www.wis-tns.org

The Transient Name Server & the Weizmann Interactive SNe data REPository

www.wiserep.org

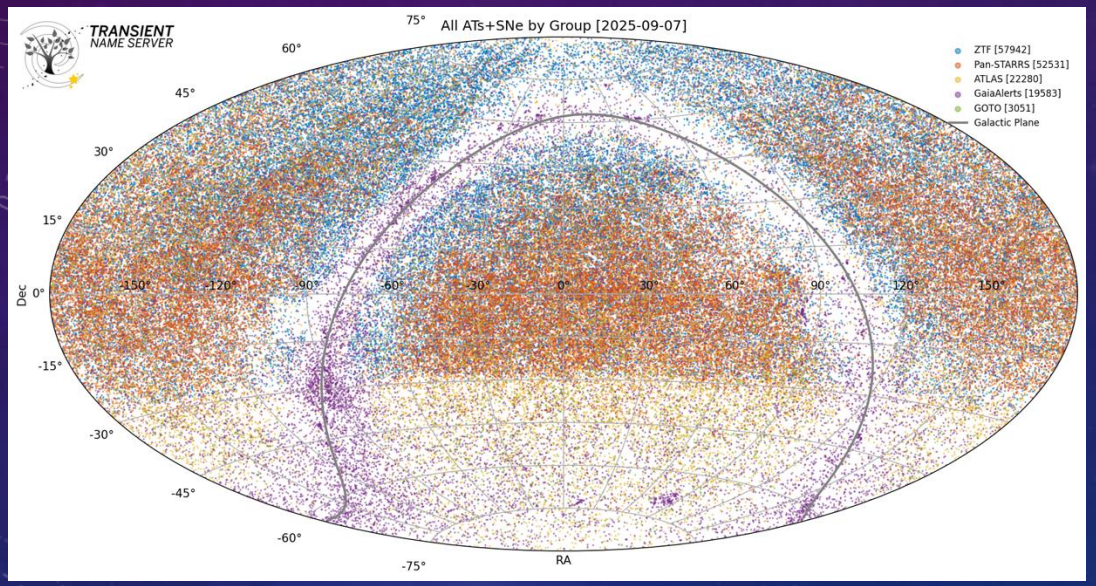
[SoXS Operations Workshop , Milano - Sep 2025]

Ofer Yaron

- Name server
- Fully searchable
- Citable (ADS indexed)

Reports

- "Manual" [forms] (including amateurs)
- Bulk via APIs [bots] (most surveys)
- Brokers



Alerts on

Transients (AT)

Classifications (SN...)

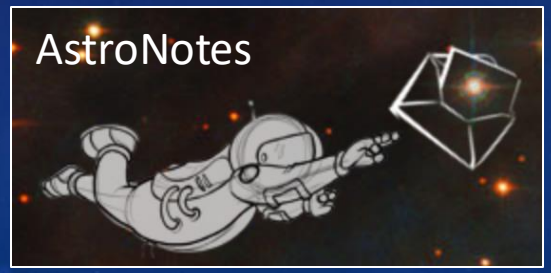
FRBs

(GRBs, GW events ...)

Team: Avishay Gal-Yam (PI, chair of IAU SN WG),

Avner Sass, Nikola Knezevic

Weizmann Institute for Science



The Transient Name Server - overview

- In operation since Jan 1st, 2016. The official IAU mechanism for reporting new astronomical (extra galactic) transients and specifically for official name designation. (Set up by the IAU in order to provide a modern, automatic mechanism to archive and distribute alerts about transients, replacing the manual CBAT system.)

- [As of Sep 2025] holds: 170k reported transient candidates ("ATs"),
  17k (10%) classified SNe (in addition to the full catalog of all pre-2016 SNe),
  >2k active users, >170 groups (programs/surveys…)

- The basic TNS object is an Astronomical Transient (AT) with a unique identifier of the form AT YYYYx (x=A..Z, aa..zz, aaa..zzz,…). The prefix "AT" can be later changed to indicate a classification (e.g., "SN") but the unique identifier is always kept.

- Most reports are submitted automatically by "bots" of the major surveys & brokers (PS1, ATLAS, ZTF, Gaia…), but it is also possible to submit reports interactively using forms. Discovery reports are called *AT-reps* whereas classification reports (supported by a spectrum, for the "normal" transients) are called *Class-reps*.

- The system naturally handles multiple reports on the same event (e.g., discoveries of the same event by different surveys) and keeps a (fully searchable) record of "internal names" that are associated with each AT-rep.

- The system supports a citable service for short astronomical announcements - AstroNotes - which is a superior version of the ATEL system (flexibility, searchability; hyperlinked to the specific objects).

The Transient Name Server - overview

- All reports and AstroNotes are indexed by the ADS and are citable.
- Currently all alerts/notifications from the TNS (discoveries/classifications/AstroNotes) are distributed via emails to the registered users, according to their defined preferences. (Additional staging/alerting mechanisms (e.g. Kafka streams) may be added.)
- Some data can be reported as proprietary for a certain period of time; e.g. securing a name designation without official release of the details yet, or not exposing a classification spectrum.
- Groups, Bots and memberships are all self-managed (by the users/group-owners), thus enabling flexible handling of access permissions, controlling the discovery credits etc.
- The system resides on the AWS cloud, utilizing high-availability and scalability architecture.
- On Dec 31st 2024 TNS Ver2.0 was deployed, with some new features such as:
    - An option to provide Automatic Classification info as part of the AT (Discovery) report
    - An option to indicate that an object (candidate transient) was found to be unreal (bogus)
    - Additional API capabilities, e.g. to include all possible search criteria
    - An official TDE prefix!

Two major guidelines of the TNS

1. To provide quick (low-latency) and robust processing of the incoming reports, and in strict order of arrival.

   - No downtime is allowed (downtimes are kept on the level of up to a few hours per year).
   - A high-availability and scalable system configuration.

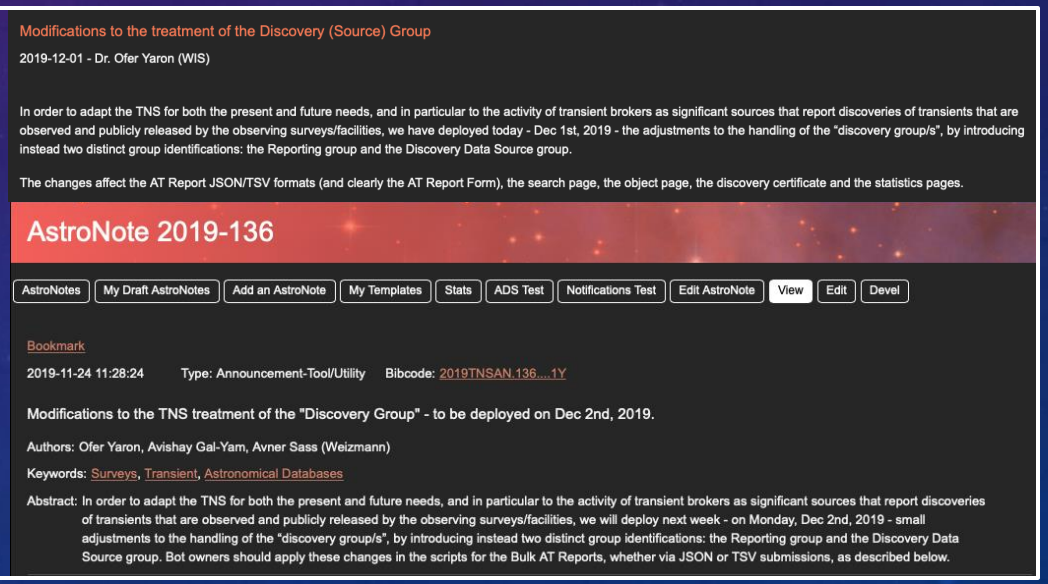
2. The TNS is dynamic - constantly adapted to meet the needs of the community and its working protocols, as well as the inclusion of new communities and system components.

e.g. with the emergence of “brokers”,
the need to split the “Source group” to the

- Reporting group

and the

- Discovery data source group.



Modifications to the treatment of the Discovery (Source) Group

2019-12-01 - Dr. Ofer Yaron (WIS)

In order to adapt the TNS for both the present and future needs, and in particular to the activity of transient brokers as significant sources that report discoveries of transients that are observed and publicly released by the observing surveys/facilities, we have deployed today - Dec 1st, 2019 - the adjustments to the handling of the “discovery group/s”, by introducing instead two distinct group identifications: the Reporting group and the Discovery Data Source group.

The changes affect the AT Report JSON/TSV formats (and clearly the AT Report Form), the search page, the object page, the discovery certificate and the statistics pages.

AstroNote 2019-136

AstroNotes | My Draft AstroNotes | Add an AstroNote | My Templates | Stats | ADS Test | Notifications Test | Edit AstroNote | View | Edit | Devel

Bookmark

2019-11-24 11:28:24 Type: Announcement-Tool/Utility Bibcode: 2019TNSAN.136....1Y

Modifications to the TNS treatment of the "Discovery Group" - to be deployed on Dec 2nd, 2019.

Authors: Ofer Yaron, Avishay Gal-Yam, Avner Sass (Weizmann)

Keywords: Surveys, Transient, Astronomical Databases

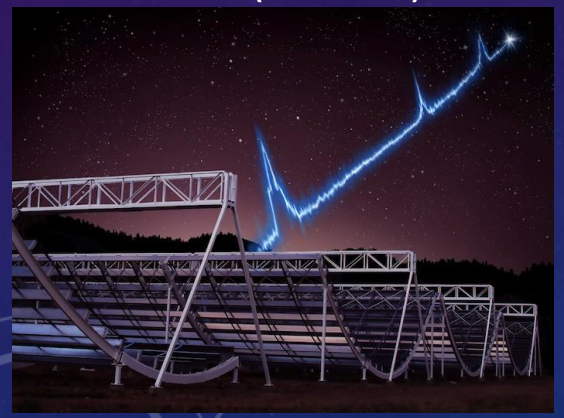
Abstract: In order to adapt the TNS for both the present and future needs, and in particular to the activity of transient brokers as significant sources that report discoveries of transients that are observed and publicly released by the observing surveys/facilities, we will deploy next week - on Monday, Dec 2nd, 2019 - small adjustments to the handling of the “discovery group/s”, by introducing instead two distinct group identifications: the Reporting group and the Discovery Data Source group. Bot owners should apply these changes in the scripts for the Bulk AT Reports, whether via JSON or TSV submissions, as described below.

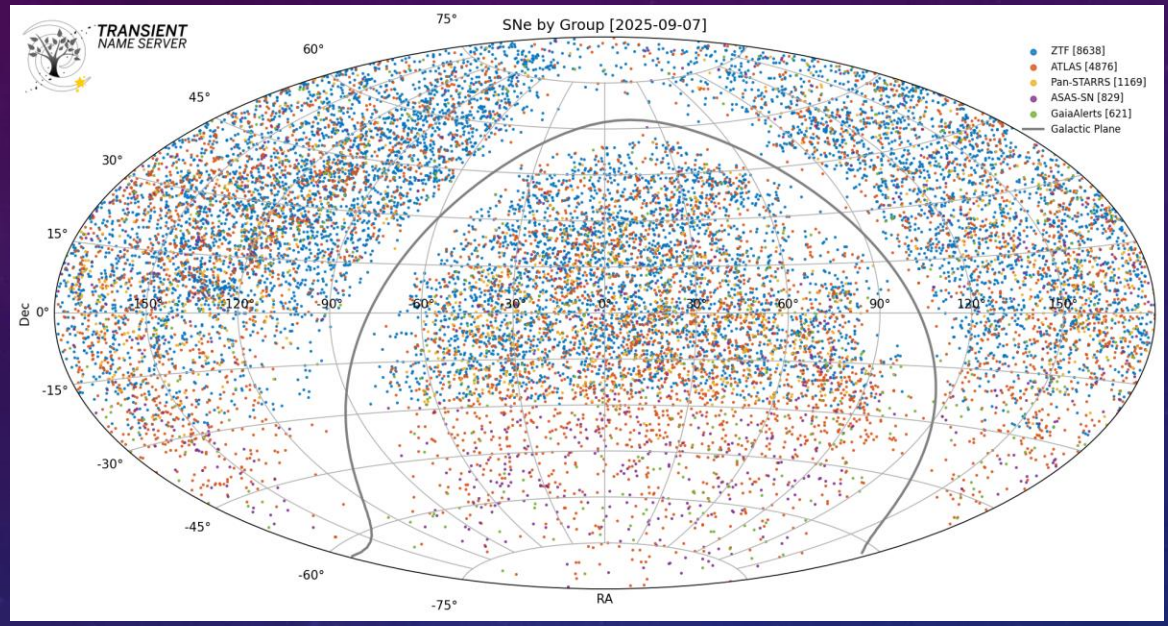
Some of the major surveys reporting to the TNS

Pan-Starrs (Hawaii)

ZTF, i/PTF (Palomar, CA)

CHIME-FRB (Canada)

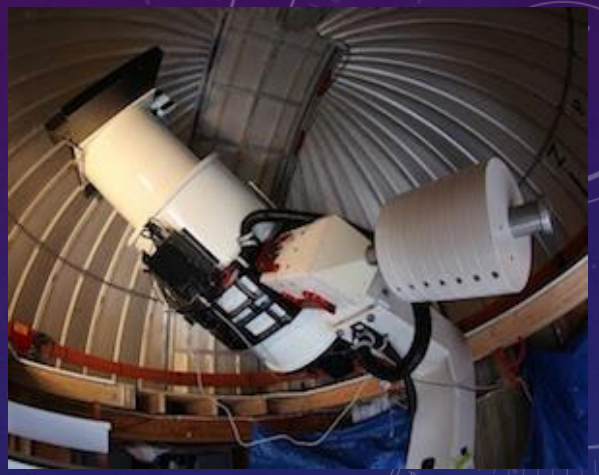




Maybe also…

- GRBs
- LIGO-Virgo-KAGRA ?

ATLAS (Multiple)



Gaia (Space)

TNS Statistics (2025-09)

ALL transients reported since Jan 1, 2016	171,769		
PUBLIC transients reported since Jan 1, 2016	171,769		
PUBLIC transients for the top 10 reporting groups	Pan-STARRS	48,411	28%
	ZTF	29,036	17%
	ALeRCE	24,825	15%
	ATLAS	22,293	13%
	GaiaAlerts	19,751	12%
	YSE	4,373	3%
	GOTO	3,055	2%
	WFST	2,941	2%
	DESIRT	2,325	1%
	SGLF	2,164	1%
PUBLIC transients for the top 10 data source groups	ZTF	58,032	34%
	Pan-STARRS	52,547	31%
	ATLAS	22,293	13%
	GaiaAlerts	19,751	12%
	GOTO	3,056	2%
	WFST	2,941	2%
	DESIRT	2,318	1%
	iPTF	1,642	1%
	MASTER	1,398	1%
	ASAS-SN	1,363	1%
PUBLIC classified SNe reported since Jan 1, 2016	17,567		
PUBLIC classified SNe for the top 10 reporting groups	ZTF	5,282	30%
	ATLAS	4,884	28%
	ALeRCE	2,922	17%
	Pan-STARRS	902	5%
	ASAS-SN	831	5%
	GaiaAlerts	621	4%
	GOTO	459	3%
	SGLF	290	2%
	YSE	268	2%
	iPTF	131	1%
PUBLIC classified SNe for the top 10 data source groups	ZTF	8,652	49%
	ATLAS	4,884	28%
	Pan-STARRS	1,169	7%
	ASAS-SN	829	5%
	GaiaAlerts	621	4%
	GOTO	459	3%
	iPTF	132	1%
	XOSS	94	1%
	PTSS	72	0%
	POSS	47	0%

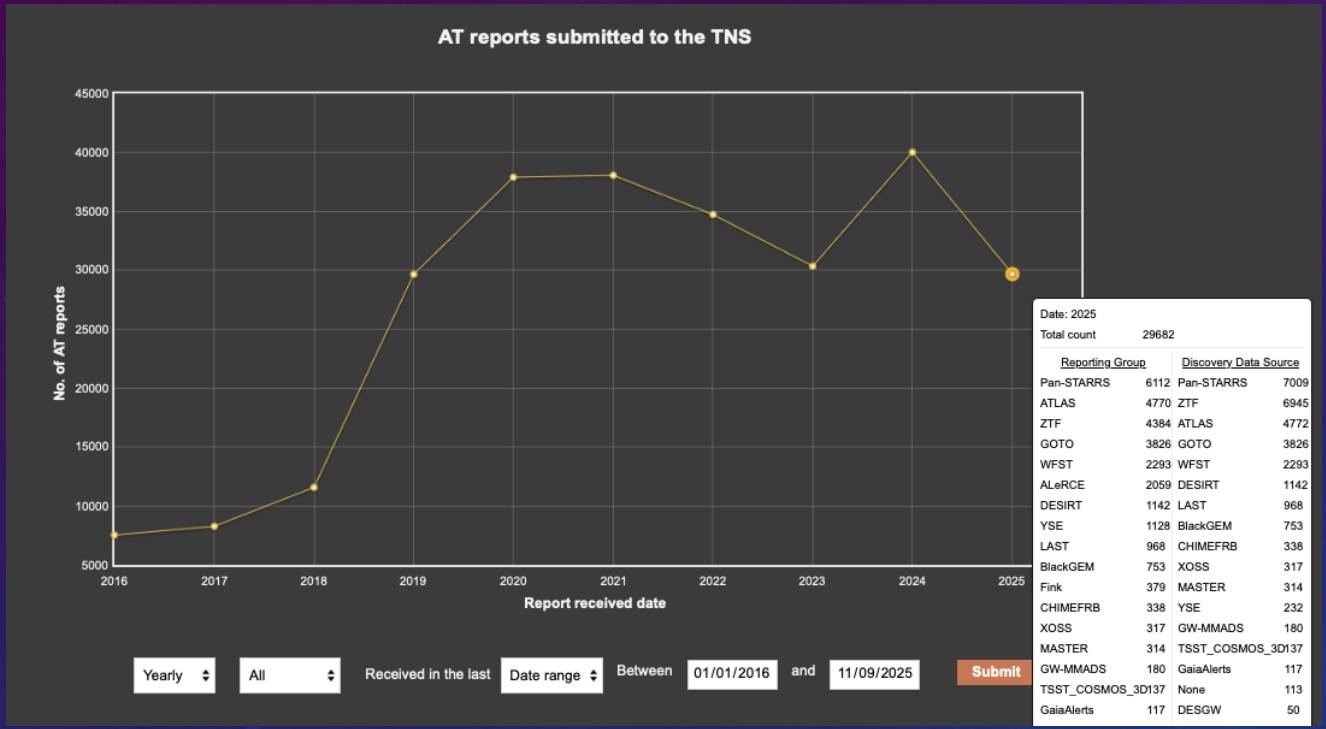
PUBLIC classified SNe by type

SN Ia	11,413	65%
SN II	2,759	16%
SN IIn	495	3%
SN Ia-91T-like	449	3%
SN Ic	385	2%
SN Ib	308	2%
SN IIP	297	2%
SN IIb	267	2%
SLSN-I	194	1%
SN Ic-BL	169	1%
SN Ia-91bg-like	158	1%
SLSN-II	107	1%
SN Ia-pec	97	1%
SN	86	1%
SN Ib/c	78	0%
SN Ibn	69	0%
SN Iax[02cx-like]	58	0%
SN I	56	0%
SN Ia-CSM	41	0%
SN Ib-pec	17	0%
SN II-pec	15	0%
SN Ia-SC	14	0%
SN Ib-Ca-rich	12	0%
SN Icn	7	0%
SN IIn-pec	5	0%
SN Ic-pec	3	0%
SN IIL	3	0%
SN Ibn/Icn	2	0%
SN Ic-Ca-rich	1	0%
SN Ia-Ca-rich	1	0%
SN Ien	1	0%

ALL spectra reported to the TNS	21,010		
PUBLIC spectra reported to the TNS	20,839		
PUBLIC classifications for the top 10 contributing groups	ZTF	8,364	44%
	ePESSTO+	2,446	13%
	SCAT	1,934	10%
	ePESSTO	723	4%
	UCSC	387	2%
	TCD	368	2%
	Global SN Project	357	2%
	PESSTO	277	1%
	iPTF	256	1%
	ASAS-SN	238	1%
PUBLIC spectral classifications for the top 10 instruments	P60/SEDM	6,834%	33%
	ESO-NTT/EFOSC2-NTT	3,729%	18%
	UH88/SNIFS	2,018%	10%
	LT/SPRAT	1,399%	7%
	P200/DBSP	1,102%	5%
	NOT/ALFOSC	698%	3%
	Lick-3m/KAST	623%	3%
	Keck1/LRIS	617%	3%
	Other/Other	551%	3%
	SOAR/Goodman	349%	2%

TNS Reports Yearly Timeline (2025-09)

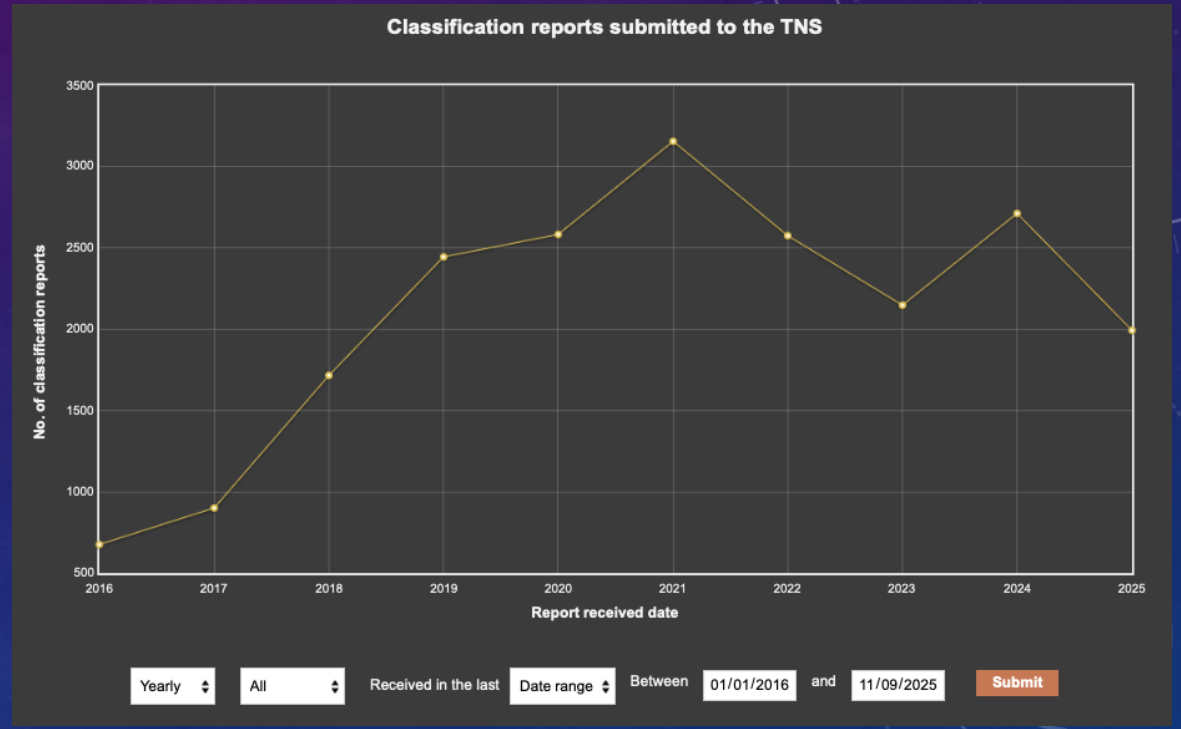
Discovery reports



Date: 2025
Total count 29682

Reporting Group		Discovery Data Source	
Pan-STARRS	6112	Pan-STARRS	7009
ATLAS	4770	ZTF	6945
ZTF	4384	ATLAS	4772
GOTO	3826	GOTO	3826
WFST	2293	WFST	2293
ALeRCE	2059	DESIRT	1142
DESIRT	1142	LAST	968
YSE	1128	BlackGEM	753
LAST	968	CHIMEFRB	338
BlackGEM	753	XOSS	317
Fink	379	MASTER	314
CHIMEFRB	338	YSE	232
XOSS	317	GW-MMADS	180
MASTER	314	TSST_COSMOS_3D	137
GW-MMADS	180	GaiaAlerts	117
TSST_COSMOS_3D	137	None	113
GaiaAlerts	117	DESGW	50

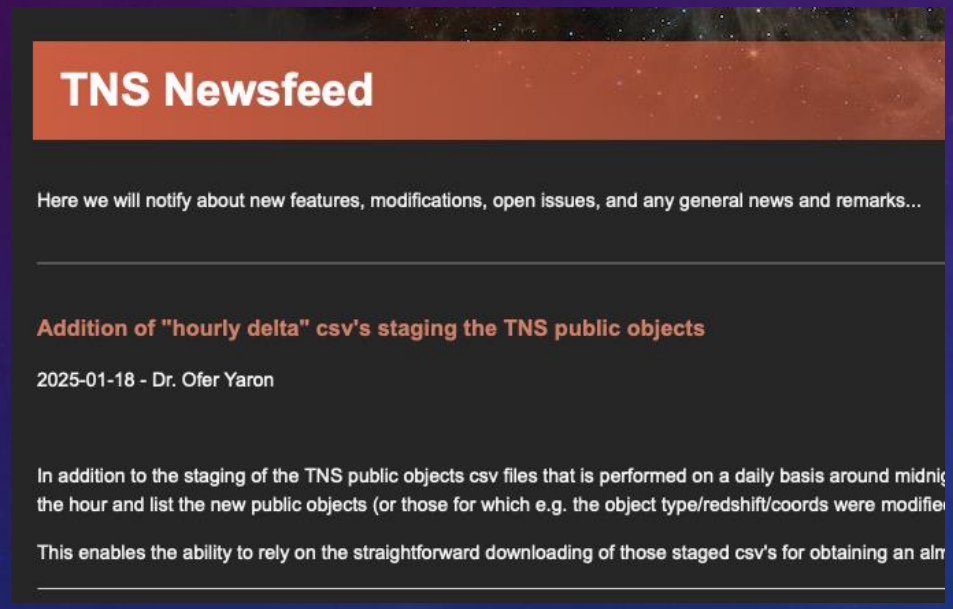
Classification reports

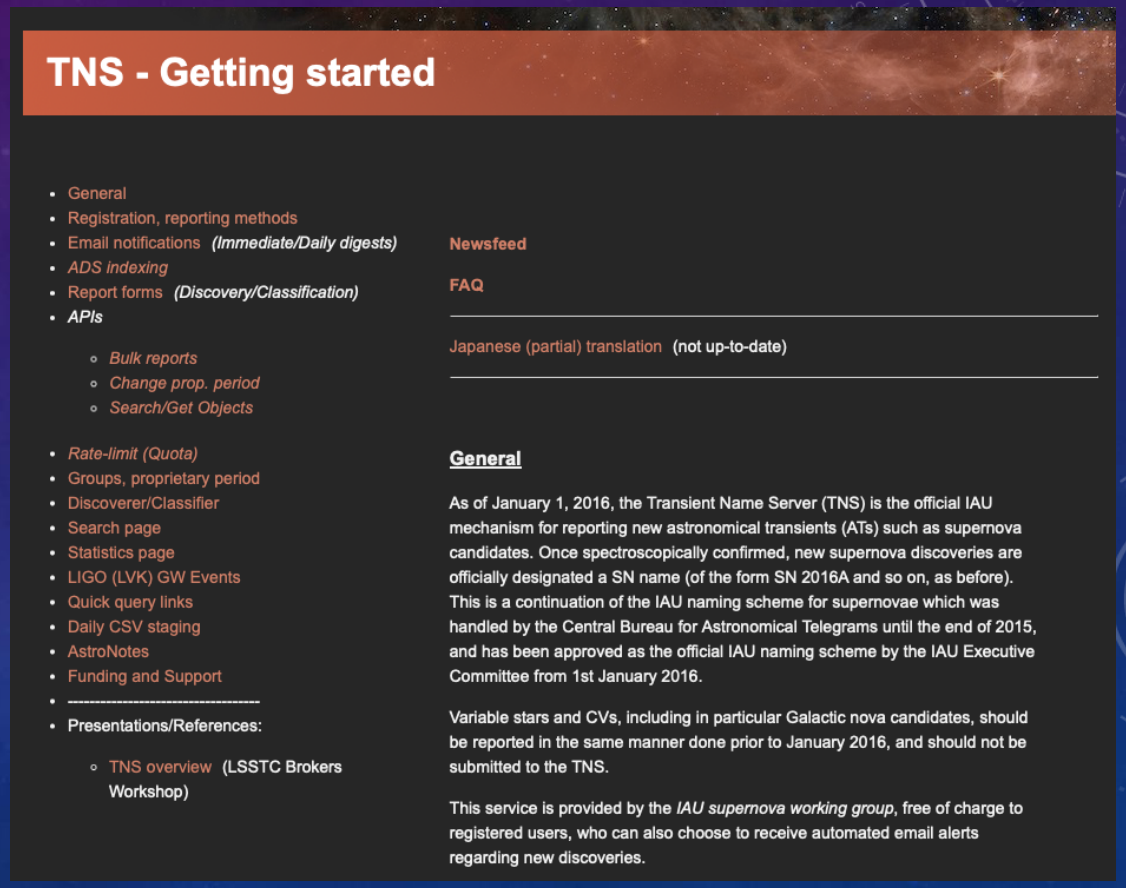


www.wis-tns.org/content/tns-newsfeed
www.wis-tns.org/content/tns-getting-started

TNS NewsFeed + Help Page

- Important updates/revisions are presented on the NewsFeed
- Use the help page, where also sample codes and examples are provided…





APIs, Bulk downloads

- A Sandbox environment exists for experimentation with the APIs (both for submission and retrieval of info)

  All API development must be performed against the sandbox!!!

  https://sandbox.wis-tns.org
  https://sandbox.wis-tns.org/api

- APIs are in place for:
  - the submission of Discovery (AT) and Classification reports.
  - Searching of objects (by coords, names – IAU/internal, and all other query parameters)
  - Retrieving object details

- CSV/TSV downloads are available from the Search page (also in a scriptable way)

e.g. https://www.wis-tns.org/search?&&classified_sne=1&date_start%5Bdate%5D=2021-01-01&format=csv&num_page=100&page=0 ←[0..N]

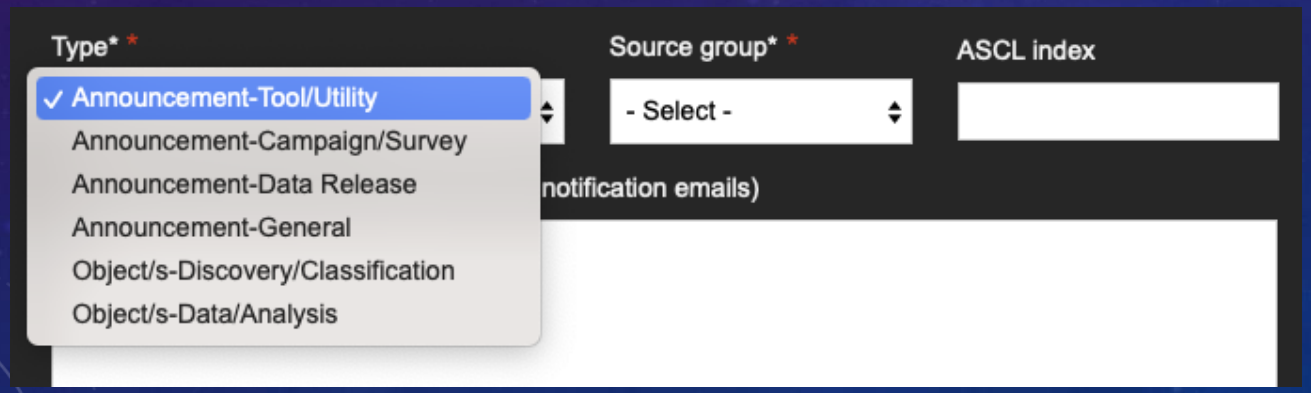
- A CSV of all public objects (as well as daily & hourly “delta” lists) are available for download, in order to allow for easy local managing of the TNS data and to perform “heavy” operations locally (such as cross-matching entire catalogs or long object lists)

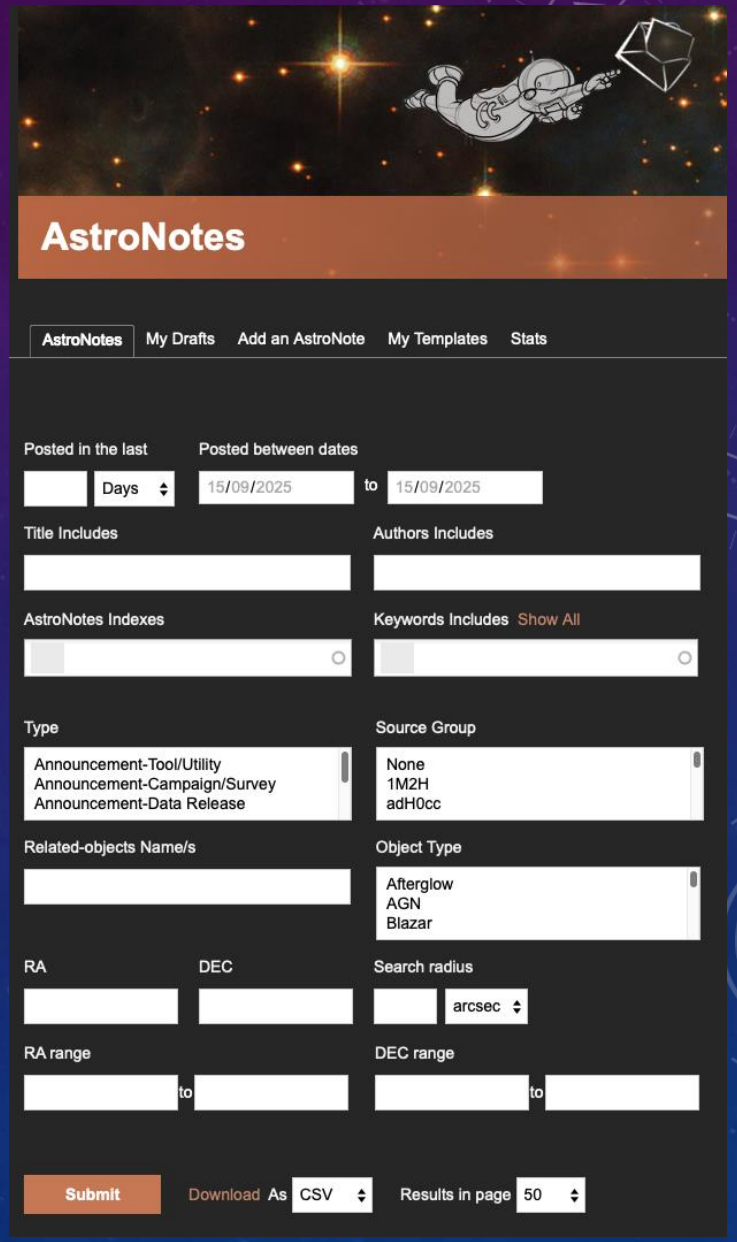
https://www.wis-tns.org/system/files/tns_public_objects/tns_public_objects.csv.zip
Or using curl (with User-Agent and api_key) for a daily csv:

```
curl -X POST -H 'user-agent: tns_marker{"tns_id":YOUR_BOT_ID,"type": "bot", "name":" YOUR_BOT_NAME"}'
-d 'api_key=YOUR_API_KEY' https://www.wis-tns.org/system/files/tns_public_objects/tns_public_objects_20220112.csv.zip > tns_public_objects_20220112.csv.zip
```


AstroNotes!!!

- A sub-system within the TNS (so no need to register to an additional service for creating and receiving these notifications).
- Enabling the distribution of notifications in a very flexible (yet accurate) way, directly coupled to the related objects, searchable and citable.
- Can create either an object-related (discovery, classification, analysis) or an "announcement" notification, without any restrictions, limitations or penalties…





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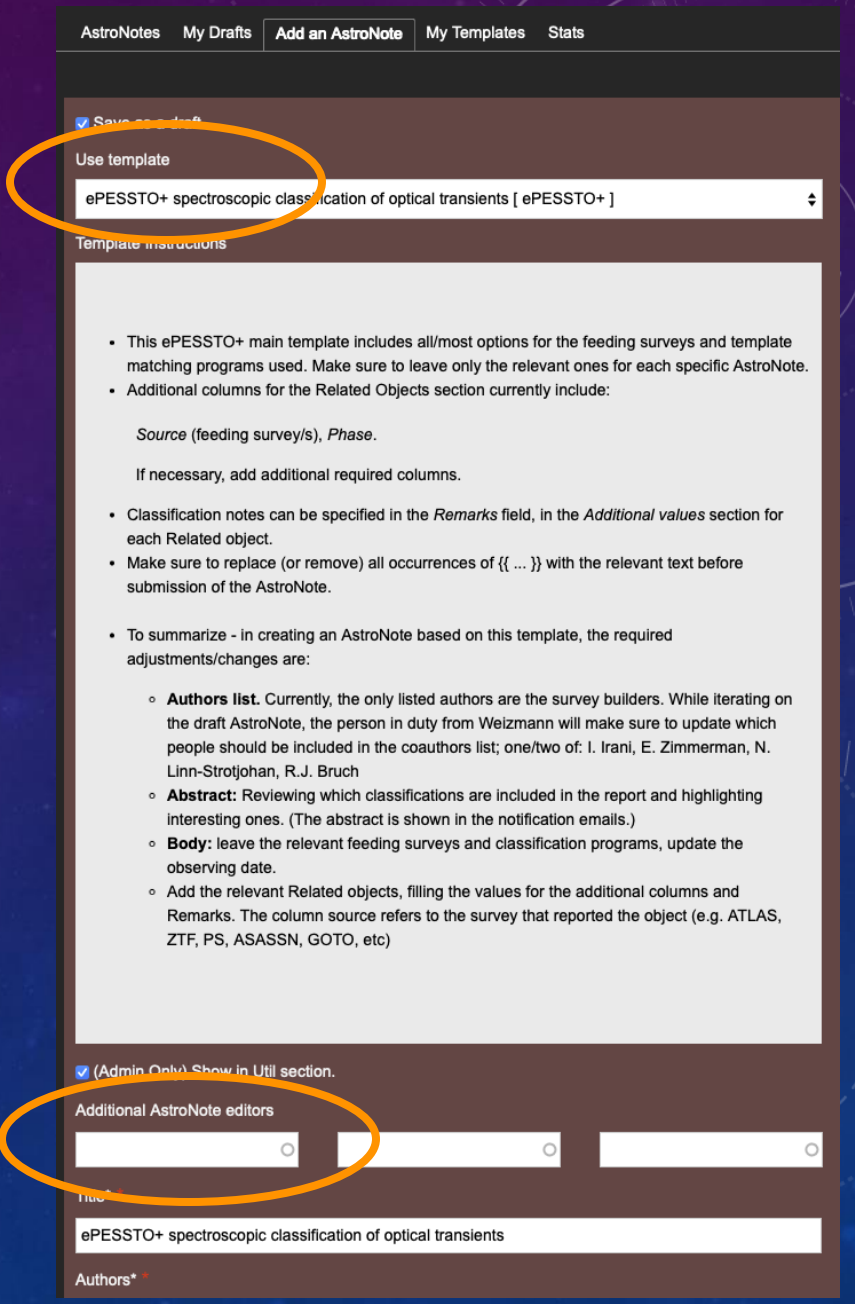

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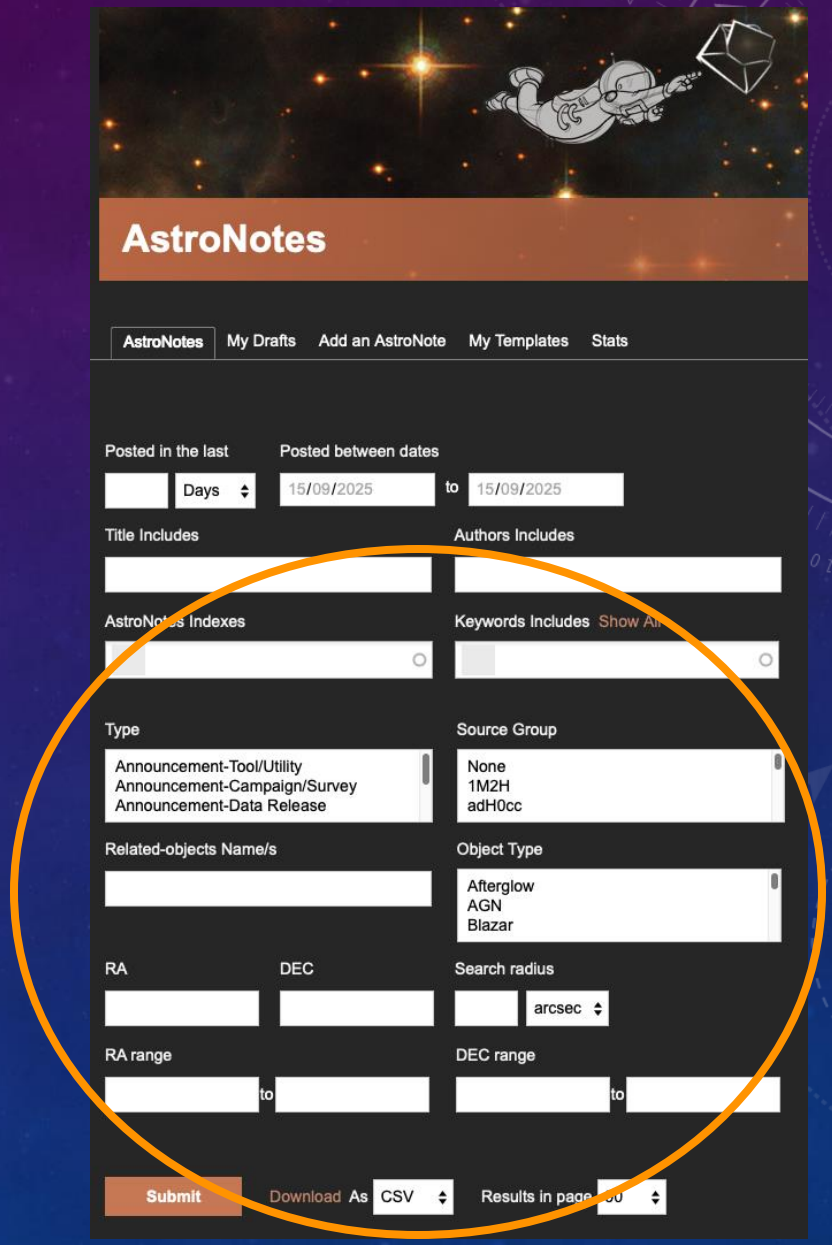

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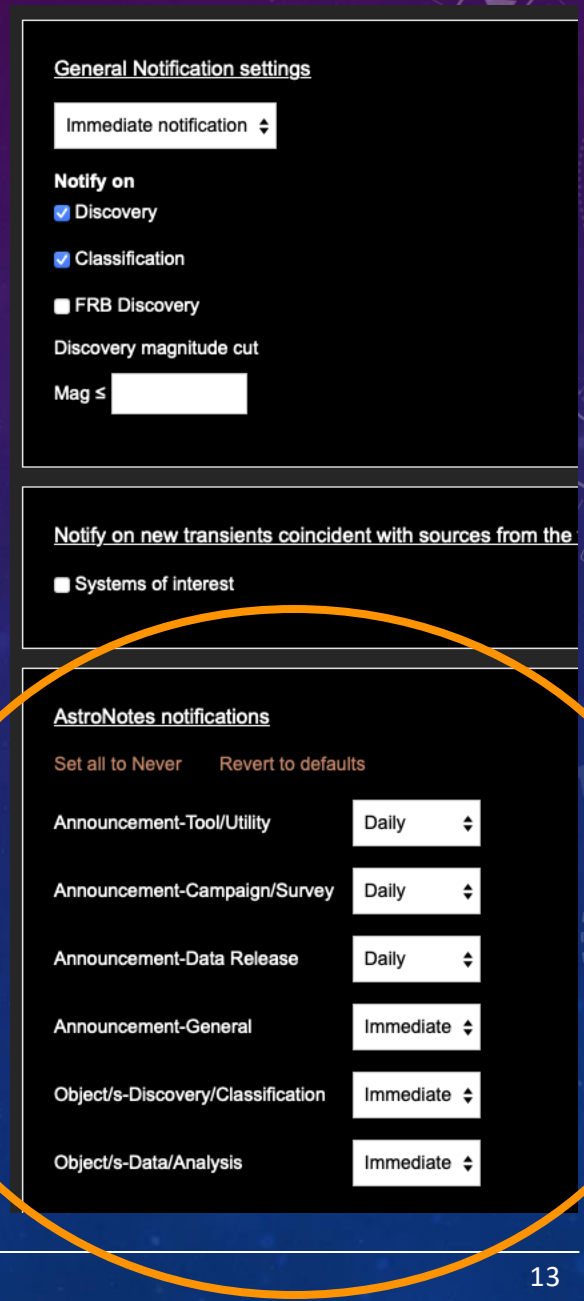
- Easy sharing of Drafts with the colleagues; allowing definition of several editors to continue editing the draft until submission.
- Many Search options, including by object names, types and coords.
- Possible to define on your My Account page which types of notifications you wish to receive, and in which manner.

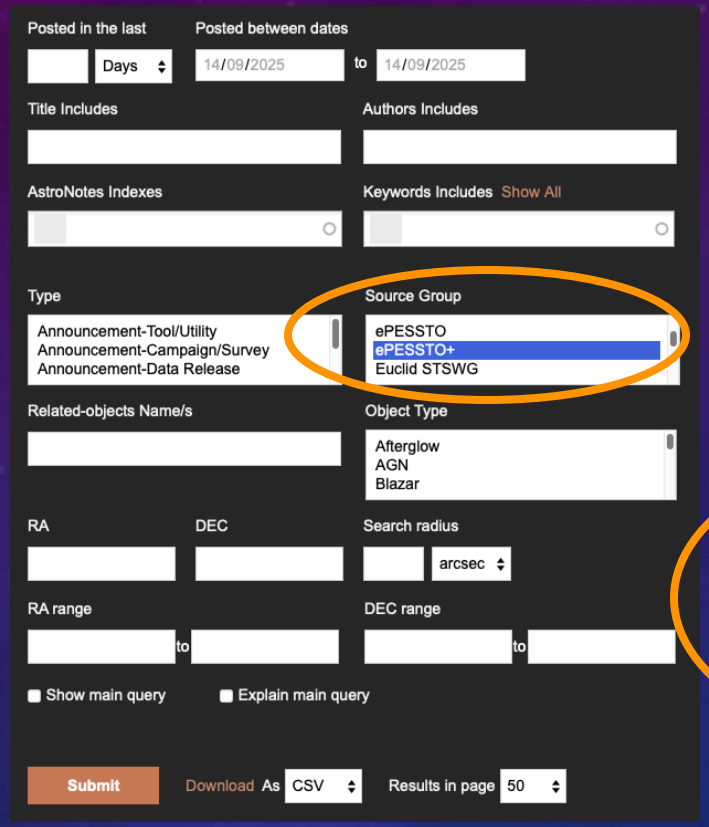


AstroNotes!!!

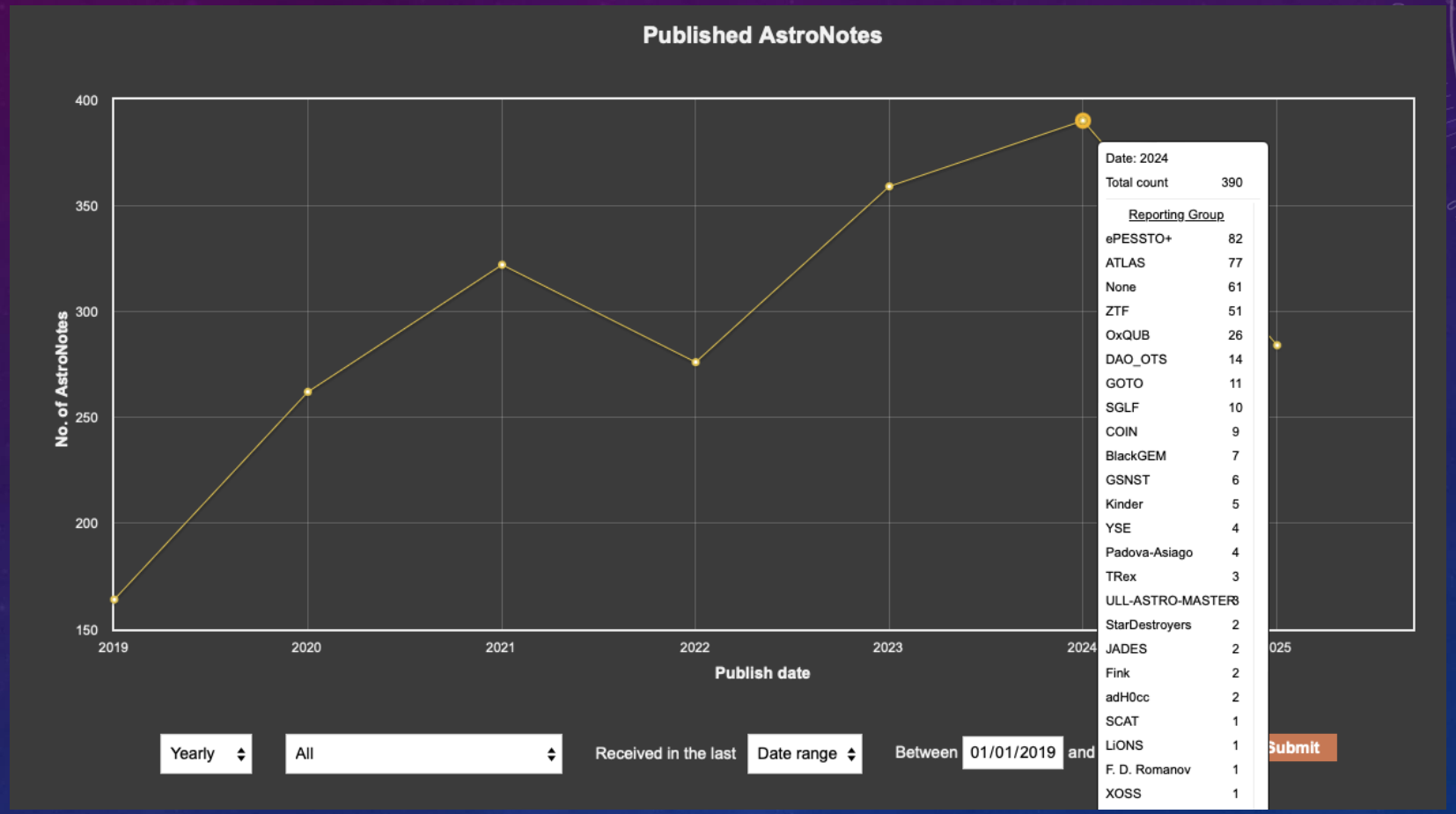
A query for ePESSTO+ AstroNotes:

- Major surveys and groups of the Transients community have already moved to using solely AstroNotes – ATLAS, Pan-Starrs, PESSTO, ZTF…

Clicking on an object name overlays its basic details, with a link directly to the object page



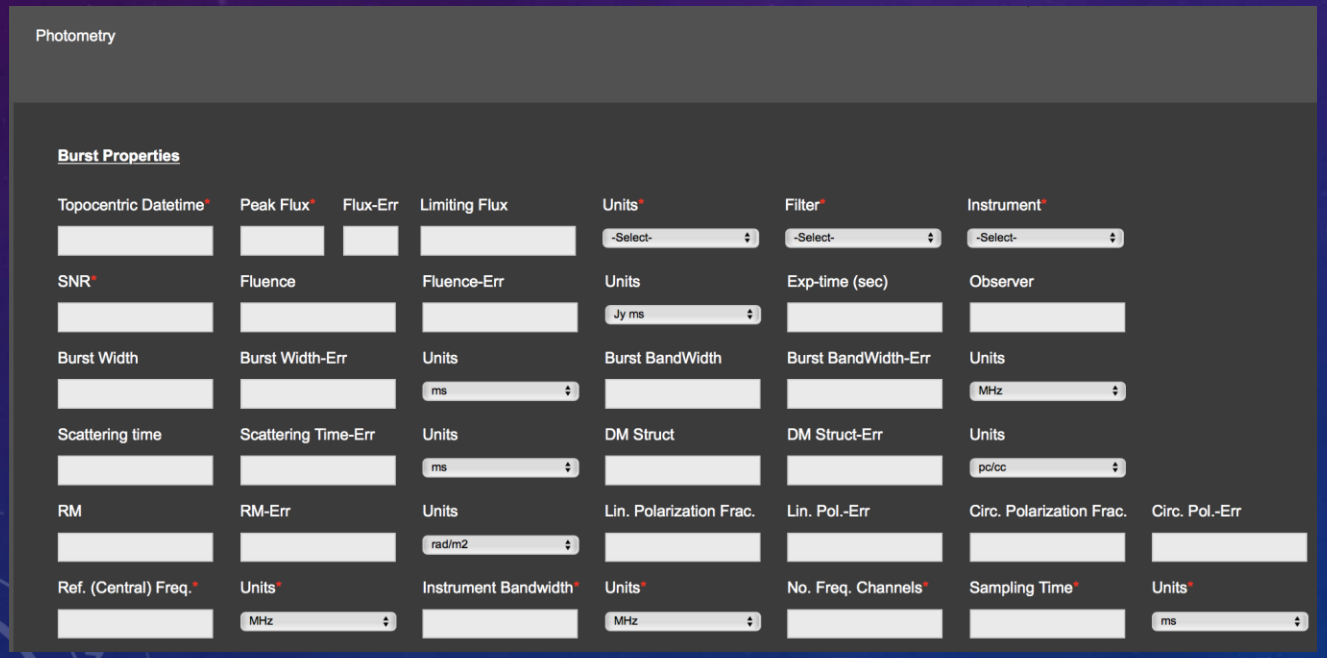
AstroNotes - Stats

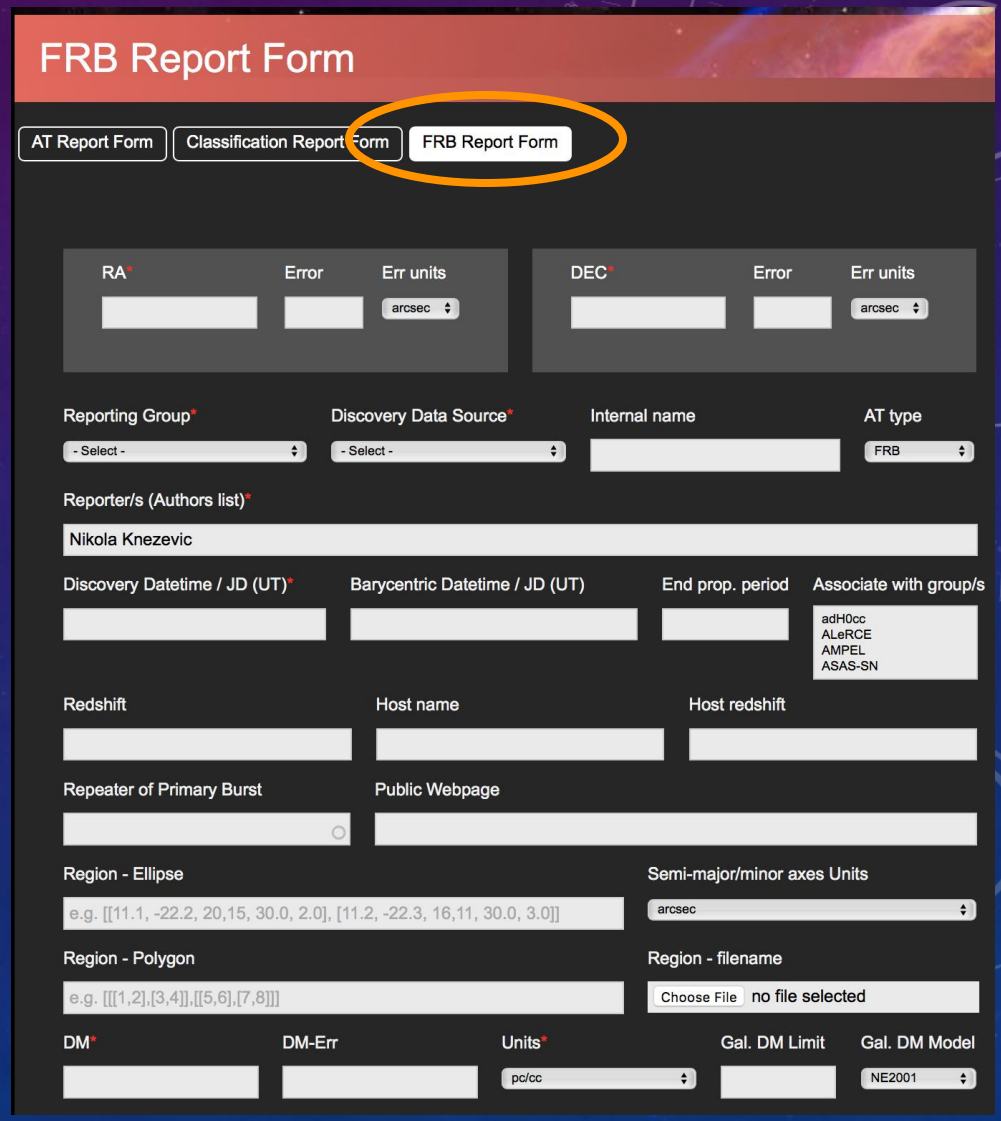


(Almost) monotonic increase since 2019, currently dominated by ePESSTO+, ATLAS and ZTF; >~1/day

Area Transients - The new guys in town (well, already since Mar 2020)... FRBs

- Main coordination with CHIME and representatives of the FRB community
- A separate engine for designation of names: (FRB)YYYYMMDDabc, coexisting next to the AT/SN names
- FRB-Catalog fully ingested to the TNS





Fast Radio Bursts

FRB Advanced Search

Repeater: Repeater | Repeater of | FRB with measured redshift

DM Range: to

RM Range: to

SNR Range: to

Flux Range: to

Show main query | Explain main query

Submit | Download as CSV | Download as TSV | Results in page 50

Columns to display

Showing results 1 to 2 out of 2

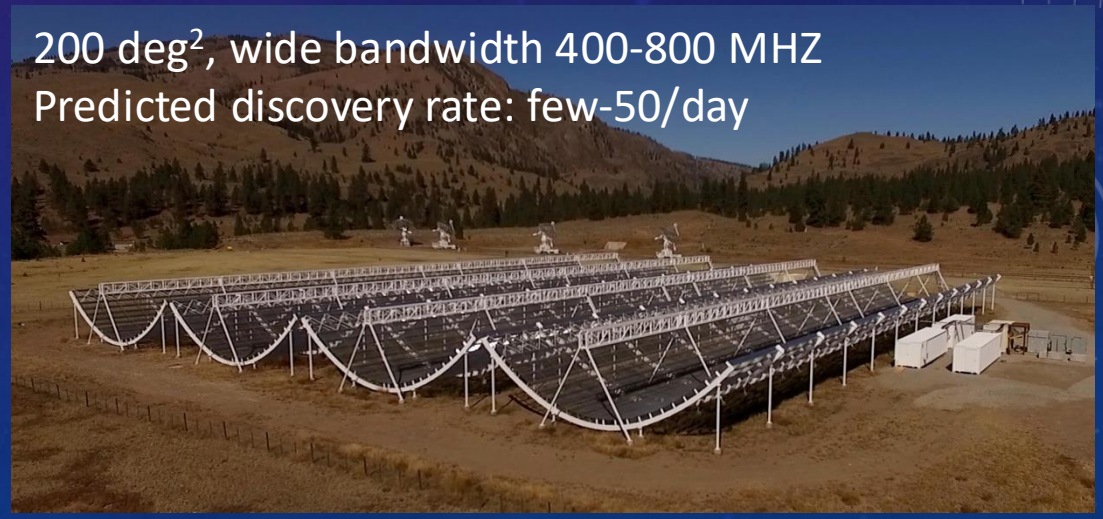
ID	Name	Reps	Class	RA	DEC	Obj. Type	Repeater of Primary Burst	DM (Err)	Galactic DM Limit	Barycentric Datetime
51465	FRB 20191202A	1		02:15:60.000	+33:00:00.00	FRB	FRB 20191202A	680 (68) pc/cc	24 (NE2001)	
51466	FRB 20190807A	1		00:08:00.000	+02:00:00.00	FRB	FRB 20191202A	430 (43) pc/cc	23 (YMW16)	

- Repeaters are distinct objects on the TNS, allowing flexible associations of multiple bursts with the Primary Burst.

CHIME/FRB Discovery of Eight New Repeating Fast Radio Burst Sources

The CHIME/FRB Collaboration, B. C. Andersen,[1,2] K. Bandura,[3,4] M. Bhardwaj,[1,2] P. Boubel,[1,2] M. M. Boyce,[5] P. J. Boyle,[1,2] C. Brar,[1,2] T. Cassanelli,[6,7] P. Chawla,[1,2]

The discovery of the first repeating FRB source, FRB 121102, at a dispersion measure DM $\simeq$ 560 pc cm^{-3} (Spitler et al. 2014, 2016), eliminated cataclysmic models as the only means for producing FRB emission. The repetitive nature of FRB 121102 enabled sub-arcsecond localization of the source via radio interferometry and subsequent optical identification of the low-metallicity host galaxy



LVK (LIGO/Virgo/KAGRA) GW service on the TNS

See AstroNote 2024-79

- Following the past O1-O3 observing runs, we now follow the O4 incoming LVK GW public alerts.
- We provide a list of both the high & low significance events with their basic info.
- For every newly released real alert, we create Aitoff-projection skymaps showing the localizations, with all known public TNS transients that lie within the 50/90/99% credibility regions, over-plotted.
- We show and provide downloadable tables of the existing TNS transients that have existed BEFORE the exact time of event and the transients that stream in AFTER the time of the GW; updated on an hourly basis during two weeks from the event time.

LVK GW events

O4 events | O1-3 events

Significance: High

Showing 208 events out of 3286

Event Date	Event ID	Last Alert Type	Significance	GraceDB URL	Instruments	Classification	Distance [Mpc] (Err)	FAR [Hz]	Group	Last Processed	Download zip file
2025-09-12 20:04:17	S250912x	PRELIMINARY	High	To GraceDB event page	L1, V1	BNS: (0%) NSBH: (0%) BBH: (94.44%) Terrestrial: (5.56%)	2208.087 (728.65)	7.852e-08	CBC	2025-09-14 12:00:03	S250912x_20250912_200417.zip
2025-09-12 06:40:08	S250912f	UPDATE	High	To GraceDB event page	L1, V1	BNS: (0%) NSBH: (0%) BBH: (99.92%) Terrestrial: (0.08%)	2740.199 (721.72)	2.873e-13	CBC	2025-09-14 12:00:40	S250912f_20250912_064008.zip
2025-09-11 07:46:39	S250911ac	UPDATE	High	To GraceDB event page	H1, L1	BBH: (96.35%) Mass-Gap: (6.96%) Terrestrial: (3.65%)	1123.517 (285.32)	6.018e-09	CBC	2025-09-14 12:01:37	S250911ac_20250911_074639.zip
2025-09-10 00:07:57	S250910b	RETRACTION	High	To GraceDB event page	H1, L1	Retracted	134.094 (45.31)	5.577e-08	CBC	2025-09-10 00:09:43	S250910b_20250910_000757.zip
2025-09-08 14:34:28	S250908y	UPDATE	High	To GraceDB event page	H1, V1	BNS: (0%) NSBH: (0%) BBH: (99.98%) Mass-Gap: (0.23%) Terrestrial: (0.02%)	1146.454 (333.87)	1.150e-10	CBC	2025-09-14 12:02:35	S250908y_20250908_143428.zip
2025-09-06 12:23:59	S250906ca	UPDATE	High	To GraceDB event page	H1, L1, V1	BNS: (0%) NSBH: (0.06%) BBH: (99.94%) Mass-Gap: (5.77%) Terrestrial: (0%)	1121.426 (266.45)	1.097e-13	CBC	2025-09-14 12:03:42	S250906ca_20250906_122359.zip
2025-09-04 13:49:52	S250904cv	UPDATE	High	To GraceDB event page	H1, L1	BBH: (99.97%) Terrestrial: (0.03%)	1806.496 (595.45)	3.168e-10	CBC	2025-09-14 12:10:41	S250904cv_20250904_134952.zip
2025-09-04 10:22:07	S250904br	INITIAL	High	To GraceDB event page	H1, L1, V1	BBH: (100%) Terrestrial: (0%)	2748.449 (680.70)	3.168e-10	CBC	2025-09-14 12:17:55	S250904br_20250904_102207.zip
2025-09-04 03:33:07	S250904ae	UPDATE	High	To GraceDB event page	H1, L1, V1	BBH: (100%) Terrestrial: (0%)	3544.907 (913.01)	3.168e-10	CBC	2025-09-14 12:24:37	S250904ae_20250904_033307.zip
2025-09-01 18:59:41	S250901cb	UPDATE	High	To GraceDB event page	H1, L1, V1	BNS: (0%) NSBH: (0%) BBH: (100%) Terrestrial: (0%)	2017.763 (482.33)	3.193e-14	CBC	2025-09-14 12:41:24	S250901cb_20250901_185941.zip
2025-08-31 12:30:48	S250831cc	PRELIMINARY	High	To GraceDB event page	H1, L1, V1	BNS: (9.25%) Mass-Gap: (8.28%) Terrestrial: (90.75%)	371.411 (108.17)	3.817e-07	CBC	2025-09-14 12:44:20	S250831cc_20250831_123048.zip

LVK (LIGO/Virgo/KAGRA) GW “service” on the TNS

e.g. for S250818k:

LIGO GW Event S250818k, 2025-08-18 01:20:06

O4 events | O1-3 events

Event ID
S250818k_20250818_012006

Significance
High

Event Date
2025-08-18 01:20:06

Instruments
H1, L1, V1

Distance [Mpc] (Err)
236.89 (61.94)

Classification
BNS: (29.45%)
Mass-Gap: (7.07%)
Terrestrial: (70.55%)

FAR [Hz]
6.810e-08

Group
CBC

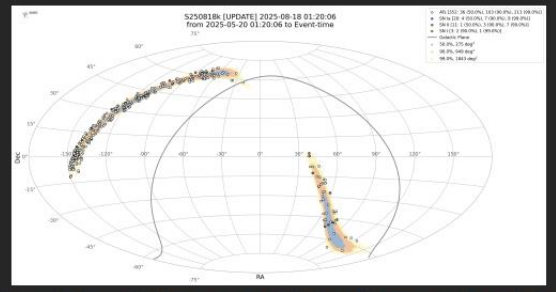
Last Processed
2025-09-01 01:08:30

Metadata JSON
METADATA_S250818k_20250818_012006.json

LIGO Alert JSON
S250818k_20250818_012006.json

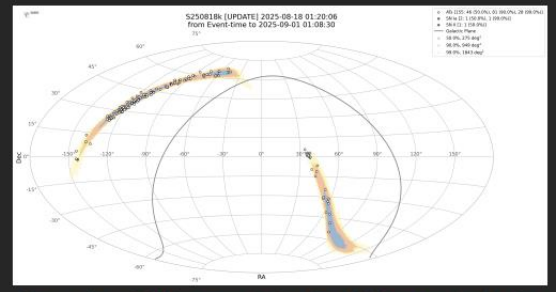
Download zip file
S250818k_20250818_012006.zip

TNS Transients discovered BEFORE the GW event
(within date range 2025-05-20 - 2025-08-18)



Skymap before JSON format transient list before TSV format transient list before

TNS Transients discovered AFTER the GW event
(within date range 2025-08-18 - 2025-09-01)

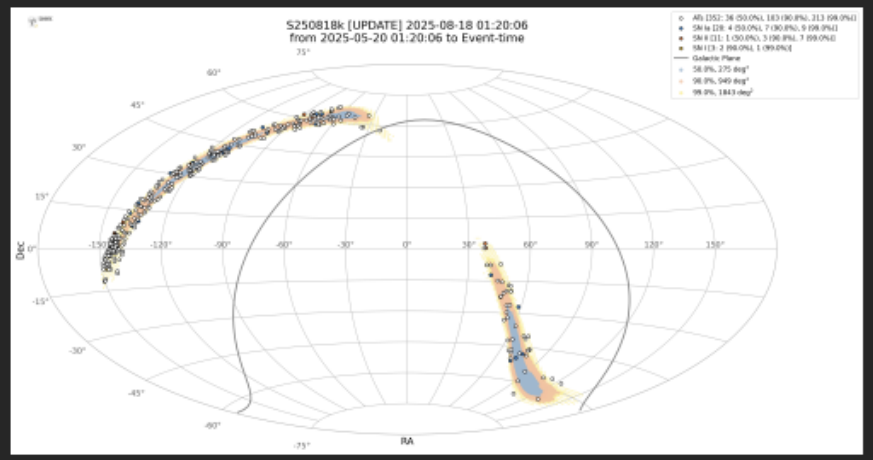


Skymap after JSON format transient list after TSV format transient list after

LVK (LIGO/Virgo/KAGRA) GW “service” on the TNS

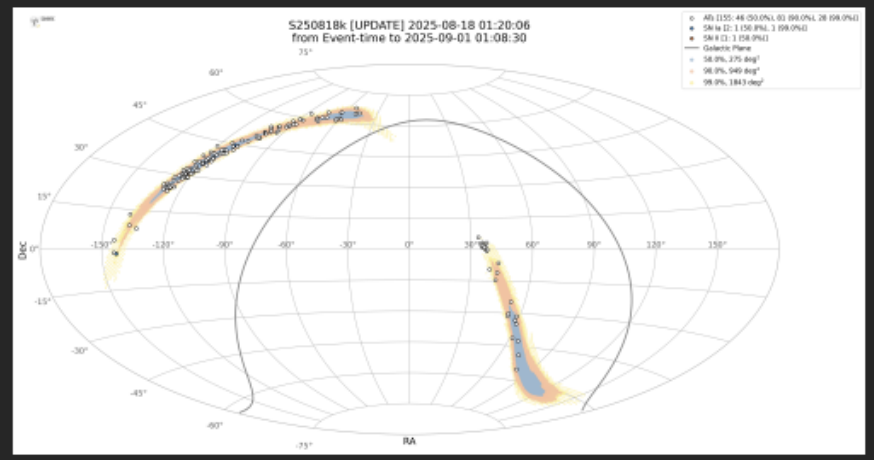
e.g. for S250818k:

TNS Transients discovered BEFORE the GW event (within date range 2025-05-20 - 2025-08-18)



Skymap before JSON format transient list before TSV format transient list before

TNS Transients discovered AFTER the GW event (within date range 2025-08-18 - 2025-09-01)



Skymap after JSON format transient list after TSV format transient list after

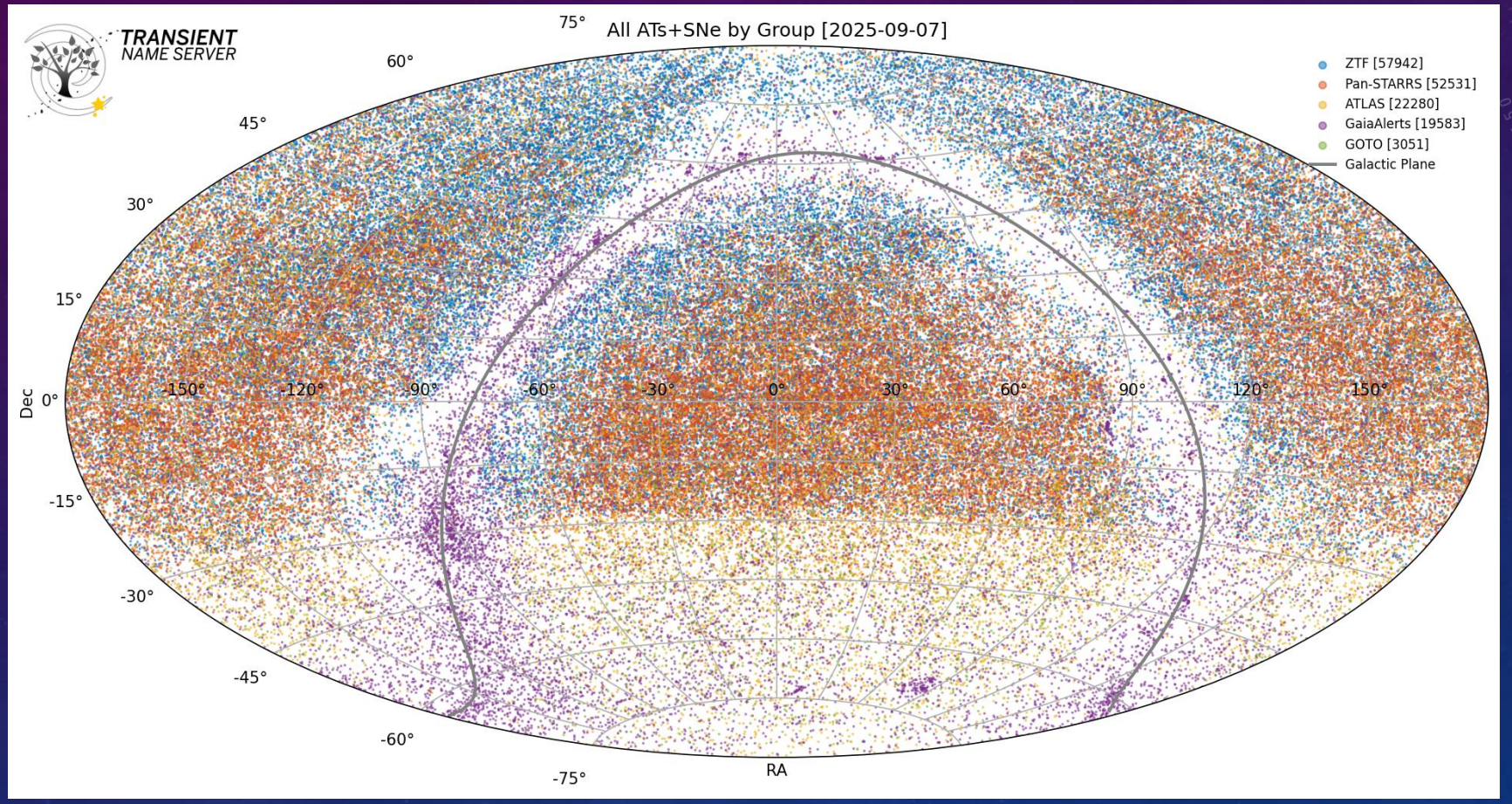
Discovered AFTER the GW event (2025-08-18 - 2025-09-01):

Name	RA	DEC	Type	Discovery Date	Discovery Mag	Filter	Source Group	Credibility Level	Region
AT 2025wnq	05:17:56.596	-55:09:07.02	None	2025-08-31 15:41:10.176	20.01	L	GOTO	0.689	90.0%
AT 2025wno	04:49:23.666	-48:50:15.56	None	2025-08-31 15:11:13.056	19.75	L	GOTO	0.255	50.0%
AT 2025wnm	04:23:09.093	-42:30:53.50	None	2025-08-31 14:48:36.576	19.9	L	GOTO	0.246	50.0%
AT 2025wnj	17:09:20.794	+54:07:57.97	None	2025-08-29 05:21:46.002	20.1547	r	ZTF	0.928	99.0%

www.wis-tns.org/stats-maps/maps

Skymaps & Plots

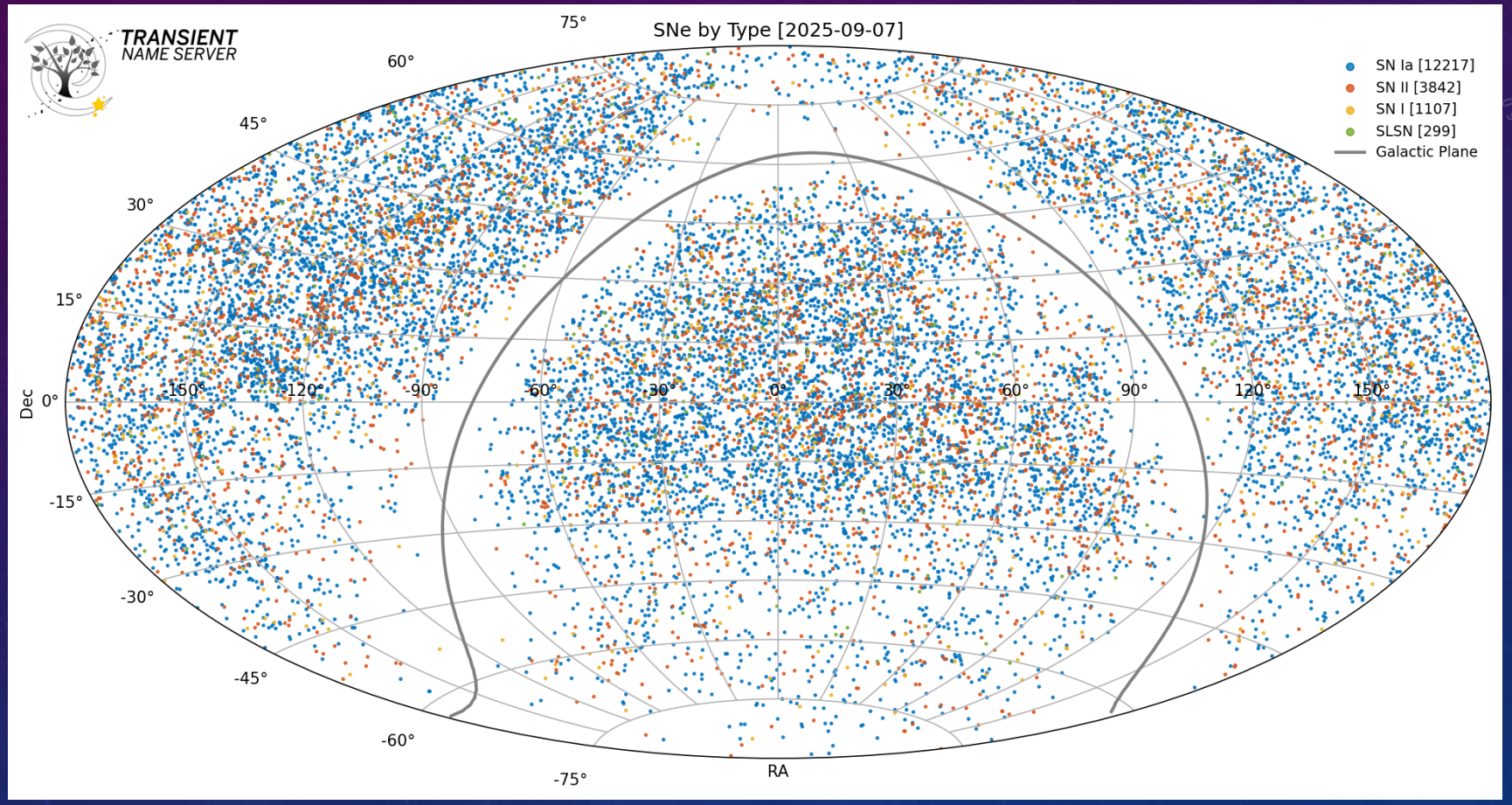
Aitoff-projection skymaps of all TNS objects by various cuts & groupings, updated every Sunday



Can see the various regions covered by the top contributing surveys

Skymaps & Plots

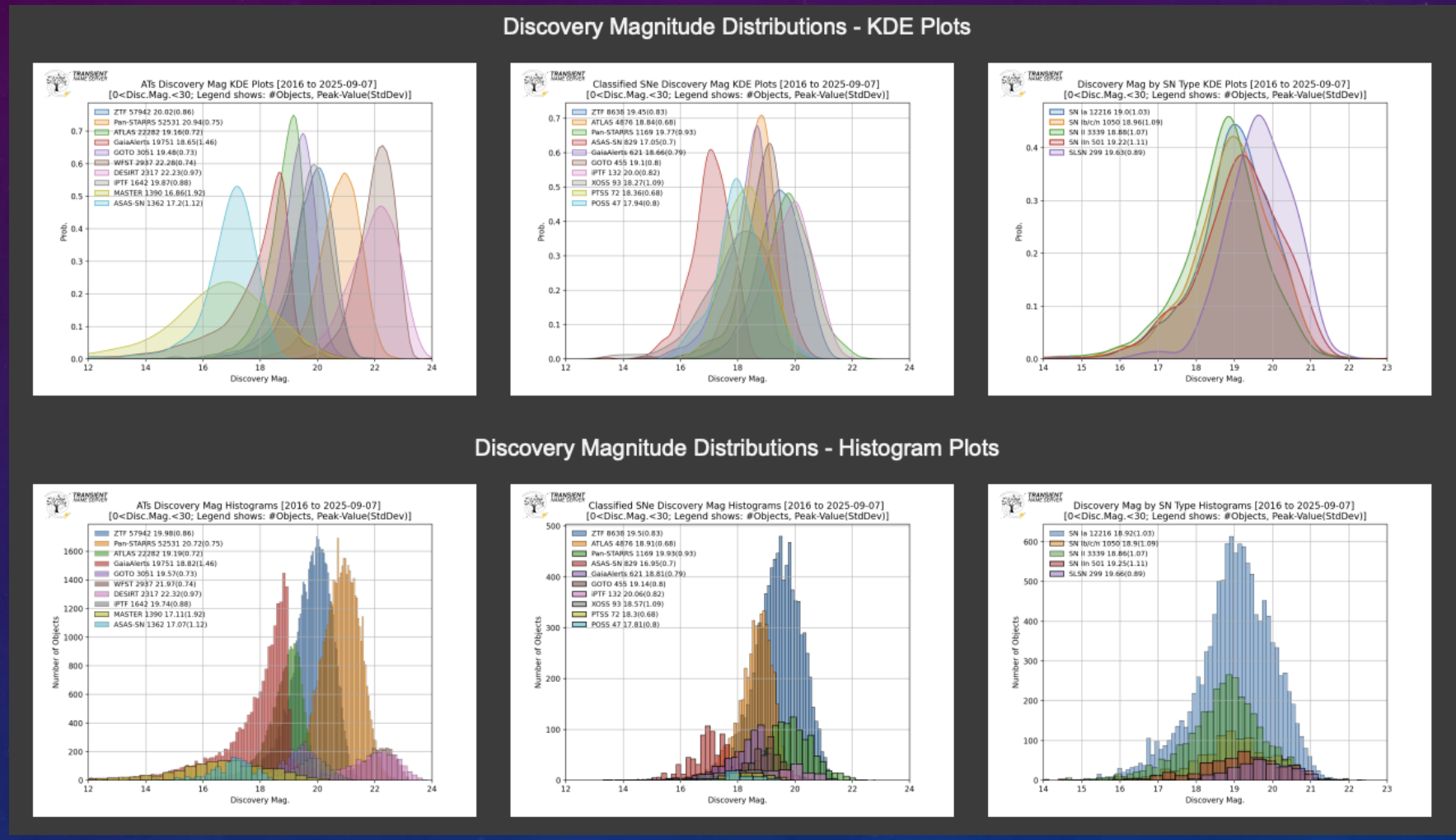
Aitoff-projection skymaps of all TNS objects by various cuts & groupings, updated every Sunday



Hardly any SNe around the galactic plane…

Skymaps & Plots

Discovery magnitude distributions plots by various cuts & groupings, also the evolution over the past 6 years.



TNS Clarifications / to summarize

- The TNS manages discovery & classification information (data), NOT extended LCs, spectral sequences etc…
  For this, data repositories such as WISeREP are relevant (https://www.wiserep.org).

- Initiated mainly for SN candidates, the TNS also handles other extra-galactic transients, including novae (CVs), AGN variability, TDEs, Kilonovae… BUT NOT variable stars, asteroids or other such galactic/local variable/moving sources.

  PLEASE DO NOT submit varstars/moving objects but only "clean" extra-galactic transient candidates!!!

- "Area/precise-time" Transients are also officially managed on the TNS: FRBs have joined, maybe GRBs in the future.

  (In future more sophisticated cross-matching and association capabilities should be implemented – both on the TNS, and hopefully also by the additional tools and brokers being developed.)

- Classifications must be supported by a spectrum (not relevant for the area transients), and currently the TNS switches the prefixes from AT to SN and TDE (Kilonovae… remain 'AT' until an official decision will be made).

- API sample codes are available for download on the help page.

TNS Clarifications / to summarize

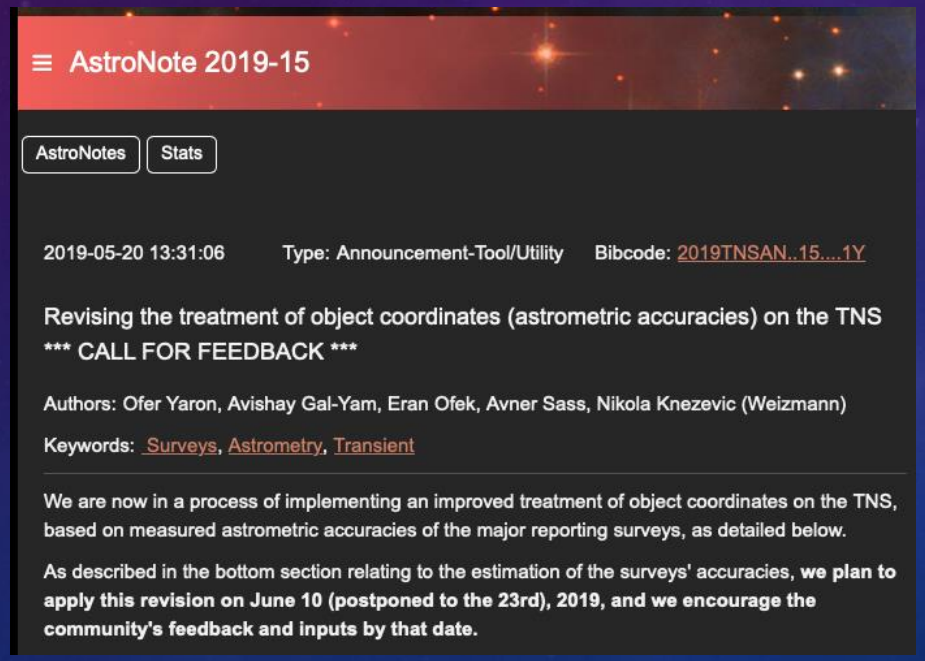
- Prospects for Rubin LSST:
  - The TNS will accommodate receipt of up to several thousands of transient candidates per day, also potential duplicate reports (for the same event) from the various brokers; however…
  - We expect “clean” streams of transient candidates, with minimal ”contamination” such as variable stars, moving objects, bogus detections etc…
  - One should also note that with the depth of LSST, only a small fraction of the transients will get a spectroscopic classification.

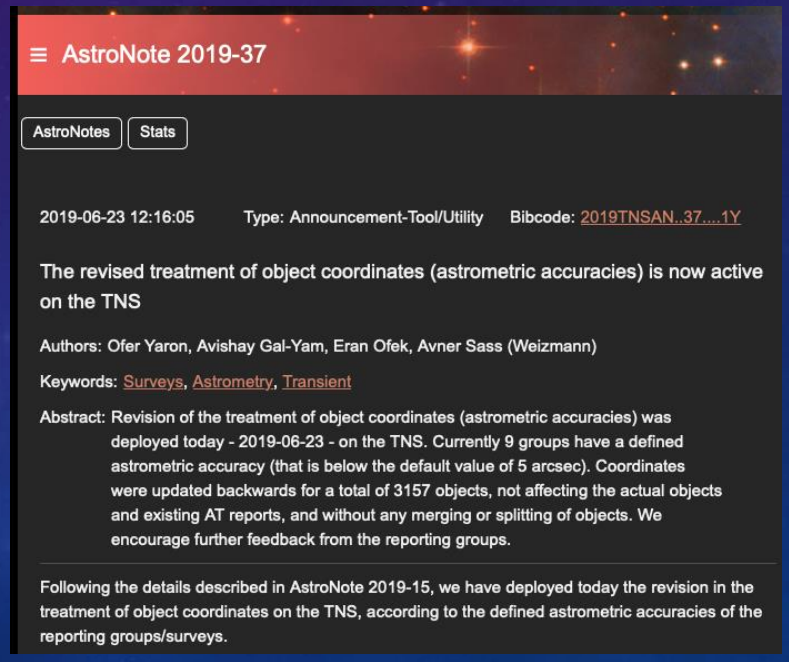
    (May have to consider enabling additional classification methods, but a slippery slope…)

- For any questions/feedback/suggestions related to the use of the TNS, its APIs and AstroNotes, please do not hesitate to contact us: www.wis-tns.org/content/contact-us (or me in person)

Astrometric accuracies of surveys on the TNS

- Several reporting groups/surveys have a defined astrometric accuracy that is significantly better than the default threshold of 5 arcsec.
- This affects the setting of an object's "principal" coordinates (in case of multiple reports from several groups), and also the decision on the creation of a new object vs association with an existing one.
- See AstroNotes 2019-15 and 2019-37 for detailed descriptions, and do let us know if the astrometric accuracy of certain groups need to be considered/revised.





Astrometric accuracies of surveys on the TNS