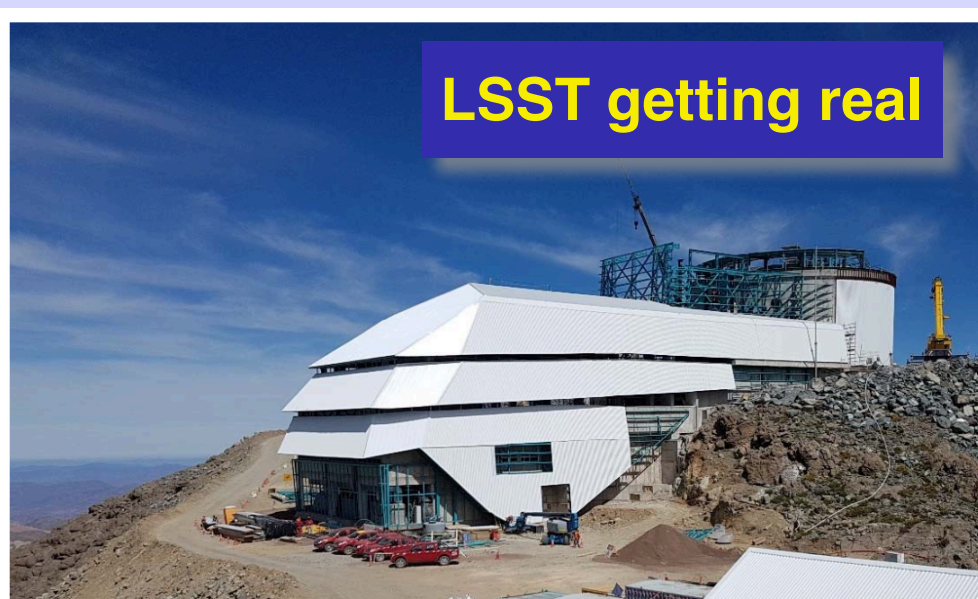


Dec 2017
Andy Lawrence
Trieste

- Status of LSST
- Overview of LSST data processing
- European involvement in LSST
- UK DAC plans
- VO related issues



LSST getting real

current schedule

First ComCam images	May 2020
First LSSTCam images	Feb 2021
SV mini-surveys	Jun 2021
Full operations	Oct 2022

LSST processing concepts

project

community

Difference imaging

Stacked images

analysis software

Image every 3 days

L1

L2

L3

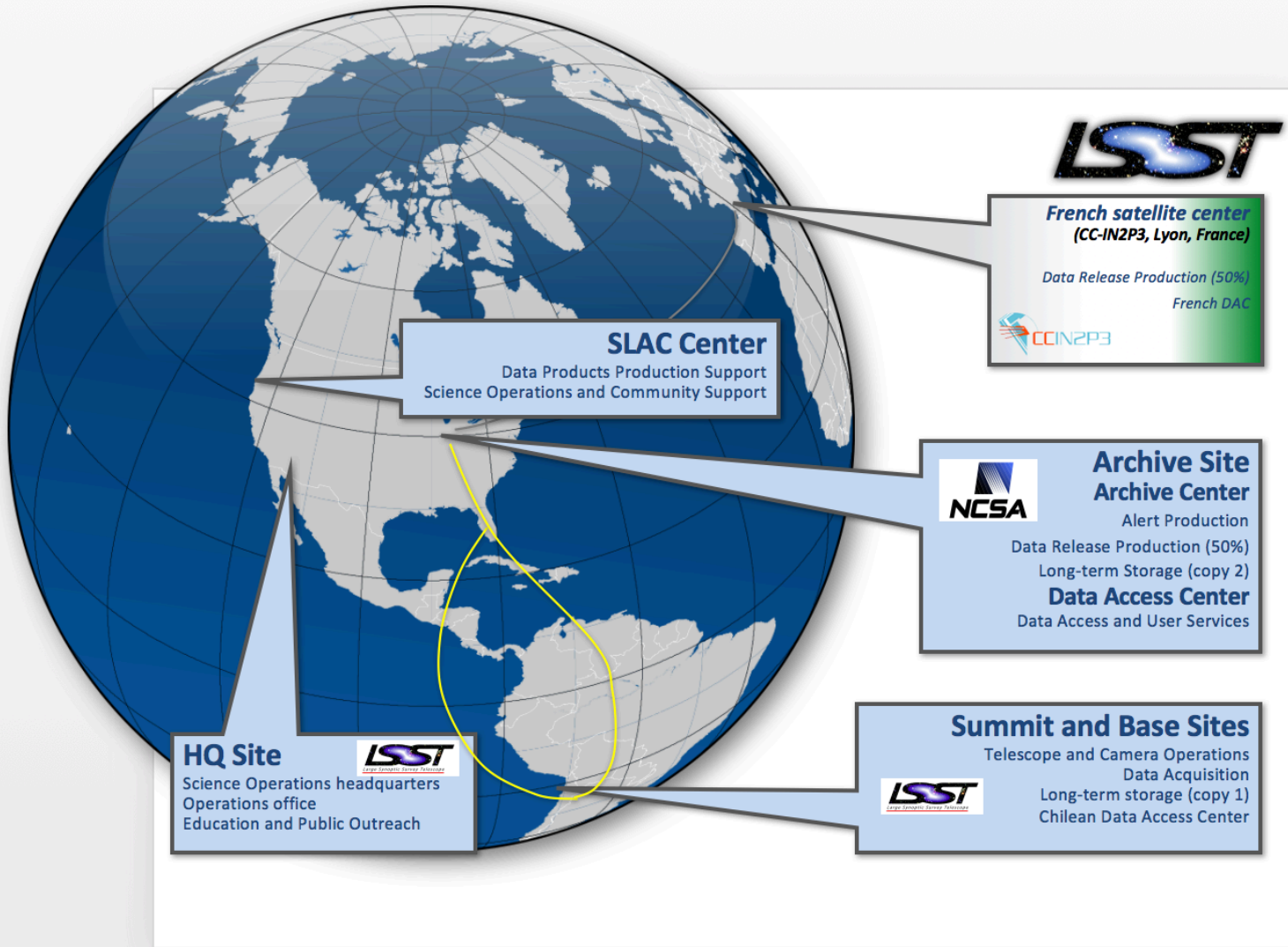
alert stream

annual releases
light curves

science!

public

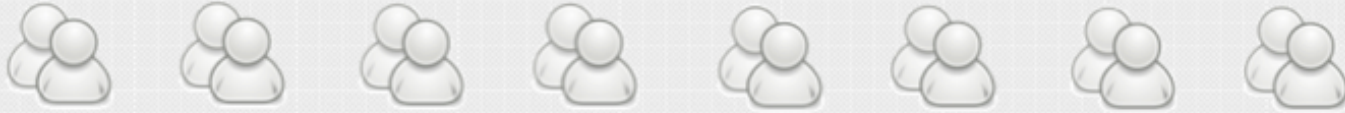
registered users



+ UK DAC

Locations

LSST USERS



INTERNET

LSST SCIENCE PLATFORM



PORTAL

NOTEBOOKS



WEB APIS



DATA RELEASES



ALERT STREAMS



USER DATABASES



USER FILES



USER COMPUTING

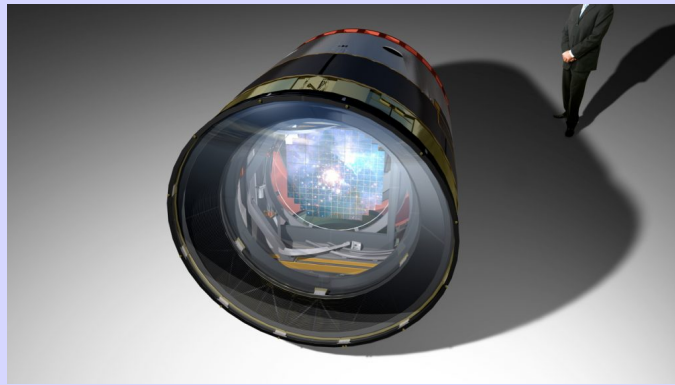


SOFTWARE TOOLS

Multiple access styles

**France
IN2P3**

~ 100 PIs



camera co-development



L2 co-processing and
2nd Archive centre

**UK
STFC**

~ 100 PIs



operations subscription



UK DAC
L3 s/w development

**assorted
institutions**

LSST-corp
subscription



- funded by STFC
- 35 partner universities
- Project Lead: Bob Mann, Edinburgh
- Project Scientist: Stephen Smartt, Belfast

- MOA with LSST Sept 2015
- Phase A study 2015-2019
 - prototype DAC
 - L3 science areas studies
- Phase B construction 2019-2023
- Phase C/D operations 2023-2033

*subscription agreed
for 100 PIs*

funded, underway

*provisional funding
reviewed 2018*

UK DAC plans*

** provisional: internal UK competition underway for structure and Phase B workpackages*

- L2 data from Lyon Archive centre
- L1 alert stream from NCSA

- clone core facilities of US DAC
- add infrastructure for UK priorities
- add L3 s/w for UK priorities

likely specialisations:

pixel datamining (eg Euclid synergy)
Multiwavelength and VO integration
Broker and Time Domain service

*take a look
at this*

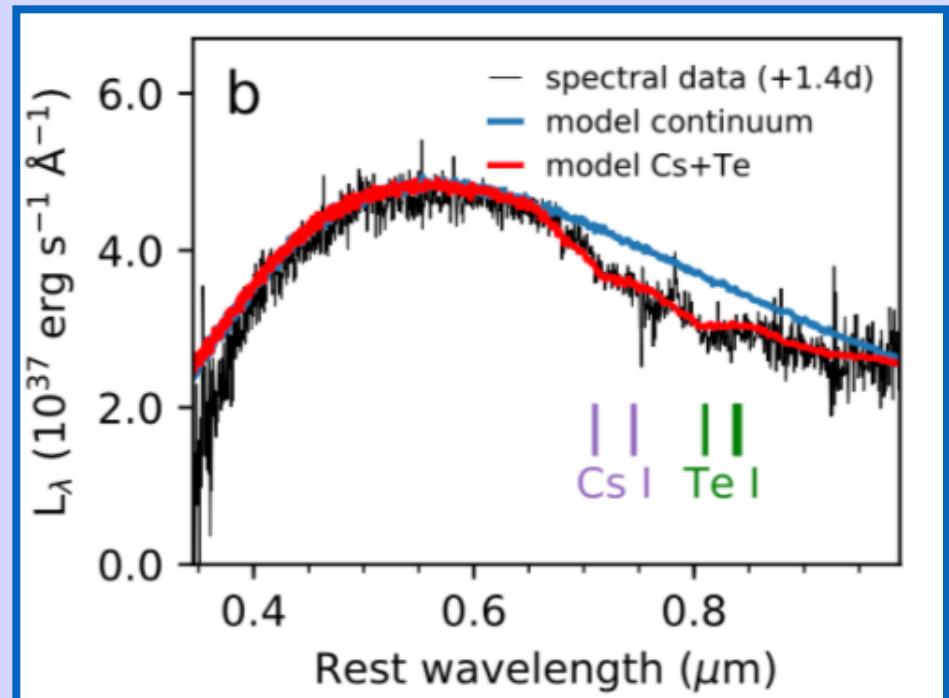


PESSTO experience

Hundreds of SNe classified/monitored

- Europe wide science consortium
- Processing millions of nightly transients in Belfast
- Filtered by machine learning + Target Alert Team
- Context classification provided
- Fed to spectroscopy: 10N/month on NTT
- Also follow-up other public alerts

One of the first spectra
of GW170817 !!

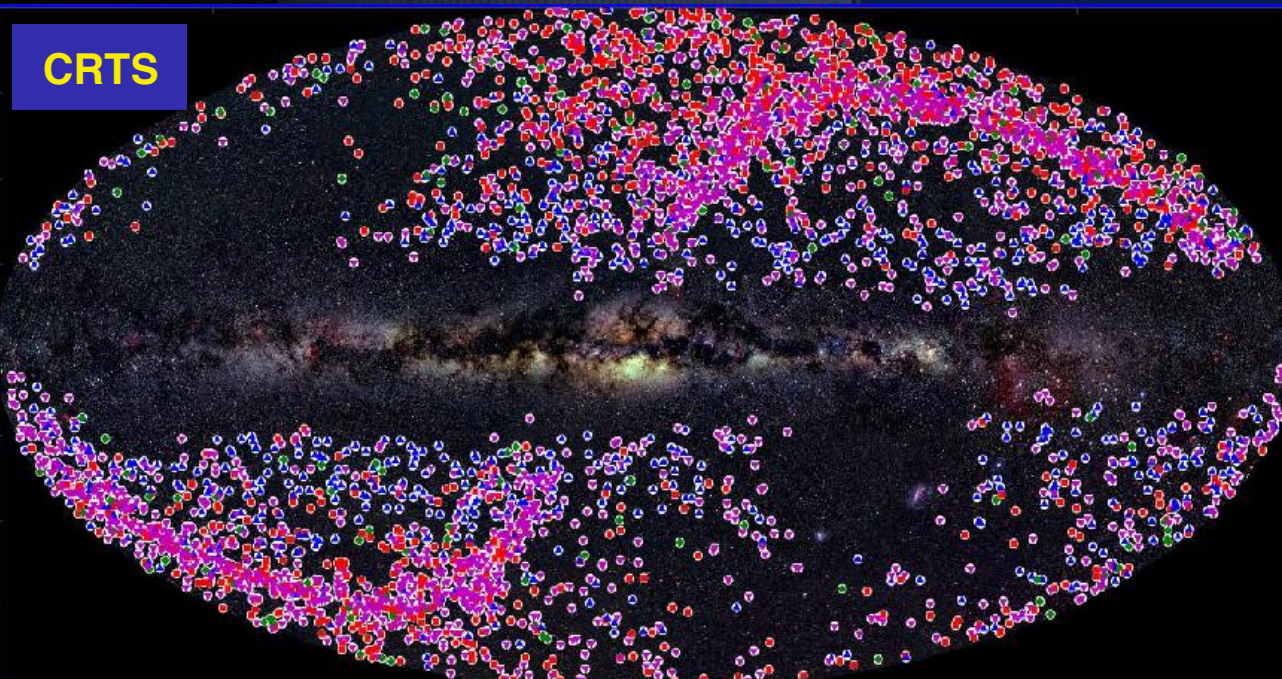


PS1
PS2
ATLAS



Live streams

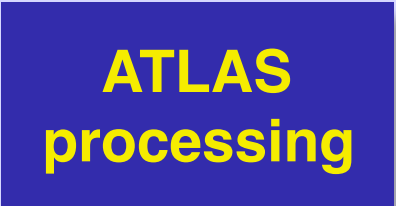
CRTS



PTF



Good Candidates (469)

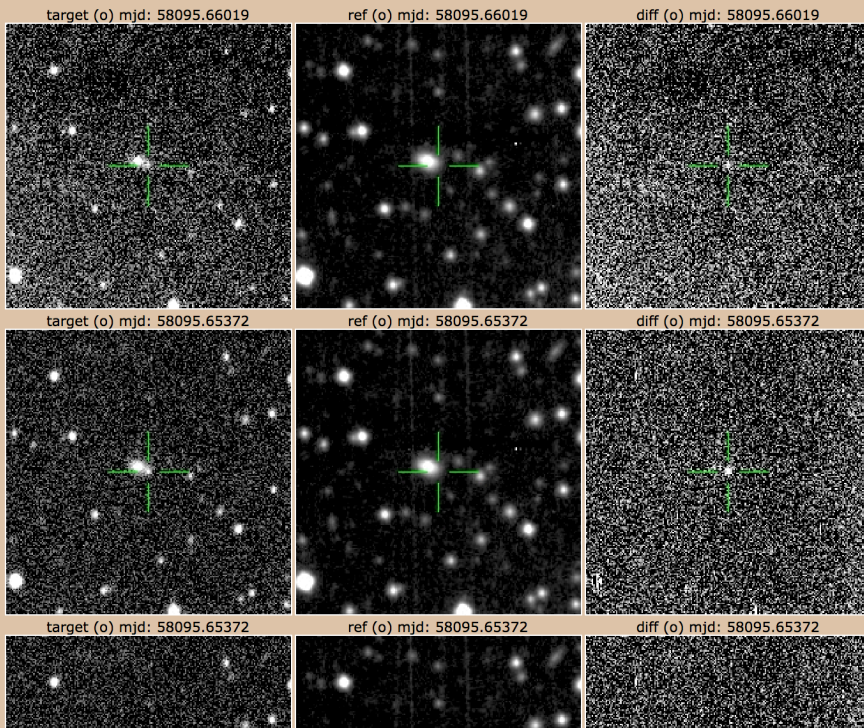


rank	id	atlas designation	other designation	ra	dec	Context Classification	Flag Date	Spectral Type	current trend	earliest mjd	earliest mag	earliest filter	latest mjd	latest mag	latest filter	RB Factor	RB Factor 2	External Crossmatches	rms																						
3880315	1233702981154914300	ATLAS17npe		23:37:02.94	+15:49:14.1	SN	Dec. 10, 2017	—	rising 00.22 (o-o)	58097.29454	18.467	o	58097.30995	18.201	o	0.858	0.997	AT2017ltq	0.303																						
3864741	1133936230112855900	ATLAS17nph	AT2017lvh	13:39:36.25	-11:28:55.8	SN	Dec. 10, 2017	—	fading 00.11 (o-o)	58092.63014	16.317	o	58096.62439	16.427	o	0.461	0.870	—	0.348																						
3819433	1235117551075800400	ATLAS17noz	AT2017lvf	23:51:17.54	+07:58:01.5	SN	Dec. 9, 2017	—	fading 00.12 (o-o)	58096.27536	18.977	o	58096.29633	19.099	o	0.163	0.857	—	0.796																						
3793628	1003035151013100400	ATLAS17npa	AT2017lvq	00:30:35.16	+01:31:00.3	SN	Dec. 9, 2017	—	fading 00.04 (o-o)	58096.29970	18.703	o	58096.32085	18.744	o	0.696	0.833	—	0.615																						
3792279	1133905300201730200	ATLAS17nnn	AT2017lvb	13:39:05.30	-20:17:29.9	SN	Dec. 8, 2017	—	fading 00.20 (o-o)	58095.64537	16.768	o	58095.66019	16.969	o	0.900	0.993	—	0.524																						
3789714	1122444530371145000	ATLAS17nnr		12:24:44.53	-37:18:45.5	SN	Dec. 8, 2017	—	fading 00.78 (o-o)	58091.61928	17.327	o	58095.65091	18.11	o	0.814	0.924	AT2017gqa	0.417																						
3754651	1063629090302540000	ATLAS17nnw	AT2017lvc	06:36:29.07	-30:25:42.6	SN	Dec. 8, 2017	—	rising 01.10 (o-o)	58067.54517	18.585	o	58095.49554	18.042	o	0.859	0.843	—	1.023																						
3752330	1223334240131541300	ATLAS17nny	AT2017luz	22:33:34.26	-13:15:42.2	SN	Dec. 8, 2017	—	fading 00.18 (o-c)	58082.26293	18.942	c	58095.24300	18.454	o	0.196	0.328	—	0.449																						
3752329	1223318620371907600	ATLAS17nnk	AT2017luy	22:33:18.64	-37:19:07.2	SN	Dec. 8, 2017	—	rising 00.12 (o-o)	58095.24438	18.434	o	58095.25770	18.268	o	0.362	0.740	—	0.59																						
3749634	1043141620210852200	ATLAS17nni	AT2017liu	04:31:41.63	-21:08:52.1	SN	Dec. 8, 2017	—	fading 00.18 (o-o)	58095.40763	18.311	o	58095.43602	18.3	o	0.750	0.926	—	0.625																						
3748354	1023325210201210900	ATLAS17nnh	AT2017liw	02:33:25.12	-20:12:09.1	ORPHAN	Dec. 8, 2017	—	rising 00.22 (o-o)	58043.46033	17.598	o	58095.38016	17.719	o	0.964	0.991	—	0.408																						
3748034	1015819300282314100	ATLAS17nno	AT2017lva	01:58:19.26	-28:23:14.9	UNCLEAR	Dec. 8, 2017	—	fading 00.32 (o-o)	58091.32713	18.165	o	58095.36092	18.529	o	0.542	0.725	—	0.568																						
3746870	1001017050404059600	ATLAS17noe		00:10:17.05	-40:40:59.8	SN	Dec. 8, 2017	—	rising 00.46 (o-o)	58067.34004	18.958	o	58095.30731	18.568	o	0.361	0.735	AT2017lmj	0.76																						
3746496	1205647970322644500	ATLAS17nne	AT2017liu	20:56:47.87	-32:26:44.5	SN	Dec. 8, 2017	—	fading 00.37 (o-o)	58095.19555	17.725	o	58095.21451	17.858	o	0.732	0.525	—	0.743																						
3736498	1062740031472945200	ATLAS17nnf	AT2017liu	05:27:40.09	+47:29:45.7	ORPHAN	Dec. 8, 2017	—	rising 00.22 (o-o)	4216.204	77198	16.893	0.0	7090.48	6143.59	0.0	2.7	93.8	2	57.21	0	999	0	0	0	0	0	0	0	0	-1	-112.0	4.4	—	58097.6625886	02a58097o0986o	17.92	—	30.0	o	T
3732946	1051149661672913400	ATLAS17nng		05:11:49.37	+67:29:15.1	SN	Dec. 8, 2017	—	rising 00.22 (o-o)	58095.19555	17.725	o	58095.21451	17.858	o	0.732	0.525	—	0.743																						
3635874	1111044381045048700	ATLAS17nmu		11:10:44.54	+04:50:50.6	SN	Dec. 8, 2017	—	rising 00.22 (o-o)	58095.19555	17.725	o	58095.21451	17.858	o	0.732	0.525	—	0.743																						
3634229	1104713231001214600	ATLAS17nmr	AT2017lit	10:47:13.27	+00:12:13.9	SN	Dec. 8, 2017	—	rising 00.22 (o-o)	58095.19555	17.725	o	58095.21451	17.858	o	0.732	0.525	—	0.743																						
3616943	1033331971031124400	ATLAS17nmo	AT2017lto	03:33:31.98	+09:11:24.2	UNCLEAR	Dec. 8, 2017	—	rising 00.22 (o-o)	58095.19555	17.725	o	58095.21451	17.858	o	0.732	0.525	—	0.743																						

millions of raw events/night

automated filtering ==> thousands

context + eyeballing ==> hundreds



Possible Associations

J2000 \uparrow 13 39 5.390 -20 17 38.10

SDSS DR14

FoV: 70.97°

Requested (ra, dec) is outside the SDSS footprint.

PESSTO Marshall

observers presented with “tickets” with complete contextual information and annotations

manual queue re-organisation

showing transients 1-10 of 58 with **decDeg < 30** in the **classification targets** list

overview | comments 1 | photometry | context | ticket history

manually create a ticket for a new comment (6 days ago): Nice constraints, quite bright and reasonably remote in the host. Good target. - Joe Lyman

create new ticket

TARGET SELECTION QUEUES

- inbox (161)
- snoozed (6958)
- review for followup (12)

OBSERVATION QUEUES

- classification targets (58)
- followup targets (26)
- all targets (84)

CLASSIFICATION & ATEL QUEUES

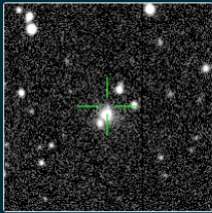
- queued for classification (0)
- queued for atel (4)

REFERENCE

- all (37239)
- classified (7671)
- followup complete (242)
- all archived (36740)


object info

ATLAS17kwg



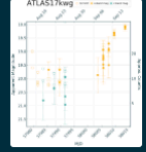
ra & dec: 02:27:30.74 +21:59:19.8
[36.67811 21.98886]
abs peak mag: -17.99
pre-disc non-detection: unknown
discovery date: 37 days ago (2017-08-18)
date added to marshall: 8 days ago (2017-09-16)

host info



exact sidc location 02197.818888888889, 21988.86111111111
contextual classification: SN - The transient is possibly associated with V Zw 243 NOTES01; a 17.20 mag galaxy found in the NED catalogue. It's located 16.31" S, 3.39" E (12.3 Kpc) from the galaxy centre. A host $z=0.037$ implies a transient $M = -17.99$.

lightcurve



discovery magnitude: 20.80 o-band 2017-08-18 +37d
latest magnitude: 18.05 ATLAS FP o-band 2017-09-17 +7d
current mag estimate: 17.75

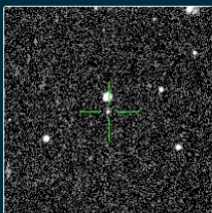
priority: HIGH
aka: AT2017gll
list: classification targets
pessto id: 11991682

overview | comments 1 | photometry | context | ticket history

latest comment (6 days ago): discovered 2 days from non-detection, in a faint host. Classify with high priority - Luis Galbany


identity

ATLAS17lau



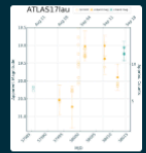
ra & dec: 02:38:37.95 -28:01:01.2
[139.65814 -28.01702]
pre-disc non-detection: unknown
discovery date: 27 days ago (2017-08-28)
date added to marshall: 6 days ago (2017-09-18)

host info



contextual classification: SN - The transient is possibly associated with APIMUKS(BLJ) B023626.99-281357.4; a 20.33 mag galaxy found in the NED catalogue. It's located 1.33" S, 1.54" E from the galaxy centre.

lightcurve



discovery magnitude: 20.54 o-band 2017-08-28 +27d
latest magnitude: 19.07 ATLAS FP o-band 2017-09-17 +7d
current mag estimate: 19.85

priority: HIGH
aka: AT2017gum
list: classification targets
pessto id: 12102252

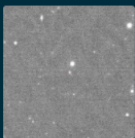
overview | comments 7 | photometry | context | ticket history

Warning: this object is too faint to take a classification spectrum - please consider archiving it

latest comment (+1hr): ATEL#10777: OGLE-IV Transient Search report 25 September 2017 part 2 - Atel 10777

identity

OGLE17esk

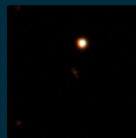


ra & dec: 04:03:36.10 -69:37:45.9
[60.90046 -69.62944]
abs peak mag: -15.45
pre-disc non-detection: 39 days ago (2017-08-16)
discovery date: 35 days ago (2017-08-21)
date added to marshall: 19 days ago (2017-09-05)

object info

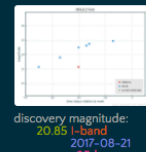
classification: unknown
classification survey: ePESSTO
classification date: 2017-09-13 (12 days ago)
classification phase: unknown
redshift: 0.1090
distance: 504.74 Mpc

host info



contextual classification: UNCLEAR - The transient is possibly associated with ST/P0065990; an unknown-mag unclassified source found in the CSC v2.3 catalogue. It's located 0.29" S, 0.74" W from the object's source centre.

lightcurve



discovery magnitude: 20.85 l-band 2017-08-21 +35d
latest magnitude: 19.07 OGLE l-band 2017-09-18 +7d
current mag estimate: > 21.0

priority: HIGH
Pi: no pi set
aka: AT2017gvr
list: classification targets
pessto id: 11333527

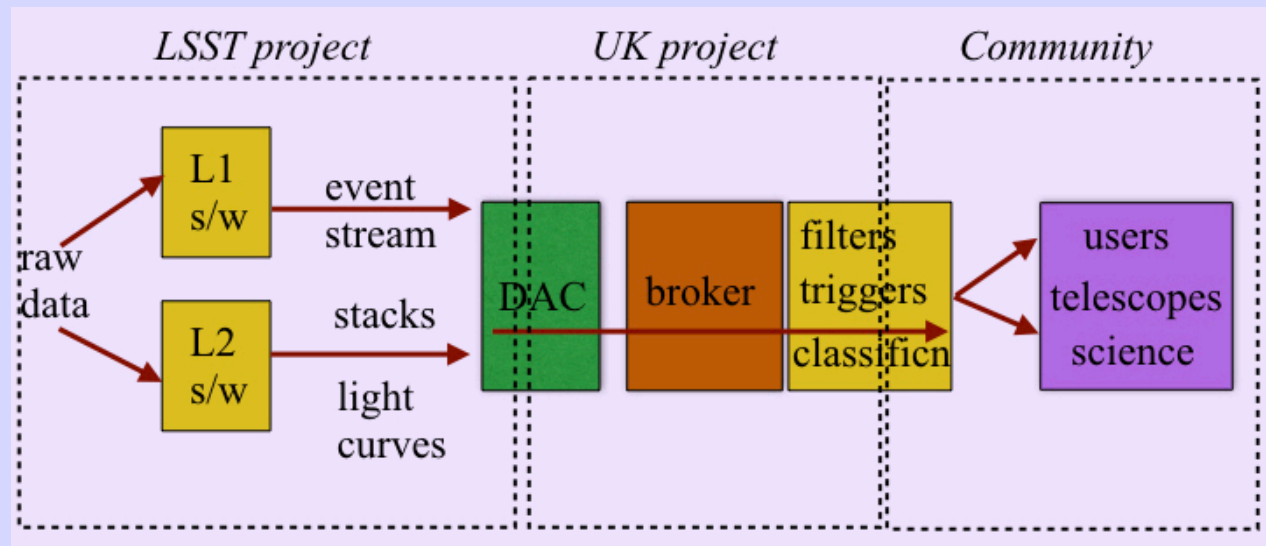
2 x Atel

already processing at LSST rates

so what next?

- open
- plug-and-play
- multi-purpose

UK DAC overview

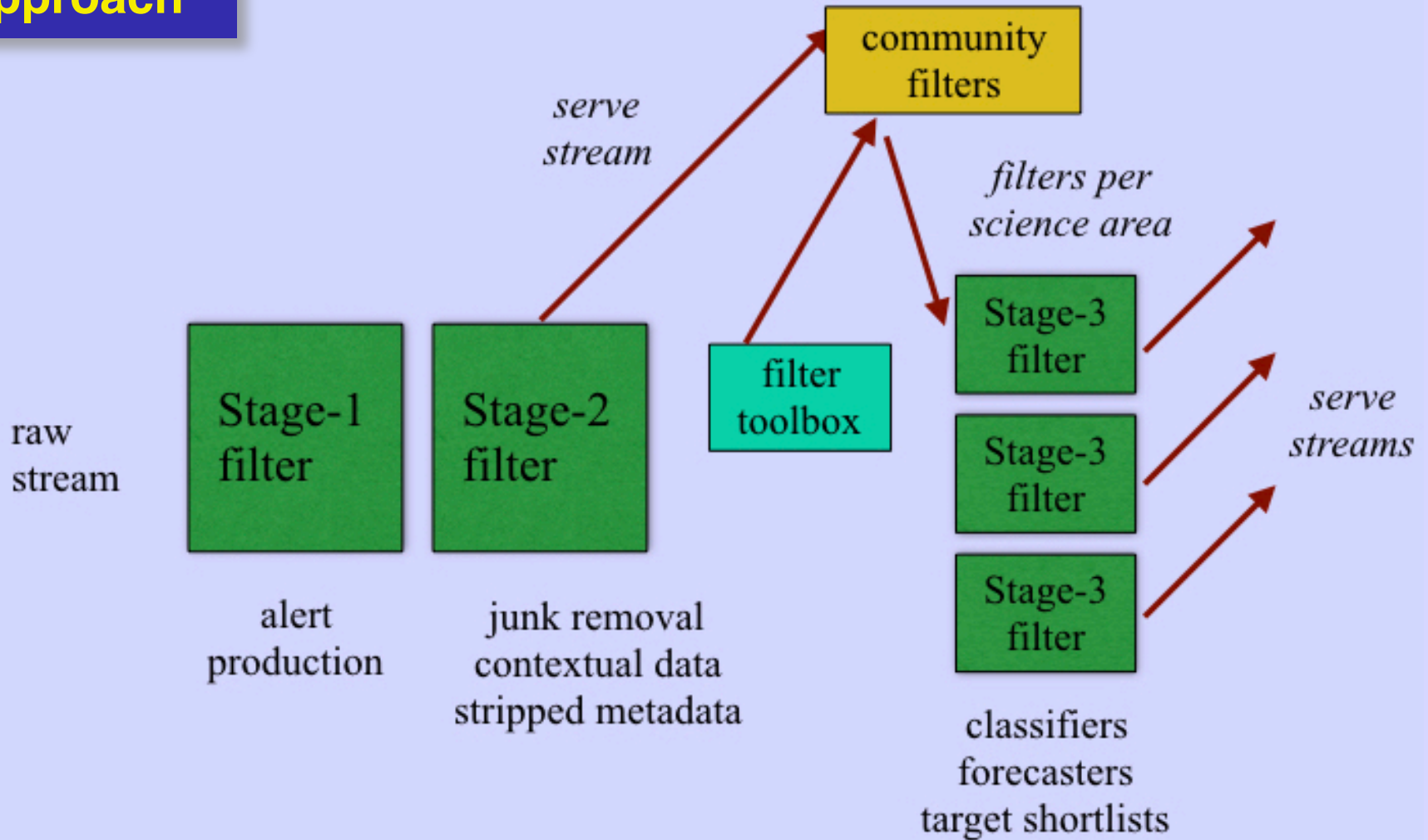


need:

- main broker
- infrastructure for L3 sub-brokers
- classification software
- automated context provision
- ability to track “watch-list”
- forecasters / triggers
(transients, outbursts, dippers)
- feed-through to follow-up

Lasair

multi-stage approach



VO issues

event format/transport

IVOA standard:	VO Event VTP	<i>much invested software and practice</i>
LSST proposal:	AVRO Kafka	<i>we have experimented with Kafka streams</i>
<i>Likely approach:</i>	<i>absorb emit</i>	<i>AVRO/Kafka VOEvent /VTP</i>

VO issues

light curves

- Adapt SSA/SSAP
- Develop new Time Series standard suite

under recurring debate at IVOA....

VO issues

time series tools

- Python notebooks + time series library
- Use Topcat
- Use SPLAT
- Develop new tool

*the right tool may be key
to deciding standards requirements*