SOXS Science Consortium Meeting

WG13

Actions from the survey and suggestions for the discussion

M.T. Botticella & S. Benetti on behalf of WG13

Discussion points

Target injection in Marshall from broker queries and external tools
Additional info on the Marshall

Strategy for transient classification during operations

Classification tools and guidelines for on duty teams
Collecting and adding templates in classification tools

Training and support of on duty teams

……

To achieve the goals of each projects it is fundamental to properly select targets

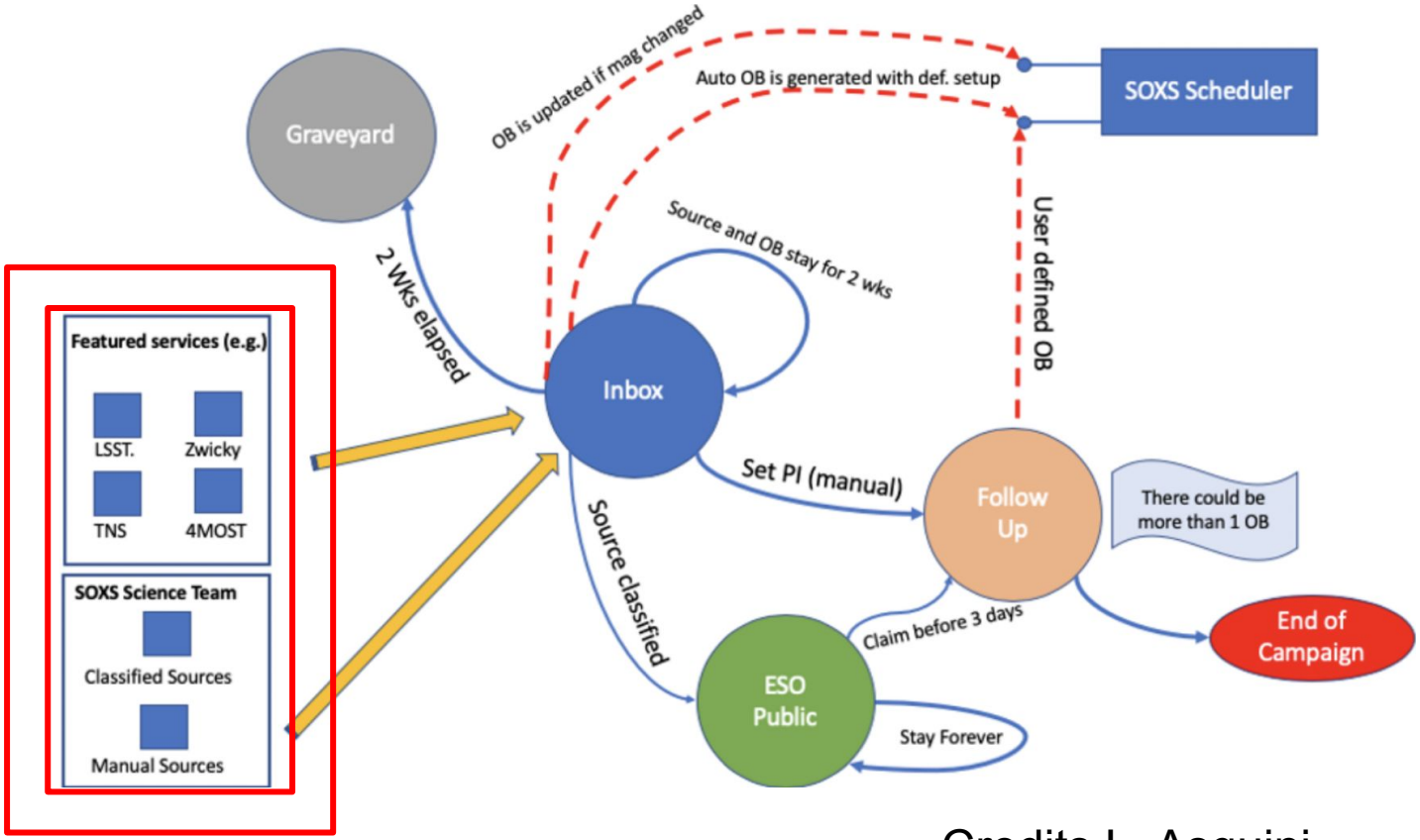
BROKERS, GCN, ATEL, TNS

MARSHALL

Queries
Selection criteria
should properly work

priority criteria
should be clearly indicated
in the Marshall and scheduler
e.g. time critical

Marshall is doing query alerts to brokers + GCN, ATEL, TNS



Credits L. Asquini

Feeder Surveys

Credits I. Arcavi

WARNING

WGs are responsible for

- selecting targets
- prioritizing them
- injecting them on scheduler
- promoting them during the shift meeting

Some tests of classification target injection in Marshall from broker queries and external tools and selection/prioritization in the Marshall could be very useful

How to add information in the SOXS Marshal ?

Info on transient

Spectroscopic classification
Re-classification for very young transients (with only Blue continuum) and for transitional transients
Follow-up spectra

Orbital parameters (to be discussed WG3)
Position within gravitational wave skymaps, Fermi GBM skymaps (WG12)

Lightcurve, merged from available optical data
Multiwavelength observations (high-energy, NIR, Radio) and multimessenger detections (high-energy neutrinos)

Info on host galaxy

host galaxy and reddening information
Redshift from host, redshift from SOXS
angular separation of the transient from the host, nuclear offset (+ error)
clear indication of the slit position and angle wrt the host galaxy

Archival data

links to archival survey data (UV, optical and NIR)
cross-match with AGN catalogs and archival X-ray and radio surveys

Discussion

How many classifications?

~550-600 classifications per year (requests from WGs + legacy programmes)

assuming

an average mag of 19 per target

a S/N ~10 per spectrum

~30 min per classification (overhead included)

300 hours per years

30-35 nights per year about 20% of SOXS

How to optimize telescope time for classifications?

Do not save time!

The S/N of the first spectrum can make the difference !!

Do not waste time!

The budget time for false positive should be decreased as much as possible

we can learn from PESSTO experience but

we should exploit two important characteristics of SOXS programme

dynamical schedule

very fast reduction

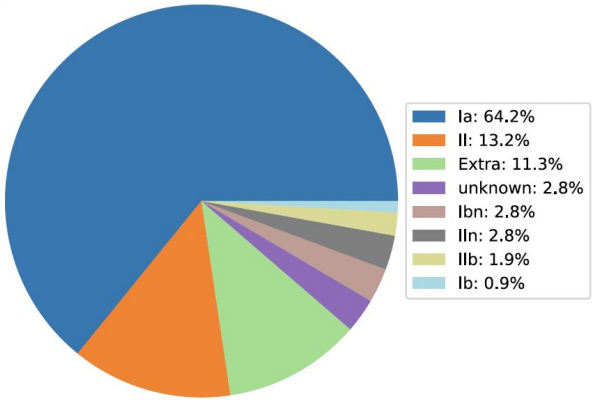
An important exercise
quantify contaminants in transient alert streams

Rapidly Evolving Transients: False Positives

Rapidly Evolving Transients in Archival ZTF Public Alerts Li et al 2023

well-defined criteria

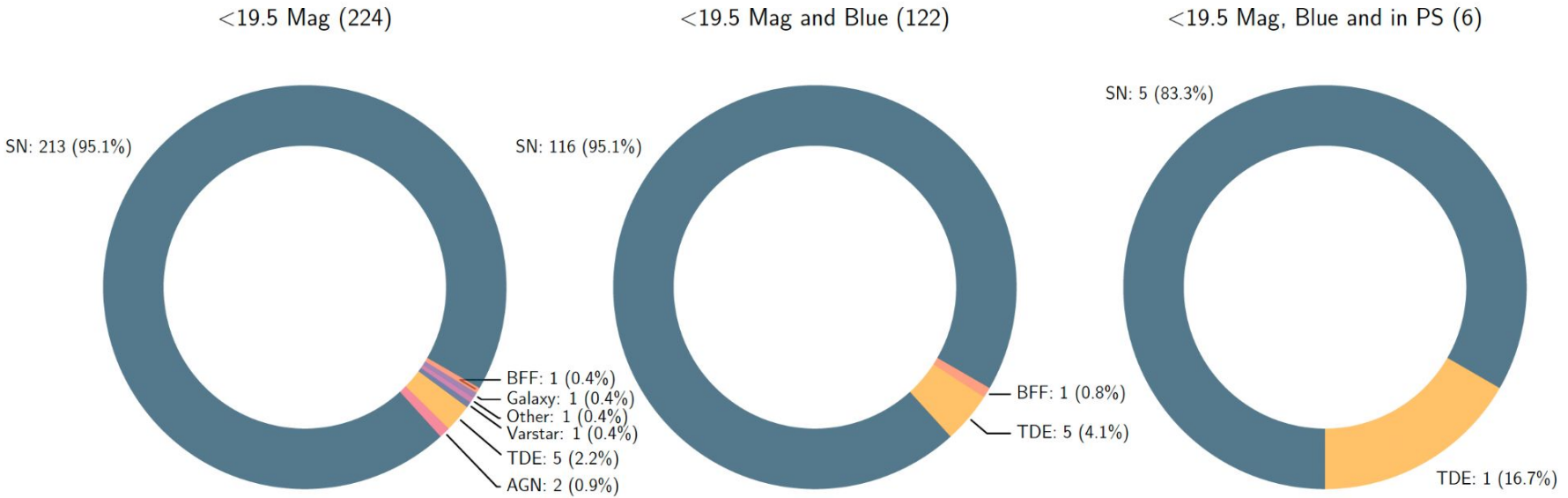
1. The candidates must have $|\ \Delta m/\Delta t\ |_{\max} \geq 0.4$ mag day^{-1}, where $\Delta t >$ two hours, and $|\ \Delta m\ | /(m_{err1} + m_{err2}) > 1.0$. If $|\ \Delta m/\Delta t\ |_{\max}$ is calculated between nondetection and detection, it is additionally required to be a rising rate.
2. The candidates must have `ndet` > 1 detections with a real-bogus score `rb` > 0.5.
3. If the corresponding `sgscore1` > 0.5, the candidates must also satisfy the condition `distpsnr1` > 2.
4. Candidates coinciding with known minor planets are excluded.



Credits I. Arcavi

An important exercise
estimate the fraction of false positives expected by different selection criteria

- Examined 224 spectroscopically classified nuclear transients from ZTF public alerts with no history of previous activity



Dgany, Arcavi et al. (2023)

Credits I. Arcavi, S Mattila

How to avoid false positives ?

- during target selection process

  cross-match of preliminary classification from different brokers

- during operations

  with a right strategy
  continuous automated (?) monitoring of classification reports

- with a posteriori analysis of classifications

  to learn from mistakes

What is not good for you, is good for me

Coordination between groups to share classification

e.g. nearby young project
TDE and Ia SNe
……

Discussion

Standard strategy

1. acquisition of spectra with S/N enough to obtain a reliable classification
2. classification for all the targets during day time
3. acquisition of a longer exp spectrum the night after if required from WG (follow up program)

it is time consuming

does not work very well for very fast transients

Alternative strategy by Benetti

1. acquisition of short exposure spectrum with S/N enough for classification
2. automated quick reduction of the short exposure spectrum and simultaneous lunch of a longer exposure spectrum
3. automated preliminary classification from the short spectrum

if the target is a bona-fide candidate

continue the acquisition of longer exp spectrum

if the target is a false positive

terminate the acquisition of the longer exp spectrum

Is this strategy feasible and efficient ?

depends on i) timing of automated reduction and classification

ii) failure rate of automatic classification on faint target spectrum

Discussion

How to implement classification tools ?

SNID and GELATO are very useful for SNe (fit of broad features without continuum)

These classification tools can be implemented for SOXS program

- direct access from SOXS pipeline
- extending the comparison with template spectra to the NIR range
- adding the template spectra of different transients classes to the archive

GELATO 4 SOXS

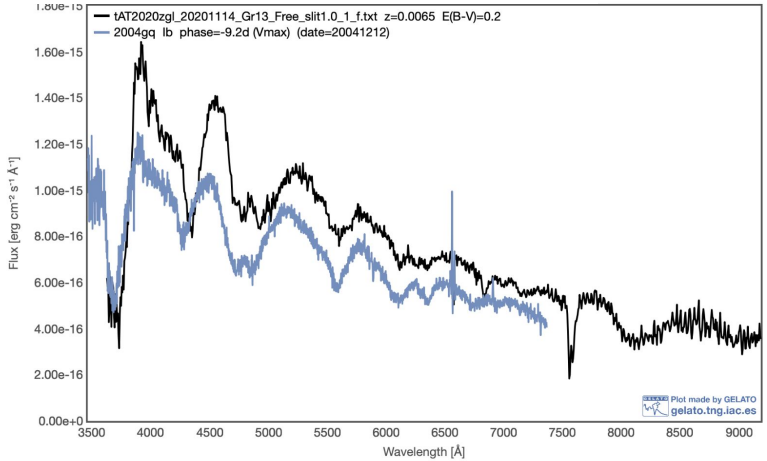
People

INAF-TNG	**A. Harutyunyan**, N. Hernández, M. Lodi
INAF-Padova	S. Benetti, E. Cappellaro
INAF-Naples	M.T. Botticella, D. Farías, L. Izzo
INAF-Brera	R. Brivio, P. D'Avanzo

GELATO code, Web page, Templates DB, REST API
will be developed, maintained and hosted by the TNG

GEneric cLAssification TOol (GELATO)

SN classifications and phase determination through comparison with a database of well studied SNe template spectra



A few GELATO highlights

- Uses template database with 3000+ spectra of different SN types and ages
- Offered as web-based tool
- No installation or templates availability is required
- Works through standard web browser on desktop or mobile
- 600+ registered users, 100-200 active users (no exact statistics available)

GELATO 4 SOXS

The comparison software will be adapted to SOXS
(e.g. spectral range from current 3500-9000 to 3500-12000 Å).

GELATO REST API will be developed
to enable a programmatic access from the SOXS pipeline

Some WGs can benefit from a classification/ quick analysis tool

Fitting tool

to assess the temperature

to fit a power-law continuum spectrum with metal absorption lines

Should be developed

How to collect new templates?

WGs need to do some more work

to get all the templates into the classification tools (e.g. WG 5, WG 7 and WG 12)

prepare guidelines for on duty teams (WG3 WG4 WG6 and WG11)

ESO X SHOOTER archive? TNS?

Warning: we don’t have template for very early spectrum

Discussion

Support to on duty teams from WGs

On duty teams should be able to classify very different kind of transients

can use available classification tools only for some transient classes (mainly SNe)

could require guidelines about other transient classes

WG13 will training the on duty teams and support during the operations

WGs could prepare some guidelines

attend the workshop on data reduction and classification

indicate a contact point willing to help on duty team with classification during shift

Discussion