M13, Leiden, 25-27 June 2014 Slide 28 of 45

Slides from Claus Fabricius

Bi-level light-curve





Transits from two physical sources with different magnitudes matched to same source ID: two distinct levels in light curve.
Gives false alert, either for bump or dip depending on which light curve was contaminated.

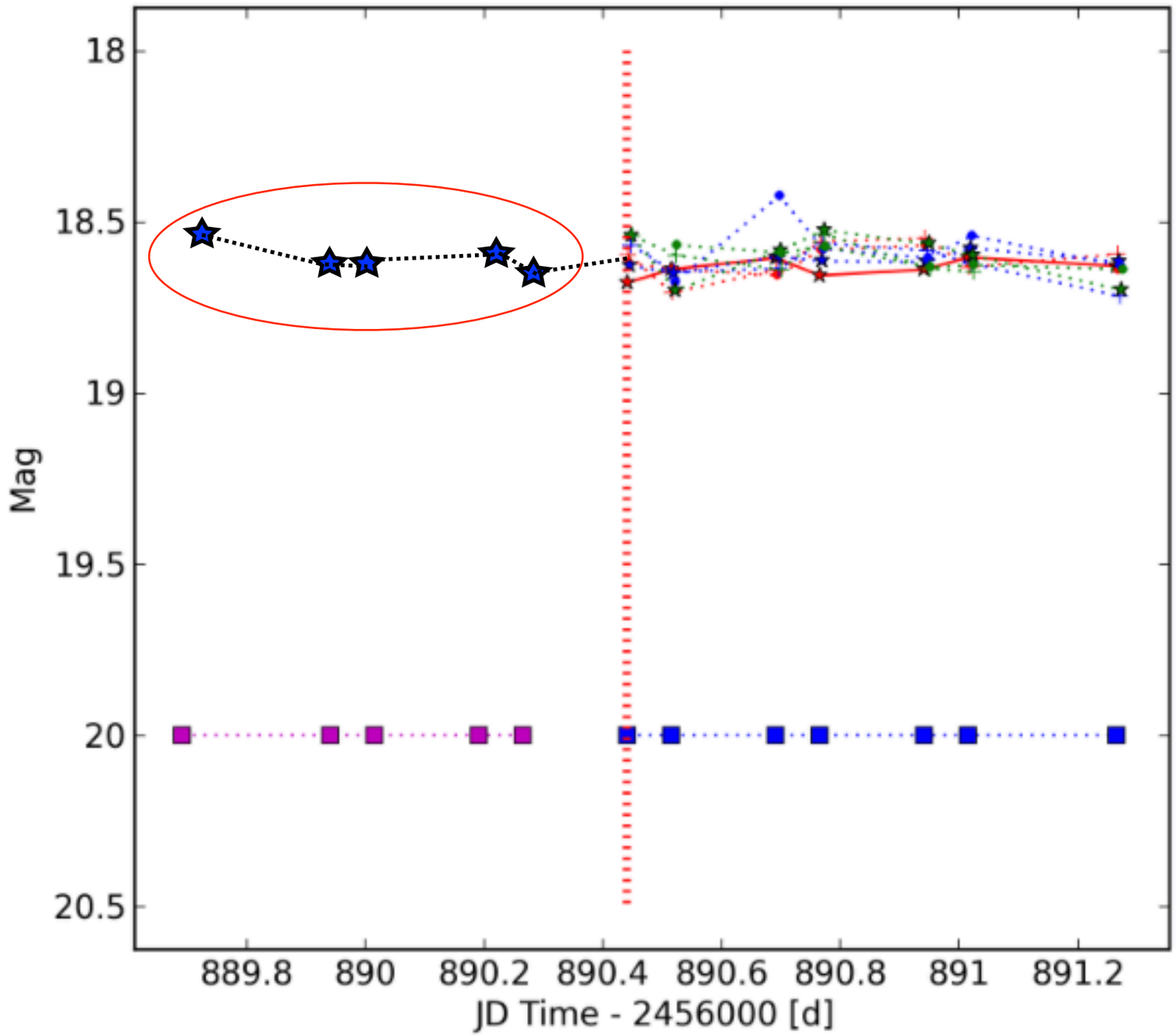
Rixon: *Technical challenges and solutions for Science Alerts:* 5th Gaia Science Alerts workshop, Warsaw, September 2014

Stolen transits: fake supernova

If these transits of a constant source are assigned to the wrong light curve...

...AlertPipe infers non-detections at these scan times...

...and thinks it's seen a brightening source!



Rixon: *Technical challenges and solutions for Science Alerts:* 5th Gaia Science Alerts workshop, Warsaw, September 2014

Gaia DPAC
Data Processing & Analysis Consortium

Spurious detections: A proposal for their treatment in IDT and IDU

prepared by: C. Fabricius
approved by:
reference: GAIA-C3-TN-UB-CF-030-01
issue: 01
revision: 0
date: 2014-10-20
status: Issued

Abstract

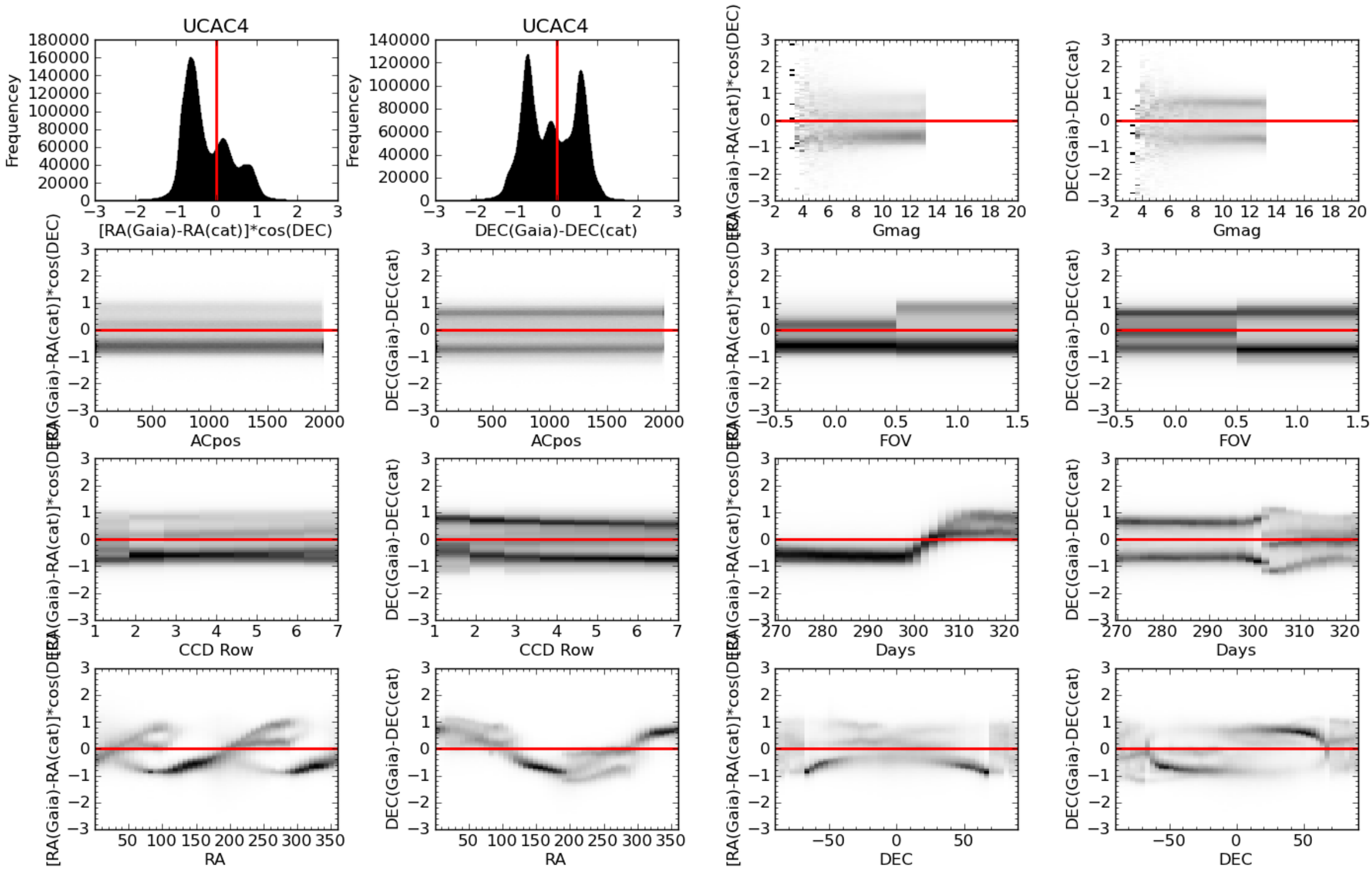
We discuss a mitigation strategy for spurious detections in IDT and IDU. The main goal is to avoid that these detections result in new sources. We therefore propose to allow both elements of close double detections to be matched to the same source, and to prevent other spurious detections from entering the cross match altogether. This is achieved by classifying detections in genuine and spurious and by maintaining a list of blacklisted detections. Contributions from downstream processes will be needed to blacklist additional detections, and - especially - to whitelist some of those currently blacklisted. The blacklisted observations are processed normally in every other respect (raw and elementary data) to allow any kind of use downstream

- Expect IDT to start creating new tables about now, completion date ~end November.
- These new tables based on transitID, but some sourceIDs must change
- Spurious detections are still available - but flagged/ deprecated
- We have written code to handle all this within our database as a “one-off” operation

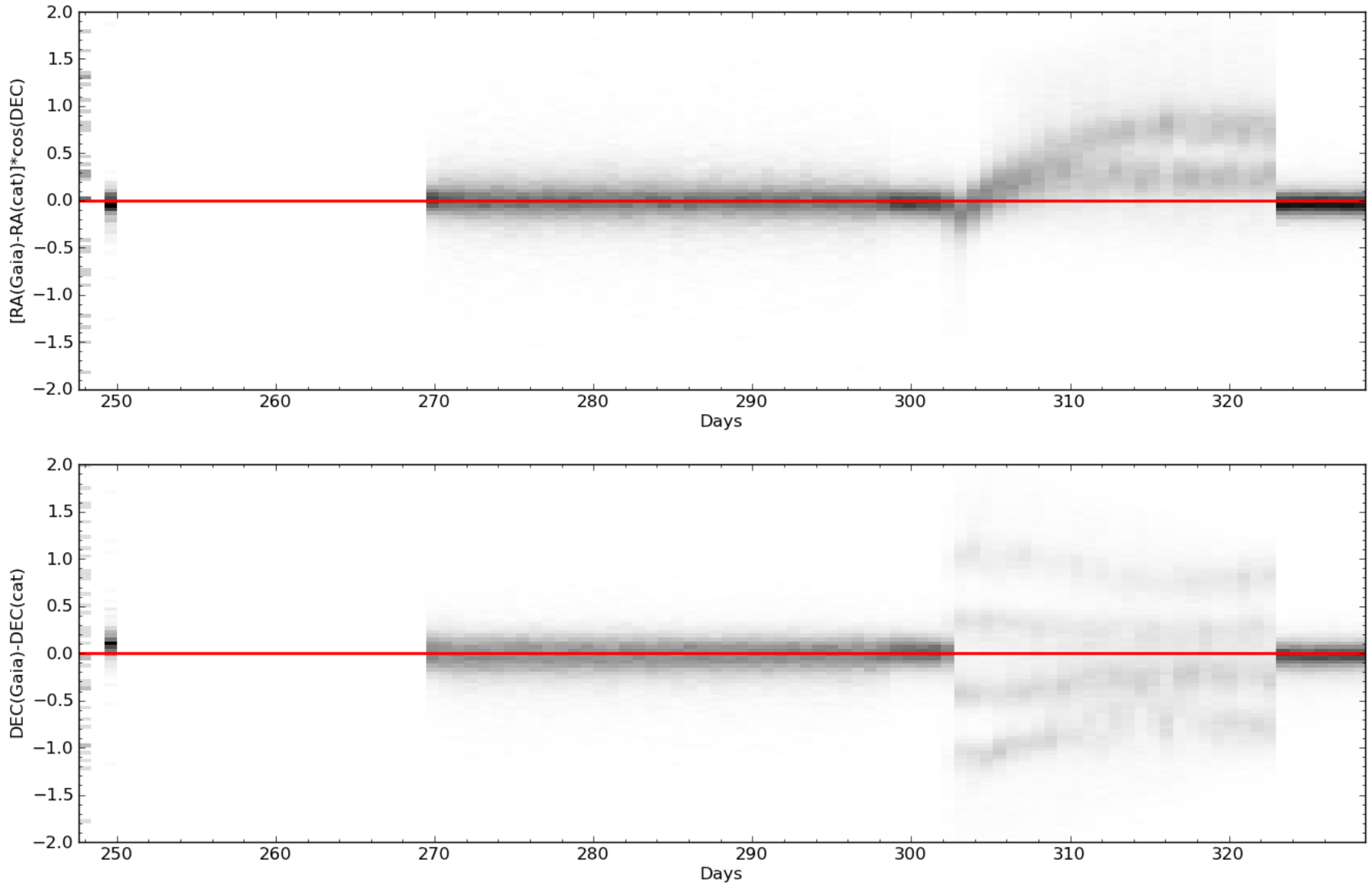
New Methods

- Because the Gaia catalogue is contaminated, we drive the discovery of transients from existing ground-based surveys (SDSS, 2MASS, VST).
- We sum per-transit fluxes in an aperture (radius 5 arcseconds) around each catalogued object.
- This by-passes problems with crossmatch and a problem of our own making (astrometry). It doesn't solve the calibration issue. Until recently we have been running uncalibrated.
- We find ~10-20 candidate events each day
- DPAC members then eyeball and initially classify the Alerts. DU17 team publish the approved alerts.

Astrometry: our computation

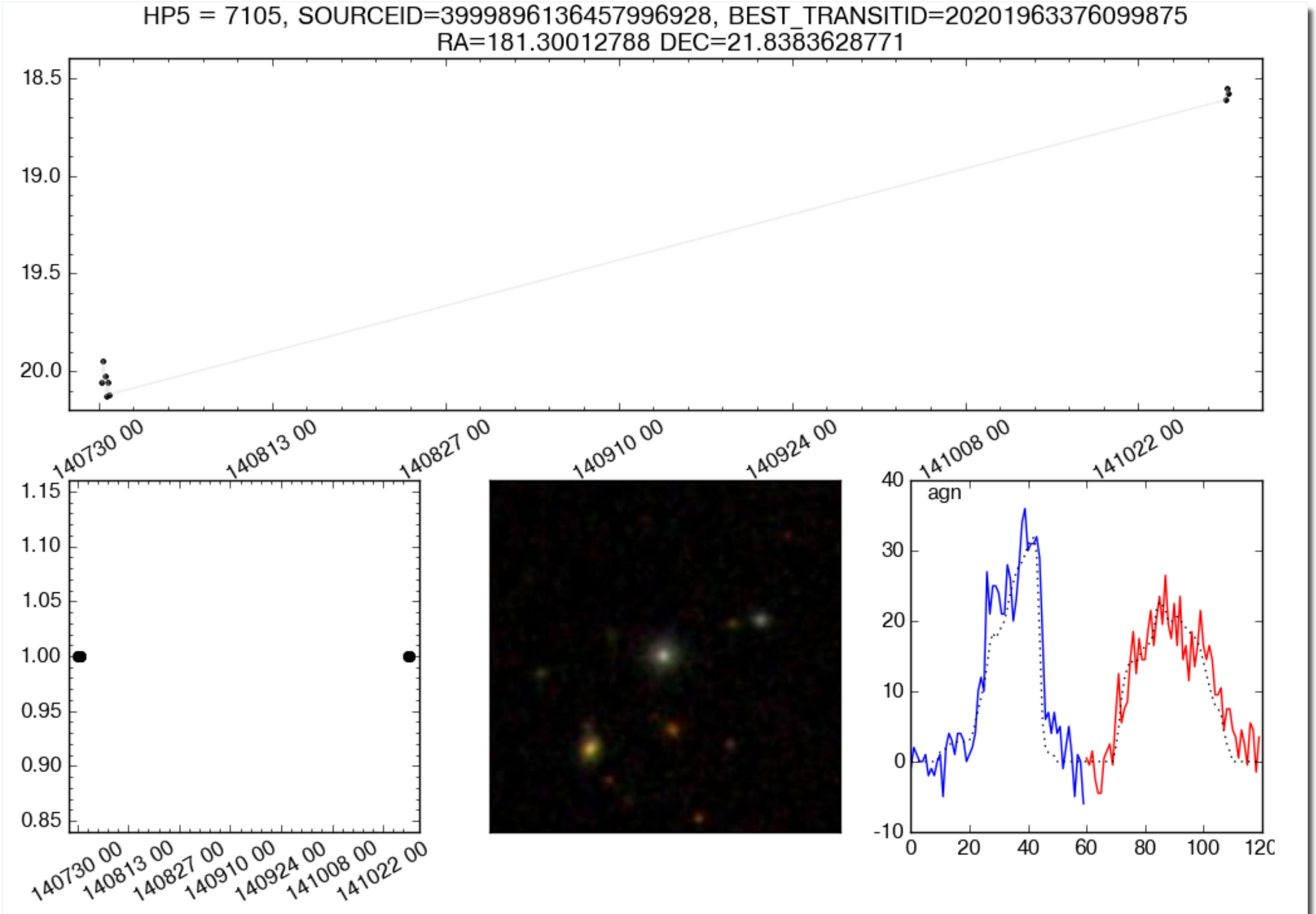


Astrometry: DetectionRecord



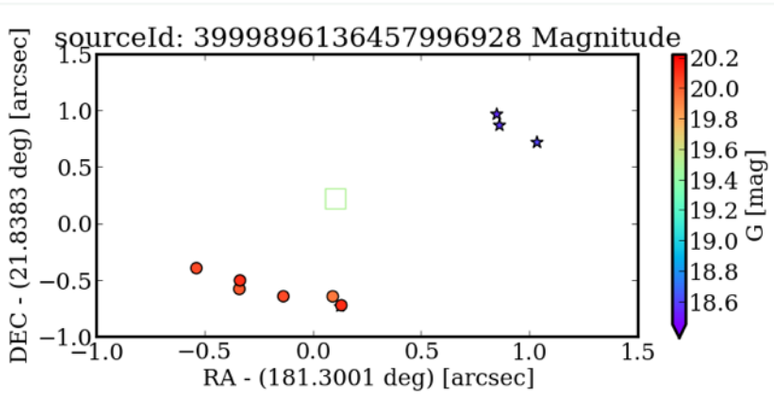
Eyeballing

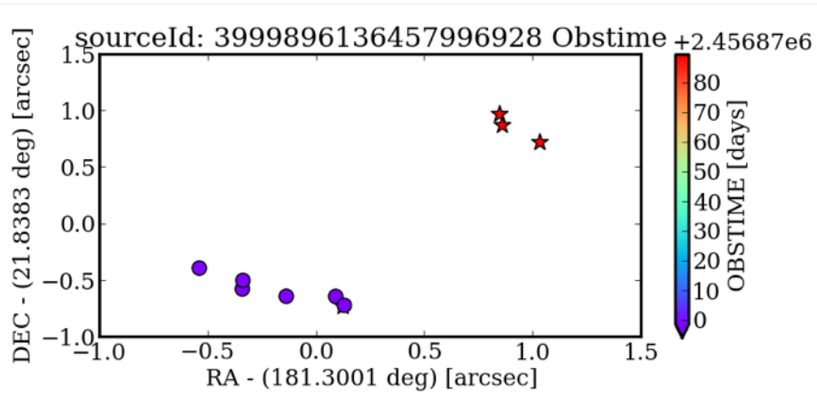
S Koposov

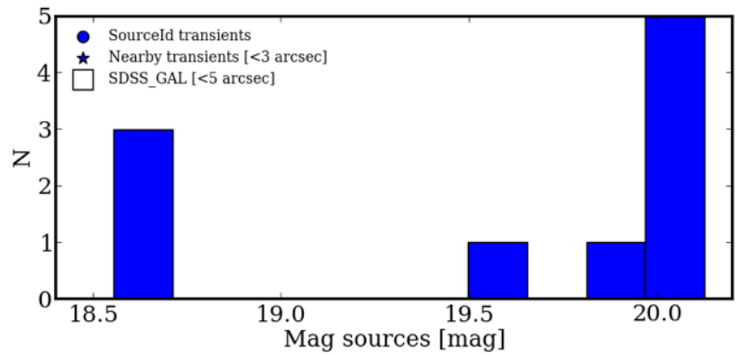


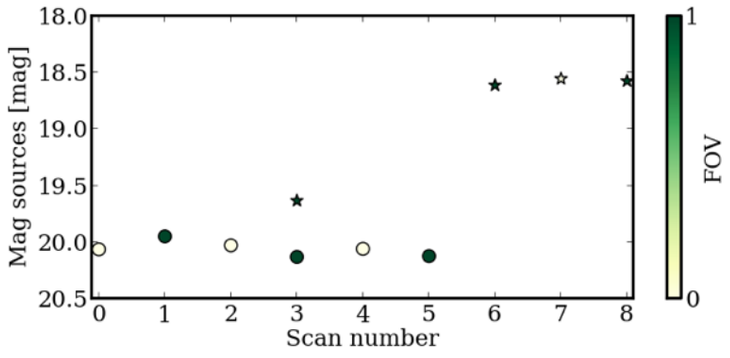
Eyeballing

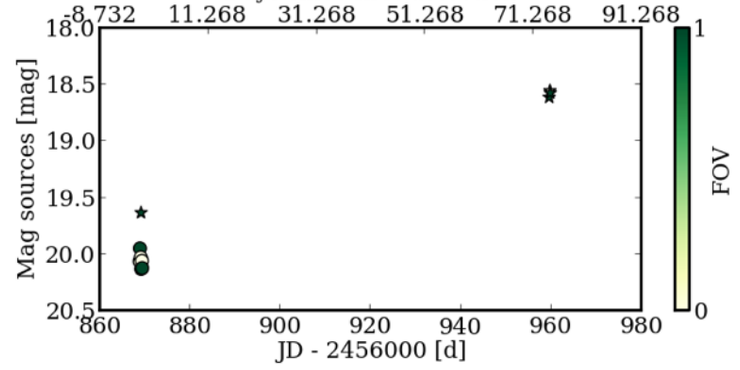
N Blagorodnova

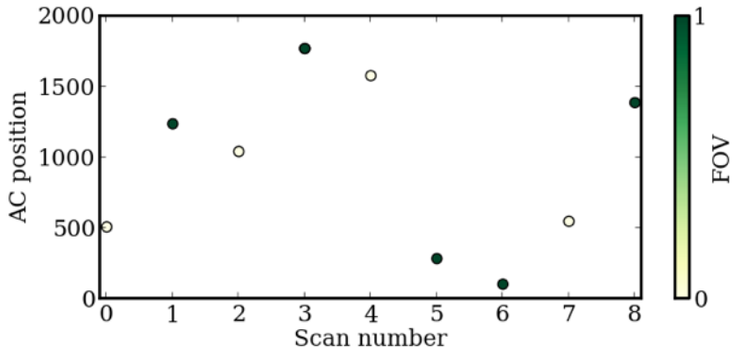


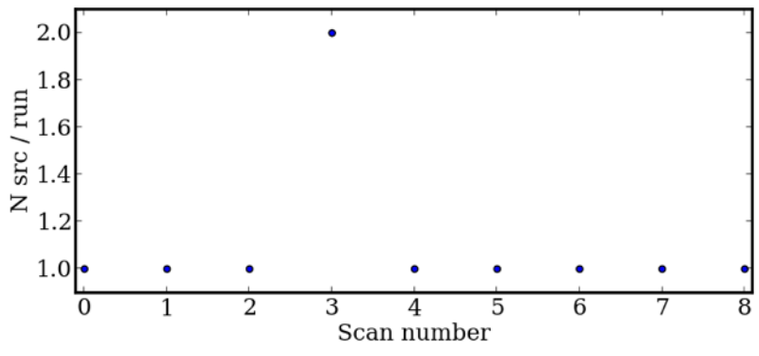


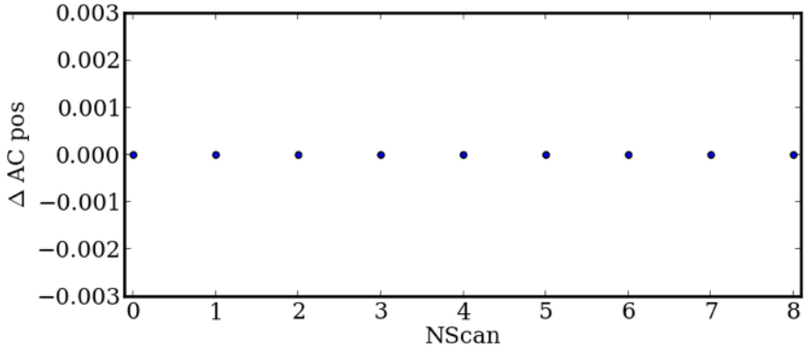


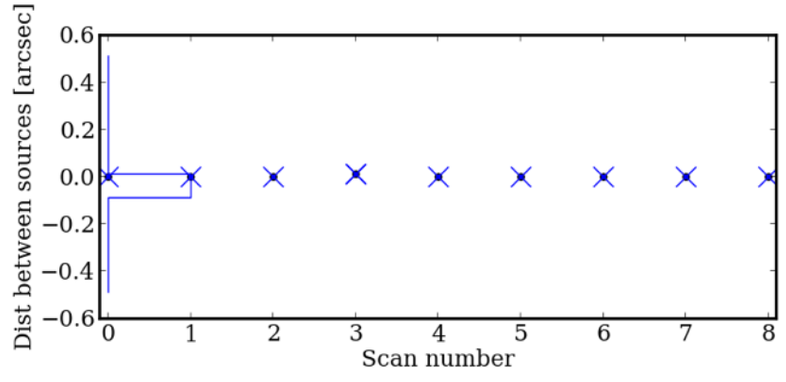












UberCal & Gaia

- As input we start with Gaia sources corresponding to SDSS stars with 17<r<18
- Then

*-2.5*log(flux_i) = Sum(Terms)*

where flux_i is the measured flux from some observation at a given time for a given Field-of-View, CCD, and position on the CCD.

- The terms we solve for are:

True magnitude of the star in the Gaia system

Zeropoint of the given ccd & FOV combination on a given day

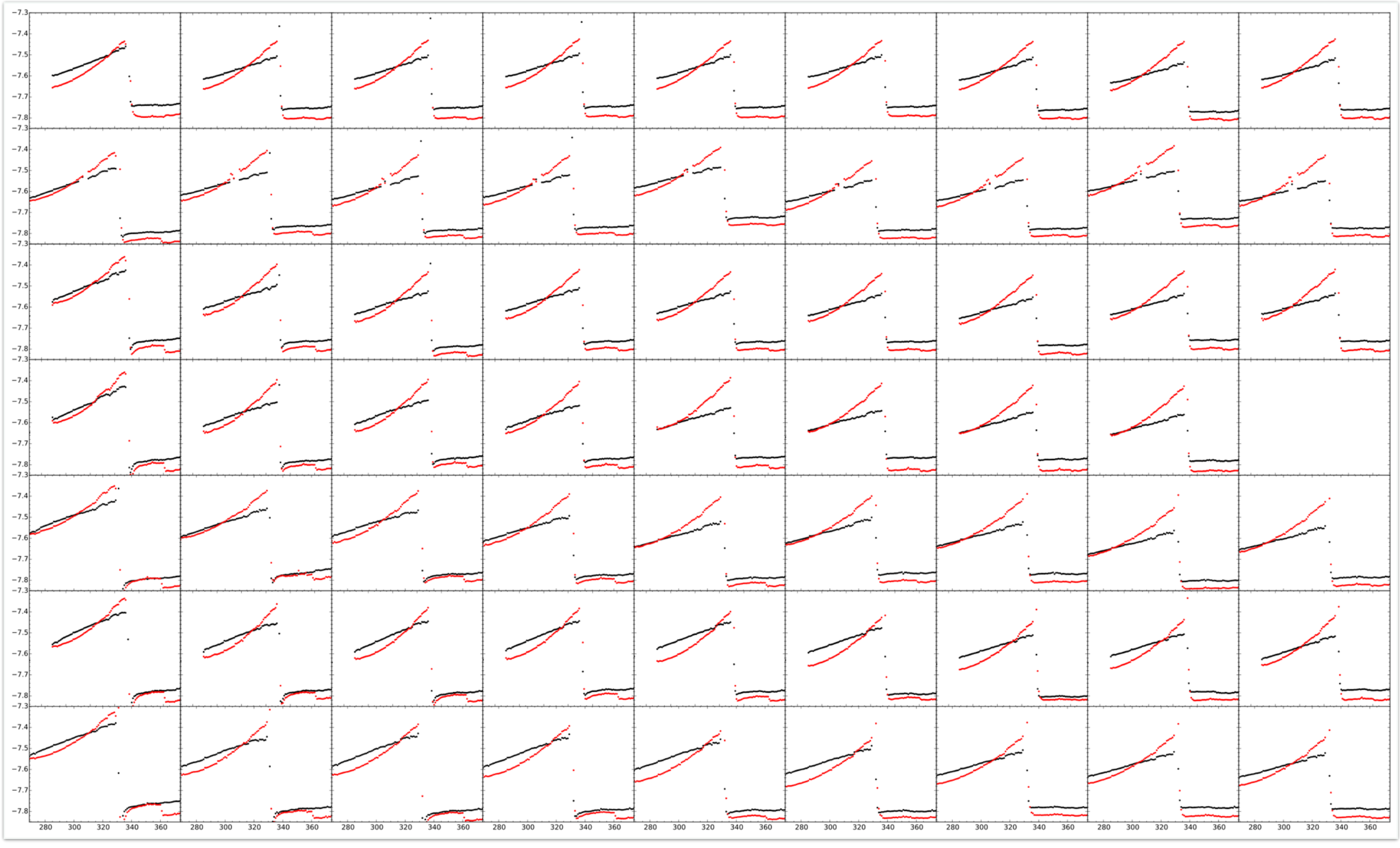
Zeropoint slope across the ccd at a given day

Flatfield (e.g. ccd sensitivity per column), constant in time

- In total we use 200 million measurements with 6 million parameters and solve the system of linear equations to produce a calibration.
- The fit is done in 4 iterations where we reject measurements outlying by more than 1, 0.5, 0.2 magnitudes from the model fitted in the previous iteration.
- We achieve a precision of 0.02-0.025 magnitudes per ccd (i.e. <10 mmag for a transit)

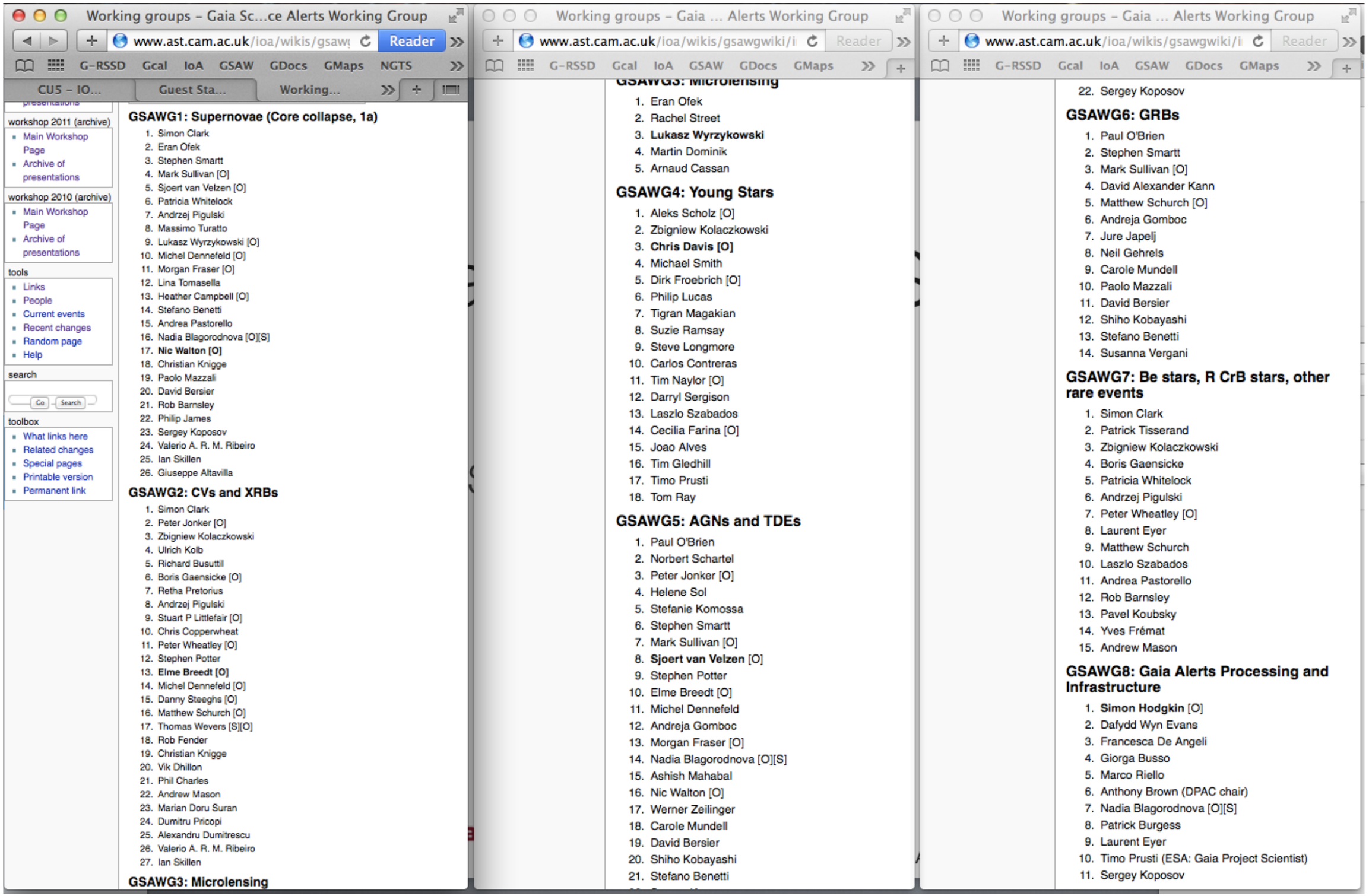
UberCal & Gaia

Koposov



ZP per CCD, per FOV, per day showing the strong decontamination event. We will provide weekly updates for DPAC to help decide when next decontamination should begin.

Working Groups



telescope awards

gsa working group

- Main page
- Working Groups

science

- Triggers
- Contaminants

alerts

- Detection System
- Verification phase
- Follow-up
- Monitoring
- Other surveys

workshop 2014

- Main Workshop Page
- Rationale
- Program
- Participants and Registration
- Logistics

workshop 2013 (archive)

- Main Workshop Page

On these pages we summarise and coordinate our **Photometric** and **Spectroscopic** observing runs for the upcoming semesters. This page will be amended as more follow-up runs are scheduled.

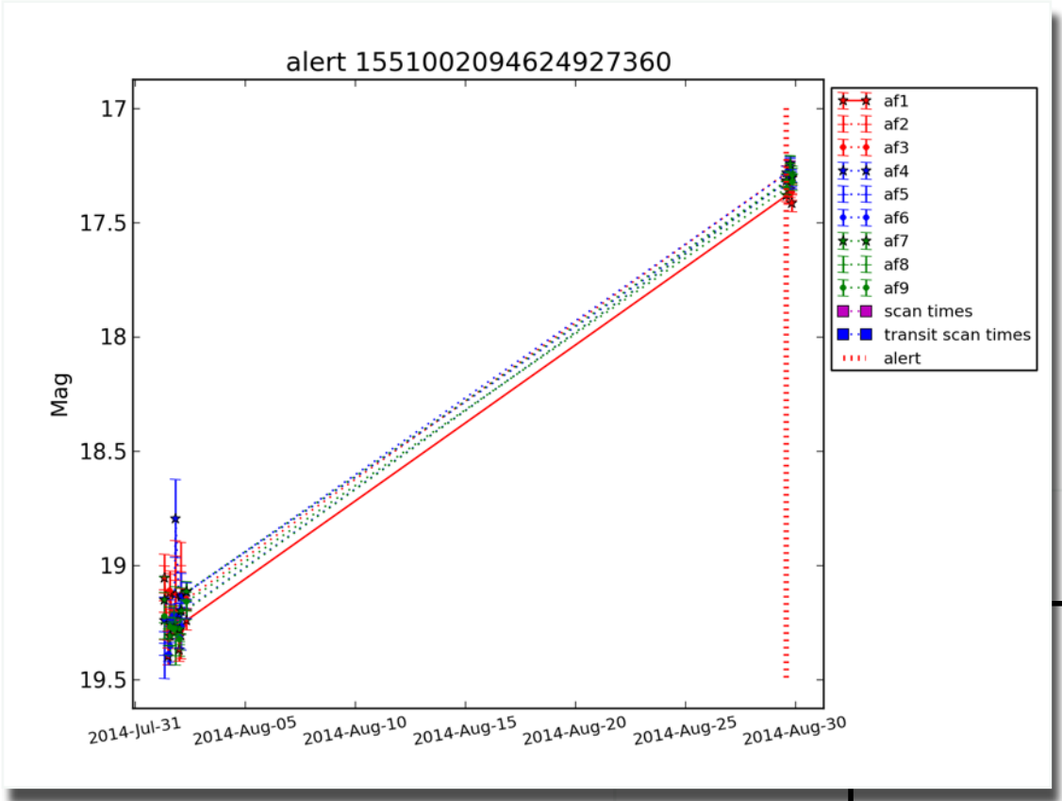
Contents [hide]

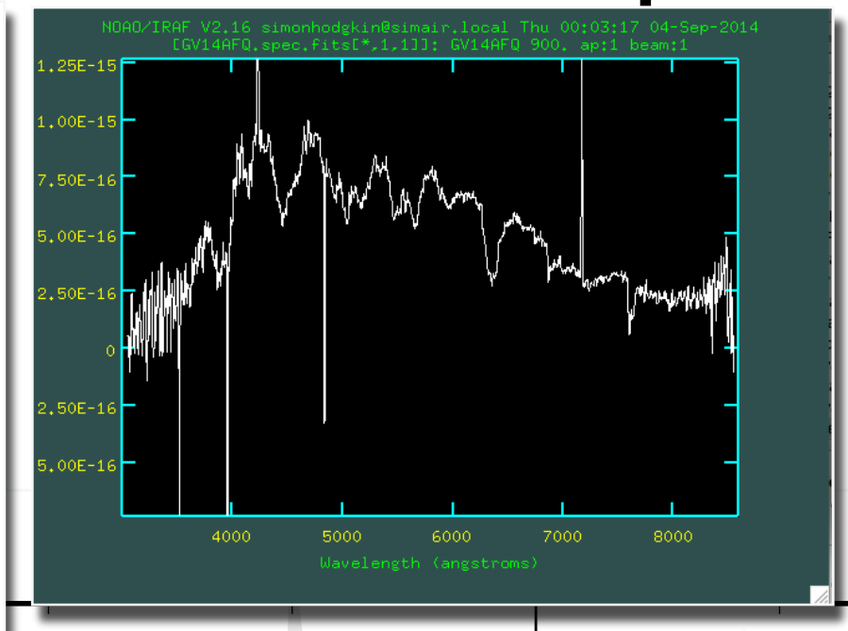
2014B Observing Time Awarded

The total amounts of time awarded for each semester (so far) is given below. Note that these come from a variety of proposals and awards, submitted by a number of individuals. While these nights should be seen as in a sense pooled, the coordination of the different programmes will be the responsibility of the individual PI's.

Telescope	2014B	2015A
Asiago	30 n	-
ESO NTT	5 n	0 n
INT	30 n	3.5 n
LT	170 h	70 h
Mercator	7 n	7 n
SAAO	-	-
WHT	15 n	3.5 n
Loiano	29n	-

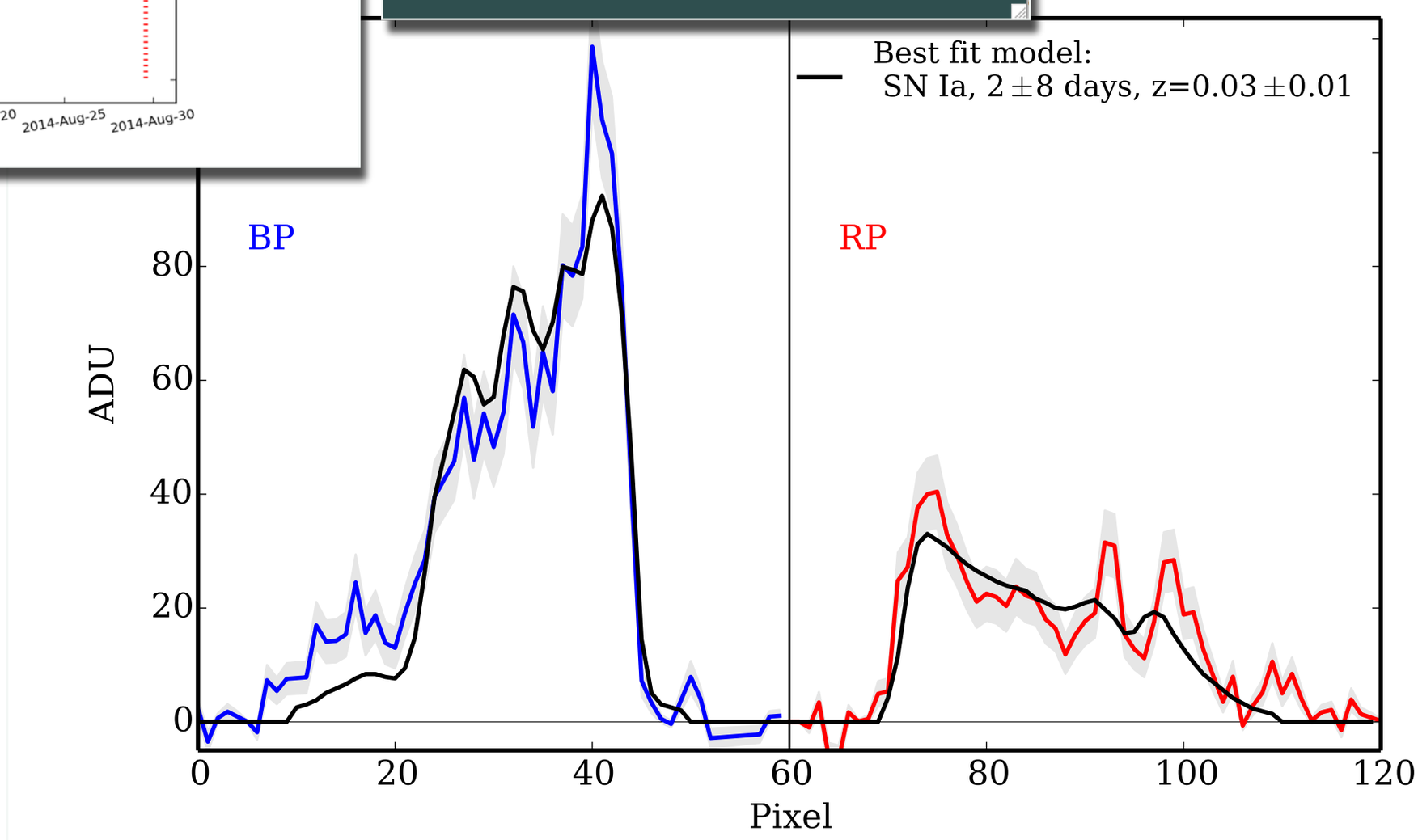
Gaia14aaa: first Supernova





Spectrum confirmed from ground with Isaac Newton Telescope

- Lightcurve showed significant brightening
- BP/RP spectrum best fit by model SN Ia



http://gaia.ac.uk/selected-gaia-science-alerts

My Drive – Google Drive

Gaia in the UK

Taking the Galactic Census

Search

Home Mission Gaia UK Science Alerts News Events Education Multimedia Blog Contact

You are here: Home » Gaia Photometric Science Alerts: Validation Phase

Gaia Photometric Science Alerts: Valida

Welcome! We have begun the experiment to validate our AlertPipe software. ' classifies and publishes Gaia Photometric Science Alerts. We are right at the b and invite you to join in.

On this web page we are publishing coordinates and photometry for a manual alerts as part of our validation process. These sources and the contents of the number of caveats (details below). The methodology used to find the alerts is

If you do measure any data for these targets, then please let us know (via Cor category: Science alerts), and if possible we'd like to get a copy of your data (in our verification analysis together with data from collaborating observatories http://www.ast.cam.ac.uk/ioa/wikis/gsawgwiki/index.php/Working_groups. Ar credited. Similarly, if you do publish any ATELS, articles, etc, then please do let

If you publish any results based on these Gaia discoveries, we would appreciat along the lines of: "We acknowledge ESA Gaia, DPAC and the Photometric Scie (http://gaia.ac.uk/selected-gaia-science-alerts)".

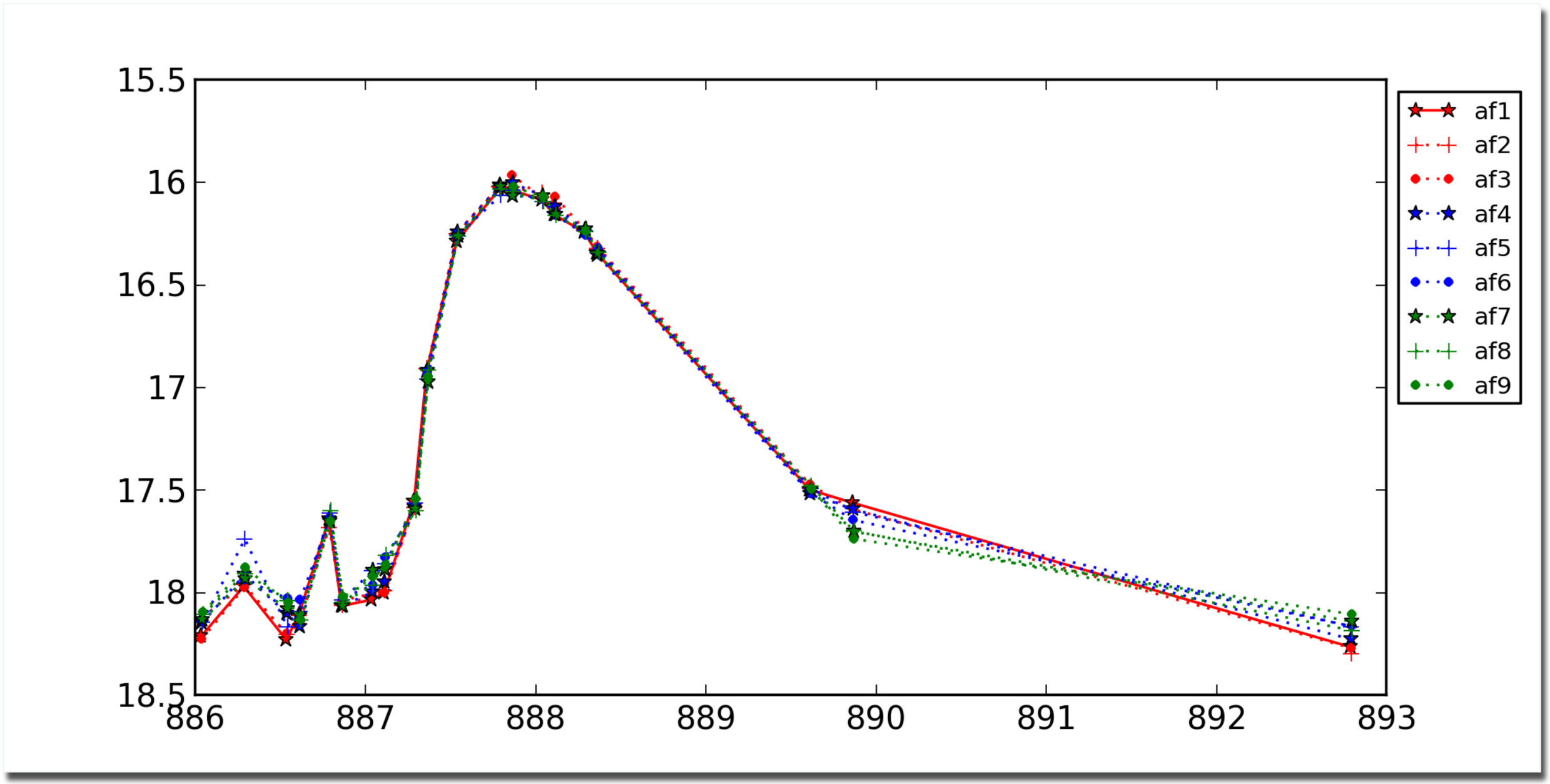
Gaia DPAC Gaia Data Processing and Analysis Consortium (DPAC)

Started 13/10/2014

Name	UTC timestamp	RA	Dec	AlertMag	HistMag	HistStdDev	Class	Comment
Gaia14ada	2014-09-10 01:32:01	208.40506	34.82615	18.73	19.68	0.05	unknown	blue star, now faded, ROSAT source within error, CV?
Gaia14acz	2014-11-01 23:47:20	211.56593	36.38459	18.96	Not known	Not known	unknown	blue in BP/RP; 5 arcsec from SDSS galaxy z=0.105
Gaia14acy	2014-10-26 21:01:38	10.16959	-28.95650	18.41	19.63	0.06	unknown	Galaxy (2dFGRS TGS287Z263), small offset?
Gaia14acx	2014-10-27 09:30:00	240.01542	33.18725	15.24	20.20	0.02	CV	Known Dwarf Nova: VW CrB (Blue SDSS star r=19.9, very blue in BP/RP)
Gaia14acw	2014-10-24 03:35:31	37.28835	-32.96673	17.61	18.39	0.04	unknown	
Gaia14acv	2014-10-25 07:06:23	182.44766	29.73023	18.40	18.97	0.03	unknown	very blue SDSS star at r=19.2
Gaia14acu	2014-10-26 00:49:49	202.47026	31.90307	18.23	19.18	0.08	unknown	SDSS star at r=20
Gaia14act	2014-10-26 06:00:00	185.09378	28.41434	18.43	Not known	Not known	SN II	offset from SDSS galaxy;last non-det 2014-07-31;blue BPRP spectrum
Gaia14acs	2014-10-06 18:34:25	57.51597	17.06699	19.22	19.95	0.10	unknown	
Gaia14acr	2014-10-08 02:24:57	59.71412	14.18758	18.26	19.04	0.08	unknown	
Gaia14acq	2014-10-08 00:38:02	59.52069	14.54791	17.70	18.34	0.06	unknown	

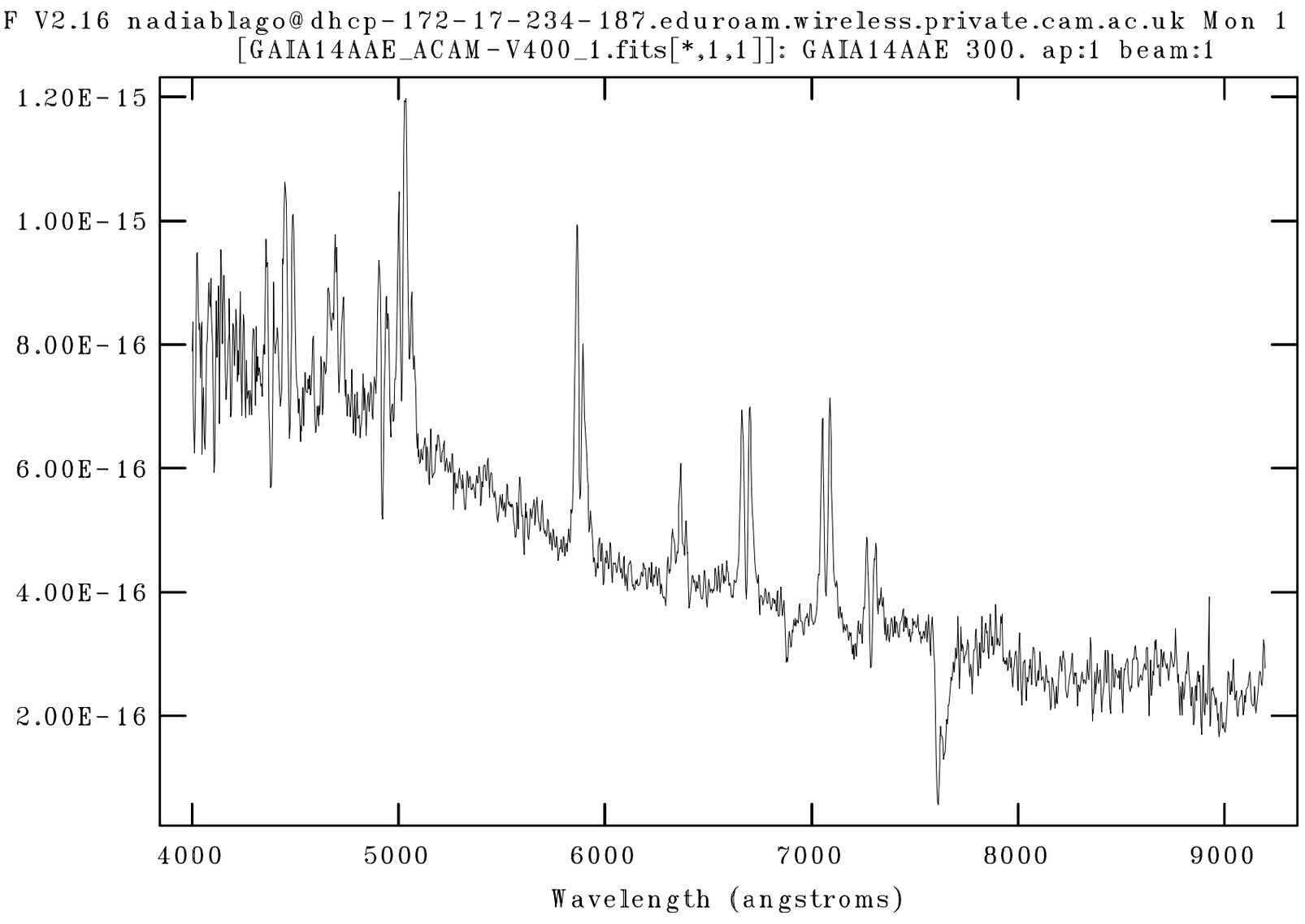
Initial simple table. Web pages per object and automatically generated CSV lists are coming soon (weeks)

ASASSN-14cn, Gaia14aae



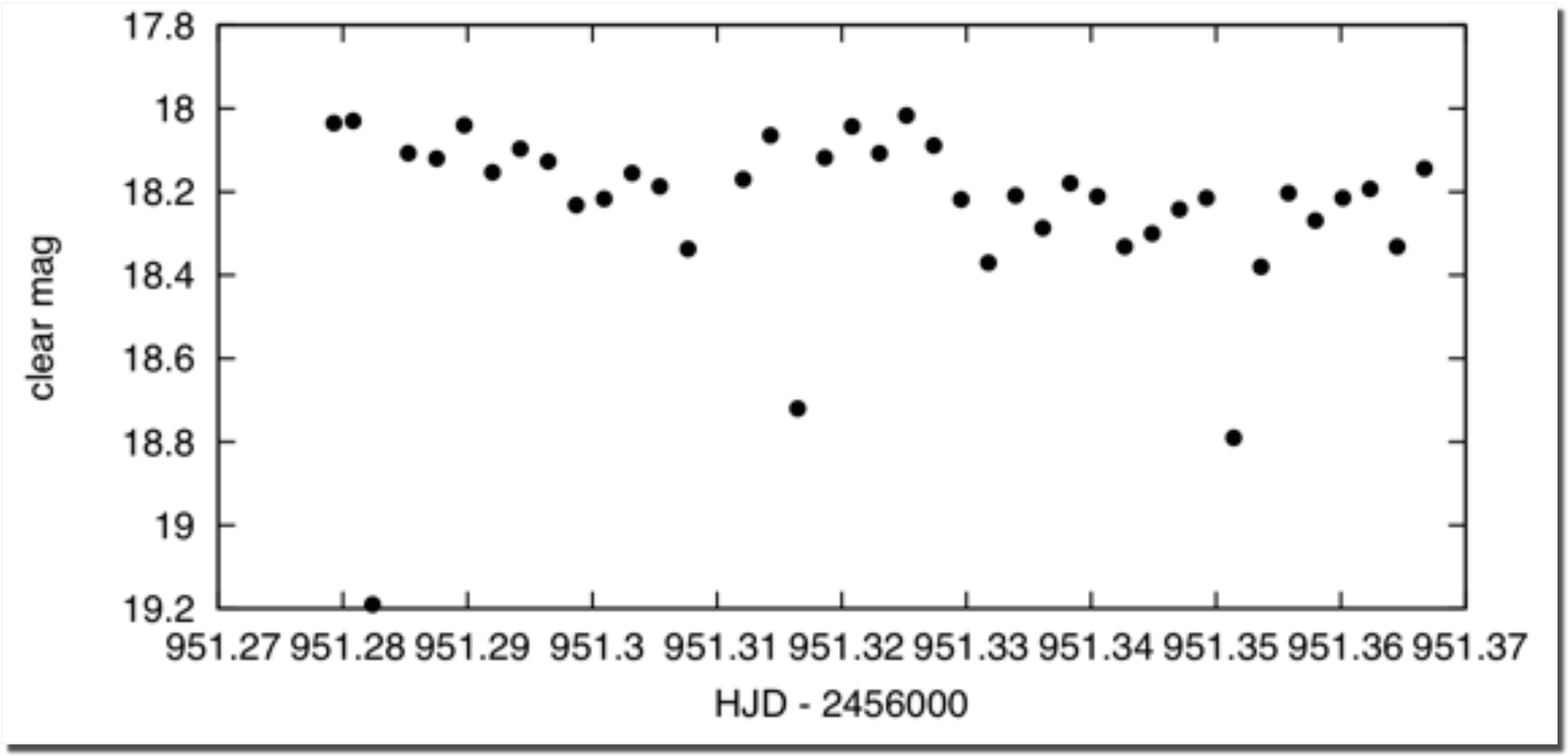
Outburst in Gaia, but object also seen in June in ASAS

Gaia14aae: An interesting CV



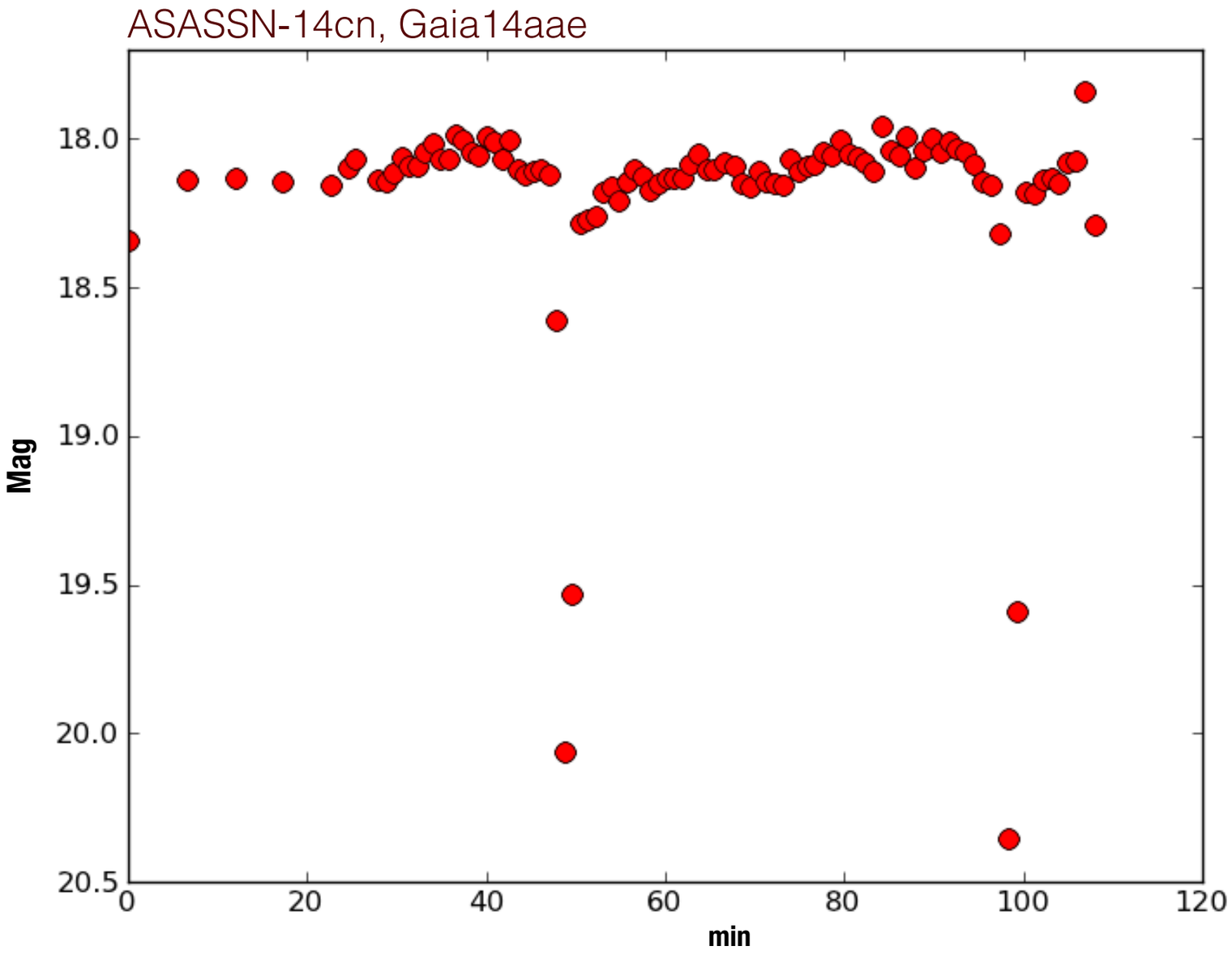
WHT follow up sees strong Helium lines - AM CVn classification

Gaia14aae: an interesting AM CVn

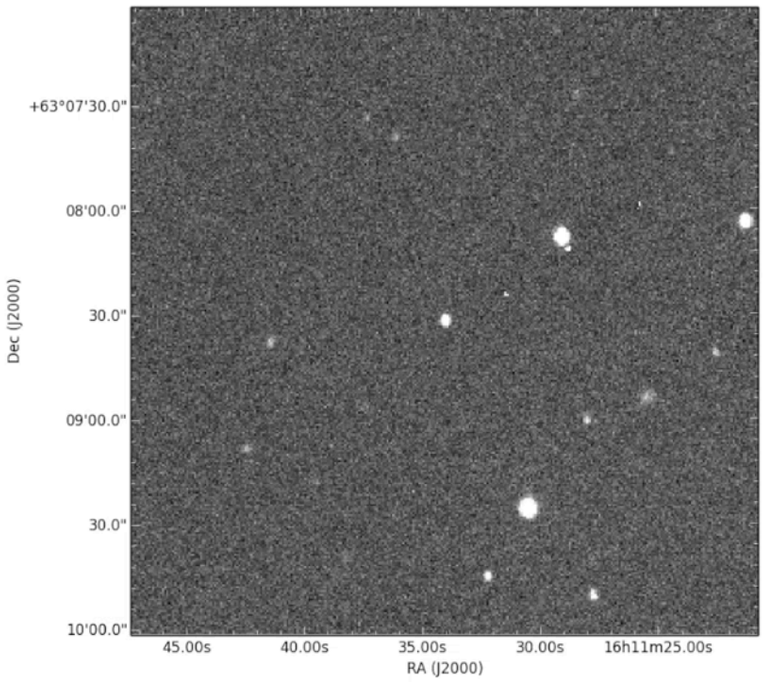


Meanwhile amateur (Enrique de Miguel, CBA) has been following up the ASAS alert and sees eclipses

Discovery of the 3rd known eclipsing AM CVn (candidate Ia progenitor)



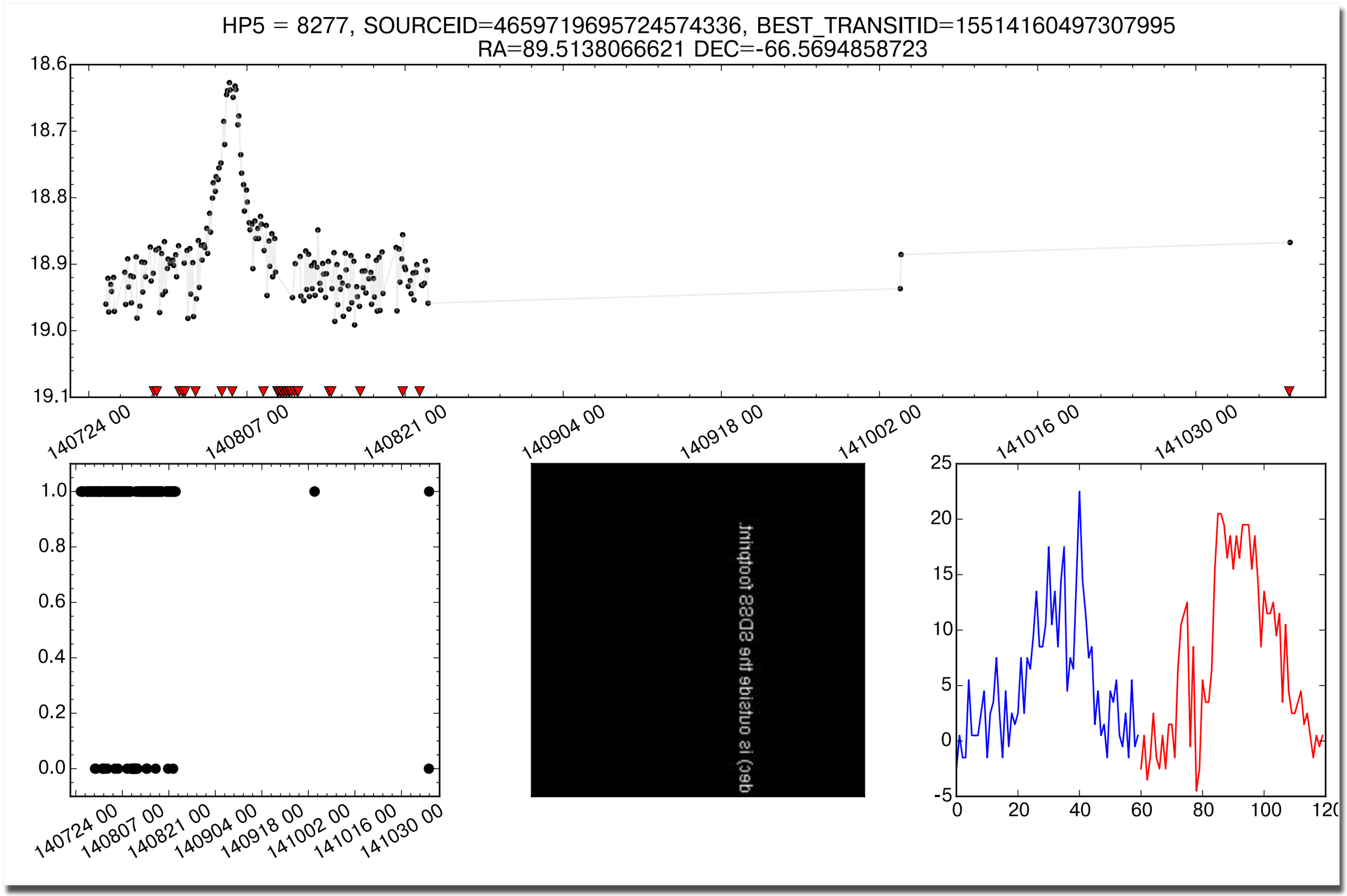
PIs : Gisella Clementini, Lukasz Wyrzykowski
Observers : Heather Campbell, Krzysztof Rybicki, Piotr Wielgórski, Giuseppe Altavilla + Support Astronomer
Reduction and observing strategy : Simon Hodgkin



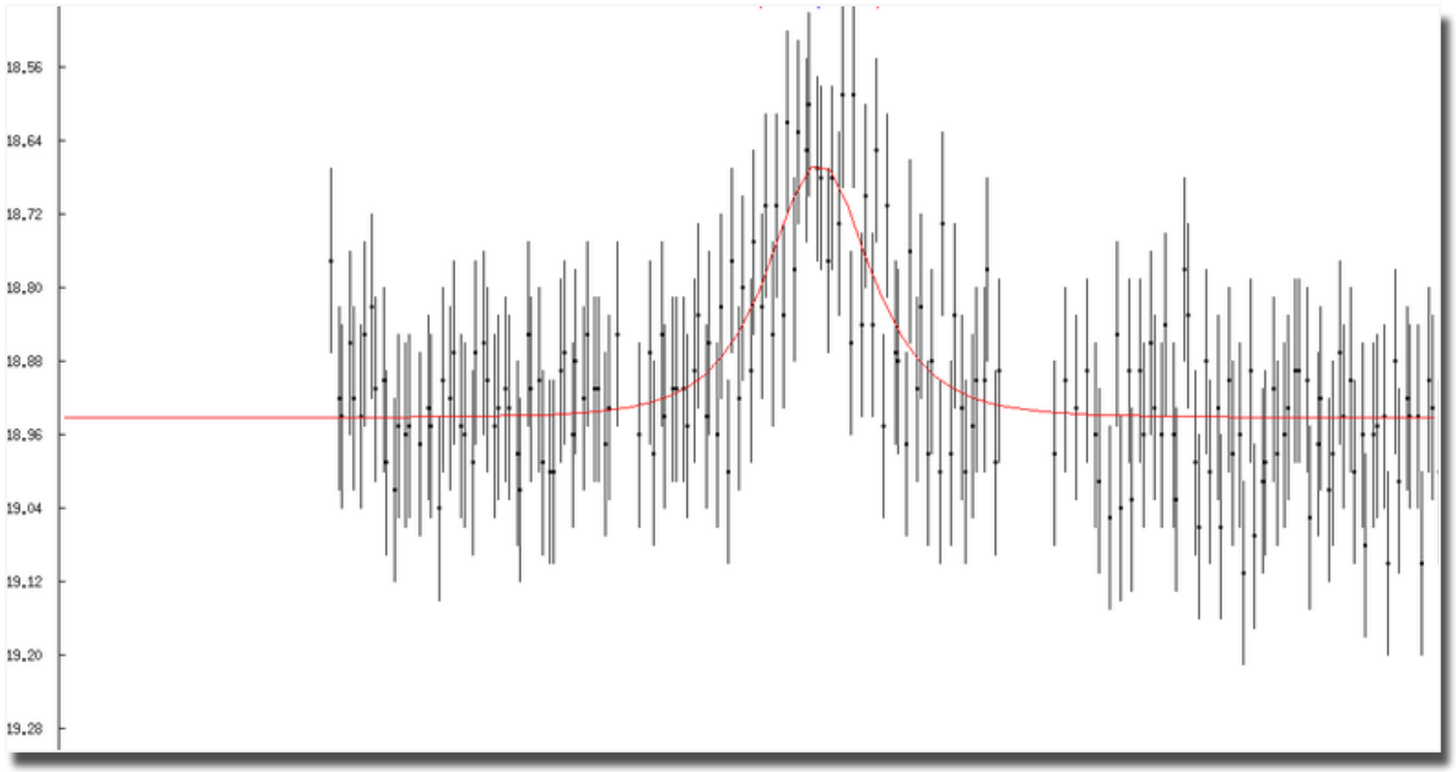
88m->21s (factor ~250)

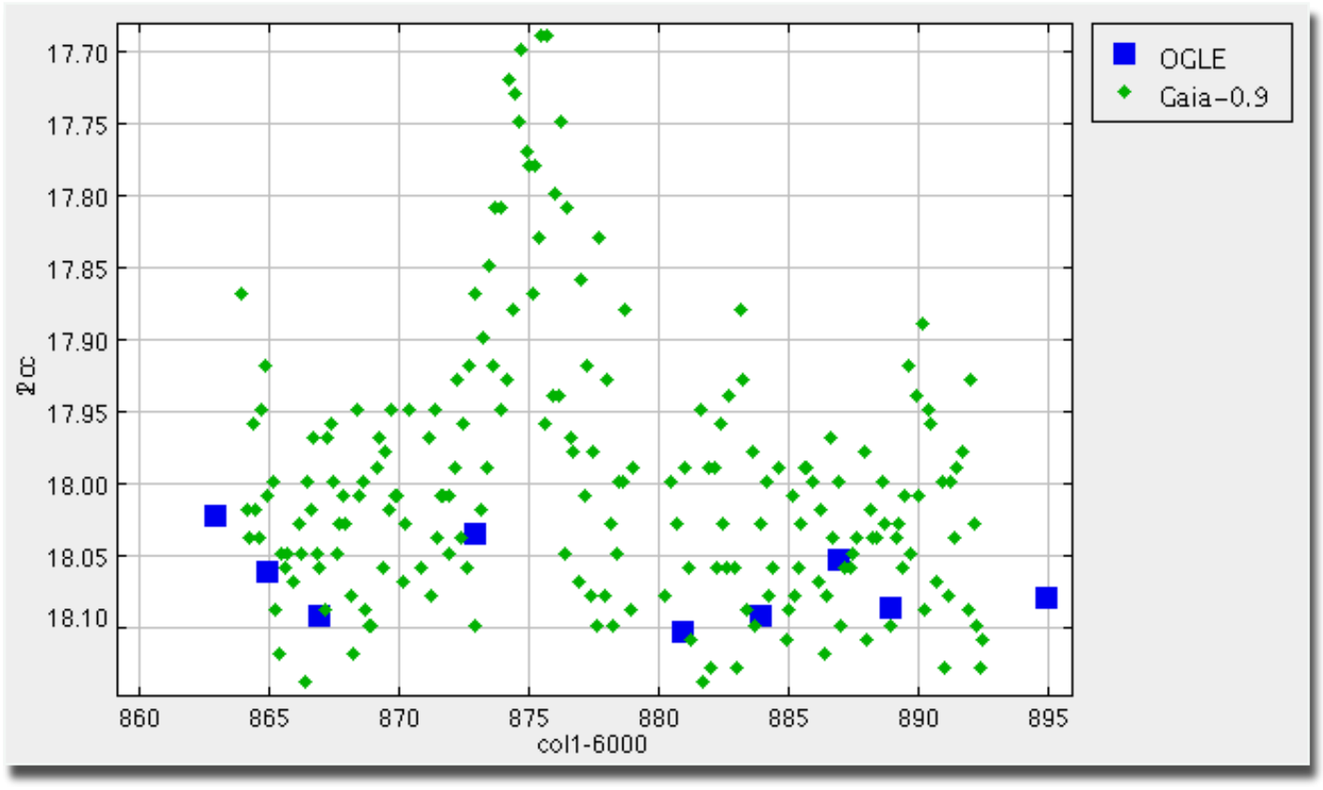
Loiano Observatory (152cm Cassini Telescope) follow-up and further CBA observations confirm Period is 49.7 mins

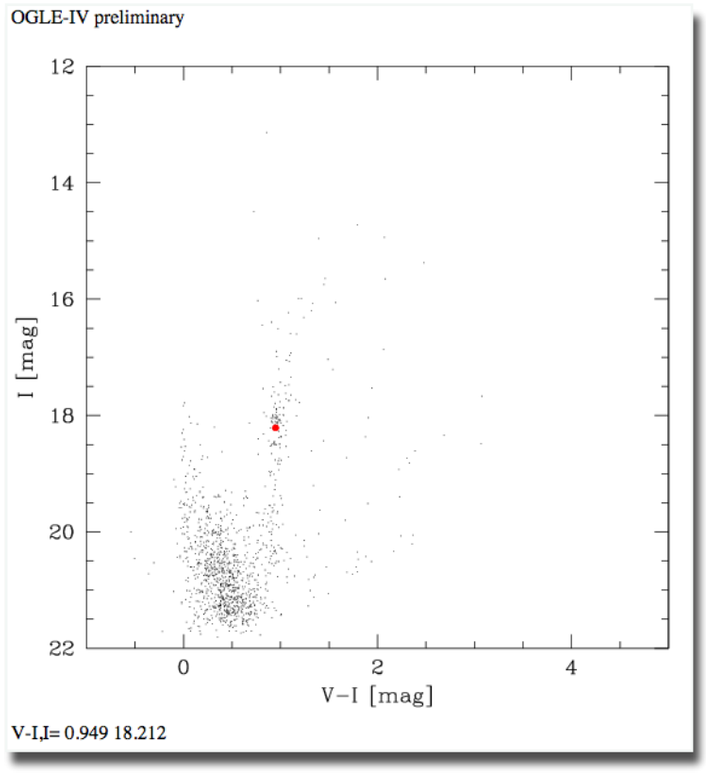
candidate microlensing event



candidate microlensing event







Credit: Lukasz Wyrzykowski and OGLE

Take Home Points

- Make sure you understand what data you are getting
- Make sure you get everything you need (there's not so much data yet)
- Understand the flags
- Don't make unnecessary and difficult work choices (if something exists and is good enough - use it)
- Allow for flexibility and testing with real data in the (ongoing) design and implementation of your algorithms.
- The data volume is entirely manageable - and if accessible, you can do an awful lot in a short amount of time
- Draw from the expertise of people around you

Conclusions

- AlertPipe software is working well and performant
- Even with an incredibly contaminated alert stream (which dominates our processing time - ingest is typically <20 mins/day)
- With significant extra effort we have produced a database full of useful diagnostic data, and begun science with it.
- We have published 80 alerts, and classified 4 SNe and 5 CVs. 62 remain unclassified
- When issues with sourceID and artefacts are resolved, we can shakedown and test our original design. We aim to start fully automated detection, classification, publication by April 2015.
- In the short term we can continue manual operations and do useful science