Gaia@OABo 2 years after launch

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&

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P. Montegriffo, S. Marinoni, G. Valentini

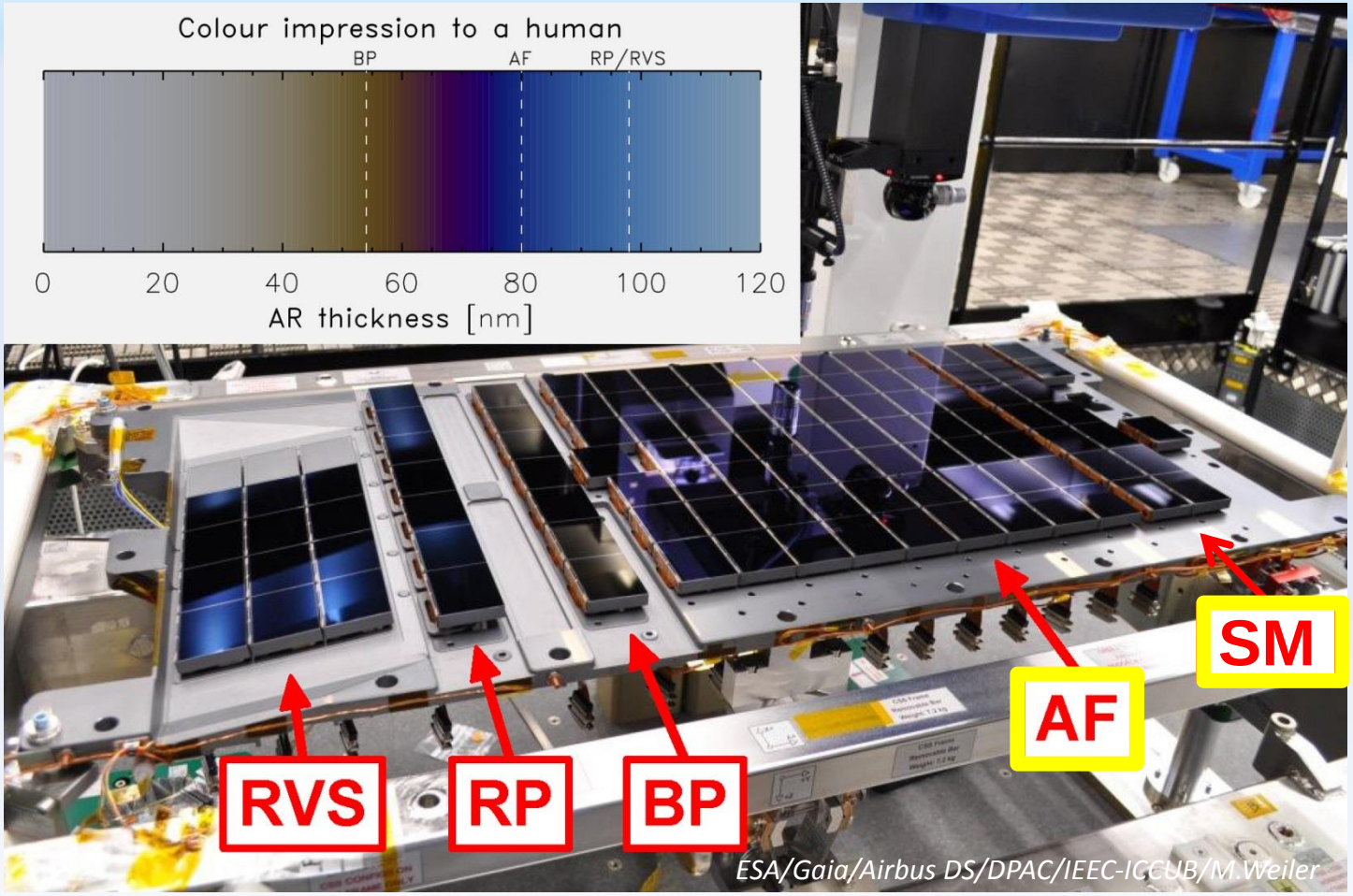
Bologna, 14 Jan. 2016

ISTITUTO NAZIONALE DI ASTROFISICA
OSSERVATORIO ASTRONOMICO DI BOLOGNA

- Gaia 2 years after
- The Gaia Spectrophotometric Standard Stars
- The Gaia Science Alerts programme

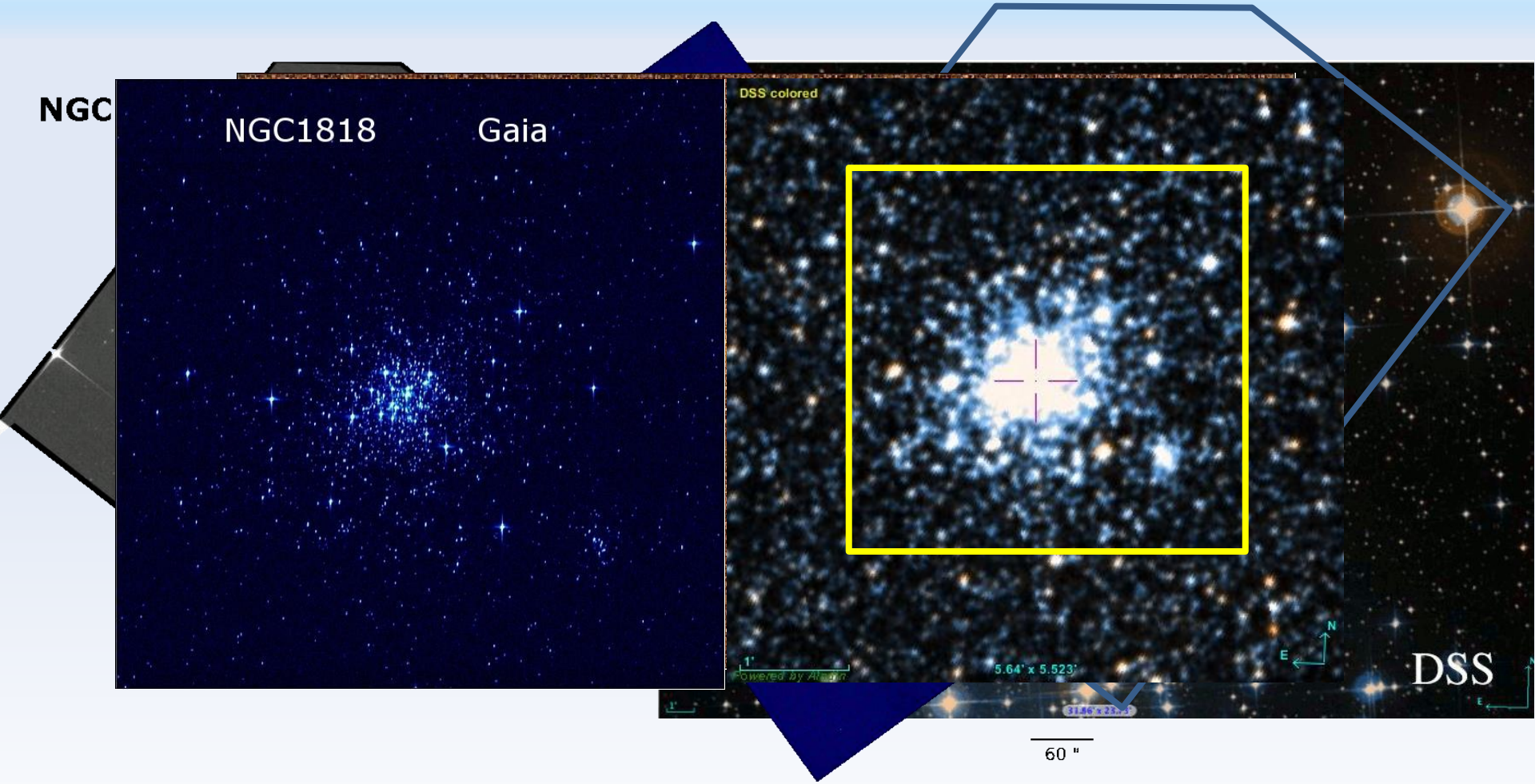
Gaia lift off - 09:12UT on 19 December 2013

Examples of Gaia imaging capabilities

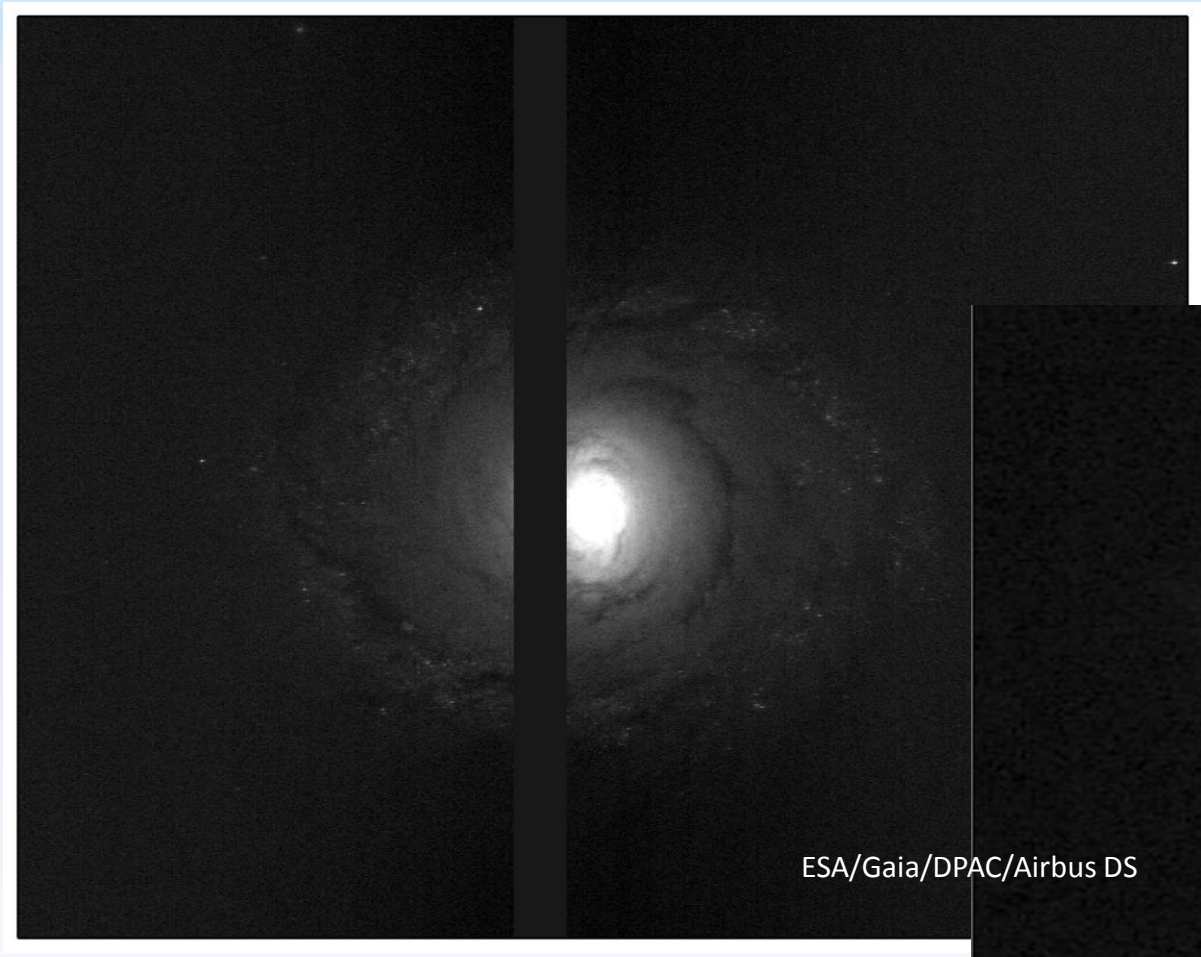


Gaia's focal plane. The inset shows the CCD colour as a function of the thickness of the anti-reflection coating on the detector.

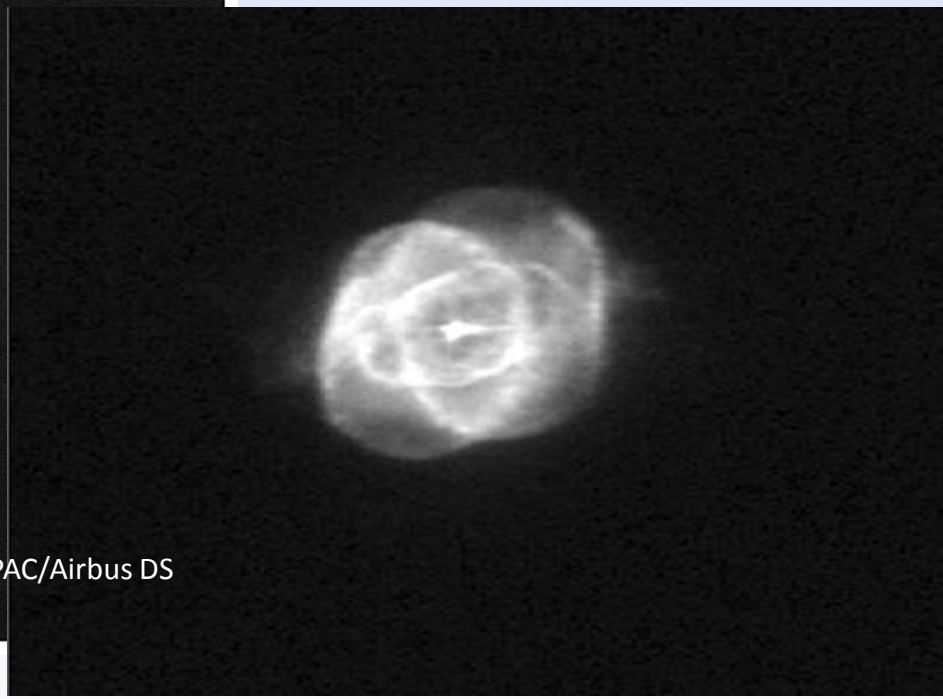
Examples of Gaia imaging capabilities



Examples of Gaia imaging capabilities



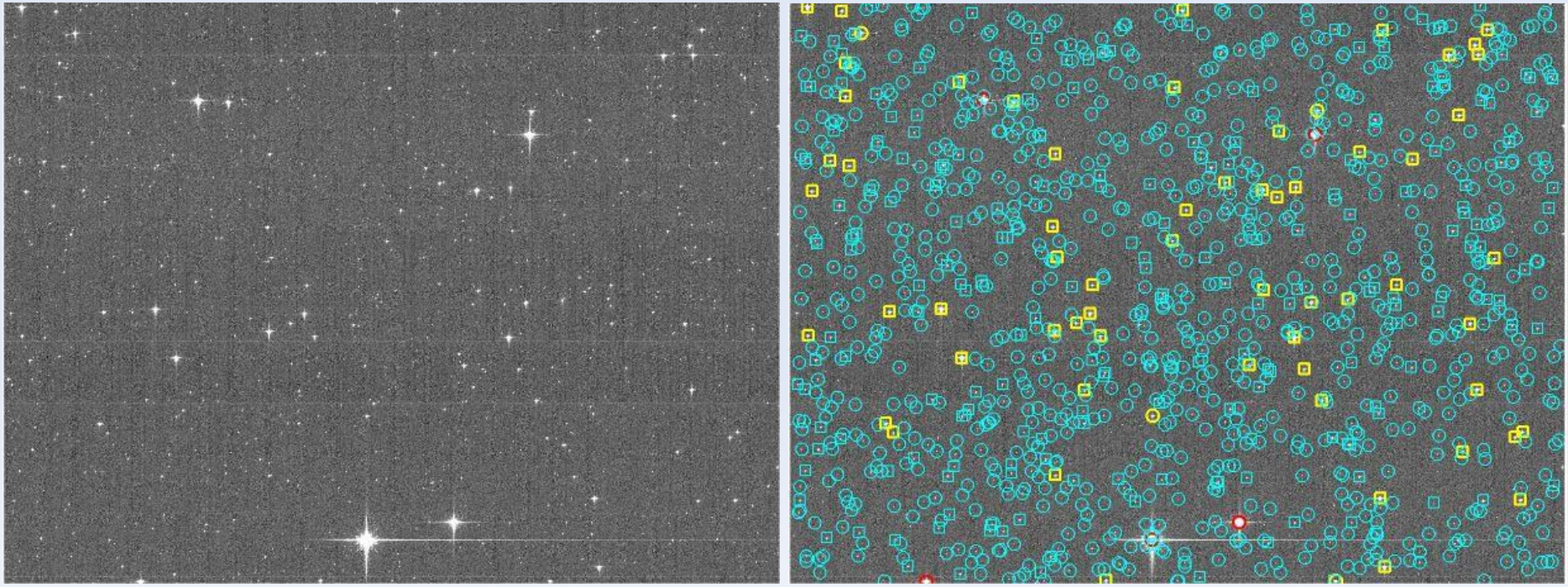
Messier 94



Cat's Eye Nebula

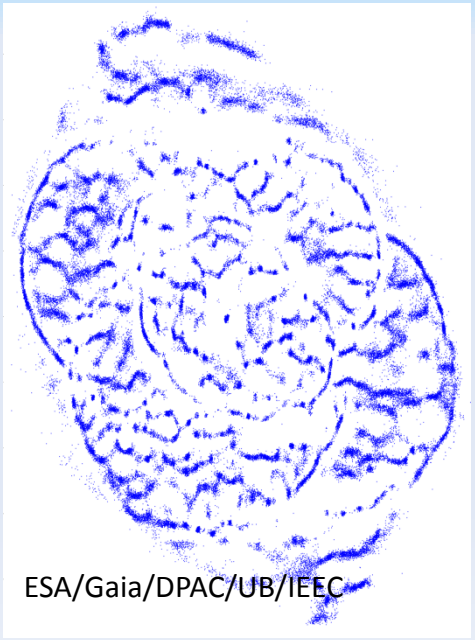
ESA/Gaia/DPAC/Airbus DS

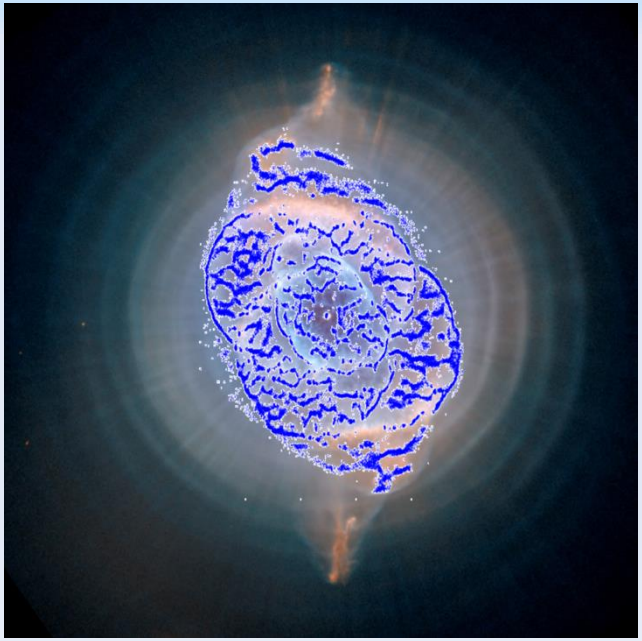
Examples of real Gaia “images”



An image of the sky as recorded by one of the sky mapper CCDs and the assignment of windows to all point-like sources detected and confirmed above a given threshold. The limiting magnitude of Gaia for this image is G = 20. Several symbols and colours encircling the sources are used for different ranges of magnitudes

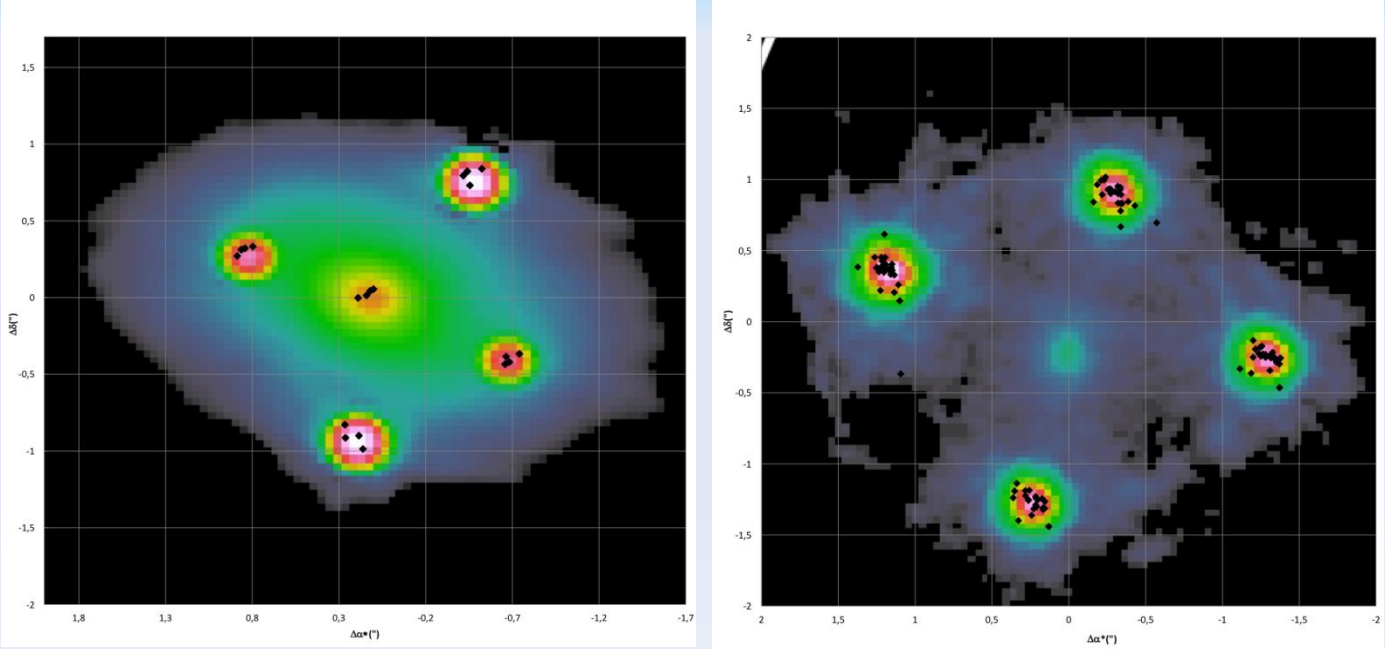
Examples of real Gaia “images”





Left: HST ACS/WFC image of the Cat's Eye nebula (integration time 1.2 h; north is up and east is left). The scale of the image is ~1 x1 arcminute. Middle: the ~84,000 Gaia detections that were made in this area from 25 July to 21 August 2014. Right: a superposition of the two images

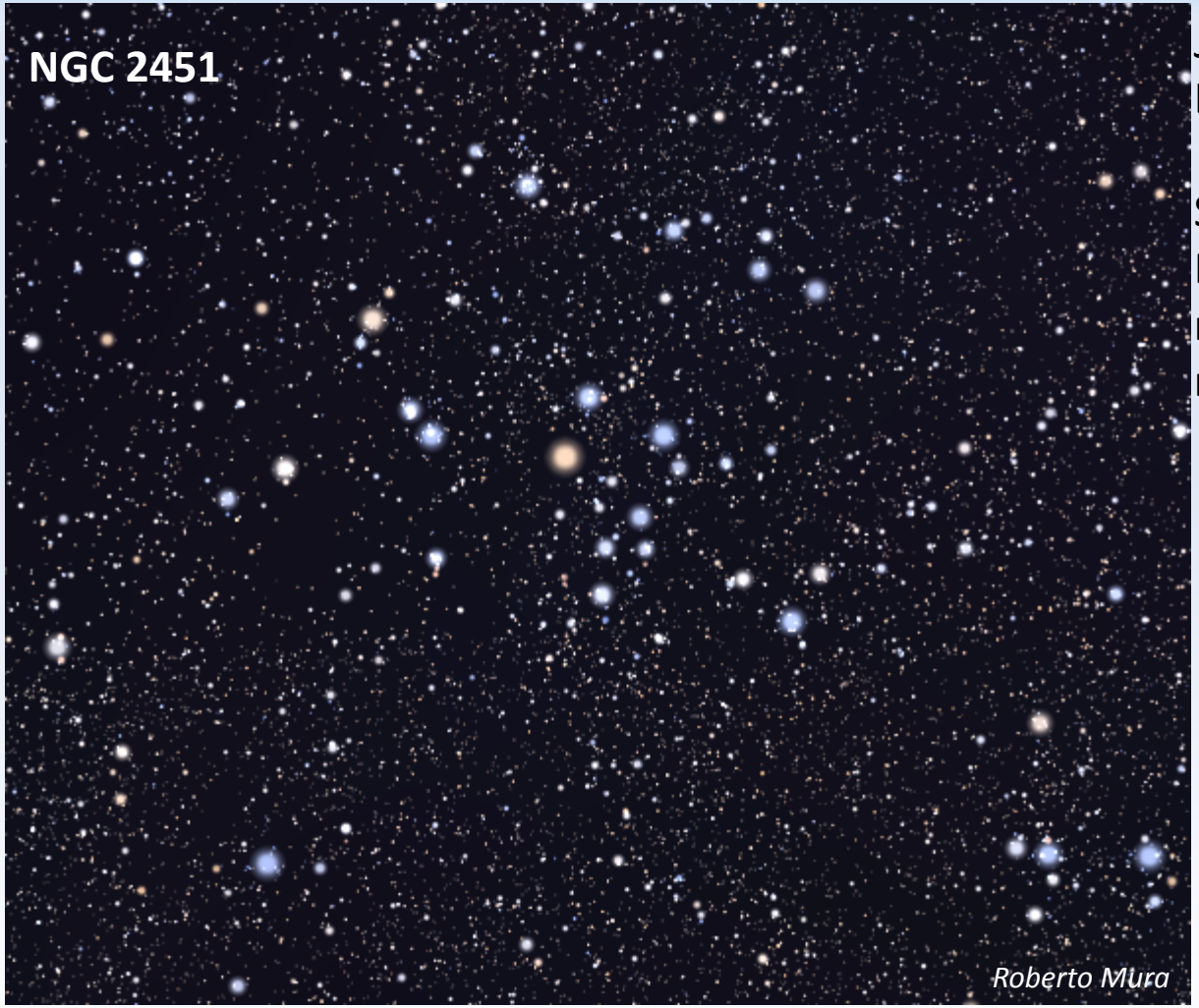
Examples of real Gaia “images”



ESA/Gaia/DPAC/Christine Ducourant, Jean-Francois Lecampion (LAB/Observatoire de Bordeaux), Alberto Krone-Martins (SIM/Universidade de Lisboa, LAB/Observatoire de Bordeaux), Laurent Galluccio, Francois Mignard (Observatoire de la Côte d'Azur, Nice)

Einstein Cross (left) and HE0435-1223 (right) with Gaia astrometric positions placed over HST images. Magnitude ranges: 17 to 19 ; astrometric accuracy of each position in this preliminary reduction is ~100 mas. It will be much improved during the global astrometric processing where spacecraft attitude will also be solved together with the source astrometry.

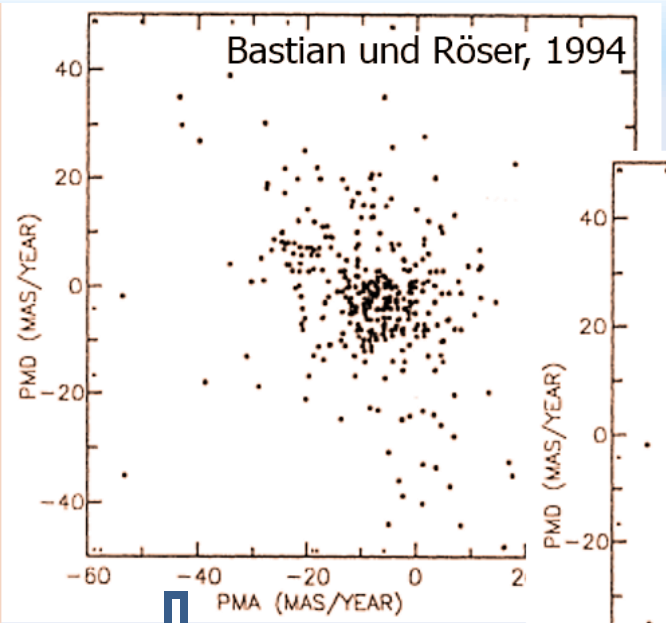
Tales of two clusters retold by Gaia



John Herschel, 1835
L. E. Dreyer , NGC2451 in 1888

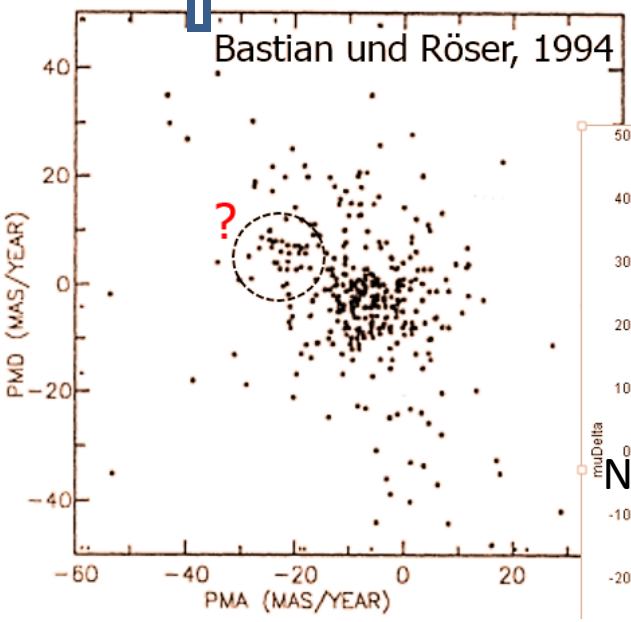
S. Röser and U. Bastian 1994
Proper Motions Catalogue (PPM)
more than 100 years of position measurements! The cluster was finally proven to be non-existent

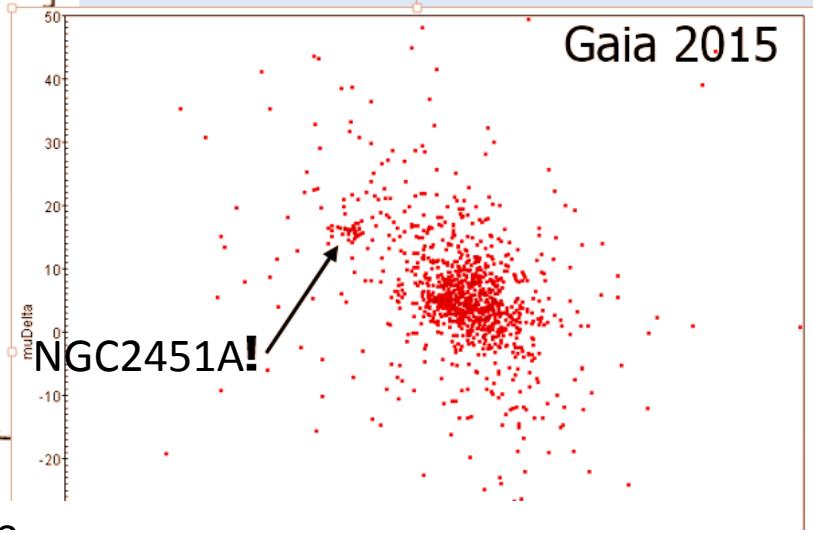
Tales of two clusters retold by Gaia



S. Röser & U. Bastian 1994
NGC2415 NON existent

A barely discernible density enhancement?





CMD
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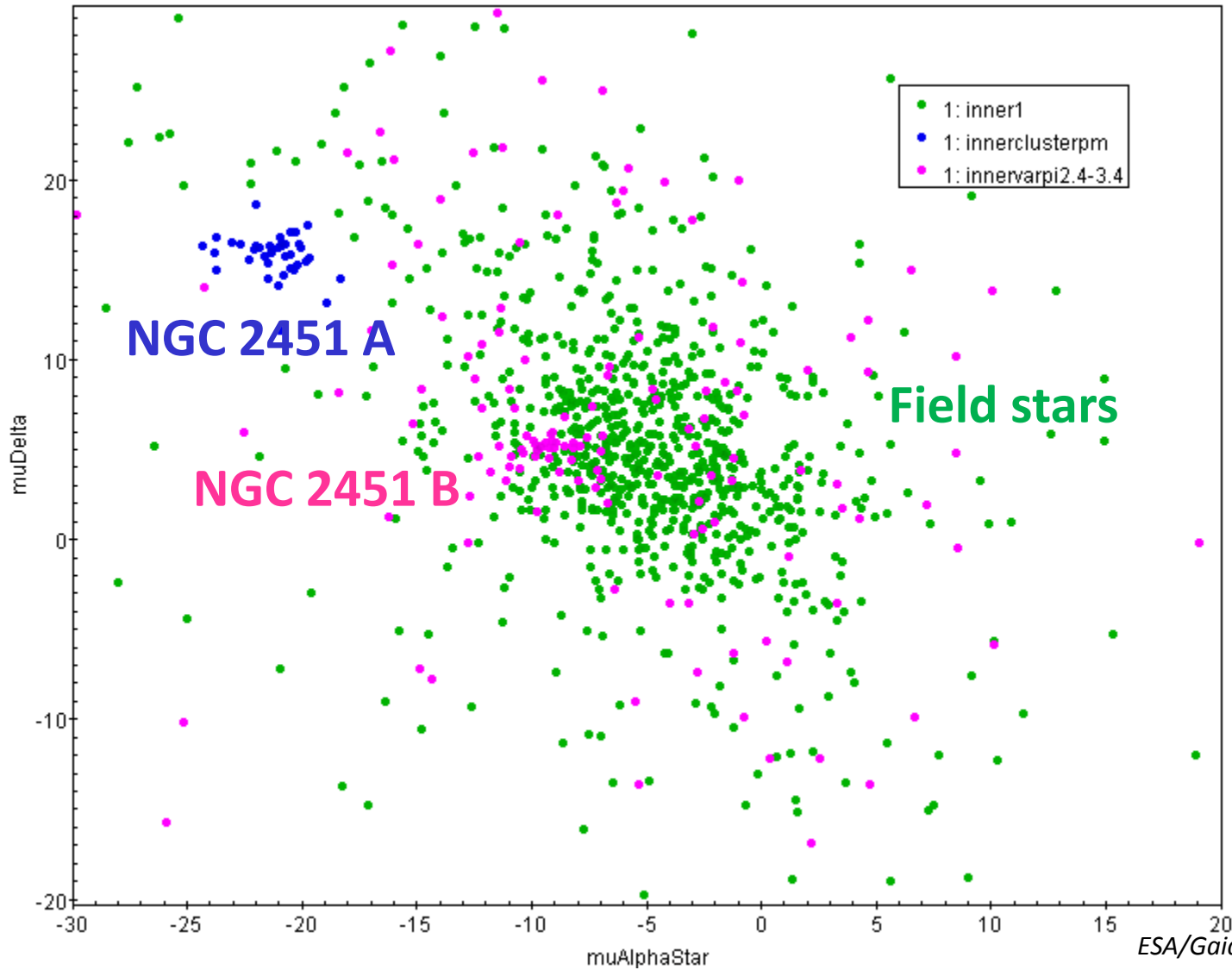
NGC

10 months of Gaia

NGC2451 nicely pop-out in the PM diagram. No need of CMD. NGC2451B still hidden…BUT Gaia distance measurements of all 1100 stars in the NGC 2451 area indicated two slight bumps at ~190 pc, and ~360 pc (in agreement with the supposed distances of the two clusters!)

ESA/Gaia/DPAC/DPCE/DPCB/CU3/U. Bastian

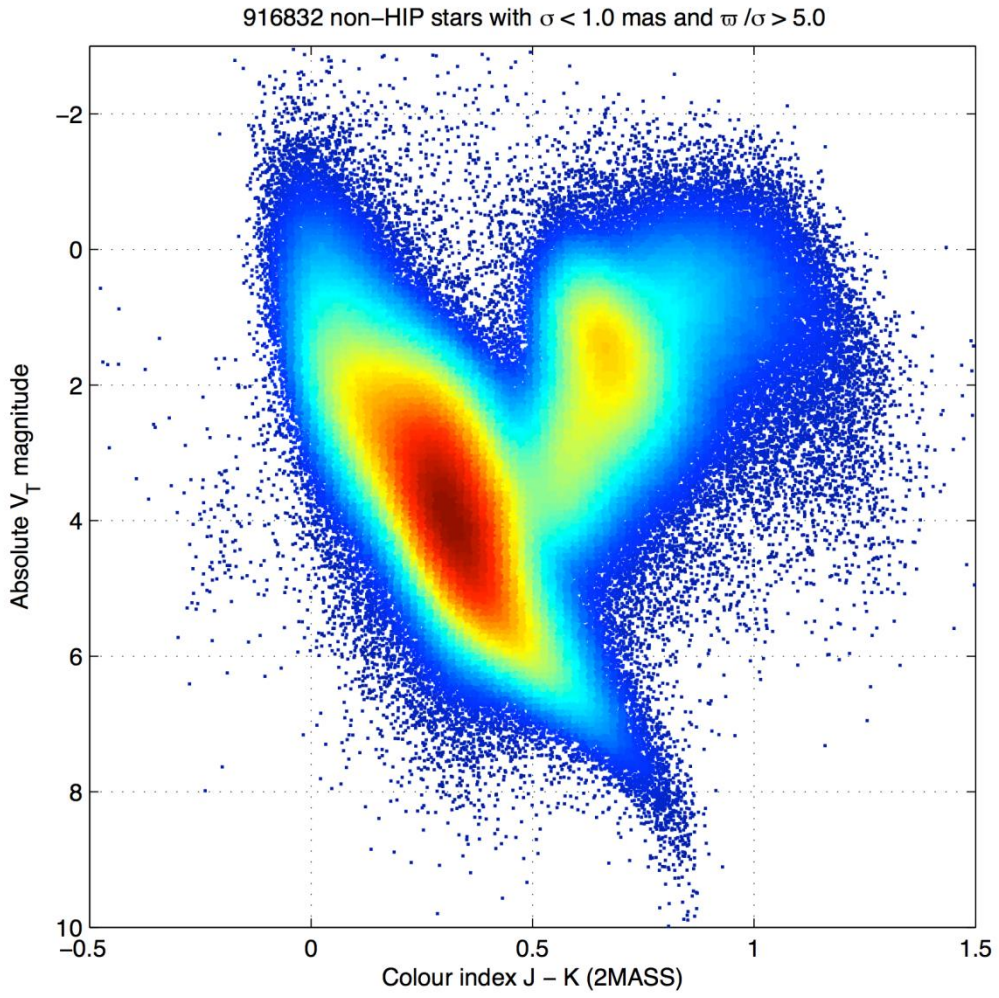
Tales of two clusters retold by Gaia



But do not trust it yet! The data shown are very preliminary. Well calibrated - while still preliminary - Gaia motions and parallaxes of 2 million stars, including the ones shown here, are still to be produced and verified over the next few months. They will not become available before summer 2016.

ESA/Gaia/DPAC/DPCE/DPCB/CU3/U. Bastian

Gaia first Hertzsprung-Russel Diagram



ESA/Gaia/DPAC/IDT/FL/DPCE/AGIS

~1 million stars observed by Gaia

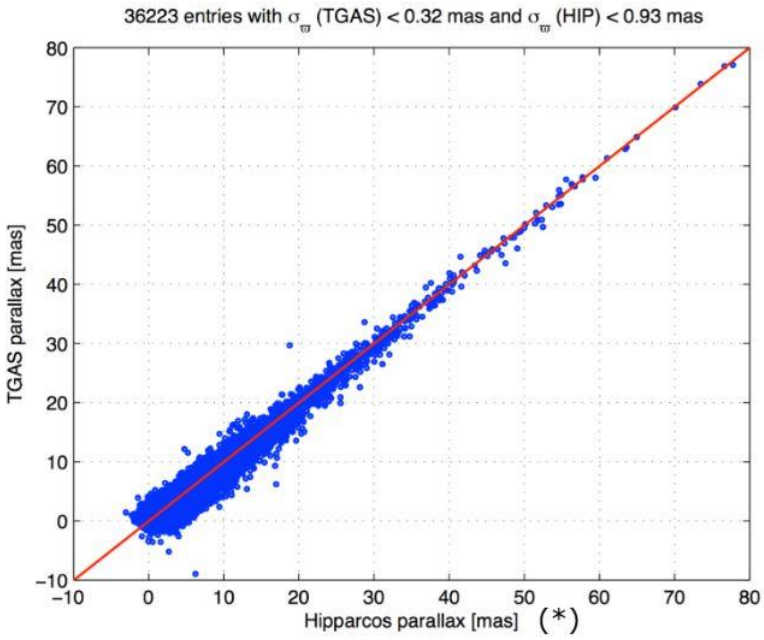
1st year of observations + earlier ground-and space-based telescopes data.

Hints of what the mission will deliver in the coming years!

Gaia first Hertzsprung-Russel Diagram

Gaia has made an average of roughly 14 measurements of each star on the sky thus far, but this is generally not enough to disentangle the parallax and proper motions. To overcome this: Gaia data combined with positions extracted from the Tycho-2 catalogue, based on data taken between 1989 and 1993 by Hipparcos.

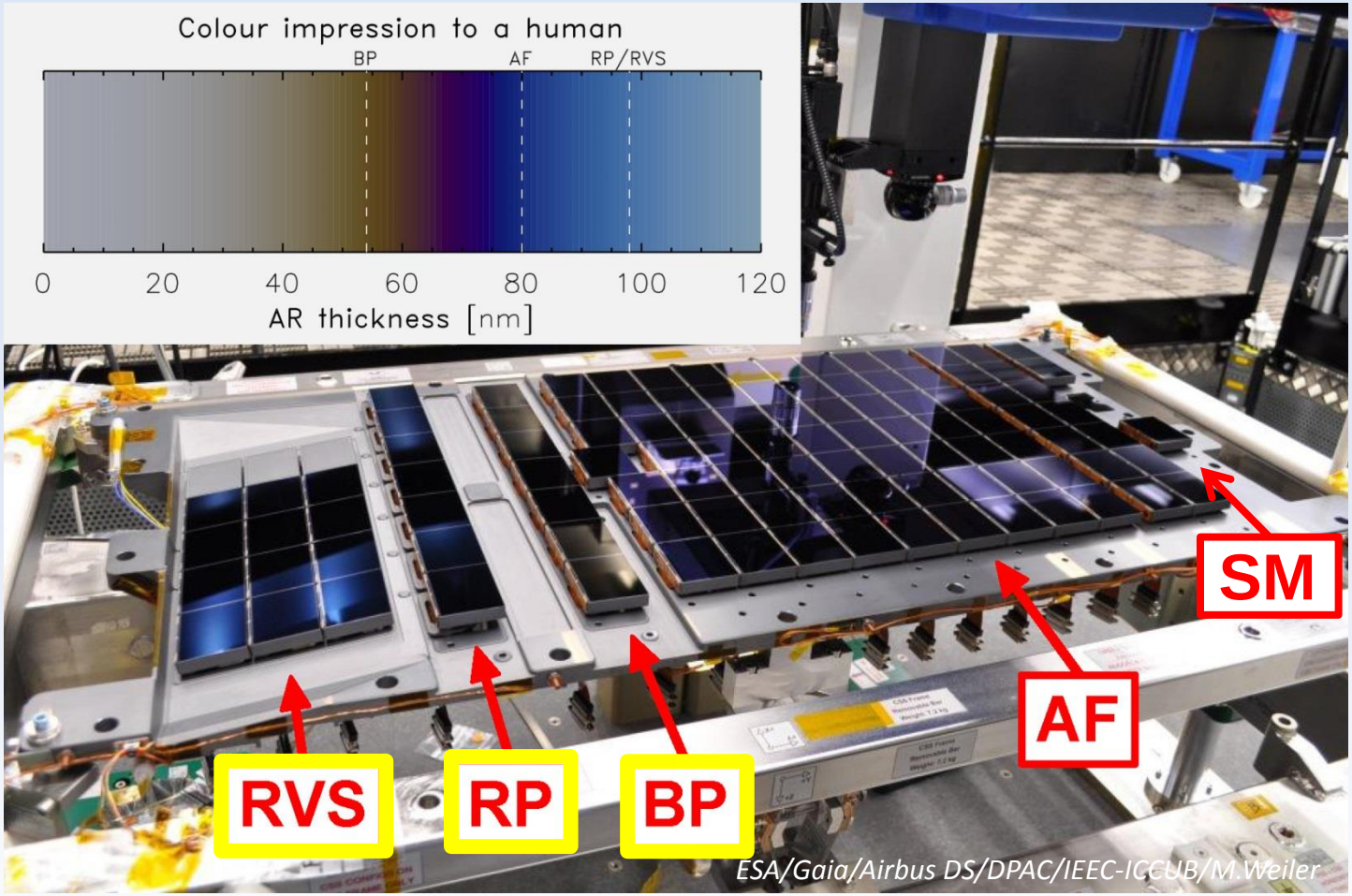
Results: ϖ_{TGAS} versus ϖ_{HIP} Credits U. Lammers



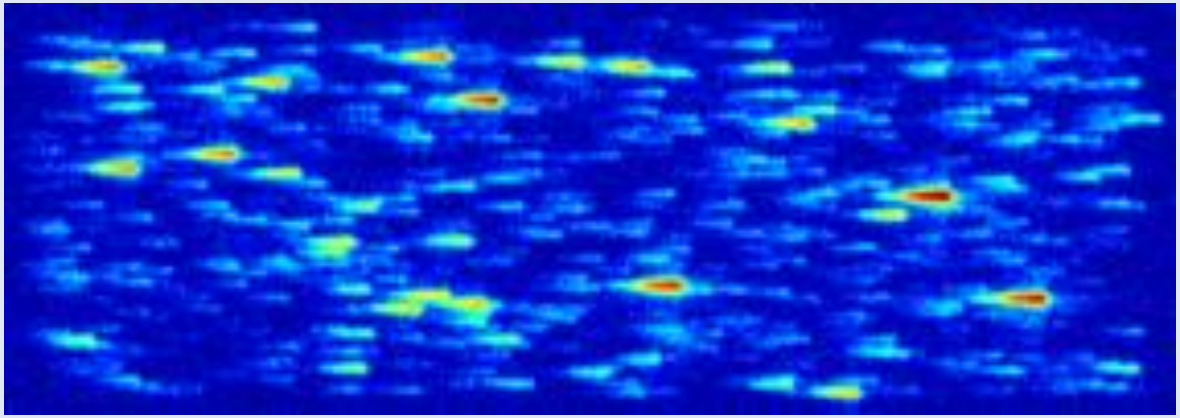
Note: TGAS parallaxes are independent of HIP parallaxes!

(*) van Leeuwen, 2007

Examples of Gaia spectroscopic capabilities

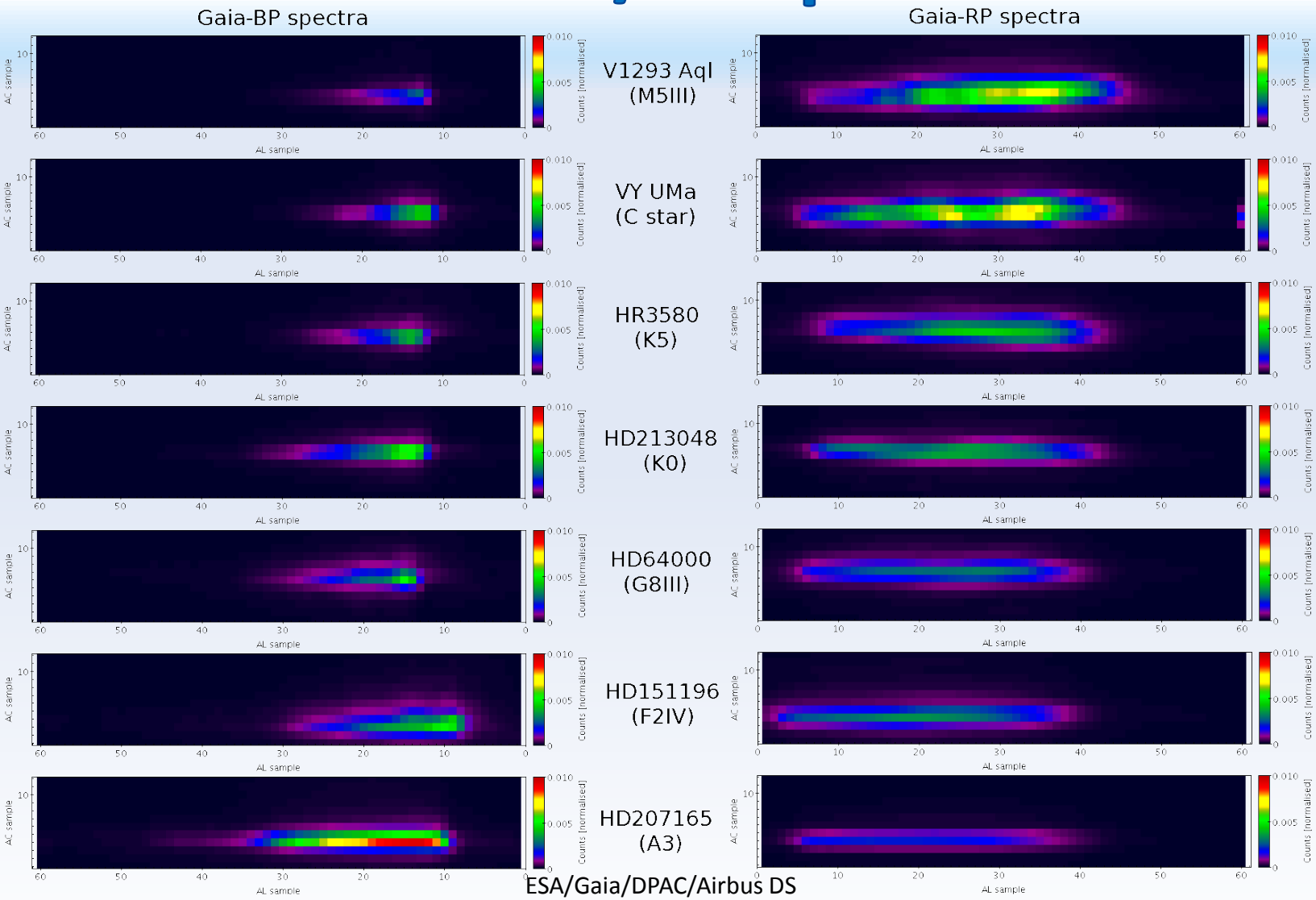


Gaia BP/RP spectra



A simulation of a crowded stellar field as observed by Gaia's photometric instruments.

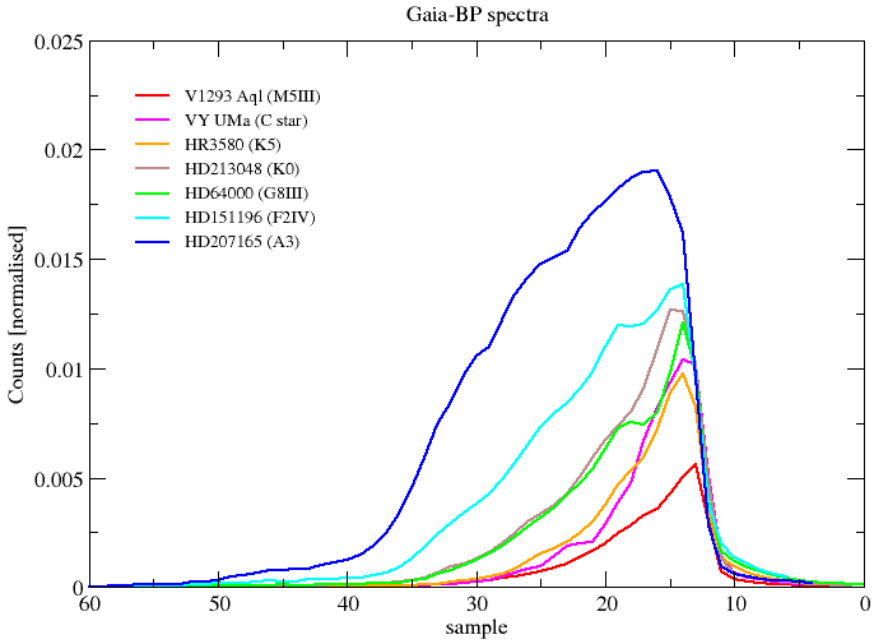
Gaia BP/RP spectra

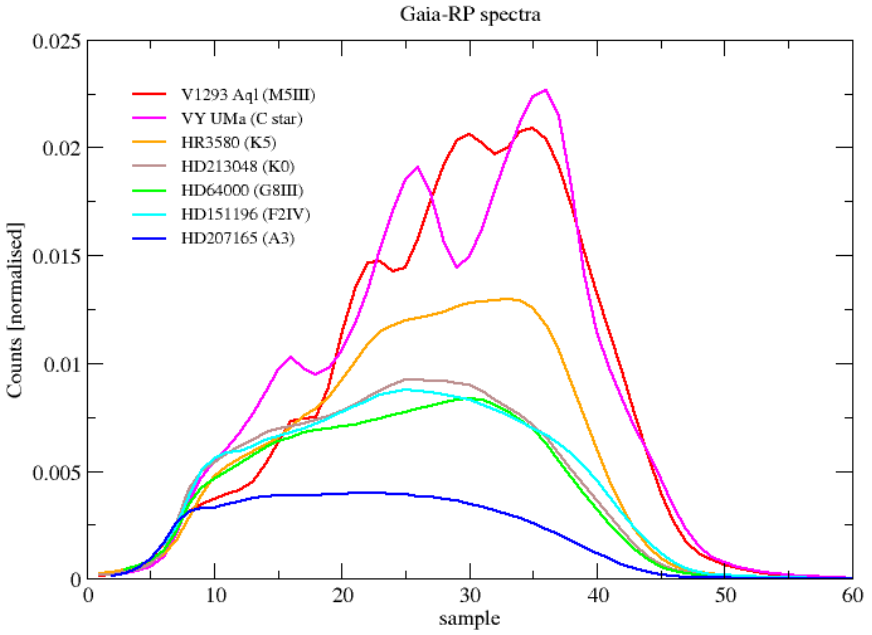


ESA/Gaia/DPAC/Airbus DS

Blue and Red Photometer 2D spectra for 7 bright cool (~3000°C) and hot (~8000°C) stars.

Gaia BP/RP spectra

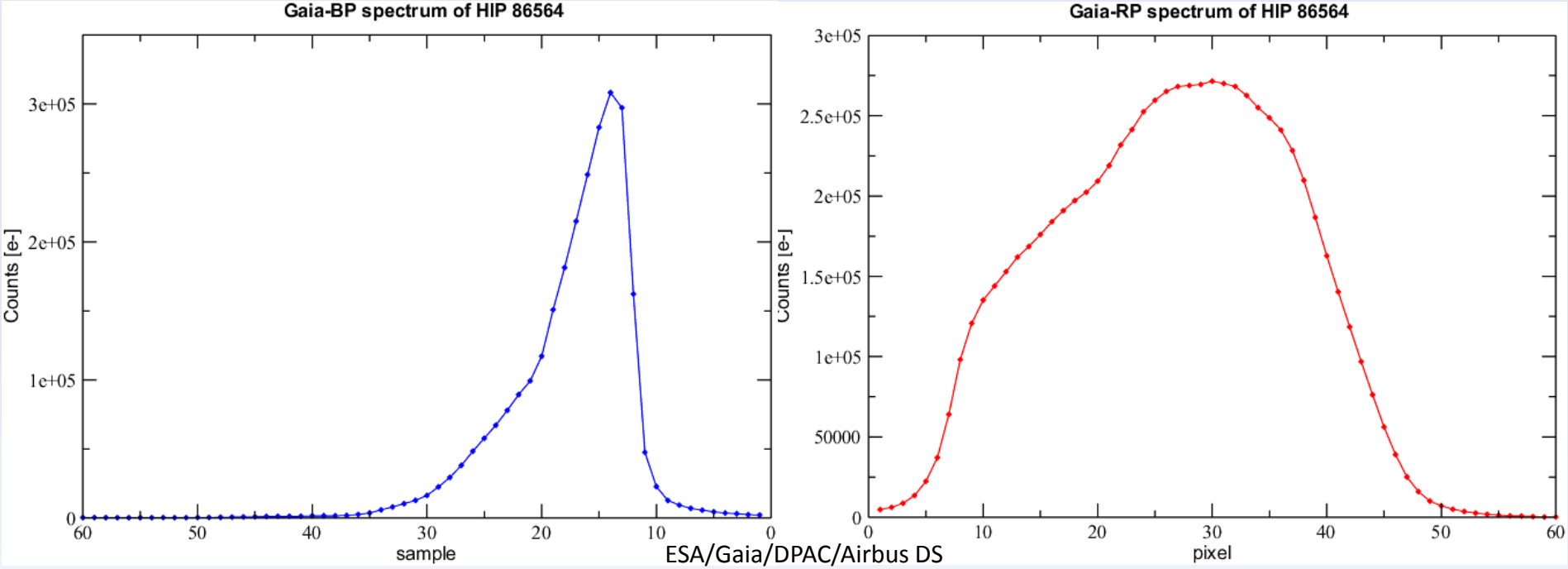




ESA/Gaia/DPAC/Airbus DS

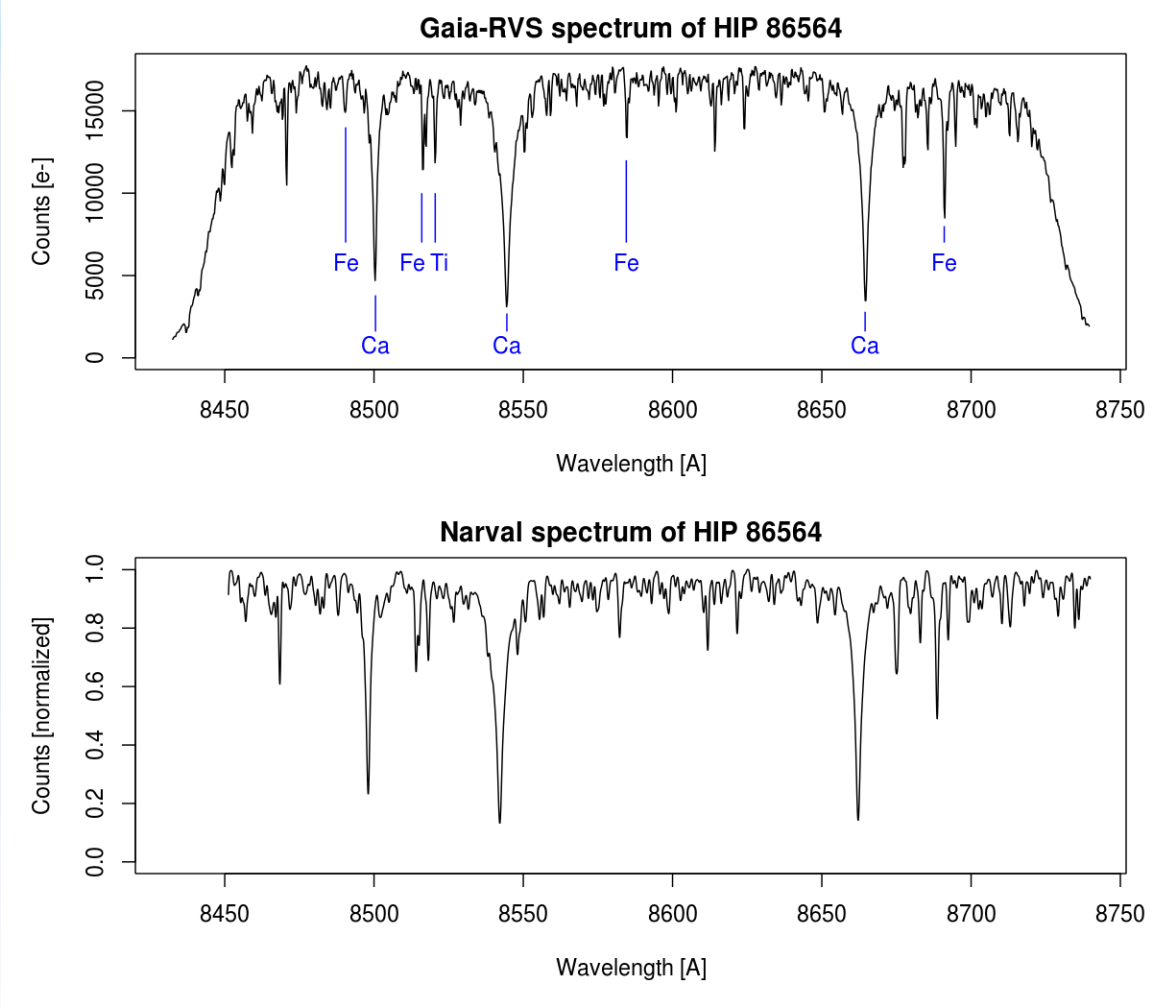
Blue and Red Photometer 1D spectra for 7 bright cool (~3000°C) and hot (~8000°C) stars.

Gaia BP/RP spectra



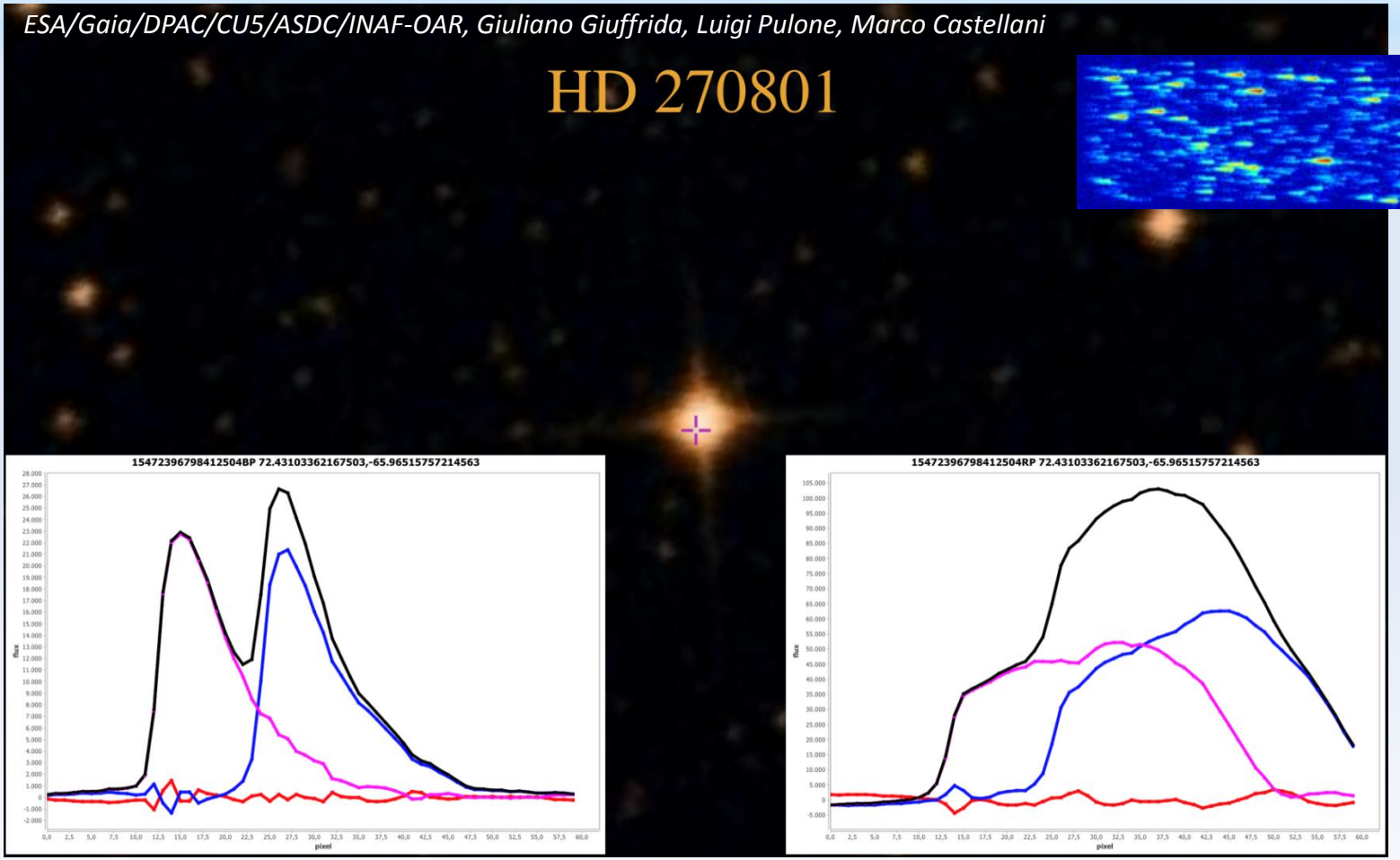
HIP 86564 (K5, V=6.6), BP and RP spectra

Gaia RVS spectra



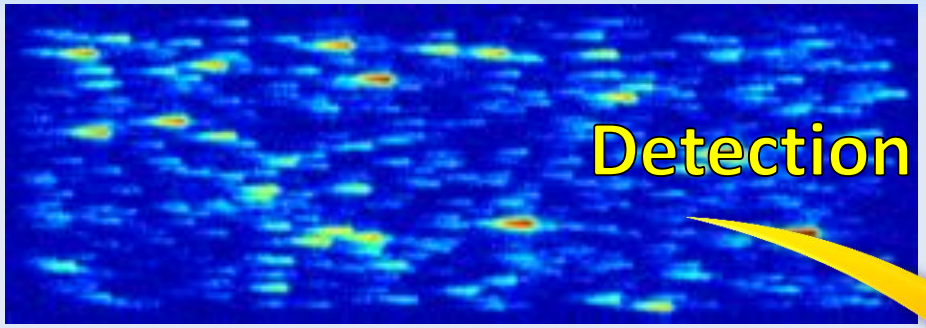
HIP 86564 (K5, V=6.6), RVS & Narval spectra R=11500

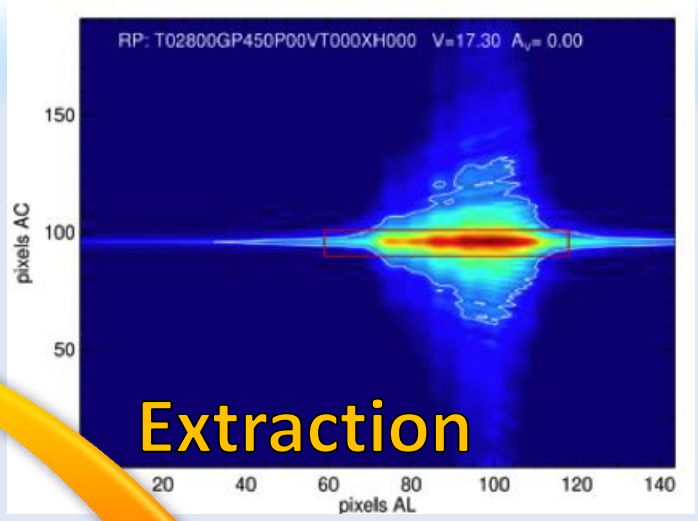
First Gaia BP/RP deblended spectra

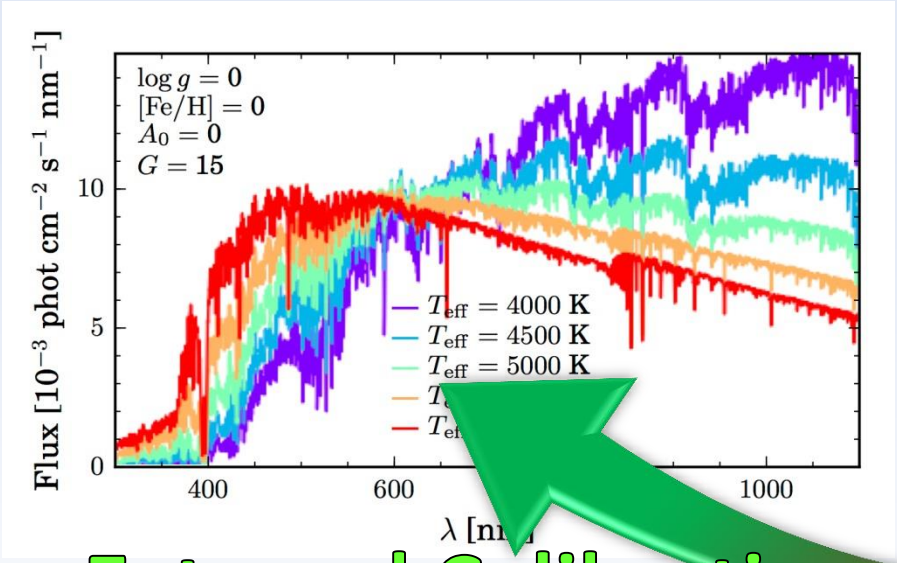


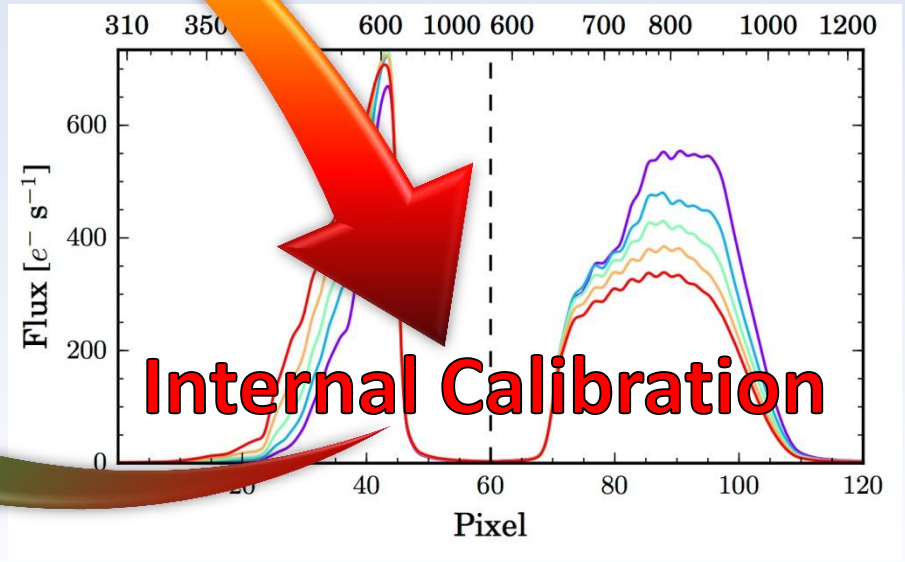
DSS coloured image of the double star HD270801. Bottom left: the observed BP spectrum in black and the two extracted spectra in magenta and blue; in red the extraction residuals. Bottom right: the same for RP

Gaia absolute calibration



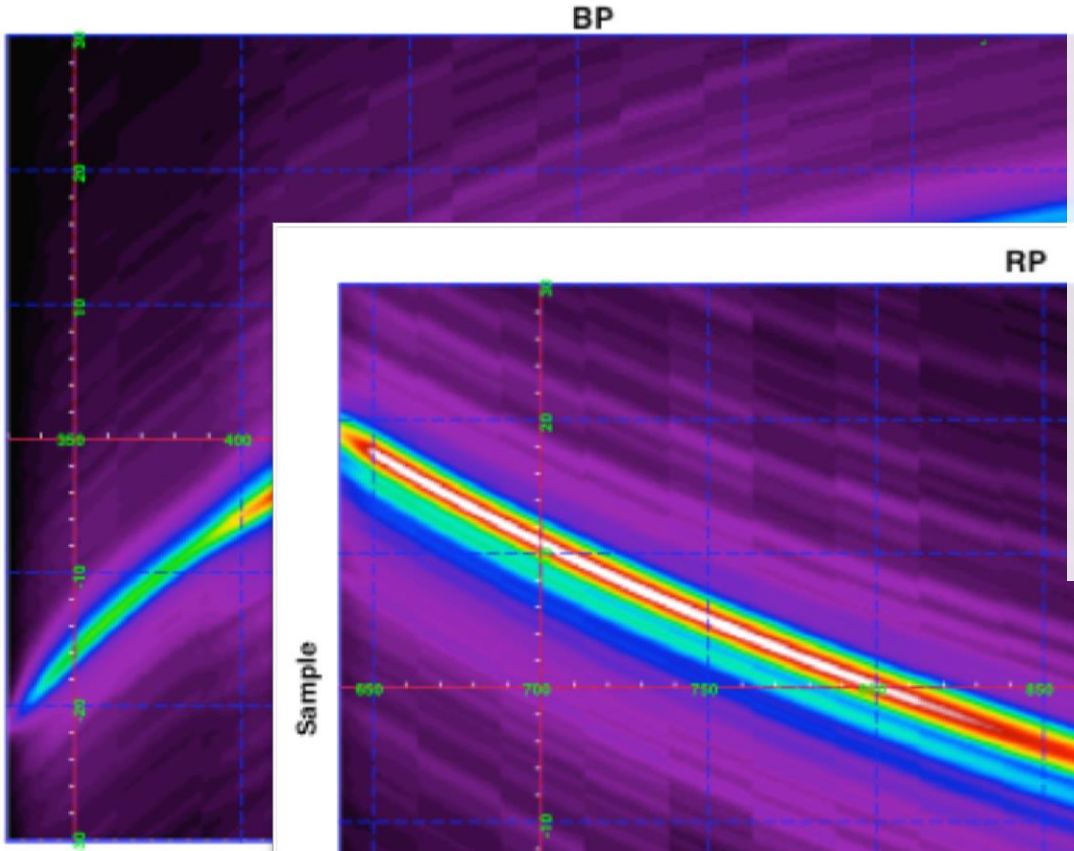




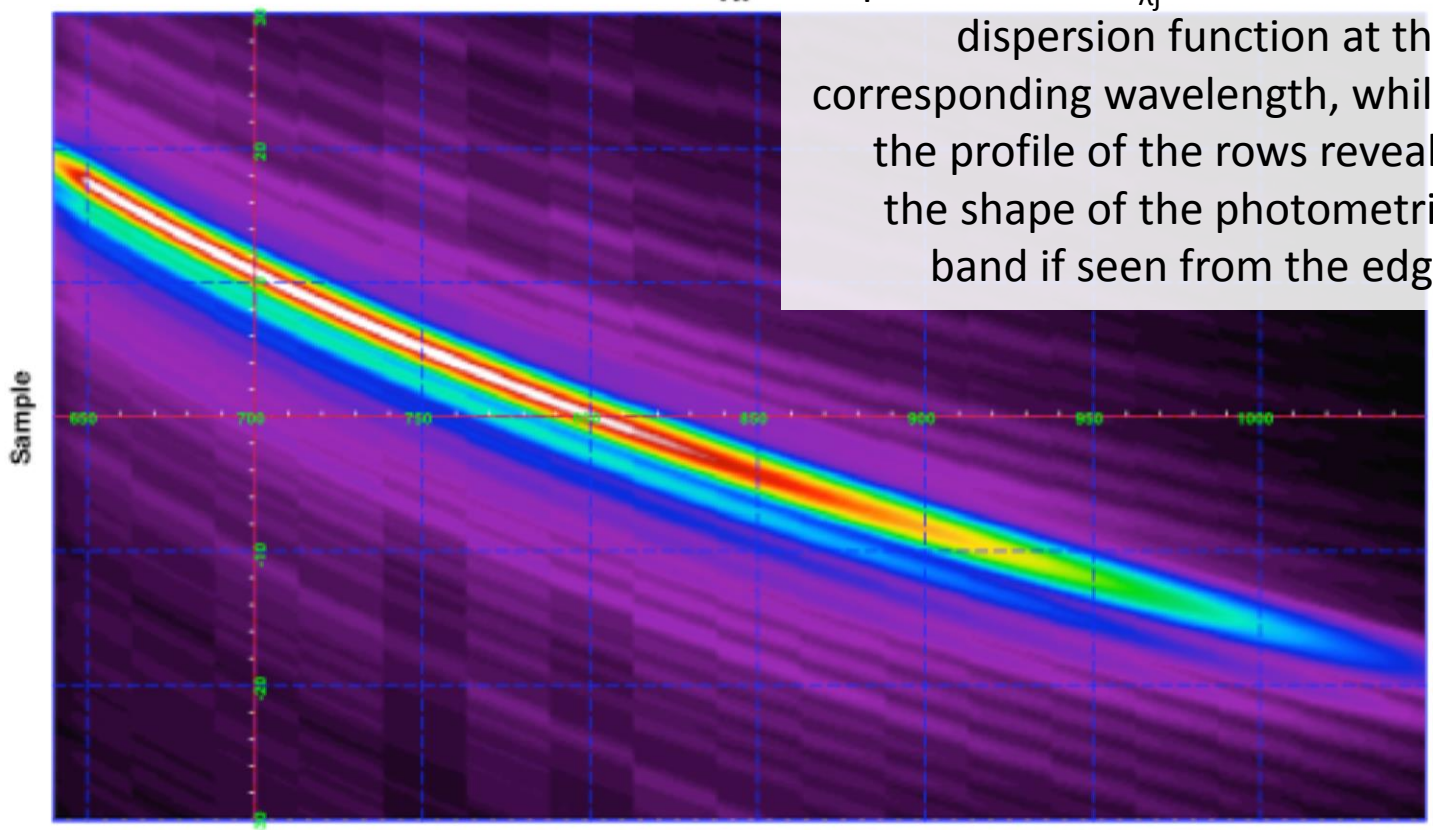


Astraatmadja, 2015, GAIA-C8-TN-MPIA-TLA-001

Gaia LSF smearing



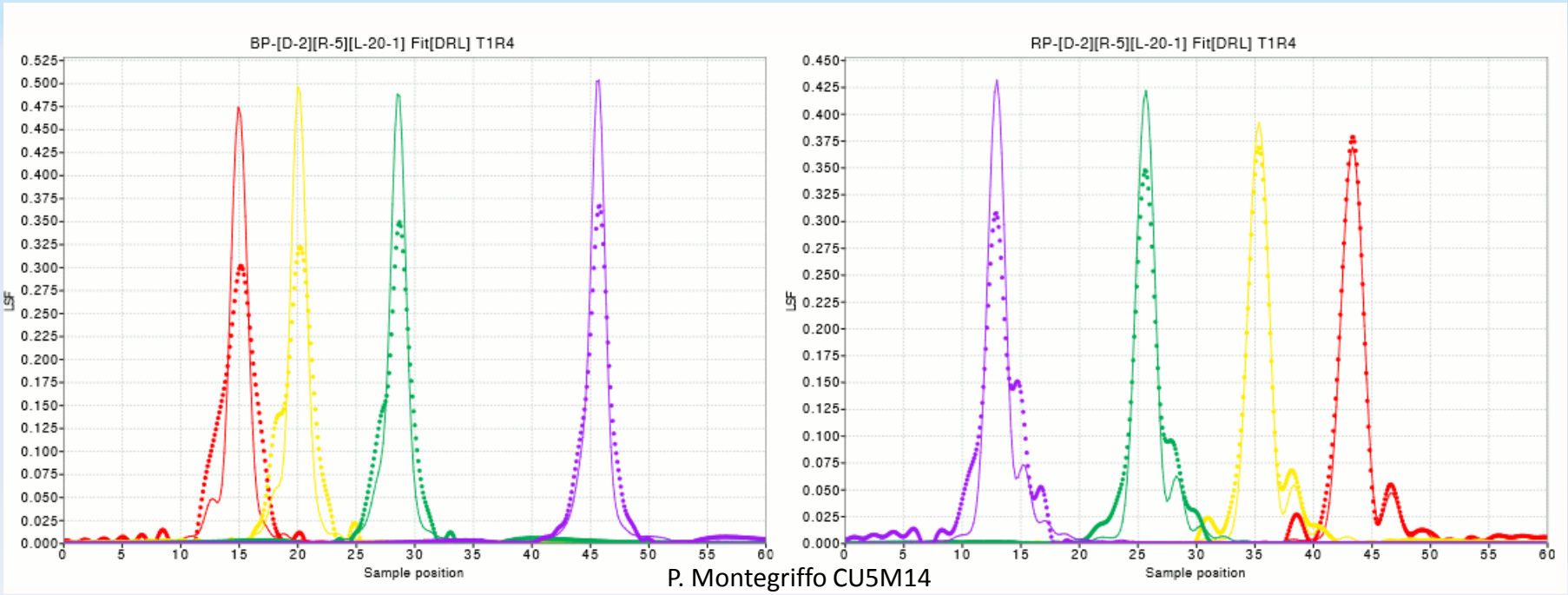
The BP dispersion ma



The RP dispersion matrix

Dispersion matrix for BP and RP instruments for FoV 1 and CCD row no 4: each column of the matrices represents a $LSF_{\lambda j}$ centred on the dispersion function at the corresponding wavelength, while the profile of the rows reveals the shape of the photometric band if seen from the edge

Gaia LSF smearing

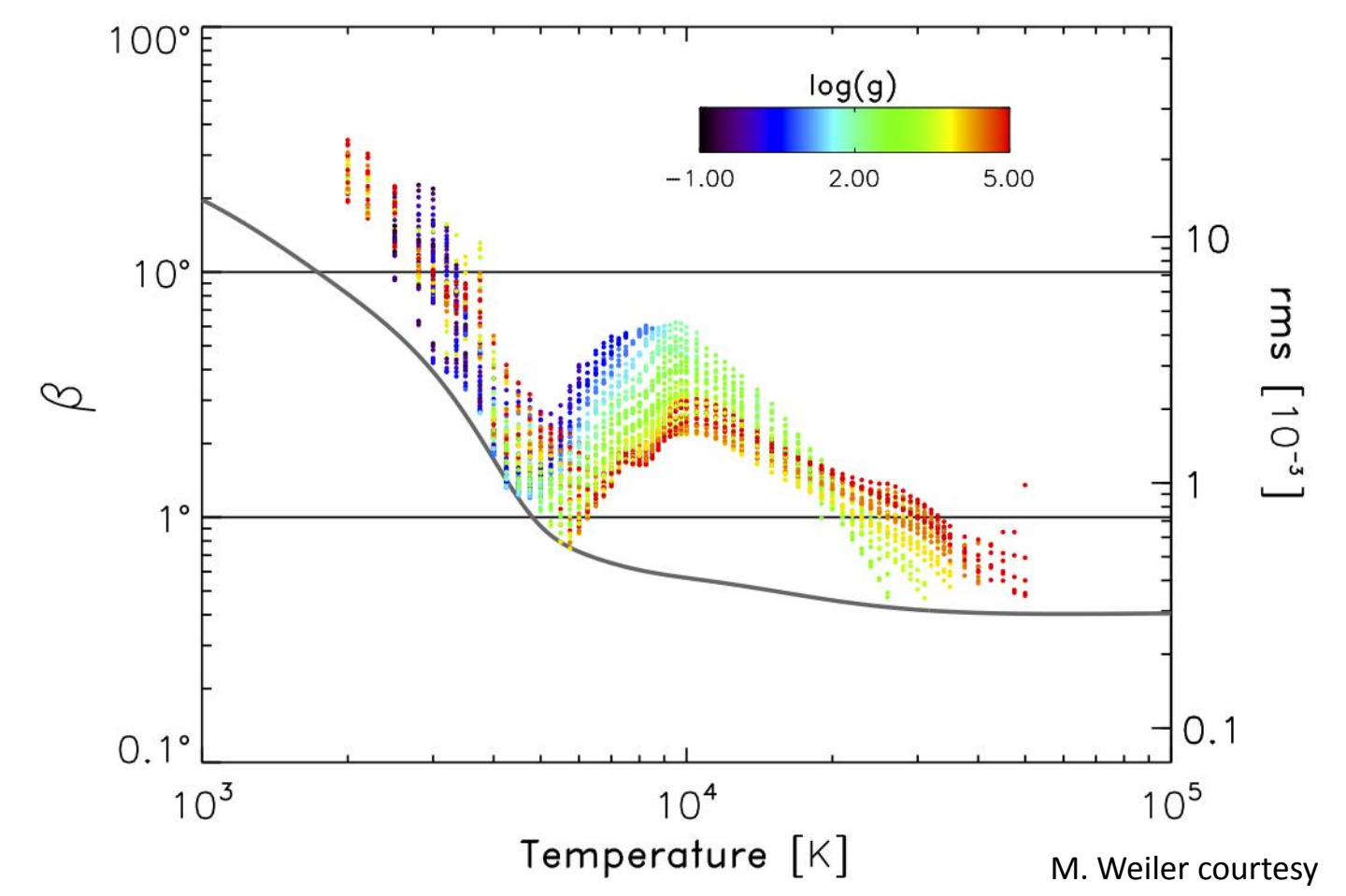


P. Montegriffo CU5M14

- 350 nm
- 450 nm
- 550 nm
- 650 nm
- 650 nm
- 750 nm
- 850 nm
- 950 nm

- line : starting model
- dots: fitted model

Gaia LSF smearing

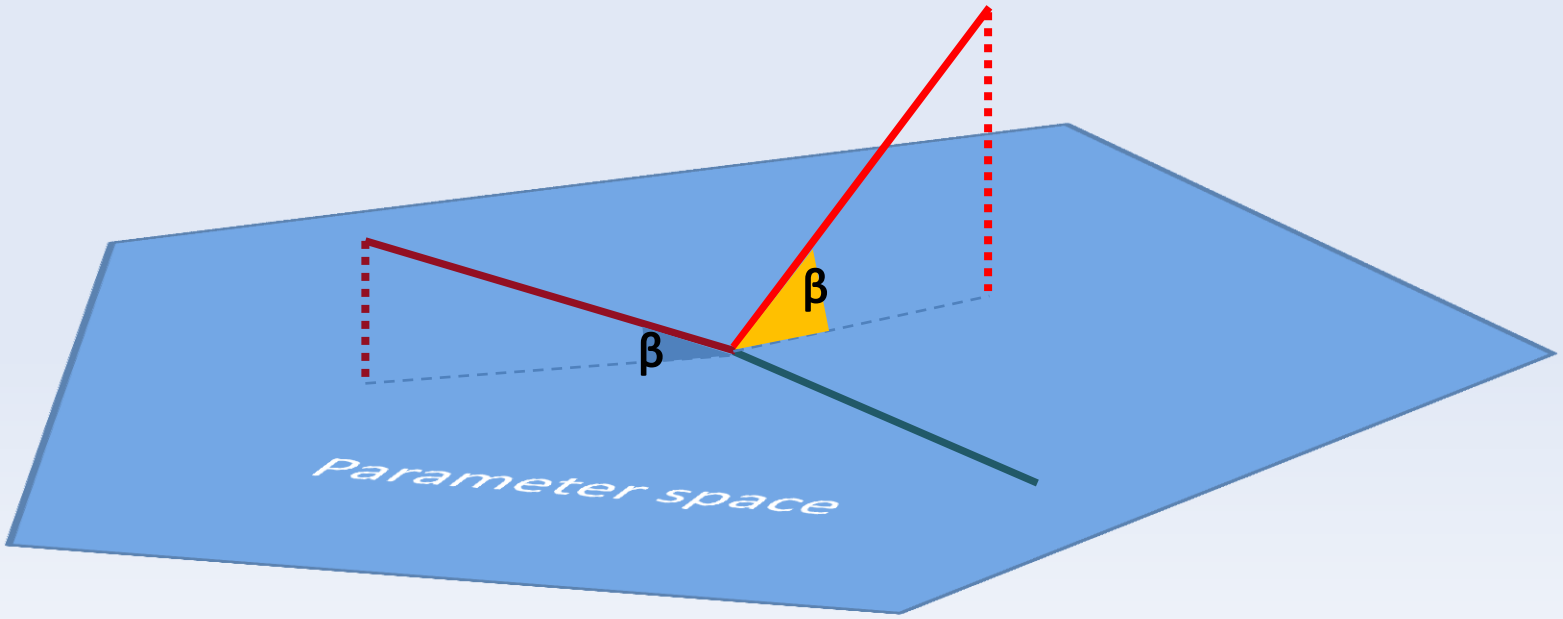


M. Weiler courtesy

94 spectrophotometric standard stars

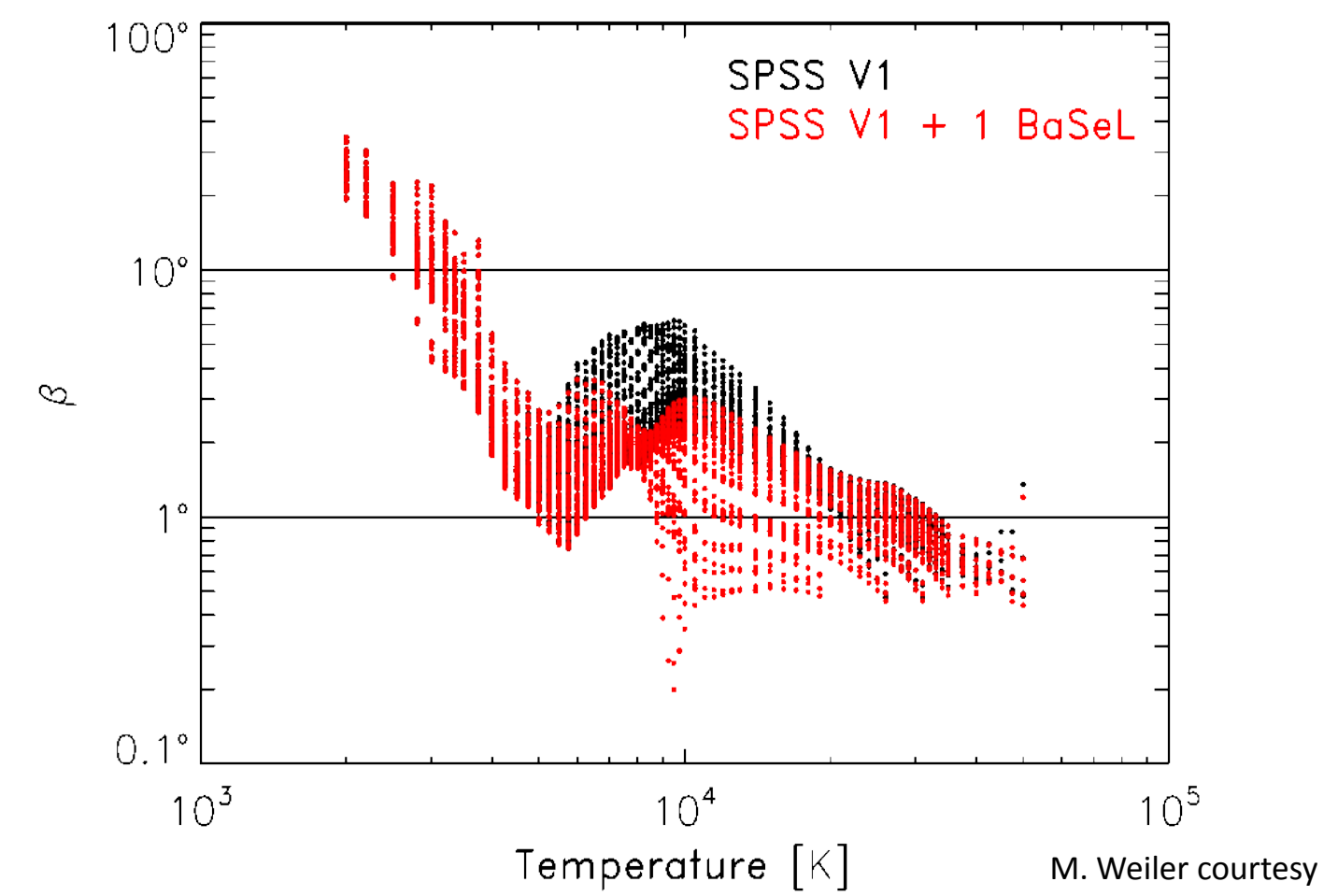
14 basis in principal component analysis to reconstruct BaSeL semi-empirical spectra

Gaia LSF smearing



The smaller is ß, the better a spectrum can be descibed with the basis functions

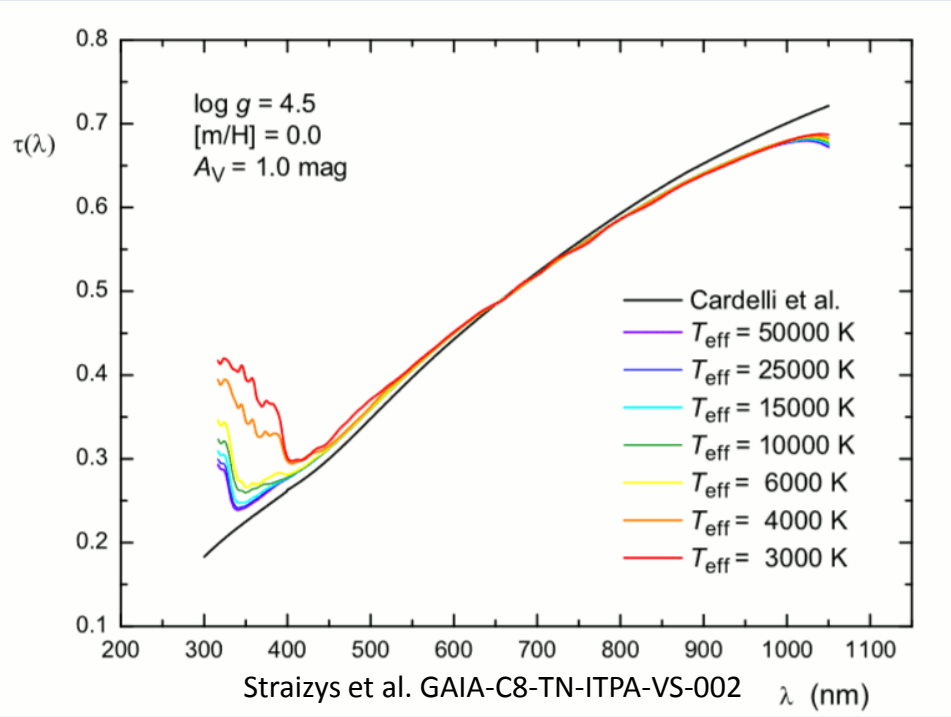
Gaia LSF smearing



M. Weiler courtesy

94 spectrophotometric standard stars + 1 ad hoc BaSel spectrum (Teff 9500, **log(g)=2.0**, z=-2)
14 basis in principal component analysis to reconstruct BaSeL semi-empirical spectra

Gaia LSF smearing



Straizys et al. GAIA-C8-TN-ITPA-VS-002

The Gaia apparent interstellar extinction laws for different effective temperatures.

Gaia absolute calibration

Same principle as for classical spectrophotometry
but
much more complicated instrument model

~100-200 calibrators needed to model instrument response
mmag internal accuracy, a few % external accuracy

The Bologna Gaia Group

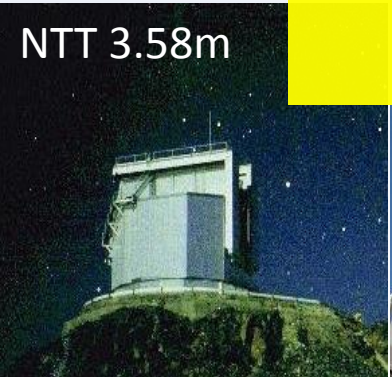
CU5 - photometric processing

- **DU13:** Provide a grid of suitable Spectro-Photometric Standard Stars (SPSS) for the absolute spectro-photometric calibration of the Gaia G-band and low resolution (BP/RP) spectrophotometry
- **DU14:** provide an absolute calibration model

CU7 - variability processing

The Bologna Gaia Group

- **A large observational effort to collect the required data started in 2006 and was completed in 2015**
- **Almost 5000 hours (the equivalent of 500 nights)**
- **Spread in >900 different nights in 66 observing runs from 2006 to 2015**
- **Using 6(+1) different telescopes and instruments**
- **Comparable to one of the large modern surveys (GES)**



The Bologna Gaia Group

DU13 Summary of last year:

- Two milestones reached:
  - End of observations
  - V0, V1 flux tables release
- Other major progress
  - Pre-reductions and ASDC archiving
  - Relative and absolute photometry
  - Advanced spectroscopy reductions

Pre-reductions

Data product	Imaging	Spectroscopy
2D pre-reduced	~71%	~67%

ASDC Archiving

Data Product	Status	Frames
Raw frames	~95 %	101010 (232GB)
Calib. Masters	~65 %	3073
2D Pre-reduced	~71 %	50272
1D extracted spectra	~67 %	5855
Photo catalogues	started	22648
Light-curves	started	146
Fringing corrected spectra	started	2462
Light loss corrected spectra	just started	7

Menu: user altavilla

asdc ASI Science Data Center

GAIA.SPSS ARCHIVE

Data Management Back to home page

Session	Data Browsing	Data Metadata Editing
Logout	SPSS Reference	File Upload
Change Password, e-mail	Browse by Night	
	Raw Data...	
	Masterframe...	
	2DPreRed...	
	Extracted Spectra...	
	Fringing Corrected Spectra...	
	Slit Loss Corrected Spectra...	
	Photometric Catalogues...	
	Short-Term Light Curves...	

Output Columns Choice

Click to select the columns to show

▸ Search by: Source

▾ Search by: Program and Scheduling

Night: = Observation Date – Observation Date

Run Type: IN (P, V, M)

Run ID: =

Sky Condition: IN (Clear, Cloudy, Veiled, Varying)

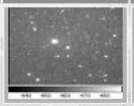
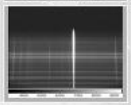
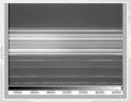
Instrument: IN (BFOSC@Cassini, CAFOS@CAHA2.2, DoLoRes@TNG, EFOSC2@NTT)

CCD: IN (EEV1300x1340OLD, EEV1300x1340NEW, SITE1d_15, E2V4240)

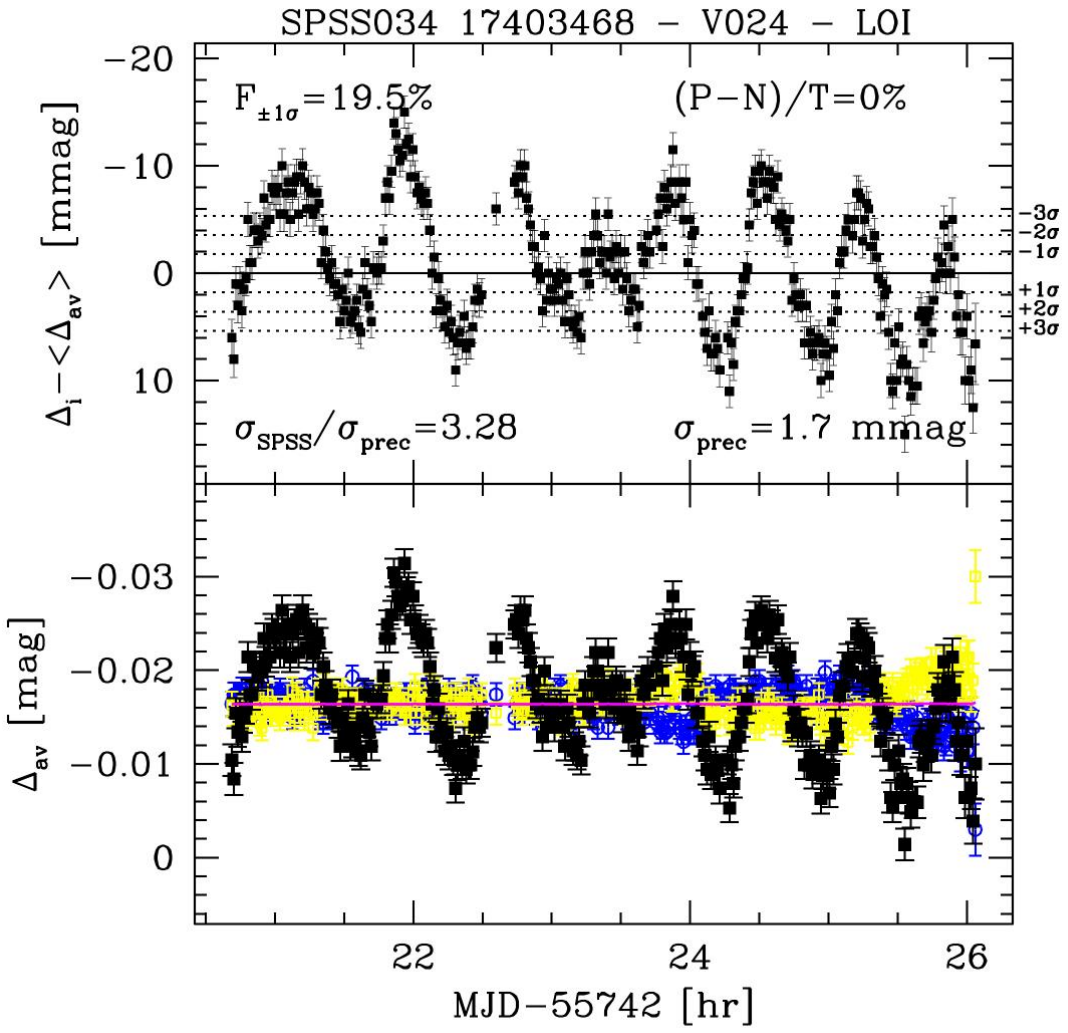
▸ Search by: Observing Information

▸ Search by: Setup Information

Reset OK

			G_TEL	G_INST	G_RUNTYP	G_RUNID	G_NIGHT	G_SKY	G_ID	FILE_THUMB	G_TYPE	G_RAhms	G_DECdms	G_DATE	G_UT	G_HJD	G_EXPT	G_EFFAM	G_SEEING
1	☐	File Download	CAHA2.2	CAFOS	M	001	2007-10-31	Clear	1		Pillar	05:06:10.31	+52:48:31.46	2007-10-31	22:04:25	2454405.42345234	10	1.511271	1.54
2	☐	File Download	CAHA2.2	CAFOS	M	001	2007-10-31	Clear	1		Pillar	05:06:06.69	+52:48:42.52	2007-10-31	22:18:33	2454405.43668268	600	1.432132	1.54
3	☐	File Download	CAHA2.2	CAFOS	M	001	2007-10-31	Clear	1		WaveLamp	05:08:47.64	+52:47:58.49	2007-10-31	22:33:58	2454405.44390024	1.5	1.403048	

Relative photometry



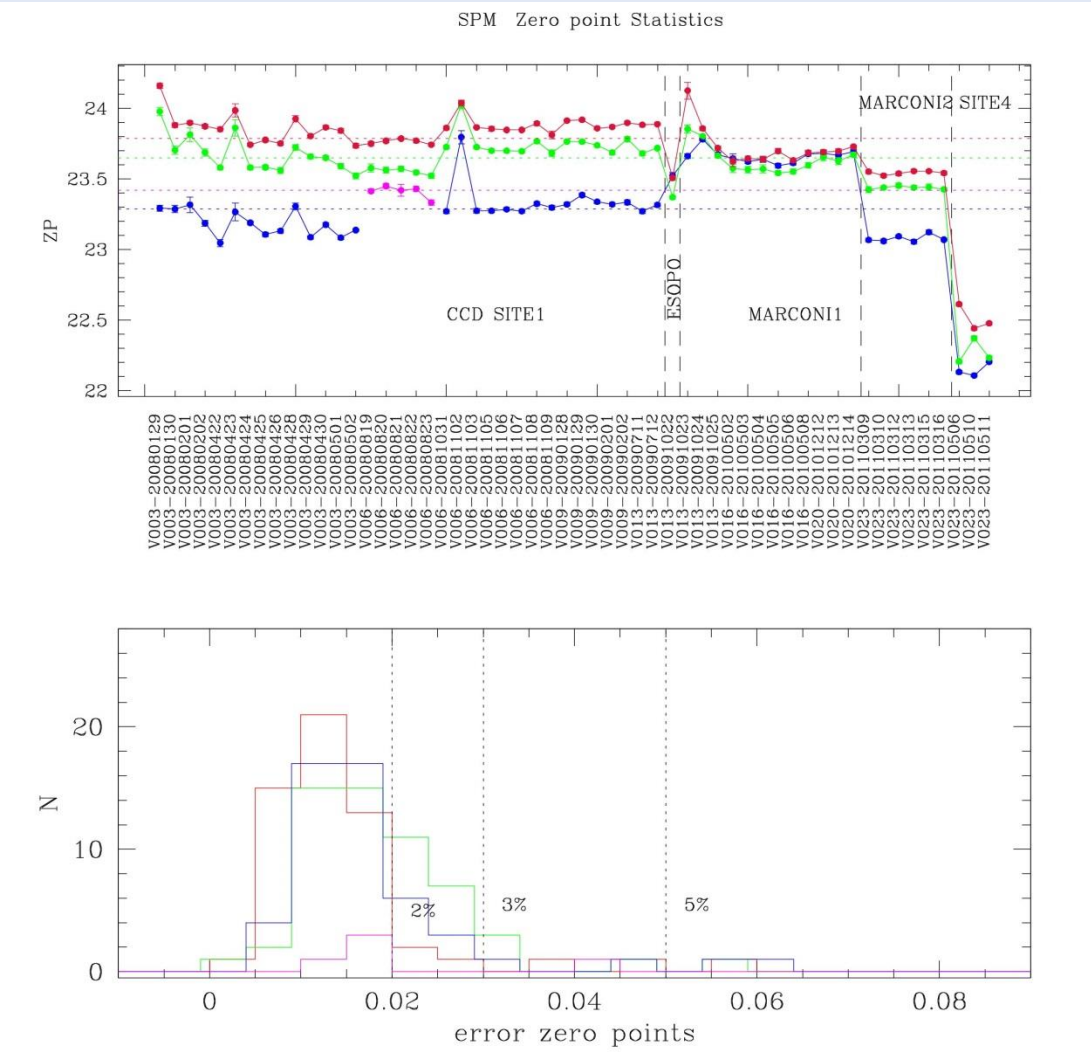
Constancy assessment:

- Short-term (1-2 h series)
- 173 SPSS monitored
- Found 8 variables

Major progress last year:

- A few SPSS pending!
- >1 good curve per SPSS (a dozen exceptions)
- Paper and Technical Note in preparation (S. Marinoni et al)

Absolute photometry



ZP calibration of (grey) spectra:

- Synthetic photometry

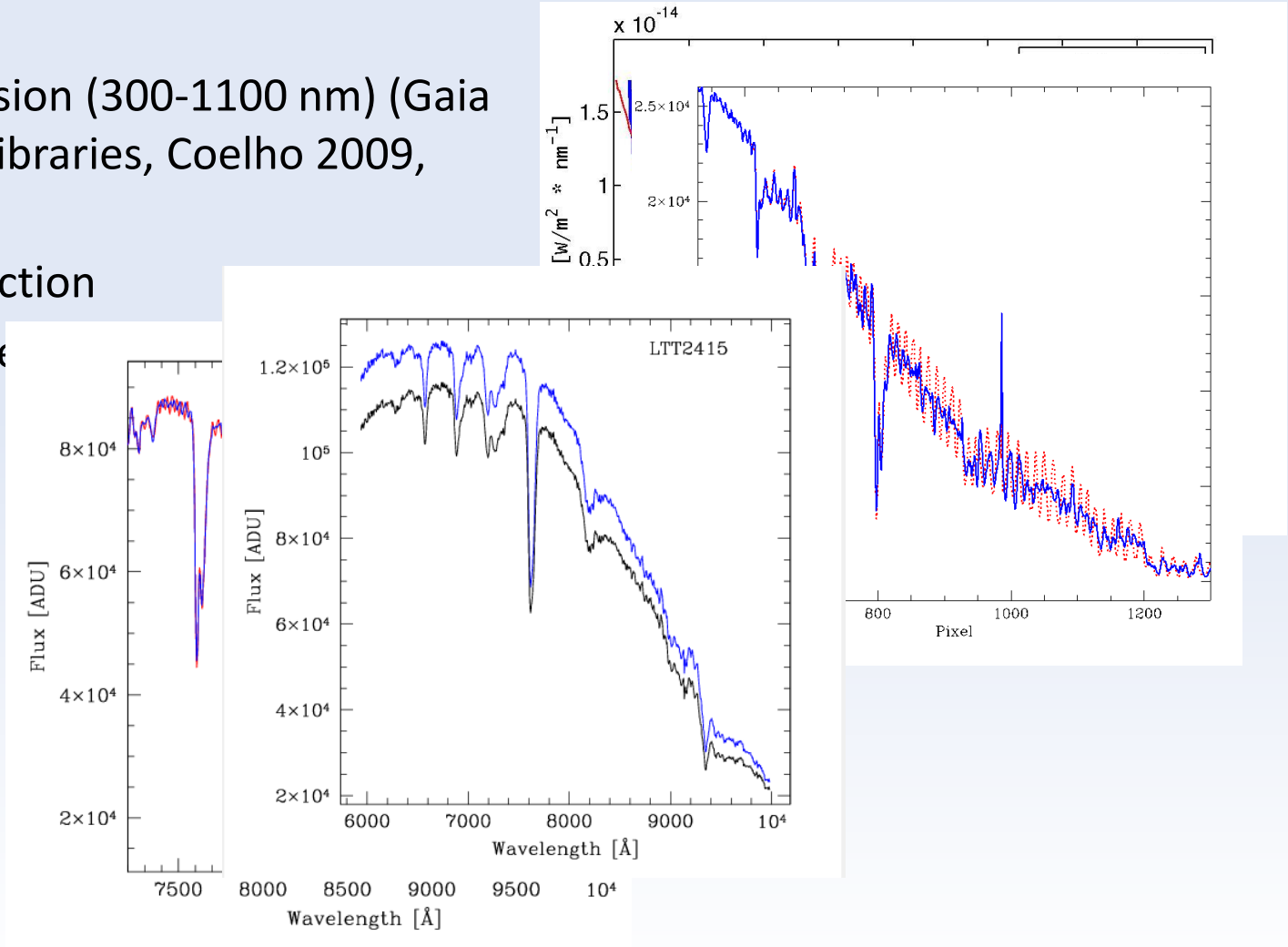
Major progress last year:

- Night solutions
  - 32 good nights
  - 27 usable nights
  - 36 non-photometric
- Instrumental magnitudes
- First pass calibration

Now comparing internally and with literature

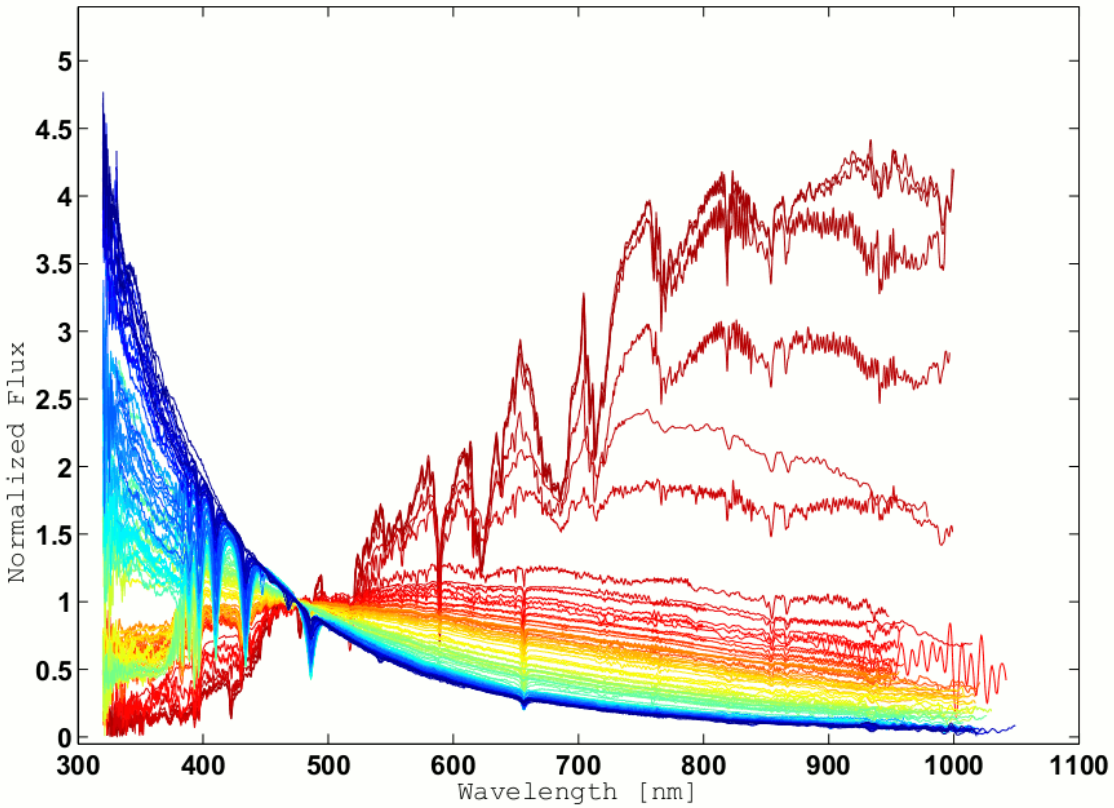
Advanced spectroscopy reductions

- Models extension (300-1100 nm) (Gaia CU8 spectral libraries, Coelho 2009, Calspec)
- Fringing correction
- Light loss corre



V0 release

The pre-launch (internal) release, October 2013



94 SPSS

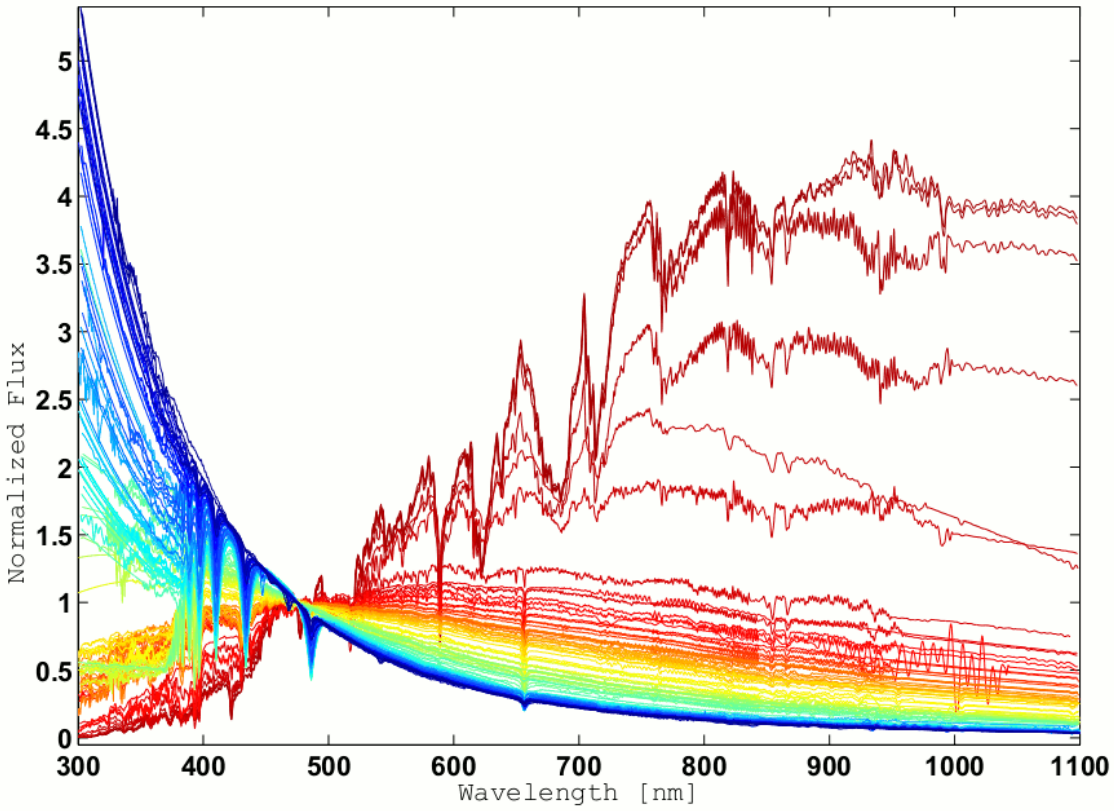
Goal:

- testing pipelines
- No fringing correction
- No narrow-slit spectra
- Cut borders (blue and red)
- Already exceeding DPAC requirements

Major problem :
Missing borders induce calibration errors > 0.1mag

V1 release

The V1 release, July 2015



94 V0 SPSS

- Extended with theoretical or empirical template spectra (CALSPEC, Gaia spectral libraries, Public libraries)
- No new observational data
- Can calibrate 1st Gaia release
  Only G and only ZP

V2 release

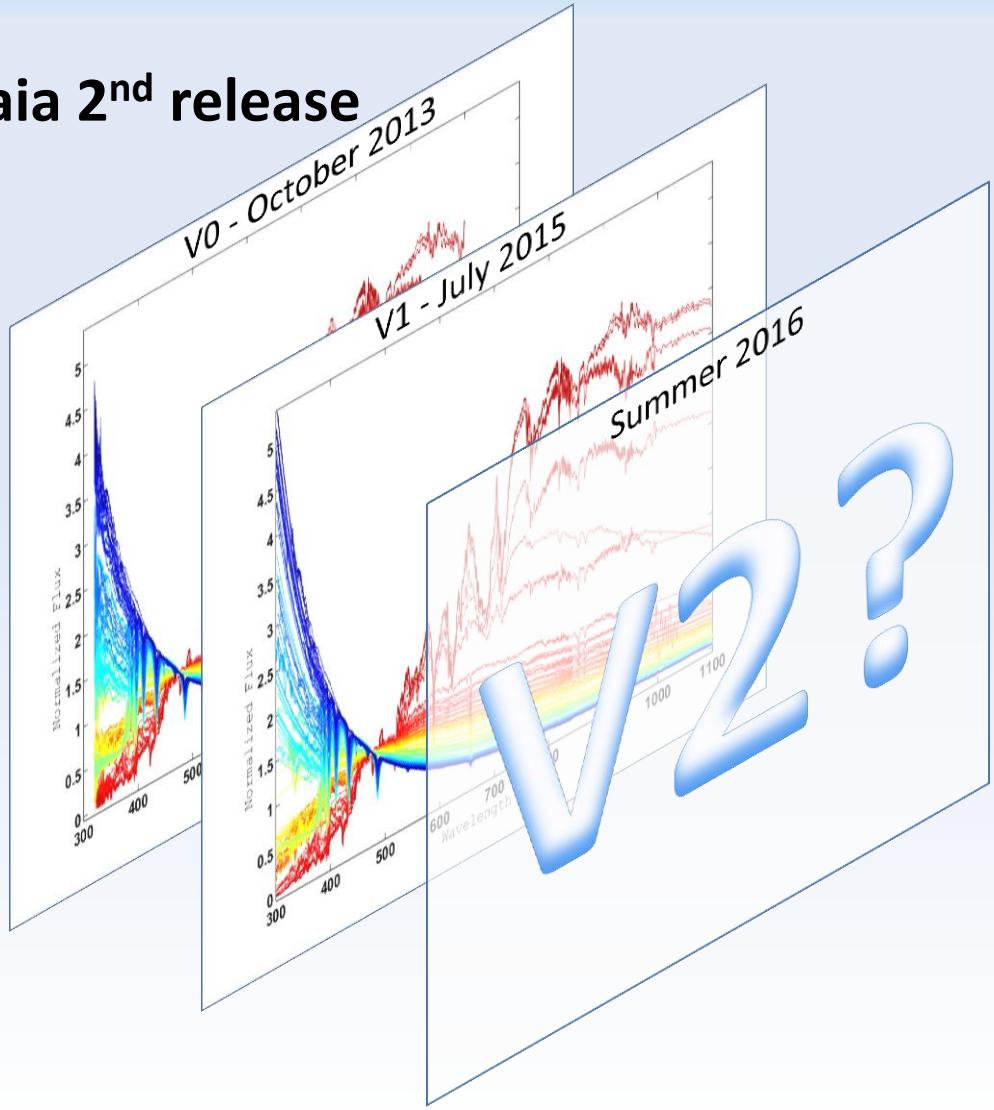
The V2 release, mid 2016 for Gaia 2nd release

Including

- constancy assessment
- absolute photometry

Fundamental question:

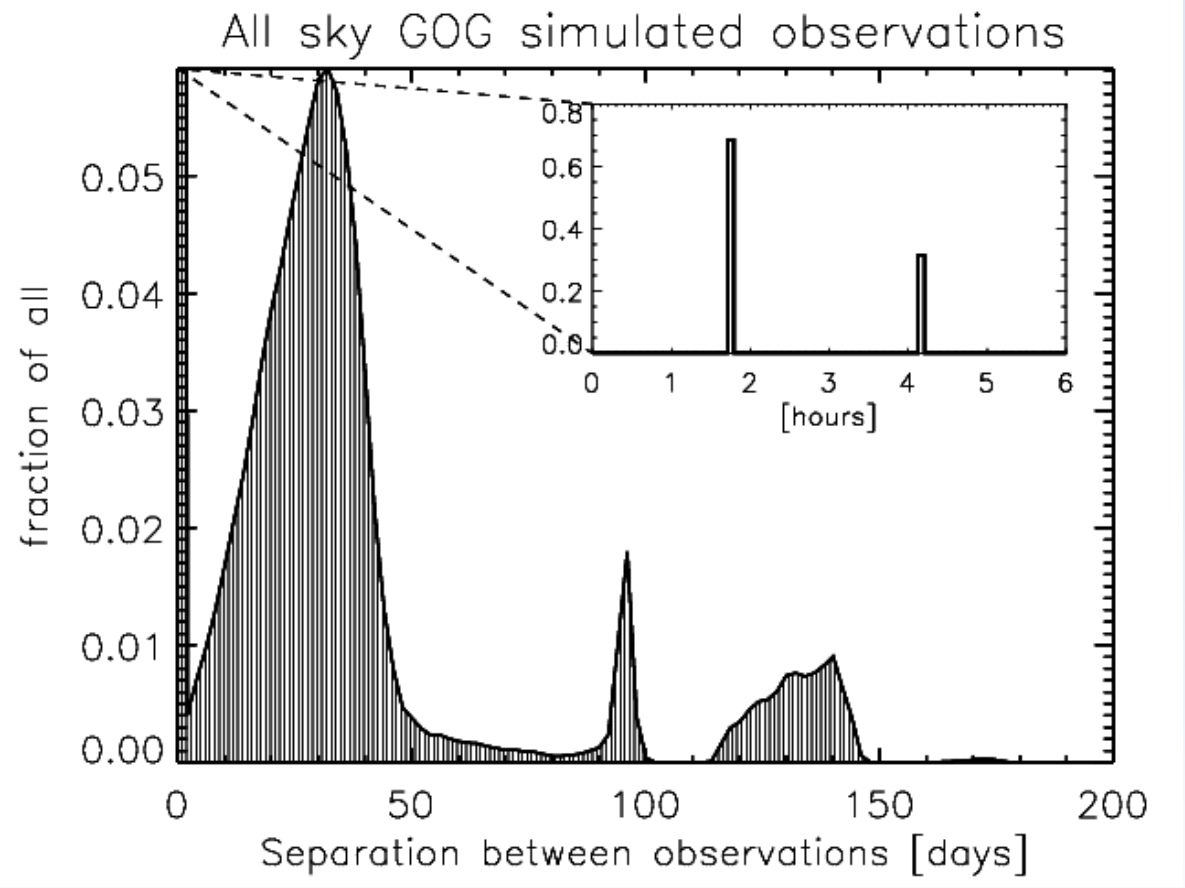
- Quality?
- Quantity?
- Hybrid?



First release: summer 2016	Positions (α, δ) and G magnitudes (single-star and good astrometric behaviour). Photometric data of Ecliptic Poles Scanning RR Lyrae and Cepheid variable stars. The five-parameter astrometric solution - positions, parallaxes, and proper motions - for stars in common with the Tycho-2 Catalogue. The catalogue is based on the Tycho-Gaia Astrometric Solution
Second release: summer 2017	Five-parameter astrometric solutions (single-star). Integrated BP/RP photometry. Mean radial (no radial-velocity variation).
Third release: summer 2018 (TBC)	Orbital solutions, system radial velocity and five-parameter astrometric solutions, for binaries having periods between 2 months and 75% of the observing time will be released. Object classification and astrophysical parameters, together with BP/RP spectra and/or RVS spectra they are based on (well-behaved objects). Mean radial velocities (no radial-velocity and with available atmospheric-parameter estimates).
Fourth release: summer 2019 (TBC)	Variable-star classifications will be released together with the epoch photometry used for the stars. Solar-system results will be released with preliminary orbital solutions and individual epoch observations. Non-single star catalogues.
Final release: 2022 (TBC)	Full astrometric, photometric, and radial-velocity catalogues. All available variable-star and non-single-star solutions. Source classifications, astrophysical for stars, unresolved binaries, galaxies, and quasars. An exo-planet list. All epoch and transit data for all sources.All ground-based observations made for data-processing purposes.

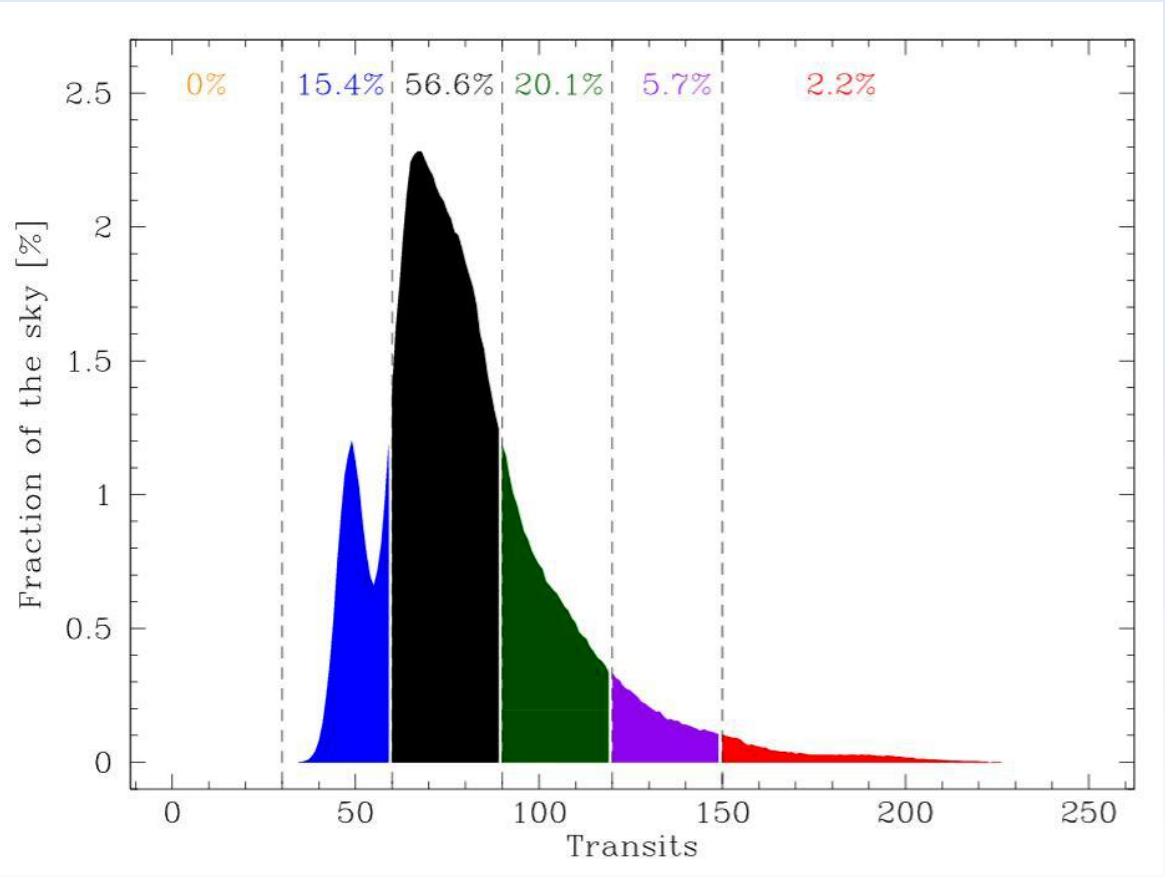
The Gaia Science Alerts programme

The very early data products released to the astronomical community



Gaia will cover 1230 sq. deg. / day with high spatial resolution and well known (but non-optimal) cadence.

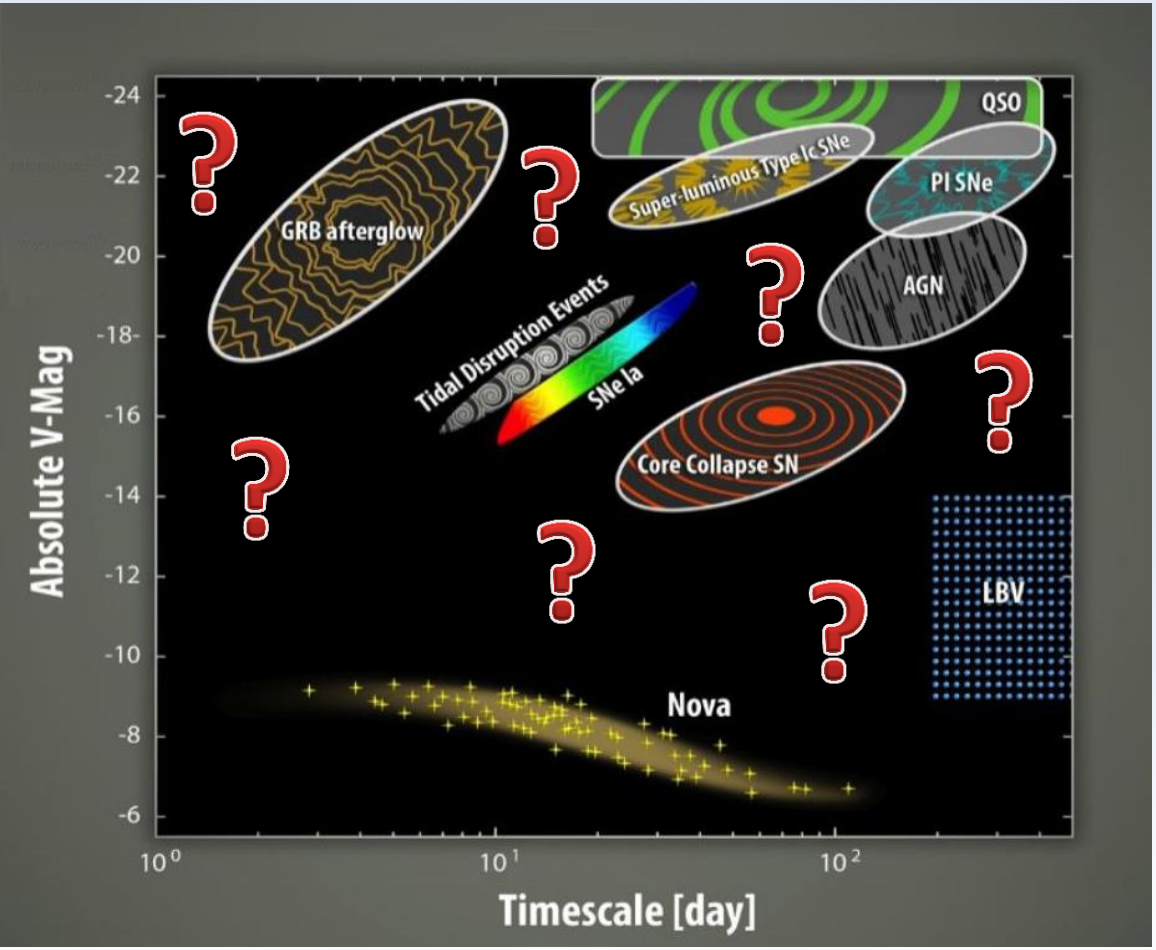
The Gaia Science Alerts programme



~ 15% of the sky is expected to be observed 30-60 times,
~57% of the sky is expected to be observed 60-90 times and
~20% 90-120 times.
The remaining 7.9% is expected to be observed 120-240 times.

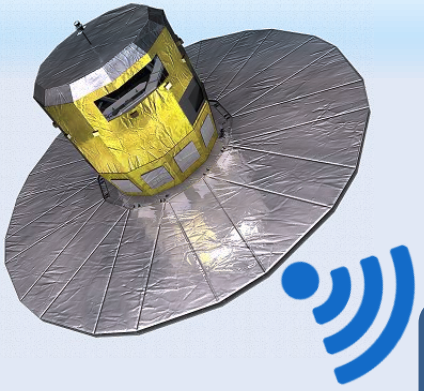
J. de Bruijne, private communication.

The Gaia Science Alerts programme



Repeated observations of the same patches of the sky will allow **transients** detections (G≤19)

The Gaia Science Alerts programme



Telemetry - ESOC

CU3
Initial Data Treatment (IDT) - ESAC

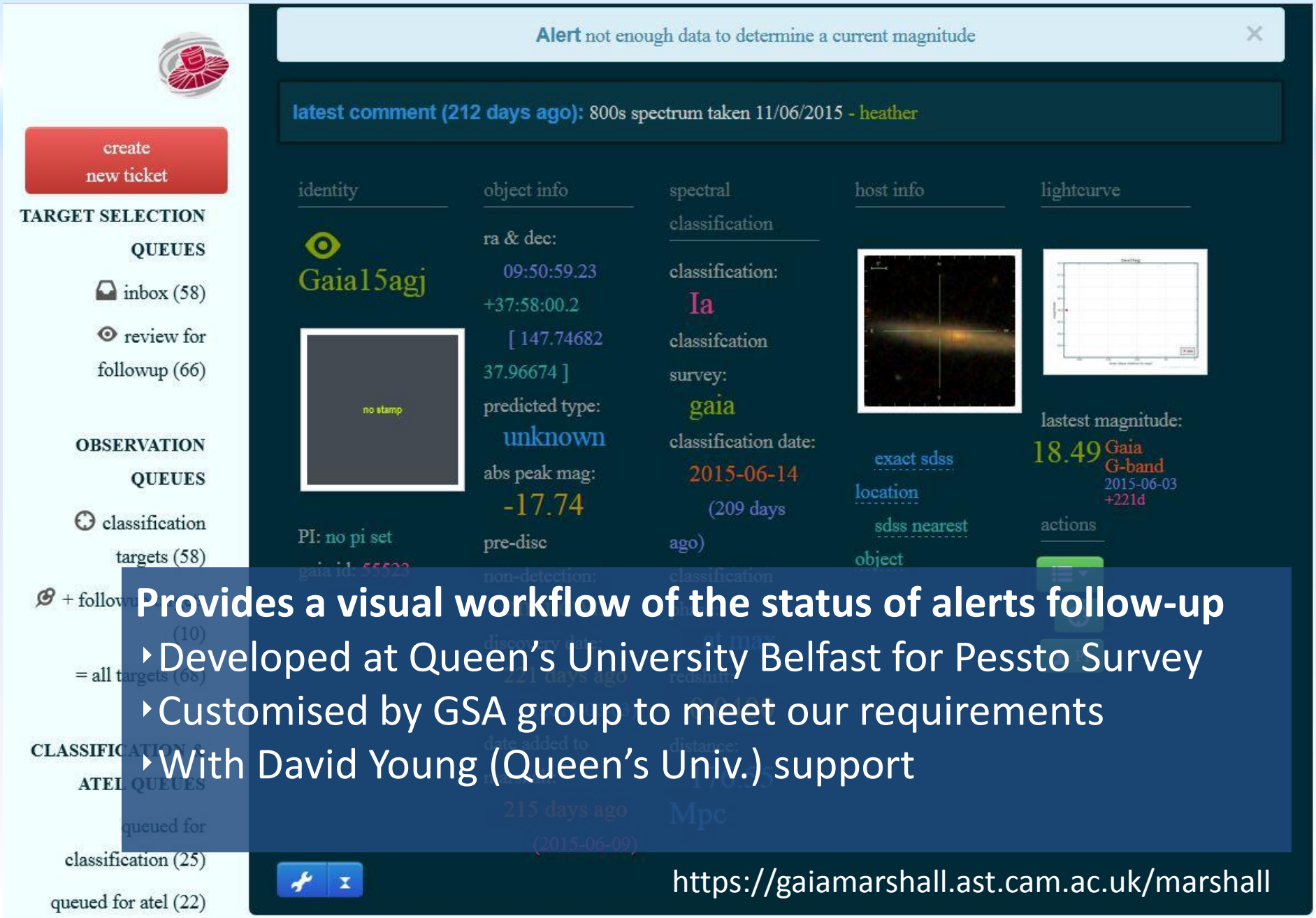
CU5
Photometric processing Cambridge – IoA
Alertpipe

Alerts candidate calibration, detection, classification, cross match

Gaia Science Alerts

Follow-up:
- Gaia Marshall
- Calibration Server

Gaia Marshall



Provides a visual workflow of the status of alerts follow-up

- Developed at Queen's University Belfast for Pessto Survey
- Customised by GSA group to meet our requirements
- With David Young (Queen's Univ.) support

https://gaiamarshall.ast.cam.ac.uk/marshall

Gaia Photometric Science Alerts

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

Gaia Photometric Science Alerts: Validation Phase

12/11/2015 update: Alerts are not currently being published while we are in development and testing. We plan to start publishing new alerts in January 2016. Per-source alert pages, including lightcurves and BP/RP spectra are available. They can be accessed by clicking on alert names in Alerts table.

10/7/2015 update: The Gaia Alerts Validation Phase is now complete, and we are currently pausing publication of Gaia Alerts. The full Gaia alerts system will become operational by mid November 2015.

Currently, a number of improvements to the alerts systems are being implemented, based on our experience with the validation phase activities, and with the important information that you as the Gaia Alerts Followup community have shared with us.

The full operational system will eventually include a number of improvements including:

1. Links to new tables and per-source alert pages.
2. Inclusion of lightcurves and BP/RP spectra.
3. Results of automated detection, filtering and classification.
4. Connections to ground-based telescopes involved in educational follow-up programs.
5. Publication of VOEvents.

Alerts science

- Guest Stars with Gaia
  - Exploding stars
  - Variable stars
  - Cosmology with Supernovae
- Supernovae in one minute
- History of Supernovae detections movie

Alerts downloads

- Download FUGA-William Herschel Telescope follow-up spectra tarball. (353KB)

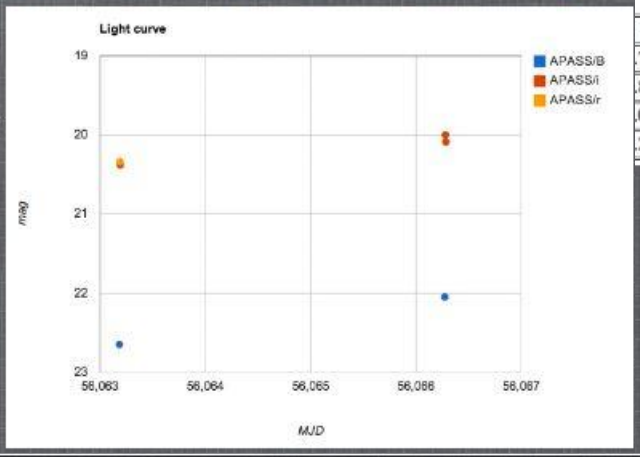
Gaia Calibration Server

The main purpose of the Cambridge Photometry Calibration Server (CPCS) is to provide a uniform calibrations of photometric follow-up observations of transient targets to be reported by Gaia Science Alerts team.

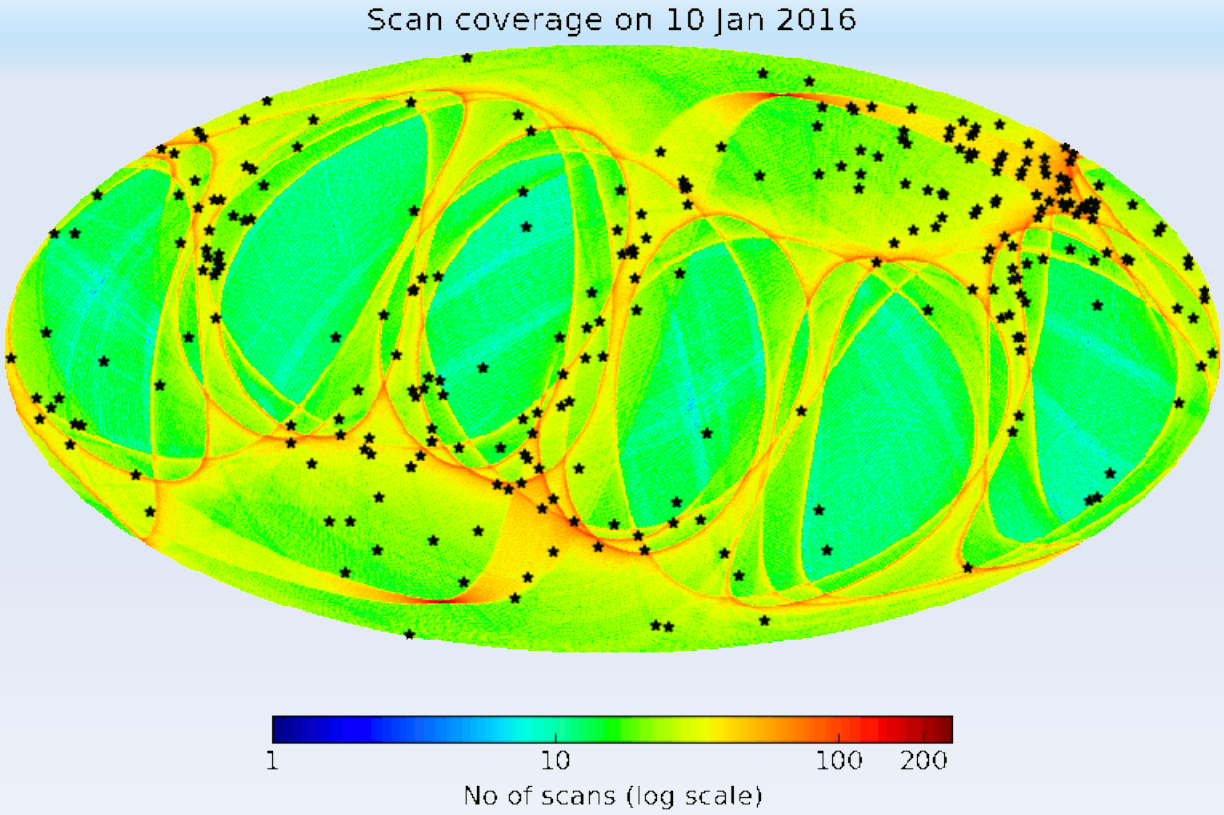
http://gsaweb.ast.cam.ac.uk/followup

id	ivorn	published	ra	dec	nfollowup	lc
25090	ivo://nvo.caltech/voeventnet/catot#1206121210604127753	2012-06-11 22:06:54	178.23886	21.71335	0	LC
25087	ivo://nvo.caltech/voeventnet/catot#1204240090814131436	2012-05-17 12:31:29.738149	229.05438	-9.91775	6	LC
25086	ivo://nvo.caltech/voeventnet/sssot#1205140310714115953	2012-05-17 12:29:53.886991	164.16582	-31.37003	6	LC
25084	ivo://nvo.caltech/voeventnet/sssot#1204260070624132119	2012-05-14 08:56:37.080339	124.13131	-6.58991	6	LC
25083	ivo://nvo.caltech/voeventnet/catot#1204231150484101073	2012-05-14 08:52:38.205503	138.92333	14.16077	6	LC
25082	ivo://nvo.caltech/voeventnet/catot#1204231090504125181	2012-05-14 08:48:54.636982	141.1142	10.05259	6	LC
25081	ivo://nvo.caltech/voeventnet/catot#1204300010664124998	2012-05-09 14:25:31.463083	184.64554	-1.33181	6	LC
25080	ivo://nvo.caltech/voeventnet/catot#1204251210744104178	2012-05-09 14:24:11.979957	218.66588	19.86692	5	LC
25079	ivo://nvo.caltech/voeventnet/catot#1204111210464120236	2012-05-09 14:22:51.307489	135.61214	20.84623	6	LC
25078	ivo://nvo.caltech/voeventnet/mlsot#1110241160614114623	2012-05-03 14:51:01.711265	67.59319	16.91804	6	LC
25077	ivo://nvo.caltech/voeventnet/catot#1201181150564107728	2012-05-03 14:47:26.647255	162.44317	14.49414	3	LC
25076	ivo://nvo.caltech/voeventnet/catot#1109260040234128189	2012-05-03 14:33:39.574826	62.44411	-4.00095	6	LC

Light curve with all data collected for a given object

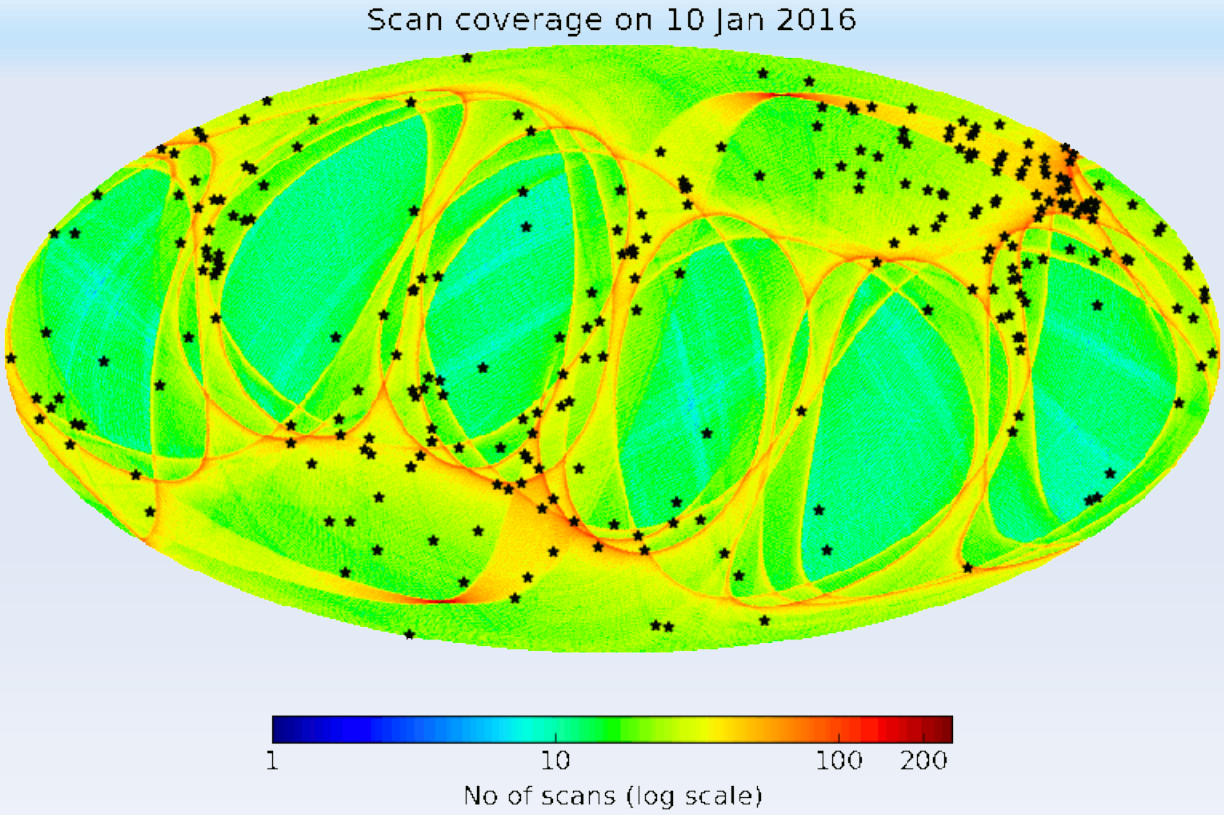


The Gaia Science Alerts programme



The map shows locations of Gaia Science Alerts published between **13 October 2014 and 9 June 2015** (black stars), superimposed on the scan density map of the sky. The background colour indicates how many times each area, of approximately 0.05 square degrees, of the sky was seen by the Gaia Photometric Science Alerts up to date (data processed even if Gaia Alerts are not switched on)

The Gaia Science Alerts programme

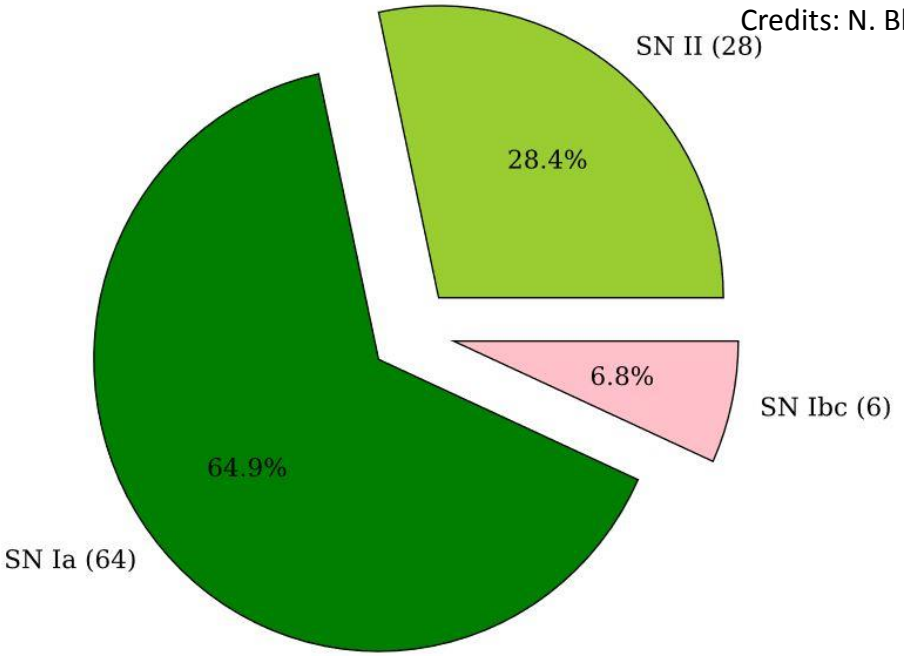


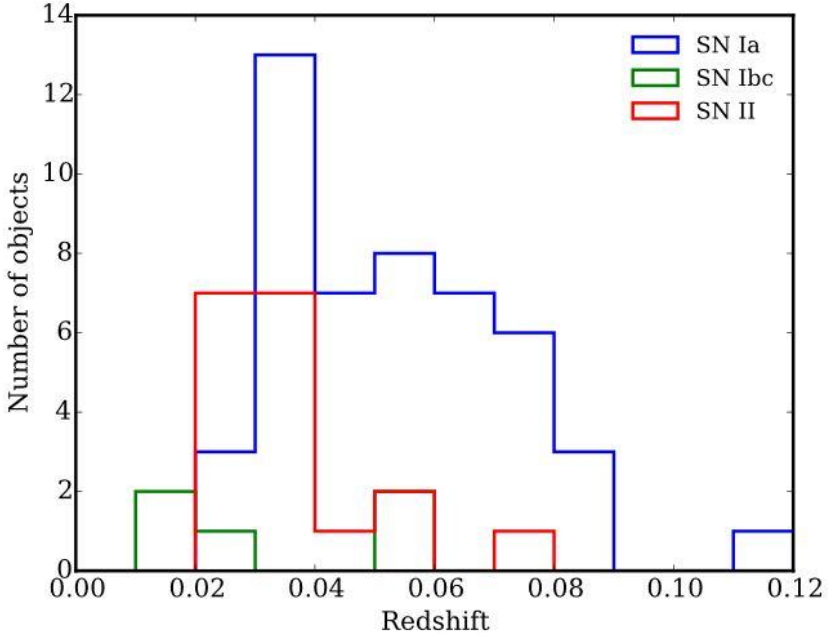
From 13 Oct 2014 — 9 Jun 2015

- 297 IDT runs ~16 billion transits ingested
- ~52 million alert candidates
- 275 published alerts, 166 in 2015

The Gaia Science Alerts programme

Credits: N. Blagorodnova



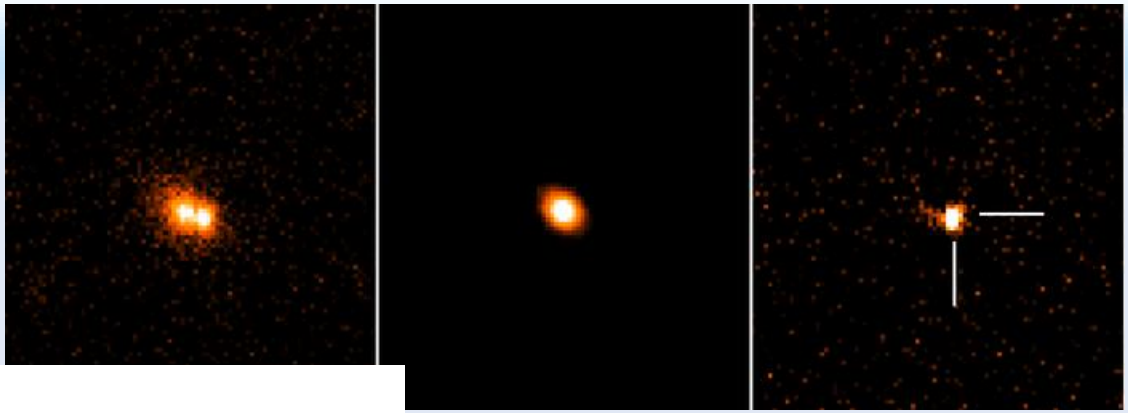


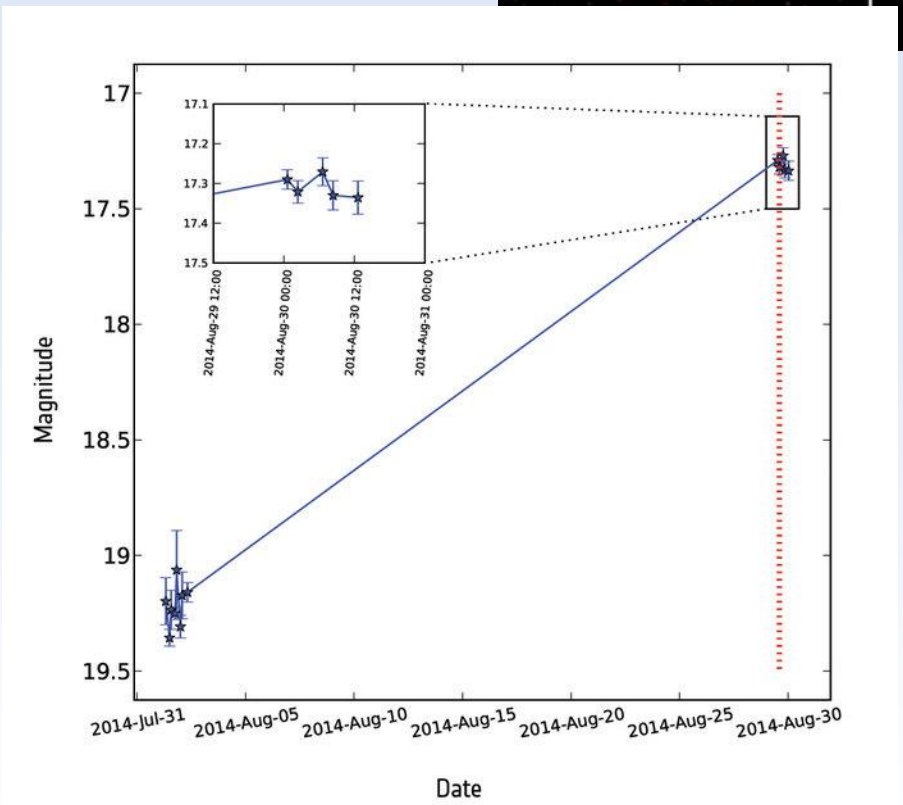
So Far:

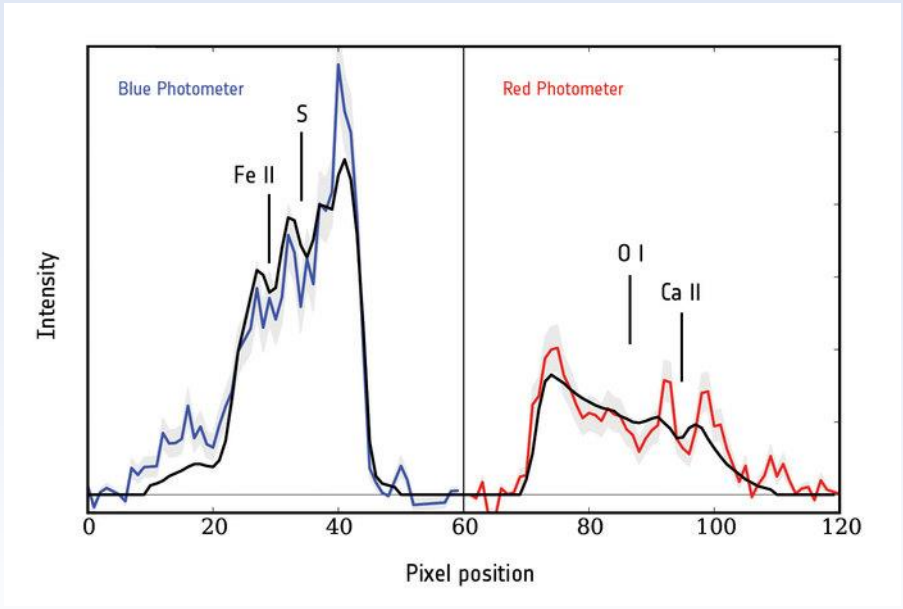
- 275 published alerts, 55 in common with other surveys, 217 NEW
- 41% spectroscopically observed (NTT, LT, INT, WHT, AAT…)
- 53% followed up photometrically (~for a total of 15000 data points)
- **98 SNe** (the first: Gaia14aaa Ia, z:0.036)

The Gaia Science Alerts programme

Gaia14aaa







credits: ESA/Gaia/DPAC/N. Blagorodnova, M. Fraser, H. Campbell, A. Hall (Institute of Astronomy, Cambridge)

The Gaia Science Alerts programme

Index to Gaia Photometric Alerts

http://gsaweb.ast.cam.ac.uk/alerts/alertsindex

These are all the alerts raised to date. You might wish to view or download these as a table in CSV format.

See here for an explanation of the columns.

Show 10 entries

Search:

Name	Observed	RA (deg.)	Dec. (deg.)	Mag.	Historic mag.	Historic scatter	Class	Published	Comment
Gaia15agm	2015-06-01 14:51:25	358.98623	-43.72412	17.35			SN Ia	2015-06-09 11:27:39	candidate SN
Gaia15agl	2015-06-01 20:34:37	337.79327	-37.82735	18.71			unknown	2015-06-09 11:27:39	candidate SN
Gaia15agk	2015-06-03 02:38:28	337.70660	-43.04732	18.80			unknown	2015-06-09 11:27:39	candidate SN
Gaia15agj	2015-06-03 05:29:29	147.74682	37.96674	18.49			SN Ia	2015-06-09 11:27:39	candidate SN
Gaia15agi	2015-01-24 09:32:33	43.08181	60.57638	18.97			unknown	2015-06-03 15:16:18	Galactic plane red transient, brightened from 20 to 18 mag in 100days
Gaia15agh	2015-05-25 01:24:24	181.02133	14.06805	17.58			SN Ia	2015-06-02 15:06:52	candidate SN in spiral starforming SDSS galaxy (z=0.043)
Gaia15agg	2015-05-29 15:41:03	64.10105	-28.49464	18.96			unknown	2015-06-02 13:22:16	Candidate SN on edge of DSS galaxy
Gaia15agf	2015-05-29 08:17:25	330.62236	-20.32945	18.54			SN Ia	2015-06-02 13:19:12	Candidate young and blue SN on the edge of a DSS galaxy
Gaia15age	2015-05-29 22:00:29	83.48209	-20.78890	16.96			unknown	2015-06-02 00:15:29	aka CSS101214:053356-204720 : CV candidate
Gaia15agd	2015-05-29 07:24:33	171.57245	28.36723	18.42			SN II	2015-06-02 00:09:38	SN candidate in low surface brightness starburst galaxy at z=0.03

Manual vs auto operation

Manual operation (last year)

- ~10^{5-6} candidates/day
- Human selection of alerts
- Slow!
- ~1 alerts/day
- Classification after publication

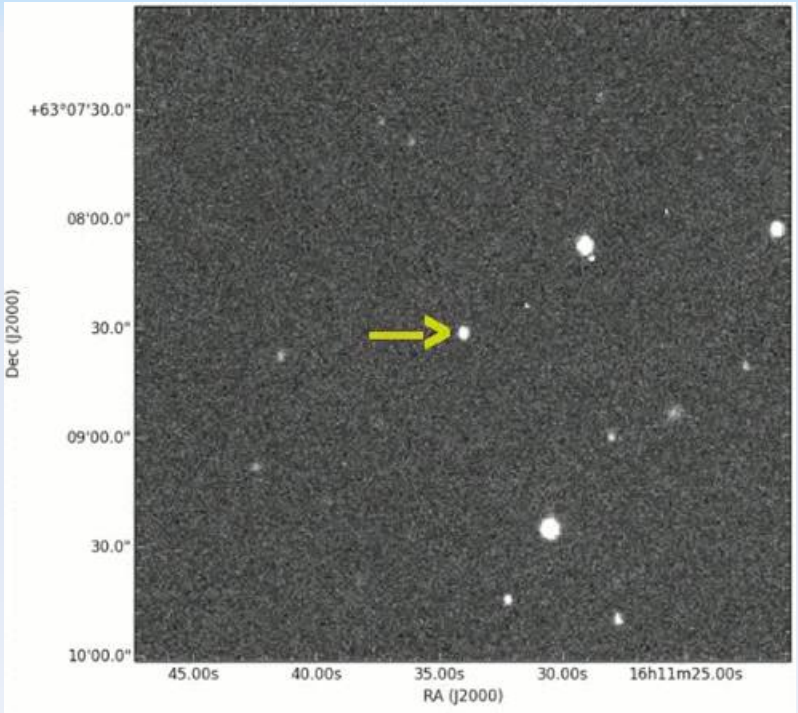
Planned operation (mid Jan)

- ~100 candidates/day
- Automatic selection
- Quicker
- ~10 alerts/day
- Classification before publication

The Gaia Science Alerts programme

We contribute to this effort with the Cassini 1.5m Telescope at Loiano.
Bologna-Warsaw joint proposals

The Gaia Science Alerts programme

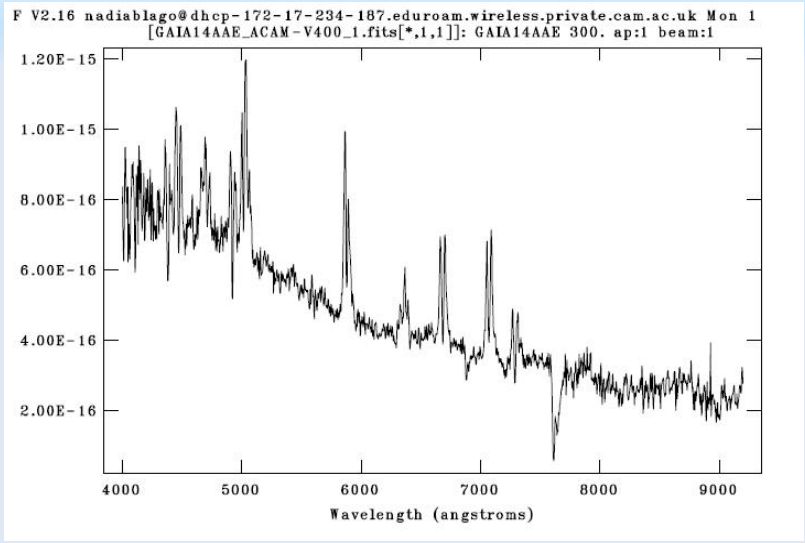


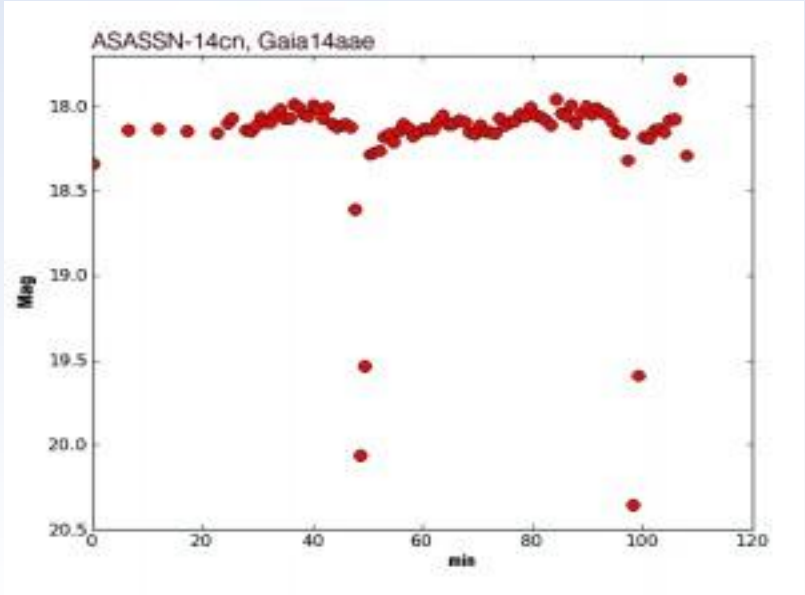
The observations span 88 min. The movie has been sped up by a factor 250, so that the whole clip lasts only 21 seconds.
The data were taken at Loiano Observatory on 2014/10/24

"Total eclipse of the heart: The AM CVn Gaia14aae / ASSASN-14cn", Campbell et al. 2015

INAF-OABO researchers (G. Altavilla, G. Clementini, R. Gualandi) as well as INAF researchers at OAPD and OACT coauthor this paper which is based on images taken also at the Cassini Telescope of the Bologna Observatory

The Gaia Science Alerts programme





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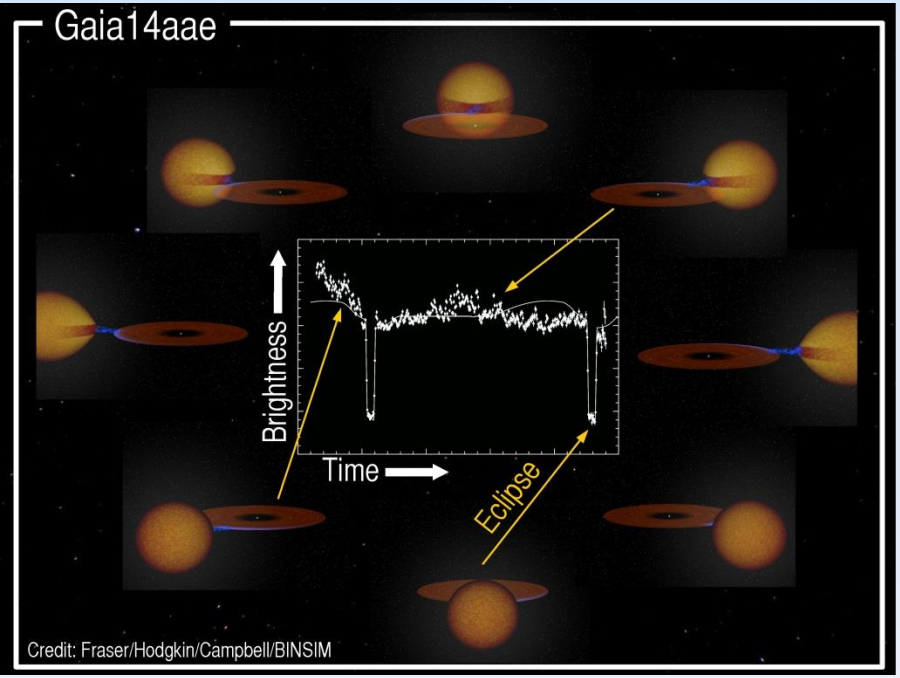
The Gaia Science Alerts programme

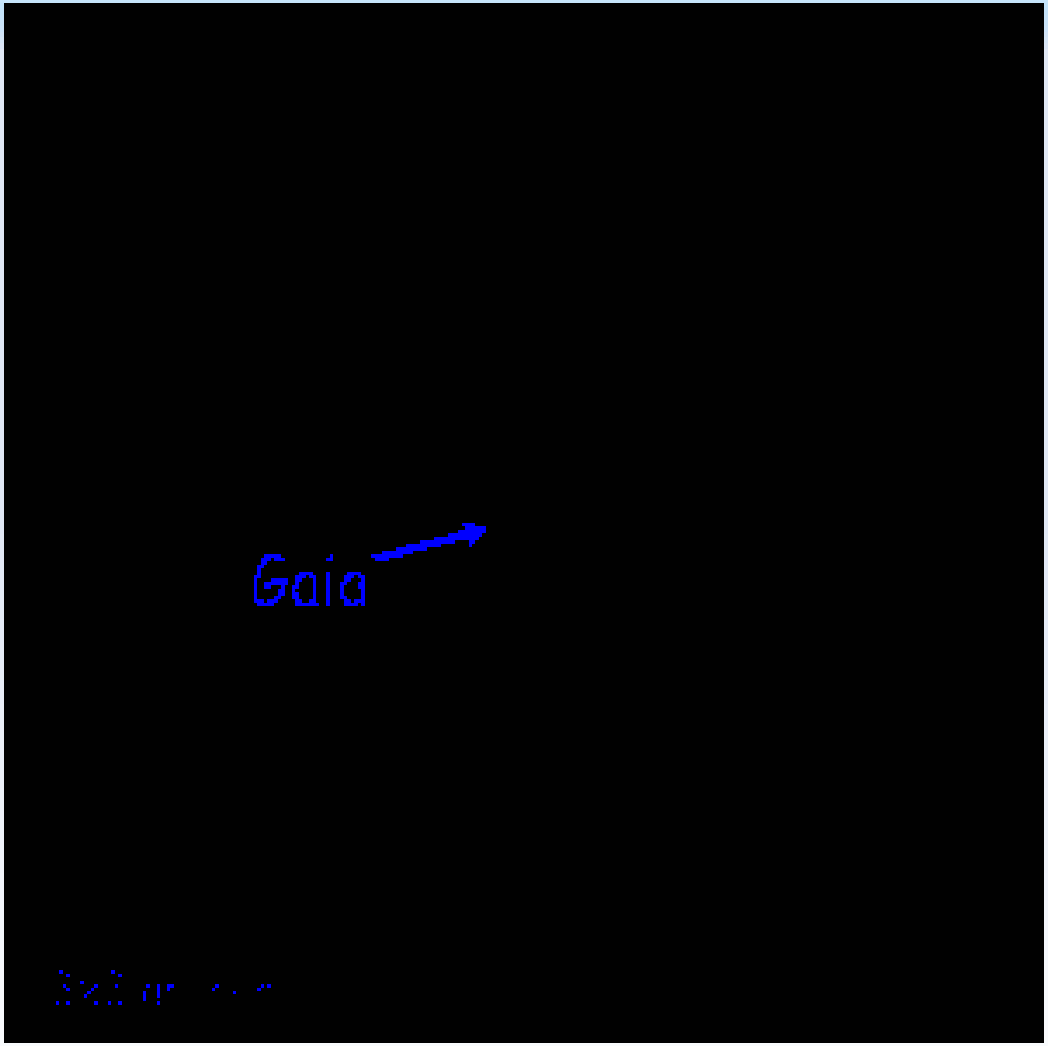


Gaia Image of the Week
01 Dec 2014
www.cosmos.esa.int/web/gaia/iow_20150717

"Total eclipse of the heart: The AM CVn Gaia14aae / ASSASN-14cn", Campbell et al. 2015

INAF-OABO researchers (G. Altavilla, G. Clementini, R. Gualandi) as well as INAF researchers at OAPD and OACT coauthor this paper which is based on images taken also at the Cassini Telescope of the Bologna Observatory

Gaia imaging…from Loiano



G. Altavilla, A. Buzzoni

Gaia Image of the Week
01 Dec 2014

www.cosmos.esa.int/web/gaia/iow_20141201

Gaia (R~21) observed with BFOSC@1.52m G.D. Cassini telescope at Loiano Observatory, Italy, on 17 October 2014

"Optical tracking of deep-space spacecraft in Halo L2 orbits and beyond: the Gaia mission as a pilot case" A. Buzzoni, G. Altavilla, S. Galleti, 2016, accepted by Advances in Space Research

Thanks for your attention