The Montsec Observatory & Gaia Science Alerts

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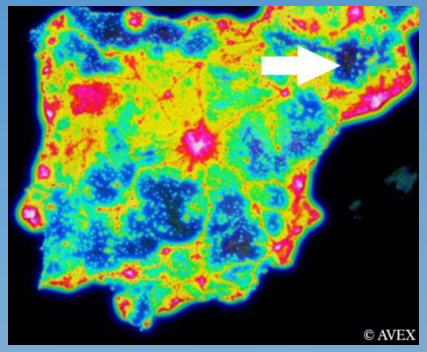
Montsec Observatory

www.oadm.cat

Longitude: 00° 43' 46" E
Latitude: 42° 03' 05" N
Altitude: 1570 m above sea level
Opening: 24 October 2010
UNESCO Starlight reservation area (free of luminical pollution):
Background brightness at zenith in moonless nights=22.0 mag·arcsec^{-2}



Montsec Telescopes

www.oadm.cat

XO-Montsec: Space Telescope Science Institute.
Giant exoplanets around bright stars

All sky camera

Joan Oró Telescope (TJO):
Generalitat de Catalunya,
installed and managed by IEEC.

Fabra-ROA Montsec Telescope (TFRM):
Reial Acadèmia de Ciències i Arts de Barcelona
and Real Observatorio de la Armada.
Baker-Nunn camera → asteroids

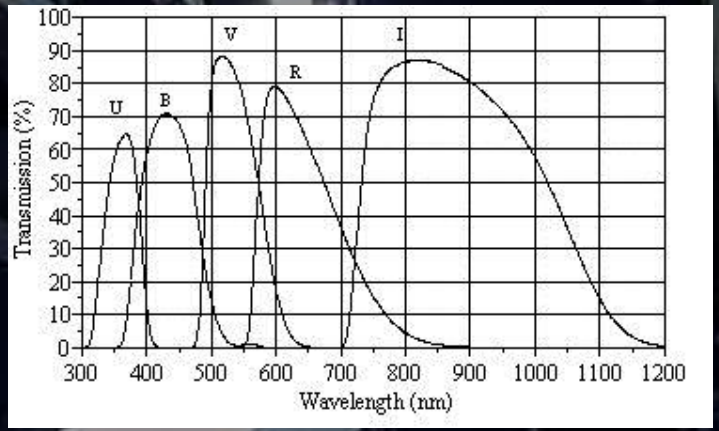
Joan Oró Telescope

- 0.8 m robotic telescope (Optical Mechanics Inc., OMI)
- F/9.6 Ritchey-Chrétien configuration. 1 arcmin pointing
- 6.15 m automatic dome (Baader Planetarium GmbH)
- Controlled by TALON software. OpenROCS architecture.
- 2 weather stations + 1 storm detection + GPS.

TJO INSTRUMENTATION

MEIA 2:

- Back illuminated iKon L (DW936N-BV model) built by Andor Technology
- 2048 x 2048 pixels
- Pixel size: 13.5x13.5 µm (0.36x0.36 arcsec)
- Field of view: 12.3x12.3 arcmin
- Gain: 1.05 e-/ADU
- RON: 9 e- RMS a 3 MHz
- Non linearity: <1%
- Read out time: 10 s
- UBV$R_C I_C$ passbands

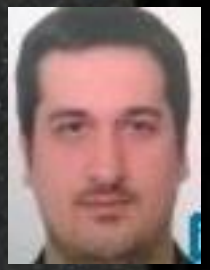


Gaia Alerts with TJO

- TJO started contributing on 23rd Feb 2015.
- Multipassband observations: B, V, R_C and I_C
- 3 exposures /passband
- 300s exposure time
- All sequence takes about 1 hour/target
- 17 alerts followed up
- 1586 images collected
- Third most contributing observatory
- Start observing only AlertMag < 17.5 mag
- Until the target reaches V ~ 19 mag
- Bias, Dark and flatfields also provided
- Astrometry.net, Sextractor and uploading to CPCS is not fully automatic yet. But it is done the next day of observations

Name	Mag	Nobs	Type	Name	Mag	Nobs	Type
Gaia14aan	15.75	6	Unknown	Gaia15acz	17.99	4	Unknown
Gaia14aav	16.06	2	Unknown	Gaia15adb	17.22	31+1	SN Ia
Gaia14adn	15.95	1	CV?	Gaia15adf	16.20	3+1	Unknown
Gaia14adr	16.68	8+1	RR Lyrae	Gaia15aea	17.46	3	Unknown
Gaia15aab	17.89	13	RR Lyrae	Gaia15aek	17.73	7	SNIIP
Gaia15aai	17.00	5	AGN	Gaia15ael	17.27	10	SNIa
Gaia15aal	17.13	1	Unknown	Gaia15aff	17.19	22+1	Unknown
Gaia15aan	13.03	1	CV	Gaia15afd	16.37	21+1	SNIa
Gaia15acx	17.28	4	SNIa				

J.M. Carrasco
CU5 member

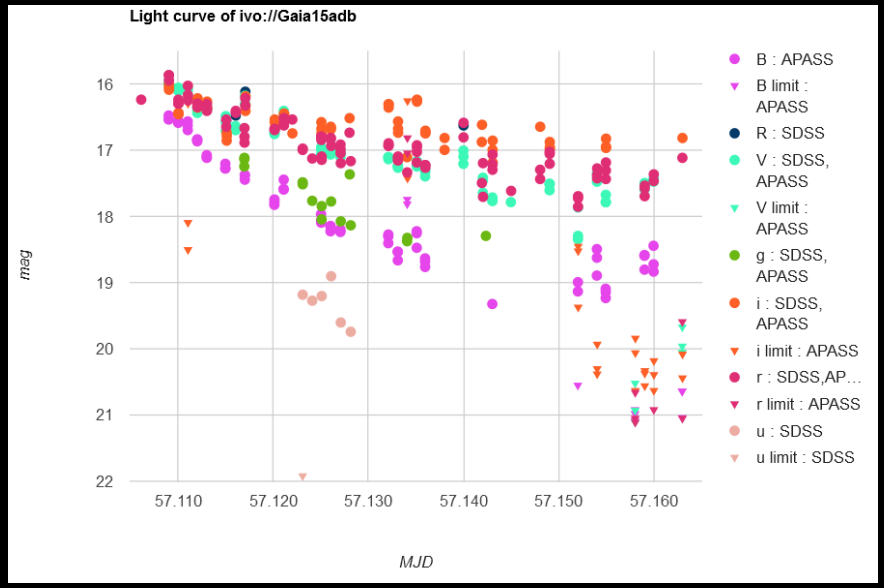


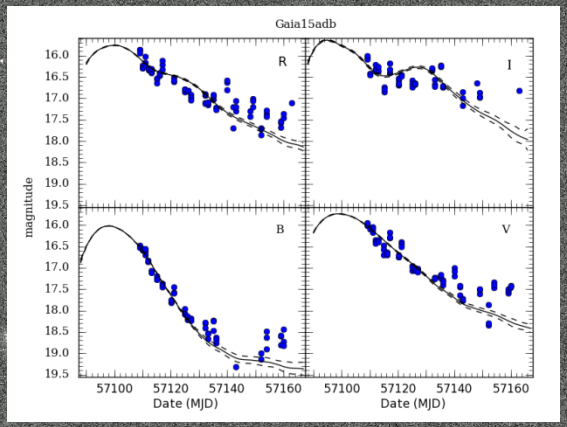
U. Burgaz
PhD student

F. Vilardell
OAdM staff

GAIA 15ADB

- AlertMag=17.22 mag, α=257.44, δ=62.97
- Classified as SNIa by The Asiago Transient Classification Program (Tomasella et al 2014)
- z=0.02735, ASASSN-15fa, ATEL#7245
- 31+1 nights observed from OAdM (27 March – 20 May 2015)
- T_{max}=57098.933, B_{max}=15.91, V_{max}=15.63, R_{max}=15.64, I_{max}=15.65

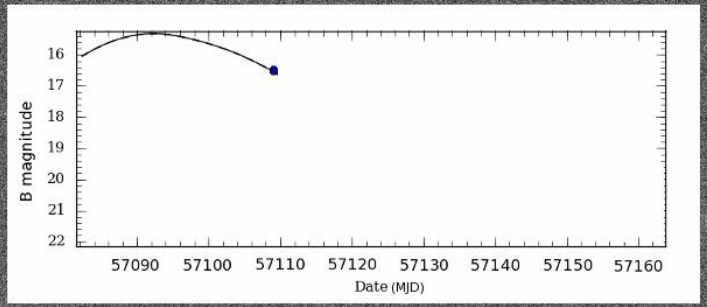




27/03/2015

NGC 6319

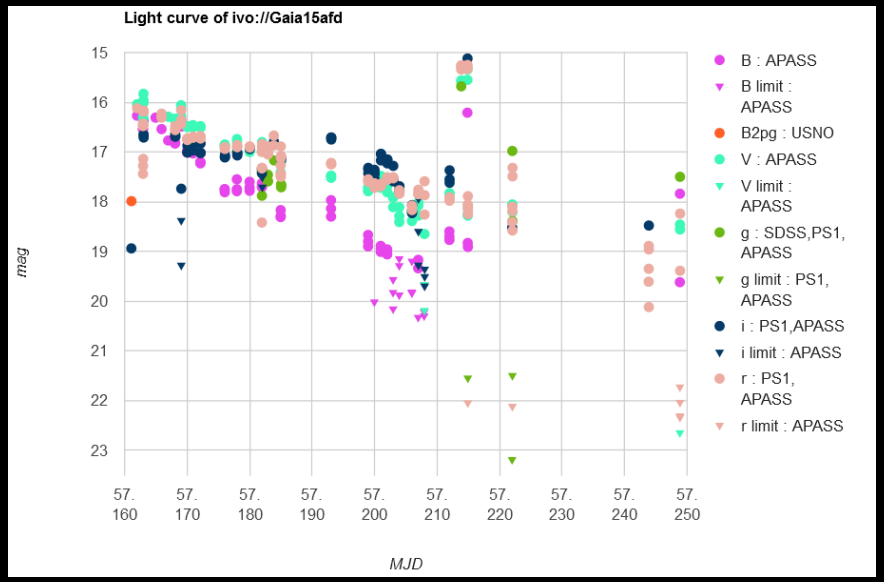
Gaia15adb

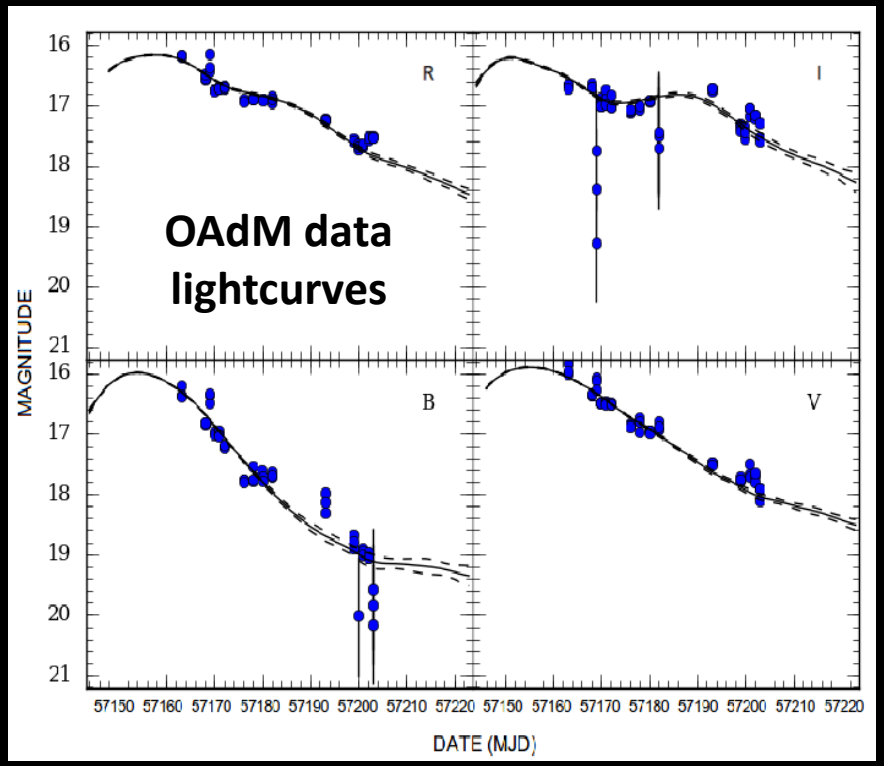


OAdM data lightcurves

GAIA 15AFD

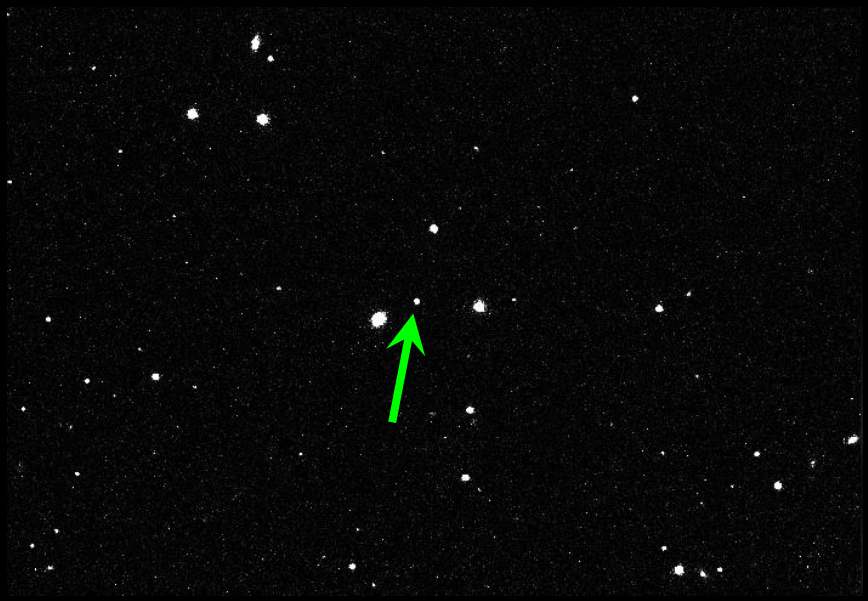
- AlertMag=16.37 mag, α= 269.87, δ=43.39
- Classified as SNIa by Roque de los Muchachos
- ATel #7477 , PS15ahs
- 21+1 nights observed from OAdM (20 May – 8 Jul 2015)
- T_{max}=57154.638, B_{max}=15.91, V_{max}=15.85, R_{max}=16.15, I_{max}=16.25

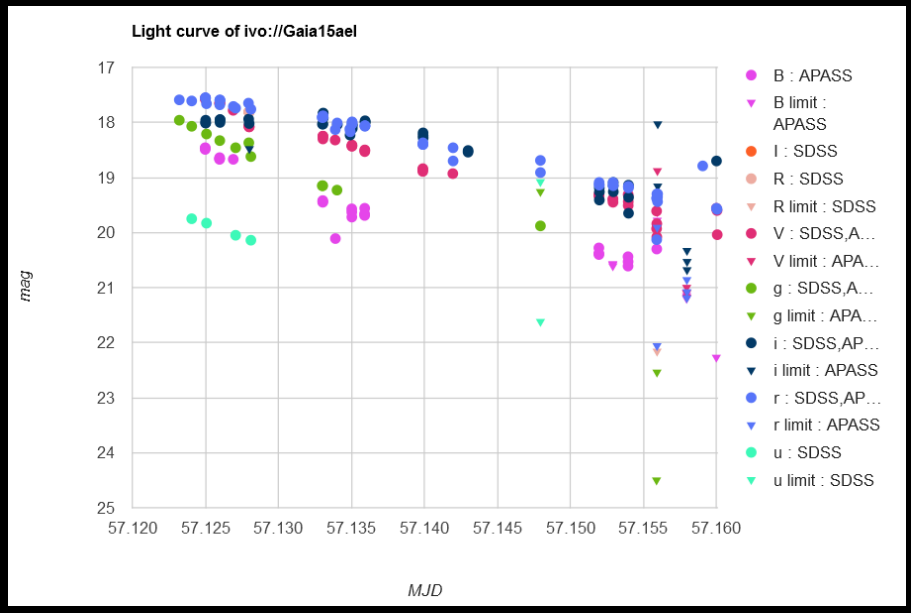


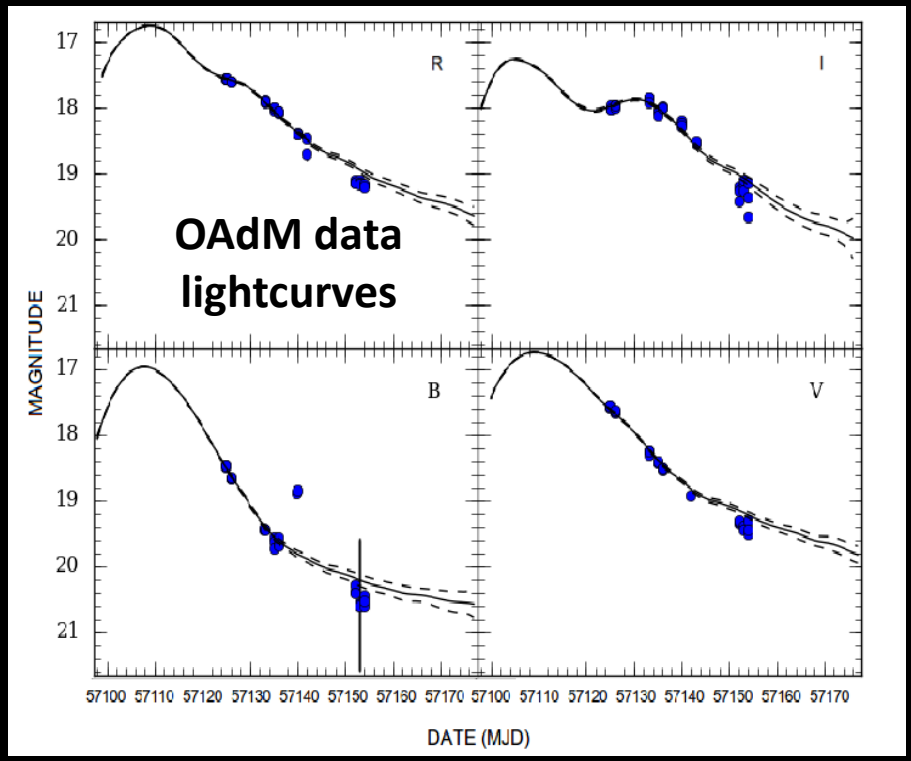


GAIA 15AEL

- AlertMag=17.27 mag, α=203.35, δ=58.73
- Classified as SNIa by F.L.Whipple Observatory
- z=0.03, ATEL #7296 , ASASSN-15fs
- 10 nights observed from OAdM (12 Apr – 11 May 2015)
- T_{max}=57108.144, B_{max}=16.86, V_{max}=16.72, R_{max}=16.89, I_{max}=17.32

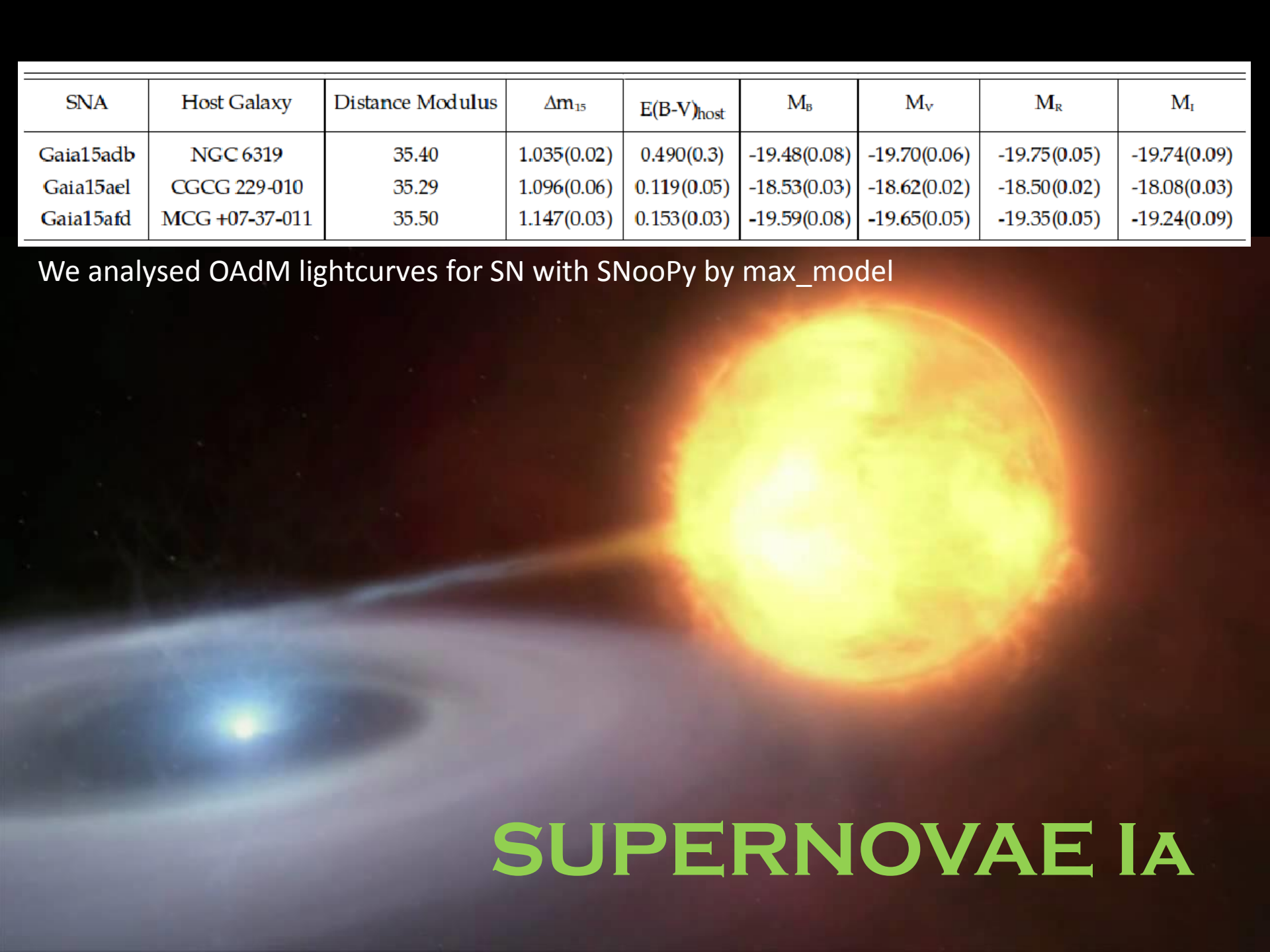






SNA	Host Galaxy	Distance Modulus	Δm_{15}	$E(B-V)_{host}$	M_B	M_V	M_R	M_I
Gaia15adb	NGC 6319	35.40	1.035(0.02)	0.490(0.3)	-19.48(0.08)	-19.70(0.06)	-19.75(0.05)	-19.74(0.09)
Gaia15ael	CGCG 229-010	35.29	1.096(0.06)	0.119(0.05)	-18.53(0.03)	-18.62(0.02)	-18.50(0.02)	-18.08(0.03)
Gaia15afd	MCG +07-37-011	35.50	1.147(0.03)	0.153(0.03)	-19.59(0.08)	-19.65(0.05)	-19.35(0.05)	-19.24(0.09)

We analysed OAdM lightcurves for SN with SNooPy by max_model

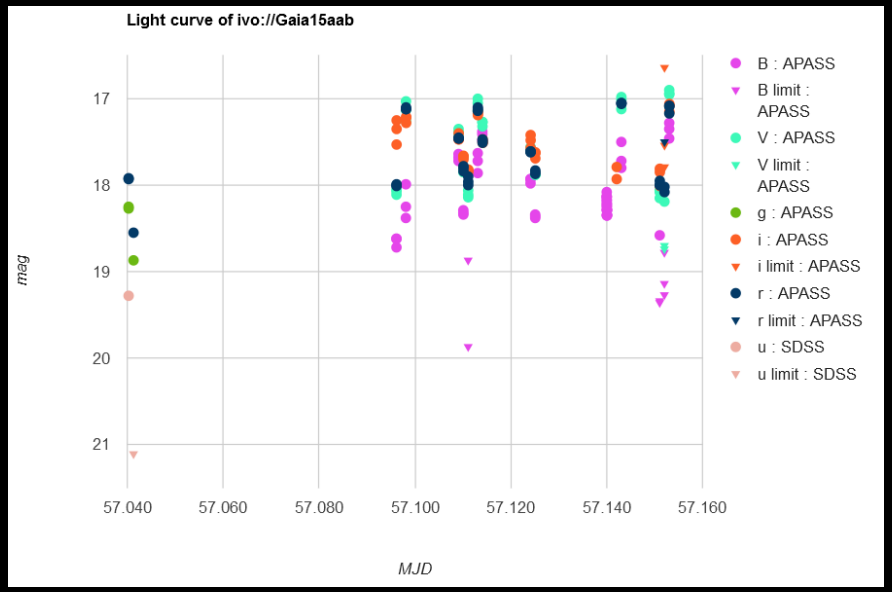


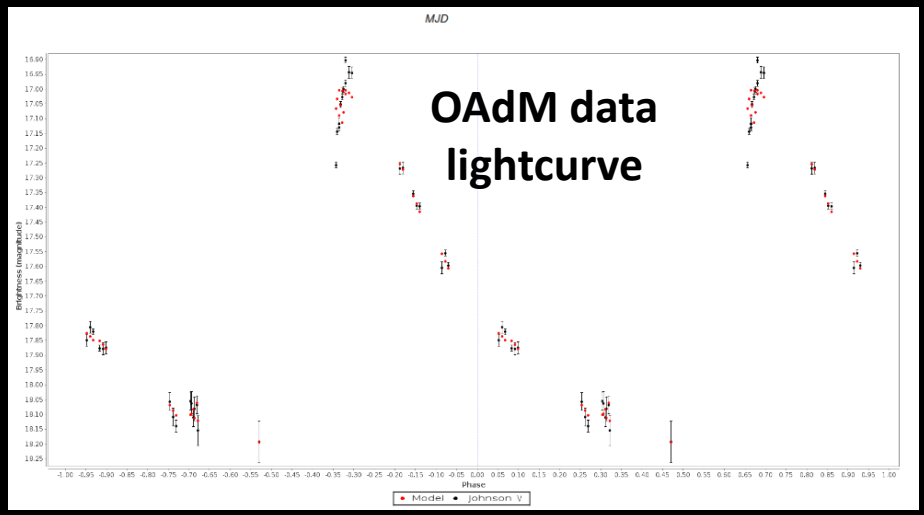
RR Lyrae

GAIA 15AAB

- AlertMag=16.91 mag, α=250.84, δ=14.50
- RRLyr (Drake et al 2013: P=0.453911 days, distance =24.19 kpc)
- 13 nights observed from OAdM (14 Mar – 10 May 2015)
- Our lightcurve (Vstar):

<V>=17.54, P=0.4539 days → distance=24.43 kpc

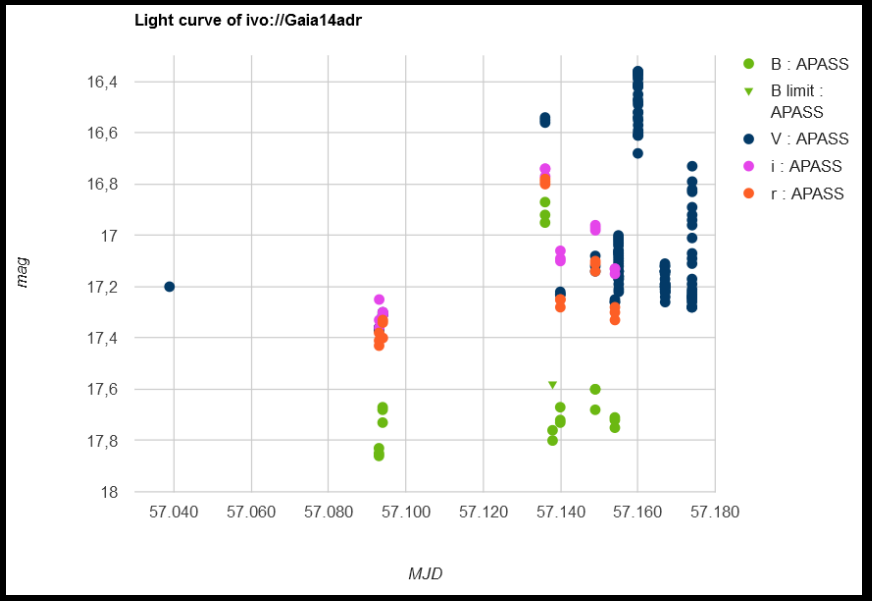


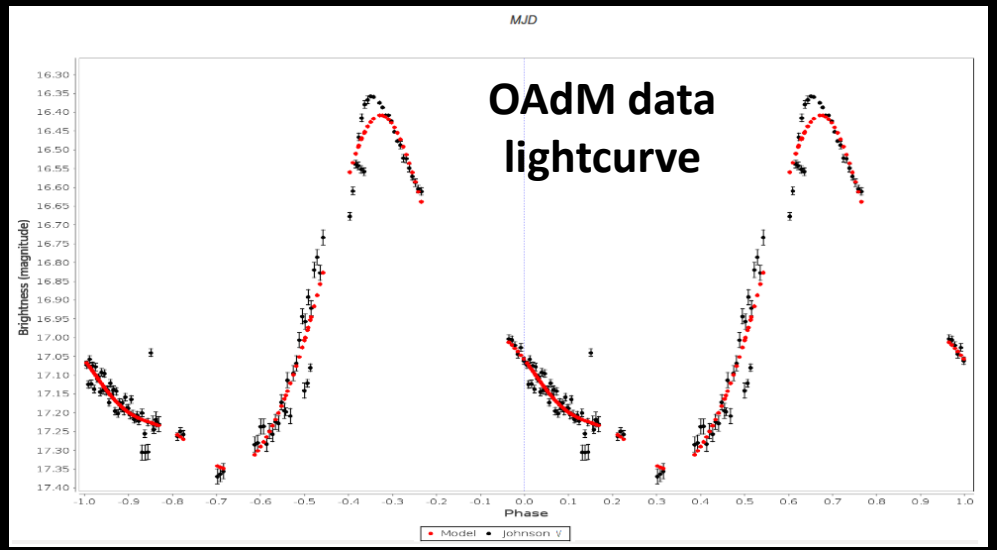


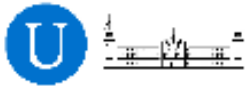
GAIA 14ADR

- AlertMag=17.25 mag, α=251.97, δ=75.28
- We didn't find previous bibliography
- 8+1 nights observed from OAdM (11 Mar – 31 May 2015)
- Our lightcurve (Vstar):

<V>=16.85, P=0.5217 days → distance=17.86 kpc







Universitat de Barcelona

Photometric Follow-up of Gaia Alerts from Montsec Observatory

- Master Thesis -

Umut Burgaz[1]

Supervised by Josep Manel Carrasco[2]

GAIAVERSE

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The Gaia Portal of the GENIUS project

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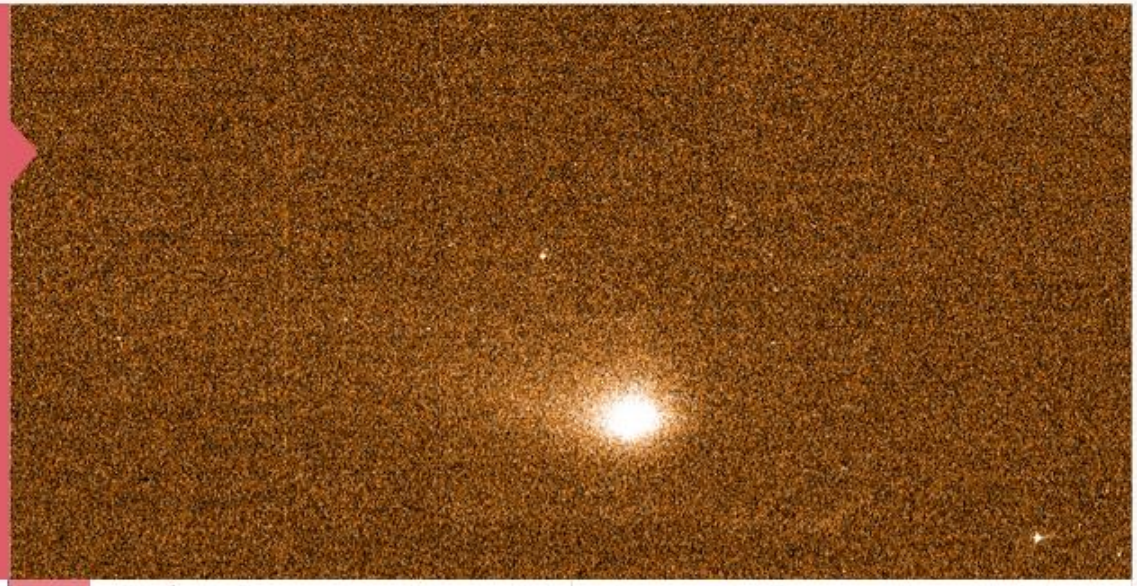
NEWS

CELEBRITY COMET SPOTTED AMONG GAIA'S STARS

A Gaia image of Comet 67P/Churyumov–Gerasimenko, obtained on 14 September 2015.



NEWS

How's the Gaia satellite doing?

Check the last article published by Ronald Drimmel on Gaia mission health and status.

NEWS

Gaia in poetry book launch

Gaia in poetry arrives at your libraries. Come to its presentation next Nov. 12!

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RT @rdrimmel: Great news for 1st release #GaiaMission astrometry: Quasars can be used to verify the parallax zero-point.. https://t.co/8IP...

rdrimmel

RT @rdrimmel: #GaiaMission #PhD #jobopening https://t.co/0is7qRBtnS

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RT @rdrimmel: More @esascience links on the lunar transit seen by #GaiaMission: https://t.co/hHv5g1HQOf https://t.co/m00xH5YdNq https://t.c...

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RT @rdrimmel: At 1.5 million km from Earth,

Send outreach proposals to emasana@am.ub.es

BLOG:

THE MONTSEC OBSERVATORY AND THE GAIA SCIENCE ALERTS

TUESDAY, 23 JUNE, 2015

Author: Josep Manel Carrasco (Institut de Ciències del Cosmos - Universitat de Barcelona (ICCUB)

While repeatedly scanning the sky, sometimes Gaia detects a source increasing their brightness with respect to previous observations. This is a Gaia science alert and can be due to several types of phenomenae (supernova explosions, novae, microlensing effects, among others). The first Gaia science alert was published in September 2014.

After its detection by Gaia a ground-based follow-up programme is activated to monitor the evolution of this transient objects. From February 2015 a team of researchers from ICCUB contributes to this programme with the robotic telescope Joan Oró (TJO), at the Montsec Observatory (OAdM), located at Àger (Lleida, Spain). Since then, a total of about 1400 images in multicolor Johnson-Cousins passbands were obtained with TJO for 17 Gaia science alerts (see Table 1).

Name	Alert Magnitude	TJO Observations
Gaia14aan	15.75	6 nights
Gaia14aav	16.06	3 nights
Gaia14adn	15.95	1 night
Gaia14adr	16.68	9 nights
Gaia15aai	17.00	5 nights
Gaia15aan	13.03	1 night
Gaia15aal	17.13	1 night
Gaia15aab	16.91	14 nights
Gaia15adb	17.22	29 nights
Gaia15adf	16.20	3 nights
Gaia15aea	17.46	3 nights
Gaia15aek	17.73	7 nights
Gaia15ael	17.27	10 nights
Gaia15aex	17.28	4 nights
Gaia15aez	17.99	3 nights
Gaia15afd	16.37	9 nights
Gaia15aff	17.19	8 nights

TAGS:

Gaia Science Alerts, Gaia15adb, Montsec Observatory, supernova

ARCHIVE

TWITTER Gaiaverse Follow

Celebrity comet spotted among @ESAGaia's stars! @ESA_Rosetta #67P Read more at @Gaiaverse https://t.co/4YyD3TXHtl https://t.co/zPoGI3ZLv4

StefanJordanARI

RT @StefanJordanARI: The video on the astrometric solution for the #GaiaMission now also has subtitles included (click on CC)! https://t.c...

StefanJordanARI

RT @StefanJordanARI: Ein Interview über den Sternkatalog der #GaiaMission in der Novemberausgabe des Astronomie-Magazins Sternstunde: https...

rdrimmel

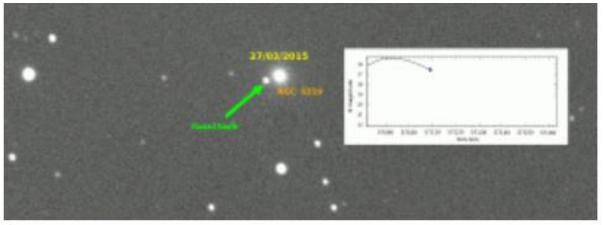
RT @rdrimmel: MT @demitrimuna: Some tables in #GaiaMission data release will have 80 billion rows.

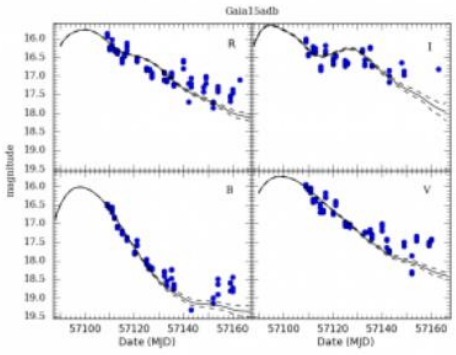
This makes OAdM the third most contributing observatory among all of the participants in the Gaia photometric science alert project. TJO is the largest telescope in Catalonia (0.8-m), named Joan Oró after the famous Catalan biochemist and pioneer of astrobiology, and is operated since 2007 by the Institut d'Estudis Espacials de Catalunya (IEEC). Transient phenomenae, as the Gaia science alerts follow-up programme, requires the capability to change the observatory scheduling in real time with the minimal human interaction, as TJO is able to do.

The MEIA2 camera is the optical imager of TJO with 2048 x 2048 squared pixels of 13.5 micrometers size each (providing a total field of view of 12.3 x 12.3 arcminute^2, a bit less than a quarter of the full Moon size). This instrument allows also to use a wheel of filters to get images in different photometric passbands (Johnson-Cousins B, V, Rc and Ic passbands are used in this study).

Once a new alert is published, it enters into the automatic scheduler and could be observed during the same night if weather conditions are suitable. After removing all usual instrumental effects from TJO images using the calibration images automatically obtained by the telescope, precise lightcurves can be built and shared with Gaia and astronomical community in order to learn everything possible about the source (periodicity of the variable sources, luminosity of the supernova explosion, distance to the source, ...).

As an example, Fig. 1 shows the observed image field for science alert Gaia15adb, a Ia supernova discovered in March 2015, and how is getting dimmer with time (click to see the animated gif). Figure 2 shows the multicolor lightcurves built using our data. As it can be seen, the decrease of brightness with time matches quite well with the behaviour of a typical Ia supernova in the several passbands observed.





Summary

- $Ø_{TJO}$ = 0.8 m → Bright alerts (V<19)
- Robotic telescope → Fast response to alerts
- $UBVR_CI_C$ passbands → Multiwavelength studies
- 17 alerts already observed
- 1586 images from 23rd Feb
  (3rd most contributing user in few time)
- 3 SNIa + 2 RR Lyr → Parameters also derived
- Granted time ready to resume observations

Is anybody else interested to scientifically analyse our data or to drive our observations to some particular type of alerts?

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