ePESSTO Tutorial
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Before the training, please install the following programs, create a TNS account and join the Slack Channels.

To install:

1. ePESSTO pipeline:

Download: https://github.com/svalenti/pessto/releases
Instructions:
https://docs.google.com/a/pessto.org/viewer?a=v&pid=sites&srcid=cGVzc3RvLm9yZ3x3aW tpfGd4OjIxYjllODYxYjJhZTkwYzI

Test if your pipeline works. Type on the terminal:

> **PESSTO**

If it is installed, it should appear:

```
##############################     PESSTO     ##############################
PESSTO -h  (show the help message)
PESSTOASTRO -h  (show the help message)
PESSTOEFOSC1dSPEC -h  (show the help message)
PESSTOEFOSC2dSPEC -h  (show the help message)
PESSTOEFOSCPHOT -h  (show the help message)
PESSTOFASTSPEC -h  (show the help message)
PESSTOSOFI1dSPEC -h  (show the help message)
PESSTOSOFI2dSPEC -h  (show the help message)
PESSTOSOFIPHOT -h  (show the help message)
PESSTOWISE -h  (show the help message)
####################################################
```

2. Supernova Identification (SNID):

A tool to classify the transients **(important to have it)**
https://people.lam.fr/blondin.stephane/software/snid/

Gelato and DASH

Please be familiar with Gelato **(you need to create an account)**
https://gelato.tng.iac.es/

For the machine-learning inclined, there is this tool (less tested and used in the community):
https://github.com/daniel-muthukrishna/astrodash

3. IRAF:

It would be great if you have IRAF.
https://iraf-community.github.io/install.html

Accounts:

1. TNS

1. Create your account at https://www.wis-tns.org/user/register
2. Once you have your account, *log in* and go to the tab called **"Groups."**
3. In the list, you should look for ePESSTO+ (now number 63) and click on **JOIN**.
4. When you are confirmed as part of the ePESSTO+ group, you will have access to the templates for the astronotes.
   You can verify this by going to the tab **"AstroNote"** and exploring **"My templates."**

2. Slack channels

I recommend joining these channels:

#marshall (For all)
If you have any problem with the Marshall, you can write it down in this channel. You can use @Dave Young to have his attention.
Typical problems:
   - The Marshall is down.
   - The Marshall creates duplicate objects
   - There is no access to the information.

#tat (Mostly for the *Target and Alert team*; people selecting objects to classify)
It is important to be on this channel to follow the discussions about targets and their priorities, the Marshall, etc.

#astronote-classifications (Mostly for *FOR SUPPORT TEAM*)
In this channel, we can basically share the classifications (before the astronote submission) and discuss the astronote information (classifications, redshift, surveys etc)

#wiserep_tns_uploads (For the Support team).
This channel is used to send the reduced data to Weizmann people. Normally, we send two folders, one for the classifications (public) and the other for follow-ups (private).

More details information can be found here: **http://wiki.pessto.org/**

1. Useful webpages

ePESSTO Wikki:
http://wiki.pessto.org/pessto-wiki
ePESSTO Marshall:
http://www.pessto.org/marshall/
WISeREP:
https://wiserep.weizmann.ac.il/
Visibility:
http://catserver.ing.iac.es/staralt/index.php
https://airmass.org/

For observers:
P2:
https://www.eso.org/p2ls/login
La Silla Observatory Eavesdropping Mode (LOEM):
http://www.eso.org/loem
Meteo information in La Silla:
http://www.ls.eso.org/lasilla/dimm/meteomonitor.html

2. Documentation

The PESSTO Handbook
📄 *PESSTO-Handbook-V1.39.pdf*
This file contains all important information for observers and support teams. Please read it to have a general picture of the observations

NTT Pipeline User's Manual
https://docs.google.com/document/d/1acRqbtihK-YcnAUs2qmFvKg5H3eZ4rcMr5GPjm2v5lQ/edit

P2 tutorials
https://www.eso.org/sci/observing/phase2/p2intro/p2-tutorials.html.

3. Useful emails

- Information about the observations and reductions must be sent to alerts@pessto.org
This includes:
- Next ePESSTO+ subrun: Email a couple of days before the first night of observations informing when the observations start. Here, we also suggest to the PI to update the Marshall.
- ePESSTO+ night report: Email summarising the night. This includes the link to the night report.

- Reductions must be sent to Weizmann people either in Slack Channel (#wiserep_tns_uploads) or by email (wiserep@weizmann.ac.il). The files are normally heavy, and to avoid problems, the suggestion is to use https://wetransfer.com/

Please remember to send two files, one with Public data (classifications) and one with private data (follow-ups).

4. **Cosimo Inserra (PI):** inserrac@cardiff.ac.uk
5. **Joe Anderson:** janderso@eso.org
6. **David Young:** d.r.young@qub.ac.uk

INFO FOR OBSERVERS

The observers basically have to care for the following things:

1. **Prepare an observing plan:** See in the Marshall follow-up targets and classification targets with their priorities, and make a plan/schedule (you can use P2).
2. **P2:** Here, we have to prepare the OBs and the ranked list of the observations. Please note that the telescope is following this order (sorted by the observers at the beginning of the night) by default. **If you change the observation plan, please save the info in the P2 and check with LOEM/TO that it is effective otherwise inform TO.**
3. **LOEM:** Interface to see the screen in La Silla. This allows us to verify if the object we are moving to is the right one, to identify the object to take a spectrum, to see the order of the observations, etc. **Please note that only one person can access this interface but we may share the screen for others to see.**
4. **Marshall:** The observers must report the observations they did and change the priority of the object for follow-up targets. For classification targets, they should be moved to the queue for classifications.
5. **Night Report:** The log of observations must be accurate. This report helps the support team. Below, you can find more information.

Things to take into account:

- **Observing plan:** This is basically based on the objects to follow up/classify.
  With the P2, this is very easy.
- We have four categories in P2: 1) Calibration, 2) Standards, 3) Classification, and 4) Follow-up.
- If the observers want more calibrations before the official starting (e.g. flats, bias), they need to inform to the TO. They will manage to obtain the data the following day.

ePESSTO OBs INFORMATION

The OBS are now on the P2 webpage:
http://wiki.pessto.org/pessto-operation-groups/observing-management-team/pessto-obs-information

General information of the exposure times:
http://wiki.pessto.org/pessto-operation-groups/observing-management-team/pessto-obs-information

Finding Charts:

The finding charts (FC) can be found here:
http://wiki.pessto.org/pessto-wiki/home/finder-chart-repo
If you don't see the FC, you could ask the PI of the object for it.

Night reports:

In the following link, you can find the log of the observations:
http://wiki.pessto.org/pessto-wiki/home/night-reports
Every night, the observers report the objects they observe. The structure of the report is in the webpage, but it is basically as follows:

****
NIGHT REPORT

2021-03-02

Observers: People on duty as observers
Support: People on duty as a support
TAT: Here, we include the TAT. They are people selecting the targets to classify. This information is available here:
https://wiki.pessto.org/home-page/observing-runs#h.vdkx5n3w05ib

EFOSC Calibrations: bias, calib, grz skyflats → This is the standard, but of course depends on the night.

Weather:
Start: humidity XX, wind XX, seeing XX
Middle: humidity XX, wind XX, seeing XX
End: humidity XX, wind XX, seeing XX
The weather conditions can be found here:
http://www.ls.eso.org/lasilla/dimm/meteomonitor.html

Comments:
For example, time lost due to bad weather, problems with the telescope, etc

Started with EFOSC

UT	Target	Type	Set up	Slit	Exposure	irmass	Seeing	Notes

INFO FOR THE SUPPORT TEAM

The support team must do:

1. Obtain the data
2. Data reduction
3. **Send the reduced data to WISEReP (first do this!!)**
4. Prepare a draft of the Astronote
5. EMAIL: Inform the collaboration on the classifications.

1. Obtain the data

To download the data, go to: http://archive.eso.org/eso/eso_archive_main.html

Then you will have something like:

M	More	HDR	OBJECT	Target Ra, Dec	Program_ID	Instrument	Category	Type	Mode	Dataset ID	Release_Date	TPL ID	TPL START	Exptime
🟩	🔍	Header	AT2021BXU	02:09:16.88 -23:24:48.3	106.216C.011	EFOSC	SCIENCE	OBJECT	SPECTRUM	EFOSC.2021-02-12T00:33:35.829	Feb 12 2021	EFOSC_spec_obs_Spectrum	2021-02-12T00:33:12	900.006
🟩	🔍	Header	AT2021BLZ	04:32:31.67 -32:25:53.0	106.216C.011	EFOSC	SCIENCE	OBJECT	SPECTRUM	EFOSC.2021-02-12T00:59:54.690	Feb 12 2021	EFOSC_spec_obs_Spectrum	2021-02-12T00:59:30	1500.003
🟩	🔍	Header	L745A	07:40:22.90 -17:25:04.0	106.216C.011	EFOSC	SCIENCE	STD	SPECTRUM	EFOSC.2021-02-12T06:05:46.794	Feb 12 2021	EFOSC_spec_obs_Spectrum	2021-02-12T06:05:23	100.013
🟩	🔍	Header	L745A	07:40:22.90 -17:25:04.0	106.216C.011	EFOSC	SCIENCE	STD	SPECTRUM	EFOSC.2021-02-12T06:08:16.521	Feb 12 2021	EFOSC_spec_obs_Spectrum	2021-02-12T06:07:53	100.005

Select all targets and download them.
A window like this will appear:

Select the download options.
Note that the ZIP file works pretty well.

2. Data reduction

- Activate the PESSTO environment

- Uncompress the data:
uncompress *.Z

- Make lists with private and public data

**- Run the PESSTO pipeline** (Page 31 in the Handbook)

Individual objects → PESSTOFASTSPEC -i EFOSC.2012-08-18T06:26:32.311.fits
Lists →PESSTOFASTSPEC -i list
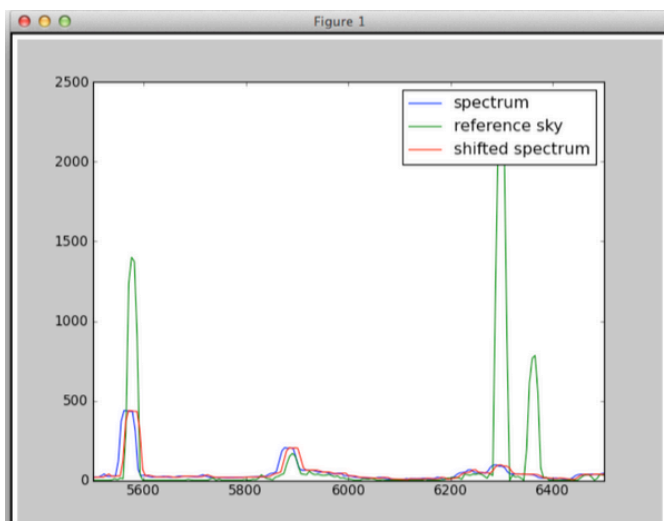
where the "-i" switch tells PESSTFASTSPEC to run in interactive mode.

The first window, which is shown, checks the wavelength calibration using the night sky lines; no action on the part of the user is required here. After this, the pipeline will ask if you want to find an aperture, recenter an aperture and edit an aperture. Answer "yes" to all of these (or simply press return), and you will be taken to an interactive window where you define the aperture and sky background regions used to extract the spectrum. Click within the window, and then use the standard iraf apall commands to define your aperture.
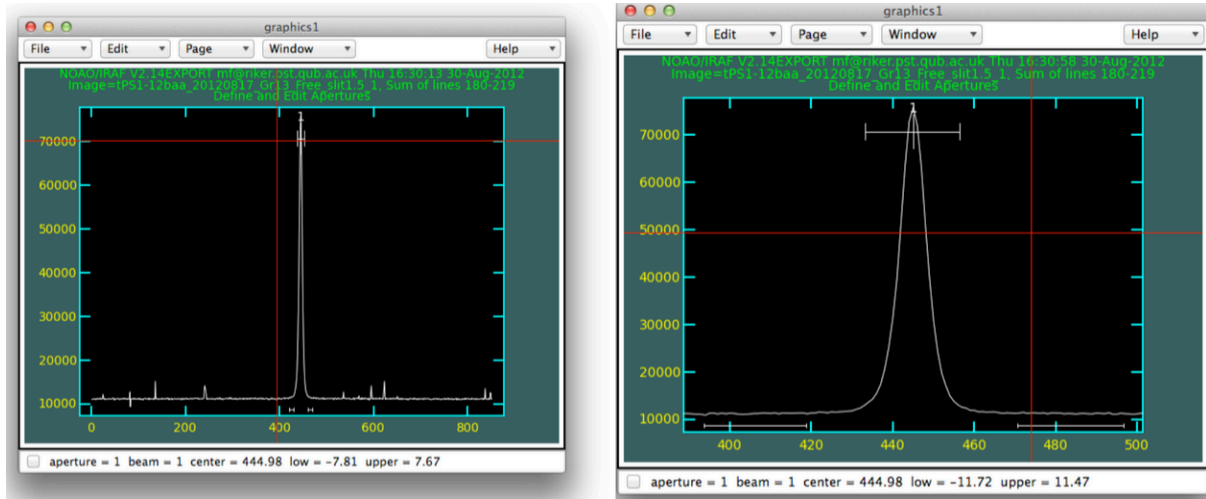
w - enter window mode
x - zoom in x axis
y - zoom in y axis
a - show entire range

Once the apertures for extracting the spectrum are defined (it should look something like the example above for a well-exposed spectrum) then press "q" to exit out of the aperture editor. At this point, the pipeline will ask you whether you want to review the extracted spectra, trace apertures, fit traced positions interactively, and fit a curve interactively. Answer yes to all of these (by pressing enter) to be taken to another interactive window where you can fit the trace of the spectrum. If you are happy with the trace, press "q" to quit otherwise, you can edit the trace with the following commands:
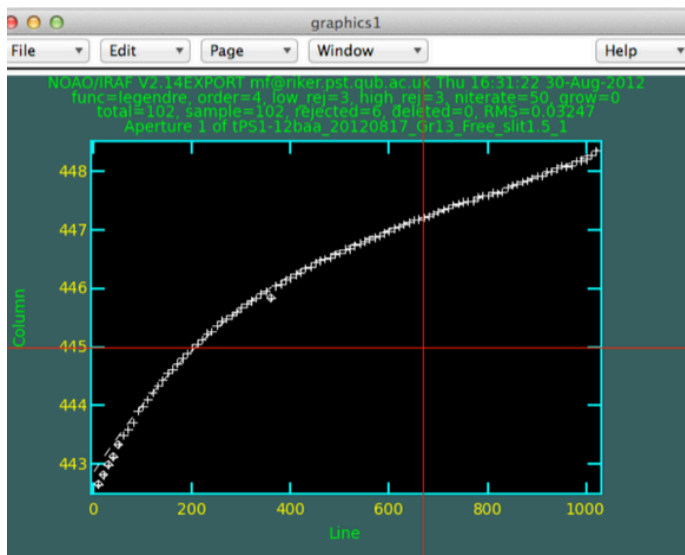

d - delete the point nearest the cursor
f - refit the trace
press ":" then type "order N" to change the order of the the fit to N

However, it should seldom (if ever) be necessary to edit the trace, and so it is unlikely that you will need to change any parameters here. Either way, when you are finished, press "q" The pipeline will then ask you if you

want to write apertures to the database, extract spectra and review the spectra - answer "yes" to all of these.

Finally, the pipeline will present you with a quick plot of the spectrum in an interactive window. Once you're done admiring your handiwork, press "q" again to exit.
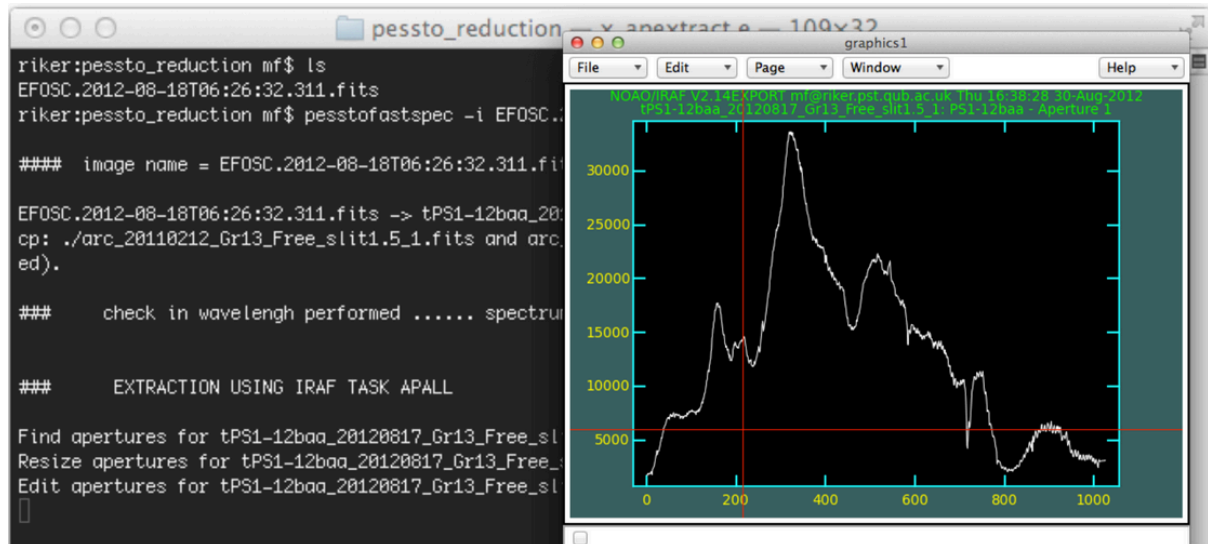
###
end of reduction
output files:
tPS1-12baa_20120817_Gr13_Free_slit1.5_1_ex.fits
tPS1-12baa_20120817_Gr13_Free_slit1.5_1_f.fits
tPS1-12baa_20120817_Gr13_Free_slit1.5_1_2df.fits
tPS1-12baa_20120817_Gr13_Free_slit1.5_1_f.asci

PESSTOFASTSPEC will have created several new files in the directory your original data was in. The file ending in _f.fits is the one-dimensional flux and wavelength calibrated spectrum, and it is this which in most cases you will be interested in. The _2df.fits file is the 2-dimensional wavelength calibrated spectrum - often useful for checking whether a feature in the 1D spectrum is real.

Finally, the .asci file is an asci version of the spectrum which SNID can read.

Run SNID: snid SN2024XXX.dat

Please remember to have two directories, one for **Private** spectra (follow-up) and another for **Public** spectra (classifications).

Now, it is time to **ingest the data to Wiserep**. To do it, follow these commands:

ls -1 *_f.fits > pub_spectra.list

PESSTOWISE pub_spectra.list

And

ls -1 *_f.fits > priv_spectra.list

PESSTOWISE priv_spectra.list

The format is as follows:

- Observer: N. Last Name, N. Last Name1, etc.
- Reducer: N. Last Name
- Quality of the spectrum: Rapid
- What is the name of the object? SN… (if you are not sure about the classification, just select SN – if you believe it is a SN or Other).
- What is the spectral type? Type the number
- What is the redshift? Please use the redshift of the host galaxy. If you only have the redshift from SNID, use it, but not precisely. For example, instead of using 0.0228, you must use 0.02.
- What type of spectrum is this..? Object

This command will create two .tar files (**public** and **private**):
- pessto_20200103_09_51_Rapid_upload_public.tgz
- pessto_20200103_09_44_Rapid_upload_private.tgz

Send the reduced data to WISEReP

Reductions (.tgz files) **Reductions** must be sent to Weizmann people either in Slack Channel (#wiserep_tns_uploads) or by email (wiserep@weizmann.ac.il). As we mentioned before, the files are normally heavy, and the suggestion is to use https://wetransfer.com/ (You don't need an account).

Please remember to send **two .tgz files**, one with the **Public** data (classifications) and another with the **Private** data (follow-ups).

Please send the data to WISeREP before the email to the collaboration with the possible classifications!

Astronotes

The **AstroNotes guidelines** can be found here:
http://wiki.pessto.org/pessto-wiki/home/astronotes-guidelines
However, here we briefly summarise it:

1. Login to your account on the TNS website.
2. Go to the tab **"AstroNote"**.
3. Go to **"My templates".**
4. Select the ePESSTO+ template.
5. Edit the following:

a) **Authors:**

The order of the authors is:
1. **ePESSTO+ observers** at the telescope for that night.
2. **ePESSTO+ data reducers** for that night.
3. **Target and alert team membe**rs (TAT) on duty.
4. People commenting helping with the classifications.

Always include:

5. **The ePESSTO+ builders:** J. Anderson (ESO), T. Müller Bravo (Southampton), T.-W. Chen (Stockholm), M. Gromadzki (Warsaw), C. Inserra (Cardiff), E. Kankare (Turku), M. Nicholl (Birmingham), O. Yaron (Weizmann), D. Young (QUB)

6. WISeREP person: E. Zimmerman (Weizmann) will be the WISeREP person on duty and will do the data upload to WISeREP and should be added to the AstroNote author list.

Depending on the source of the object to classify, include:

7. Feeder survey lists

For (7), if a target from a given feeder survey is used (i.e. is listed under "Disc. source" in the AstroNote table), then the following people and acknowledgements should be added to the AstroNote:

ZTF: No co-authorship required. But add to the text: Targets were supplied by the Zwicky Transient Facility ZTF (Bellm et al. 2019 2019PASP..131a8002B) - data stream processed through the Lasair broker (Smith, Williams, Young et al. 2019 2019RNAAS...3a..26S), and by the ALeRCE broker (Forster et al. 2020 https://arxiv.org/abs/2008.03303).

Pan-STARRS: Add this to the AstroNote text "Targets were supplied by Pan-STARRS Survey for Transients (see Chambers et al. 2016, arXiv:1612.05560, and http://pswww.ifa.hawaii.edu) "

and add the authors :

S. J. Smartt (Oxford/QUB), K. W. Smith, D. R. Young, M. Fulton, S. Srivastav, M. Nicholl (QUB), K. C. Chambers, M. Huber, A. Schultz, T. de Boer, J. Bulger, J. Fairlamb, C.-C. Lin, T. Lowe, E. Magnier, P. Minguez, R. J. Wainscoat, H. Gao (IfA, Hawaii), A. Rest (STScI), C. Stubbs (Harvard)

Pan-STARRS (Young Supernova Experiment): Add this to the AstroNote text "Targets were supplied by the Young Supernova Experiment (Pan-STARRS - see Jones et al. 2021, 2021ApJ...908..143J)". But no further authors are required if the data come from YSE rather than the Pan-STARRS Survey for Transients.

ATLAS : add this to the AstroNote text: "Targets were supplied by the ATLAS survey, see Smith et al. (2020, PASP, arXiv:2003.09052)".

And add the co-authors

J. Tonry, L. Denneau, H. Weiland, A. Lawrence, R. Siverd (IfA, University of Hawaii), N. Erasmus, W. Koorts (South African Astronomical Observatory), A. Jordan, V. Suc (UAI, Obstech), S. J. Smartt (Oxford/QUB), K. W. Smith, S. Srivastav, D. R. Young, M. Fulton, M. McCollum, T. Moore, M. Nicholl, J. Weston (QUB), L. Shingles (GSI/QUB), L. Rhodes (Oxford), J. Sommer (LMU/QUB), A. Rest (STScI), T.-W. Chen (NCU), C. Stubbs (Harvard)

NOTE: If ATLAS or Pan-STARRS find an object but it is reported publicly by another survey but not reported to TNS by that survey (e.g. as is often the case with MASTER), then ATLAS or Pan-STARRS MUST report it to TNS. We then report as normal in the AstroNote with AT name and our own PS or ATLAS name. Then, in the footnotes to the table, we acknowledge:

1. Discovered on YYYYMMDD as MASTER OT JRADEC, etc. See ATel/AstroNote #nnnnn.

OGLE : L. Wyrzykowski,(Warsaw Observatory, Poland) and cite "OGLE-IV Real-time Transient Search (Wyrzykowski et al., 2014 arxiv:1409.1095; http://ogle.astrouw.edu.pl/)"

DLT40 Survey: S. Wyatt (Arizona), D. Sand (Arizona), R. Amaro (Arizona), J. Andrews (Arizona), M. Lundquist (Arizona), S. Valenti (UC Davis), S. Yang (INAF-OAPd), D. E. Reichart, J. B. Haislip, V. Kouprianov (UNC)

7. Surveys which are not active anymore or are not feeding ePESSTO+:

SkyMapper: A. Moller, B. Tucker, B. Zhang, B. Schmidt (Australian National University) and cite Scalzo et al. ATel #5480.

The HITS survey with DECam (Chilean collaboration): F. Forster, J.C. Maureira, J. San Martin, G. Cabrera, Eduardo Vera (CMM), Mario Hamuy, S. Gonzalez-Gaitan, Lluis Galbany, Th. de Jaeger (DAS), Joseph Anderson (ESO), Giuliano Pignata (UNAB), and R. Chris Smith (CTIO)

GREAT: T.-W. Chen (MPE) and cite Chen et al. 2018, ApJ, 867L, 31

More details of the GREAT project:

http://wiki.pessto.org/pessto-operation-groups/pessto-targets-alerts/grond

Note: Please add this sentence to the classification ATel:

"AT2018XXX was observed as part of the GREAT survey (Chen et al. 2018, ApJ, 867L, 31), having a black body temperature of $T\_BB \sim XXX$ K obtained

from the photometry taken on XX.XX.2018 with griz= XX,XX,XX,XX mag."

The magnitude information can be found in the marshall.

La Silla Quest (LSQ): C. Baltay, N. Ellman, E. Hadjiyska, R. McKinnon, D. Rabinowitz, S. Rostami (Yale University), U. Feindt, M. Kowalski (Universitat Bonn), P. Nugent (LBL Berkeley) and cite Baltay et al. 2013, PASP, 125, 683

8. Acknowledging Public Surveys

The following surveys release their data publicly and they are ingested into the marshal. Co-authorship of the AstroNotes is not required, but acknowledgement is, and the appropriate text and citations are :

ASASSN: add this. Targets are are from the All Sky Automated Survey for SuperNovae ASAS-SN (see Shappee et al. 2014, ApJ, 788, 48 and http://www.astronomy.ohio-state.edu/~assassin/index.shtml)

GAIA: add this to AstroNote text : We acknowledge ESA Gaia, DPAC and the Photometric Science Alerts Team (http://gsaweb.ast.cam.ac.uk/alerts) or

"targets are from the ESA Gaia Photometric Science Alerts Team and DPAC (http://gsaweb.ast.cam.ac.uk/alerts)"

Use either, depending on how you phrase the AstroNotes.

GOTO: add this to AstroNote text: Targets are provided from the Gravitational-wave Optical Transient Observer (GOTO, see Dyer et al. 2020, SPIE, 11445; http://goto-observatory.org/)

CRTS: if targets come from CSS/MSS/SSS, which are surveys of the Catalina Real-time Transient Survey. Then add "from the Catalina Real-time Transient Survey (CRTS; Drake et al. 2009, ApJ, 696, 870 ; http://crts.caltech.edu/)."

DES: Dark Energy Survey Supernova Program (DES-SN) publishes its brighter ($r \lesssim 20$) transient candidates. If these are classified then add "targets supplied by the Dark Energy Survey Supernova Program (see Kessler et al. 2015, AJ, 150, 172 and https://portal.nersc.gov/des-sn/)

MASTER: "targets supplied by MASTER (see http://observ.pereplet.ru/ ; Lipunov et al. 2004, AN, 325, 580). MASTER do not routinely report their discoveries to TNS. So see notes for Pan-STARRS and ATLAS above.

PTSS: "targets supplied by PMO-Tsinghua Transient Survey (PTSS; http://www.cneost.org/ptss2/index.php).

9. Amateurs:

Virtually all amateurs now submit their targets to the IAU Transient Name Server (i.e. the object has an AT2016xxx name). You should add "targets were taken from the IAU TNS list (see https://wis-tns.weizmann.ac.il/) ". We let the TNS deal with the discovery and classification certificates.

No co-authorship is required now that we have this stable and IAU-recognised, platform for discovery attribution.

For the epochs, we normally use this format based on the spectral matching:
< -10
-10 to -8
-7 to -4
-3 to $+3$ (or just "at max" which we will take to mean these days)
$+4$ to $+7$
$+8$ to $+10$
$+11$ to $+20$
$> +20$ (or "several weeks after max")

These phases tie into the numbers we will be using in the ESO catalogue.

To save the astronote as a draft, please tick the box that says: Save as a draft (the status of this checkbox will serve as the default when using the template)

Inform the collaboration on the classifications.

- Send an email indicating the classifications obtained during the night before. The information includes type of object (SN, AGN, TDE, CV, Galaxy, etc), edshift, phase, velocities, etc. This must be also reported in the Slack Channel **#astronote-classifications**.
- Also included the matches you got with SNID or Gelato.
- Add the link to the astronote.

Final remarks:

- During the day people will comment about the classifications. This could be on Slack. **Stay tuned for the discussion!!**
  Please remember to include in the astronote the people that participate in the discussions, classifications, etc.
- The Astronote must be submitted in the afternoon.
  To submit it, tick the Save as a draft box (The check symbol must disappears).