

The Open mulTiwavelength Transient Event Repository

aka OTTER

In collaboration with:

UA: Kate Alexander & Collin Christy

UT: Sebastian Gomez

STScI/Johns Hopkins: Suvi Gezari, Mitchell Karmen

SciServer: Charles Glaser, Gerard Lemson, Arik Mitschang

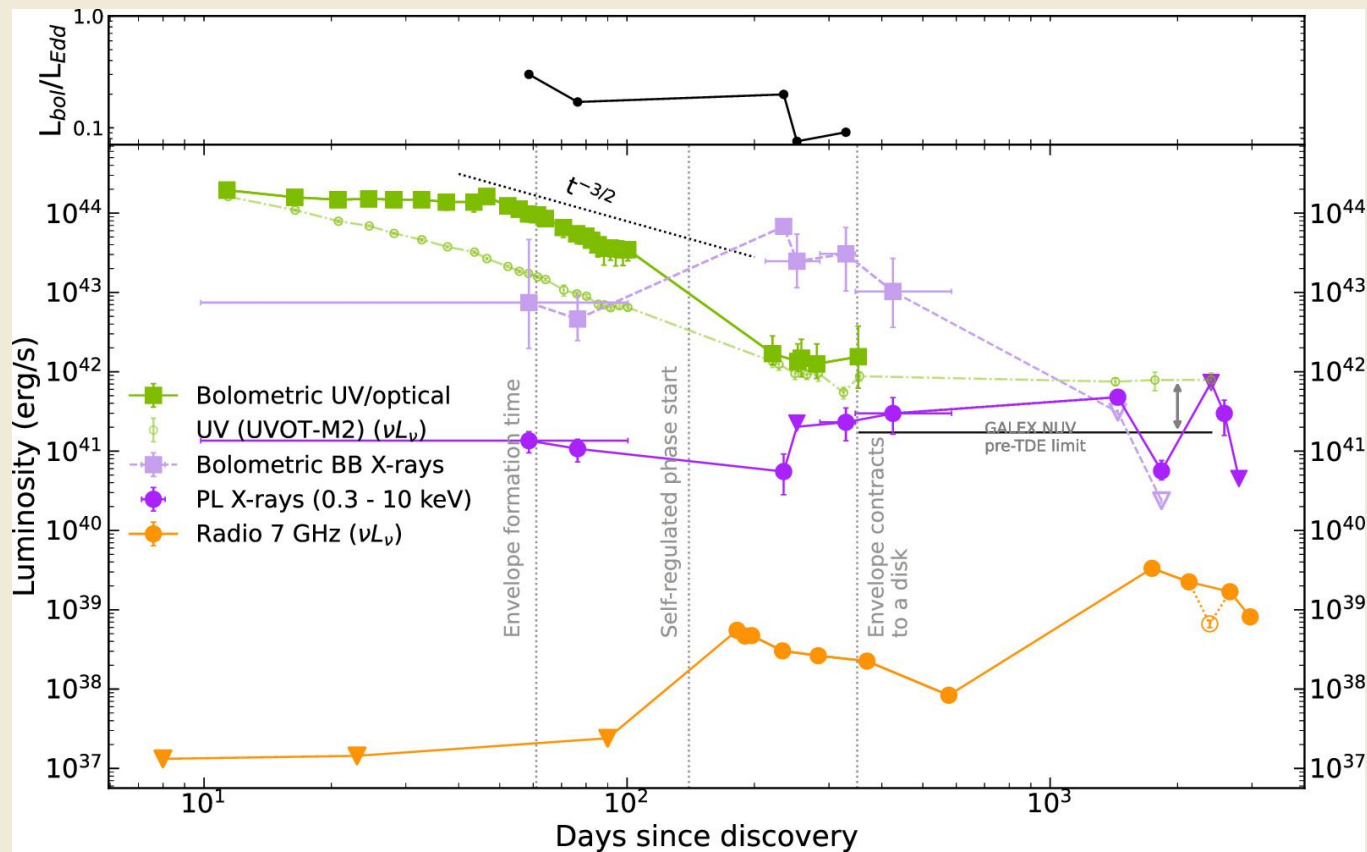
Other: Ashley Villar, Tanmoy Laskar, Sjoert van Velzen, Nicholas Earl, and others!



Multiwavelength modeling of transients is essential to extract constraints on physical properties



Ex. The TDE
ASASSN-15oi



***Problem:* Multiwavelength datasets of transients are spread all over!**



One-off
single-object
papers

Outdated Public
Catalogs
(OAC/OSC, etc)

Population Study
papers

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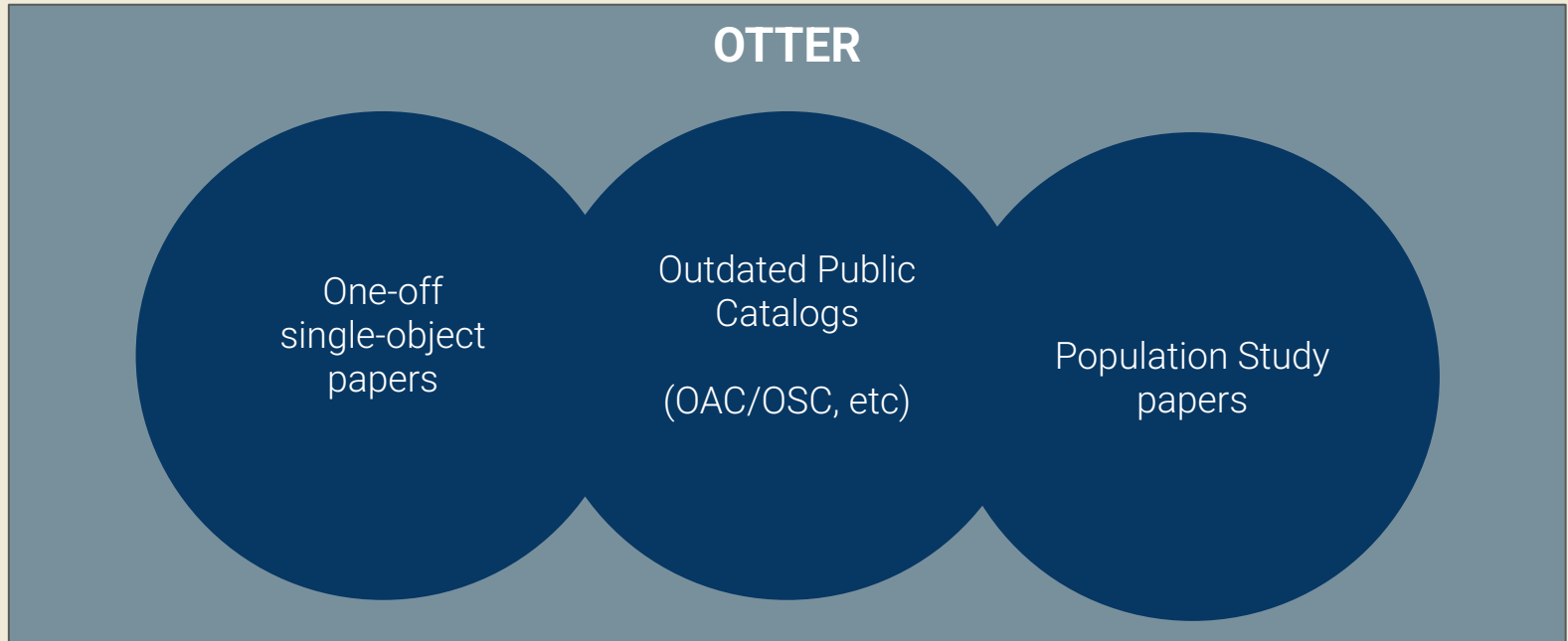


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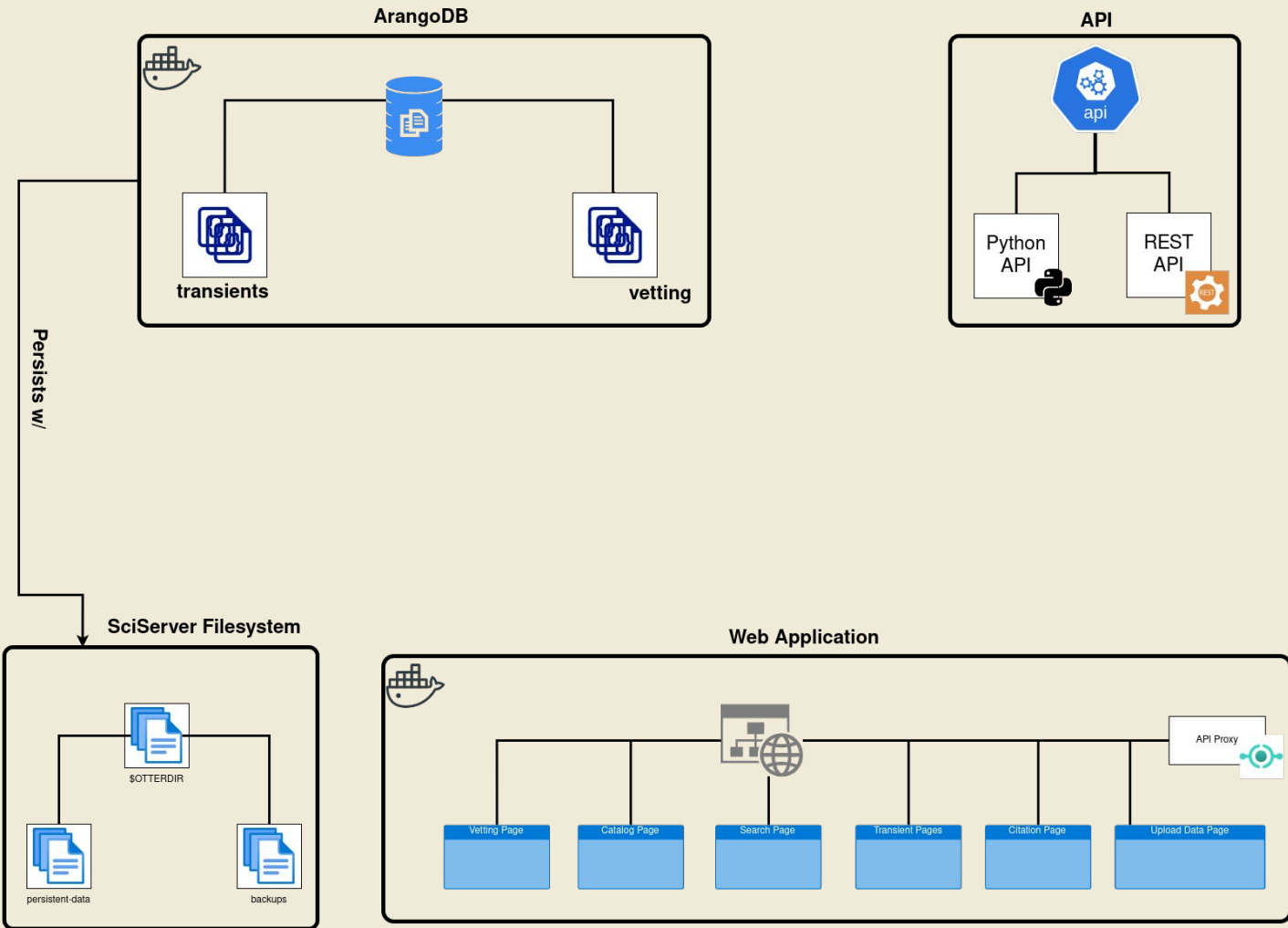
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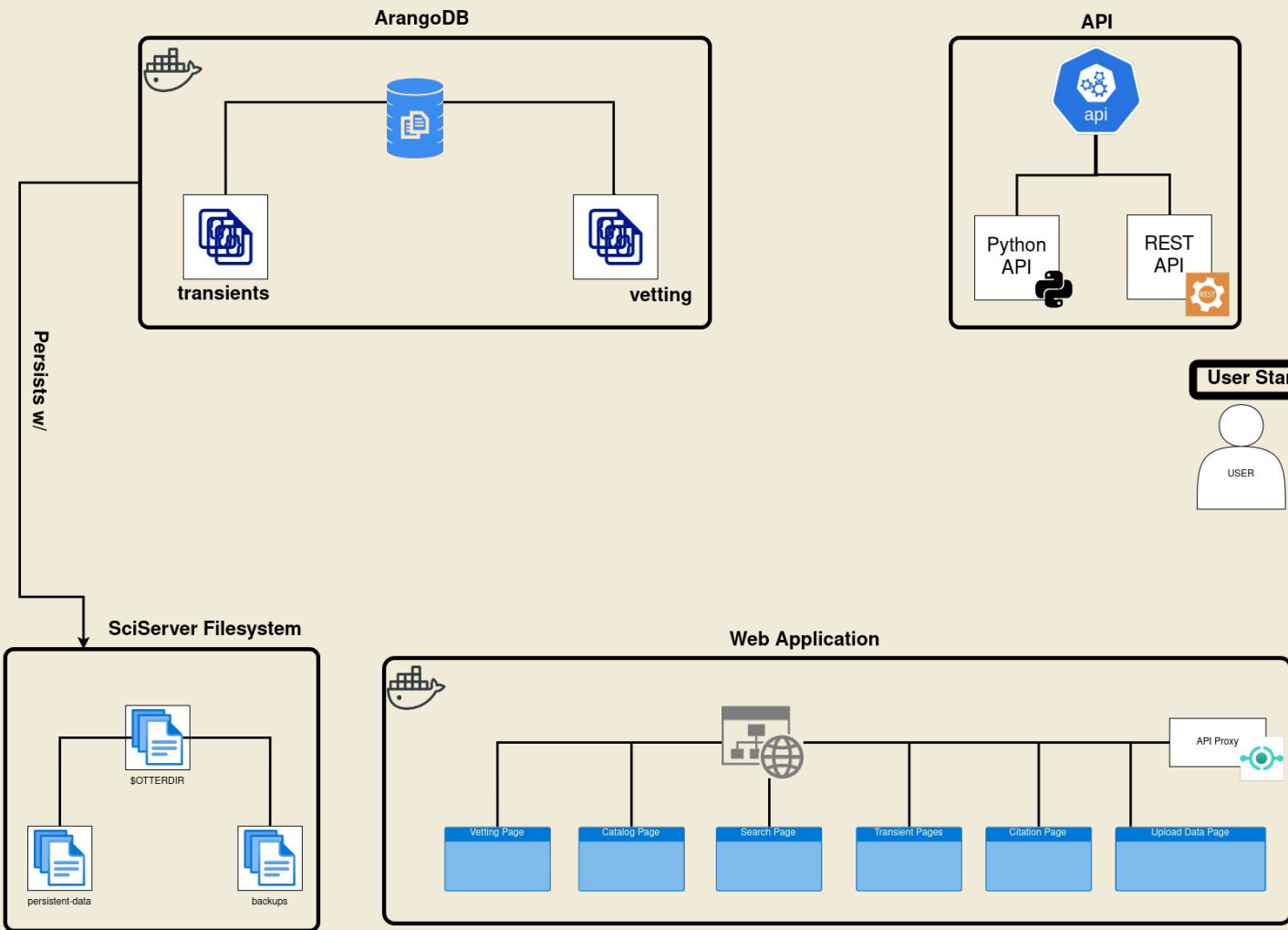


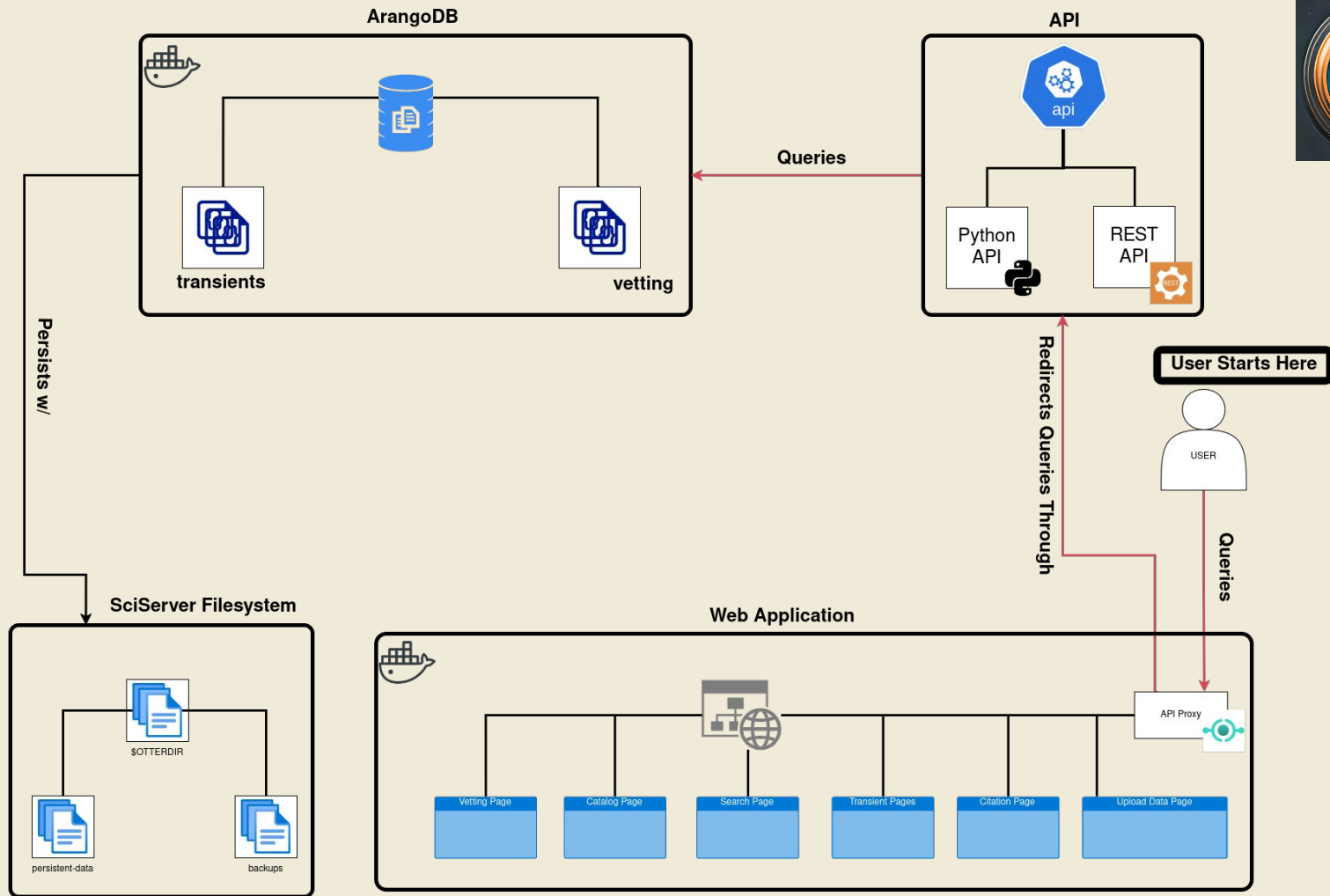
So what is OTTER?

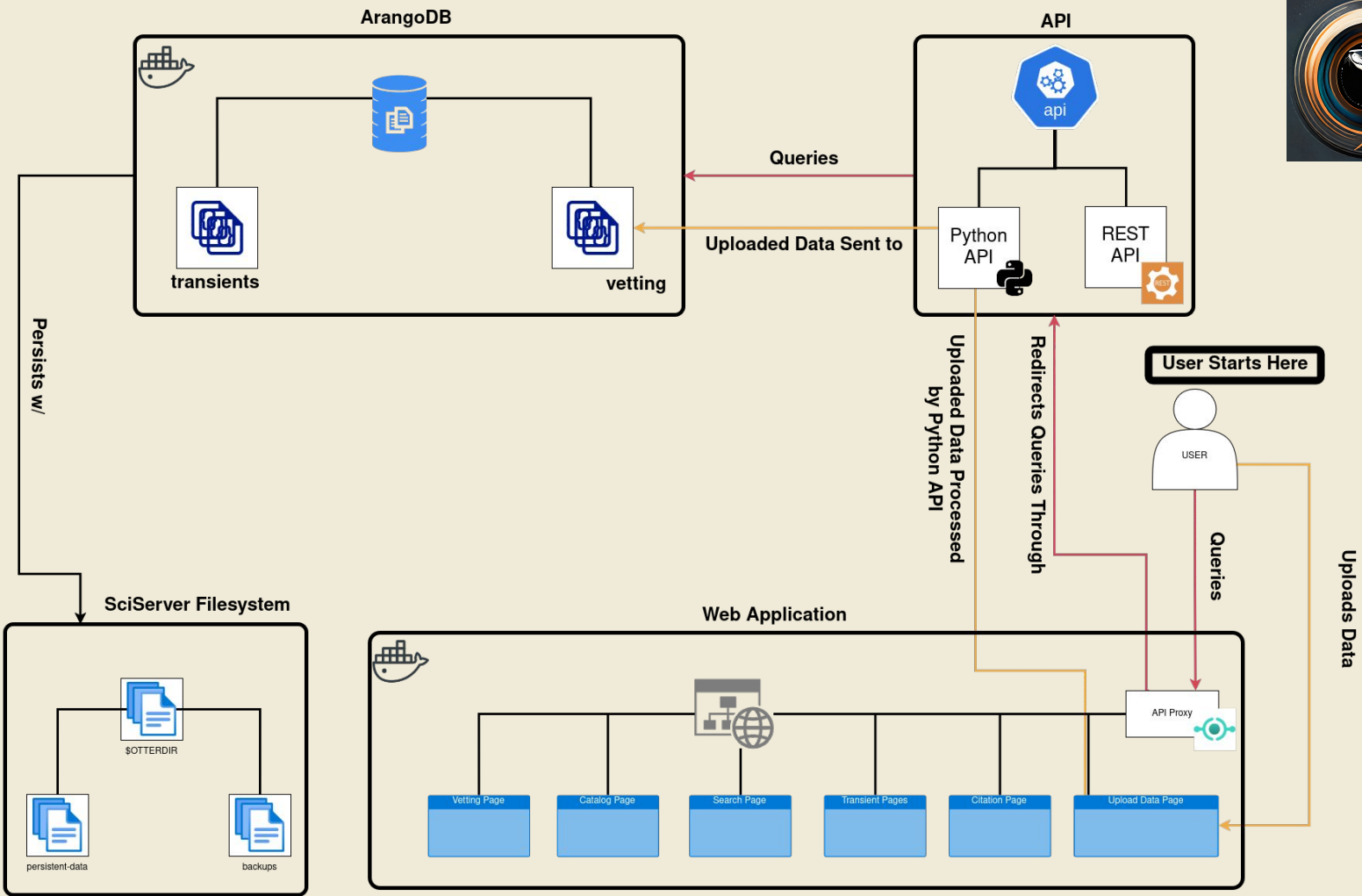


- OTTER is a catalog and software infrastructure for transient event photometry and metadata
- The catalog is built on a standard, yet flexible, schema to store multi-wavelength data
- Three software components
 - Scalable backend database
 - API for downloading and working with the data for your research
 - Web application for interfacing with the data









Uploads Data

User Starts Here

Queries

Redirects Queries Through

Uploaded Data Processed by Python API

Queries

Uploaded Data Sent to

Persists w/

SciServer Filesystem

Web Application

ArangoDB

API

transients

vetting

SOTTERDIR

persistent-data

backups

Vetting Page

Catalog Page

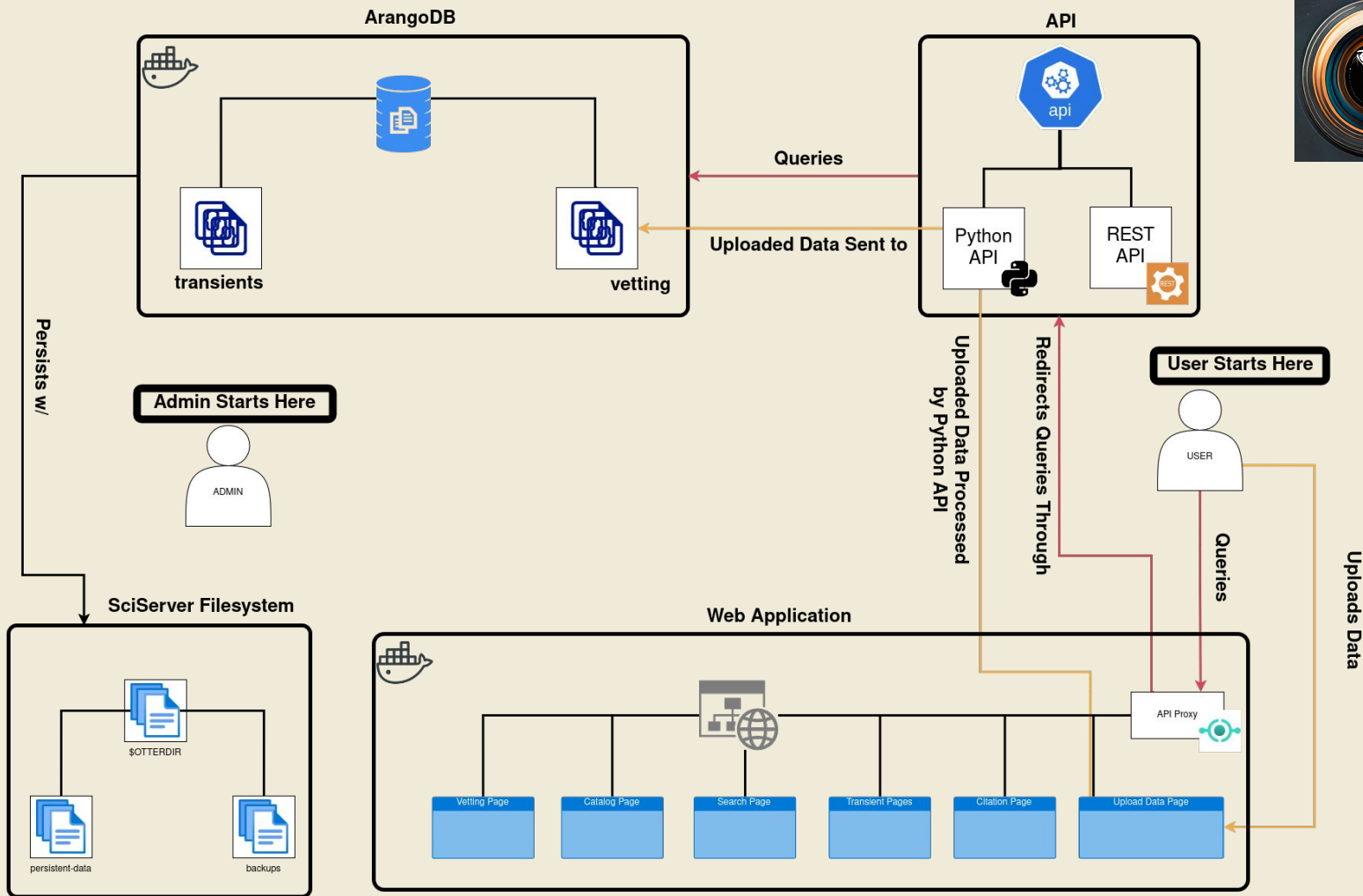
Search Page

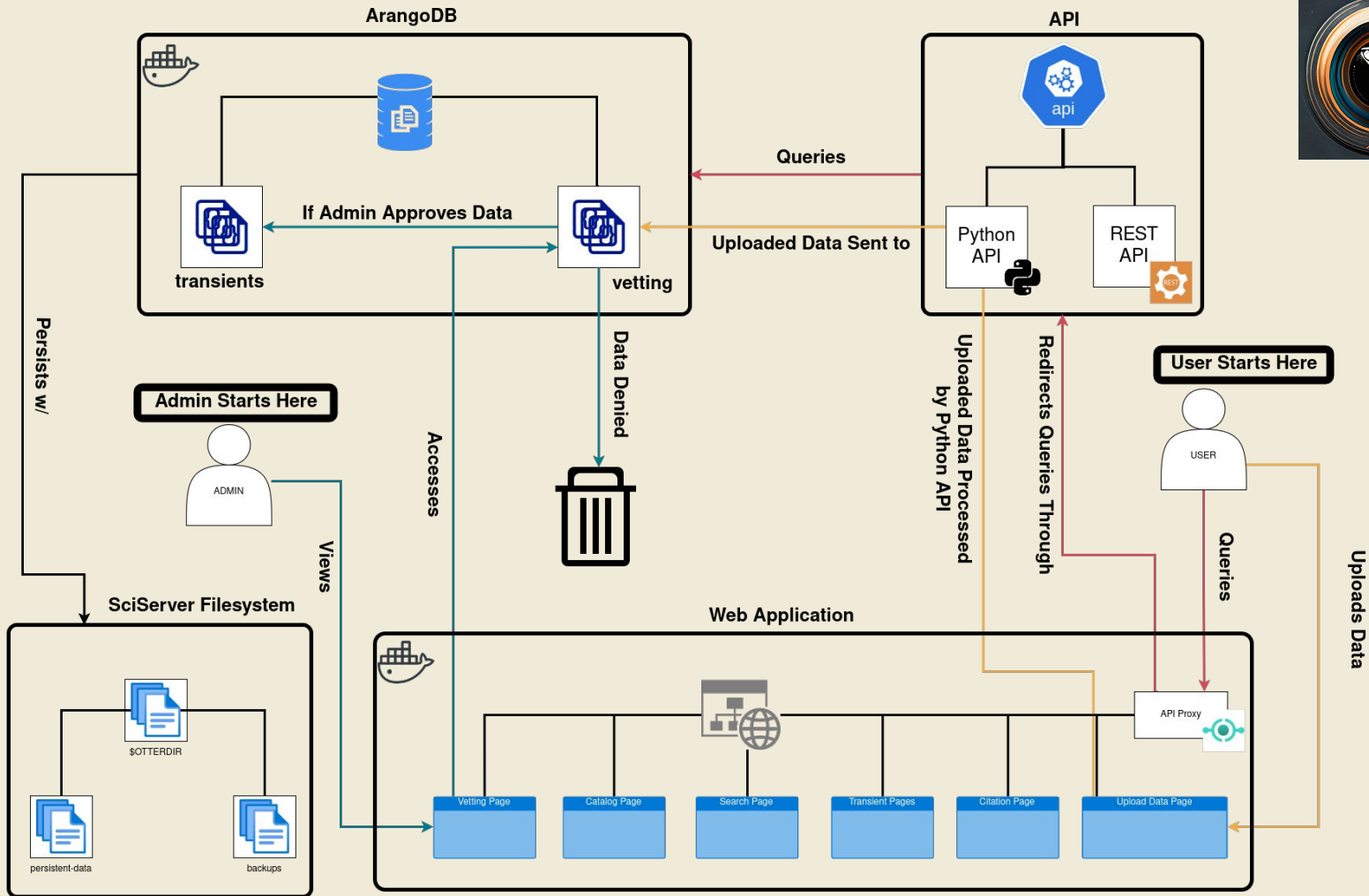
Transient Pages

Citation Page

Upload Data Page

USER

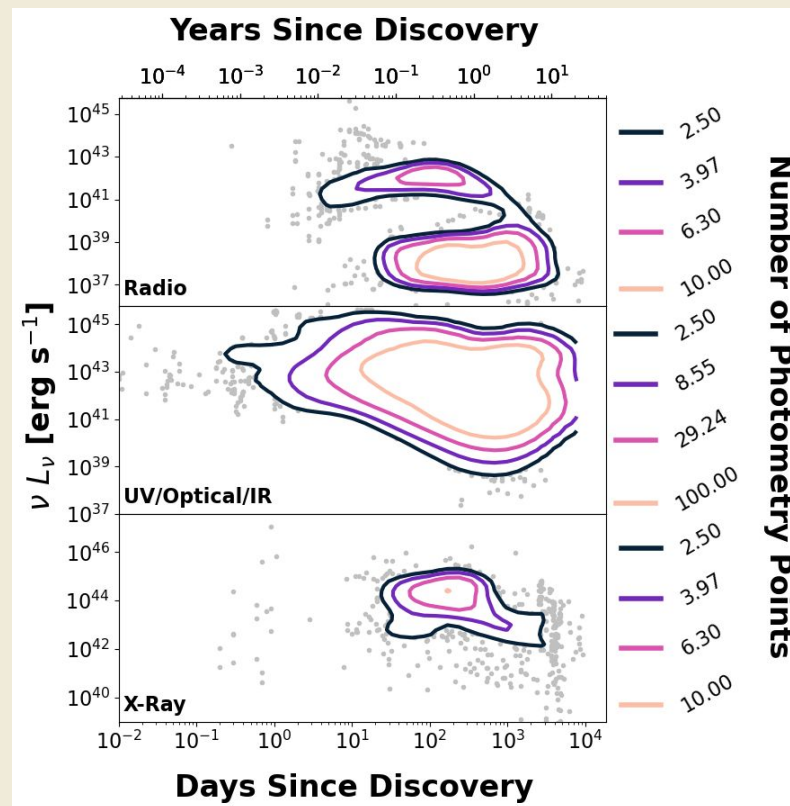




Current Status of OTTER: A TDE Catalog



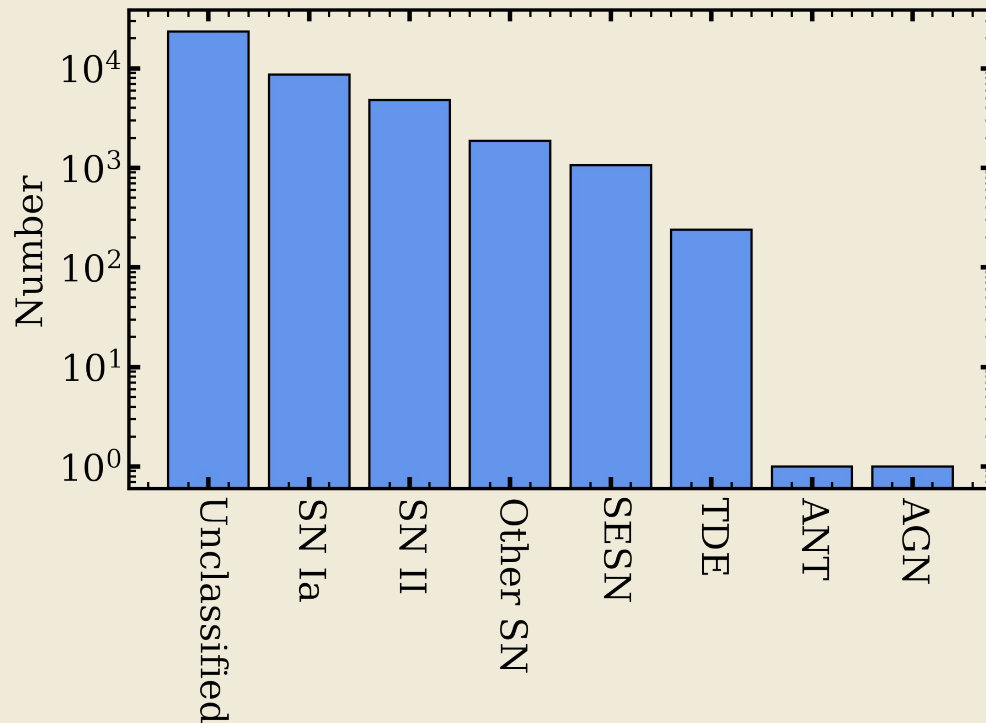
- Scope is limited to transient photometric datasets
- Currently built for optically discovered transients (SNe, TDEs, FBOTs, etc.)
- TDE catalog should be complete up through ~ 2024



Current Status of OTTER: A TDE Catalog + OSC



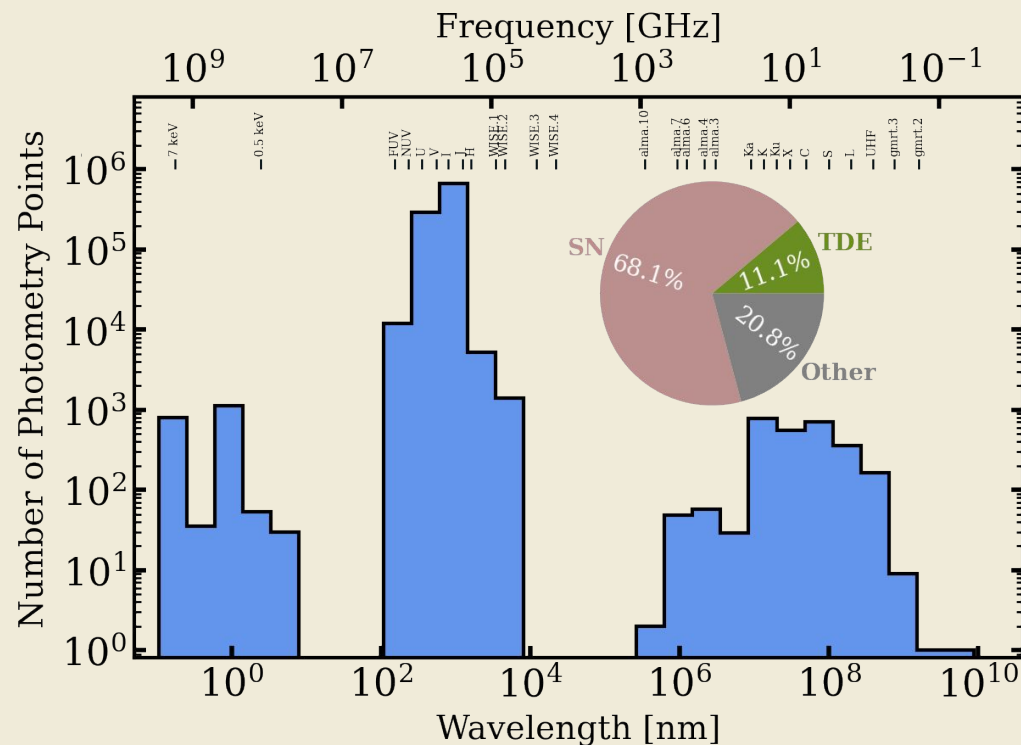
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- OSC events and photometry!



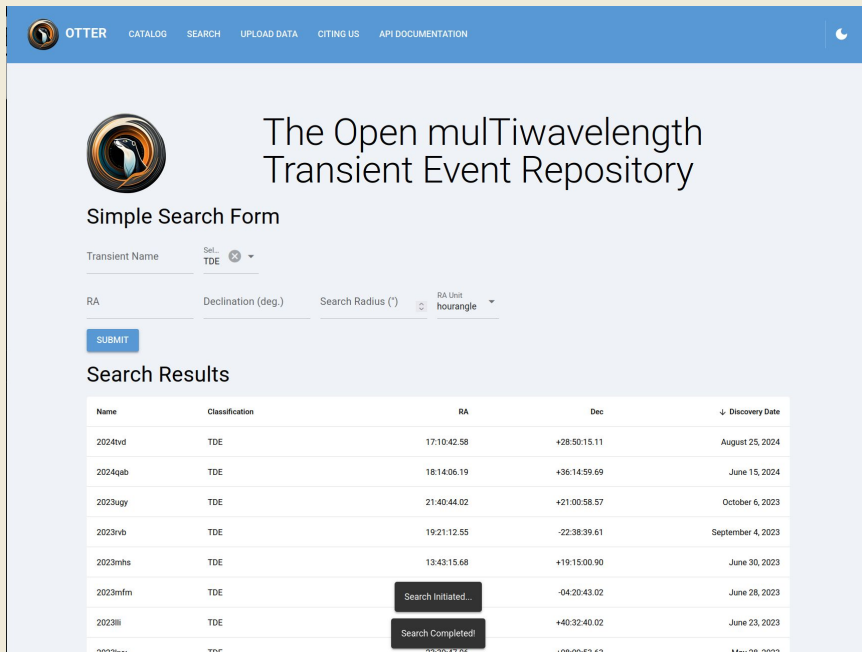
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- Scope is limited to transient photometric datasets
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- TDE catalog should be complete up through ~2024
- OSC events and photometry!
- ~Million photometry points spanning from the radio → X-rays!



Web Application Highlights



OTTER CATALOG SEARCH UPLOAD DATA CITING US API DOCUMENTATION

The Open multiwavelength Transient Event Repository

Simple Search Form

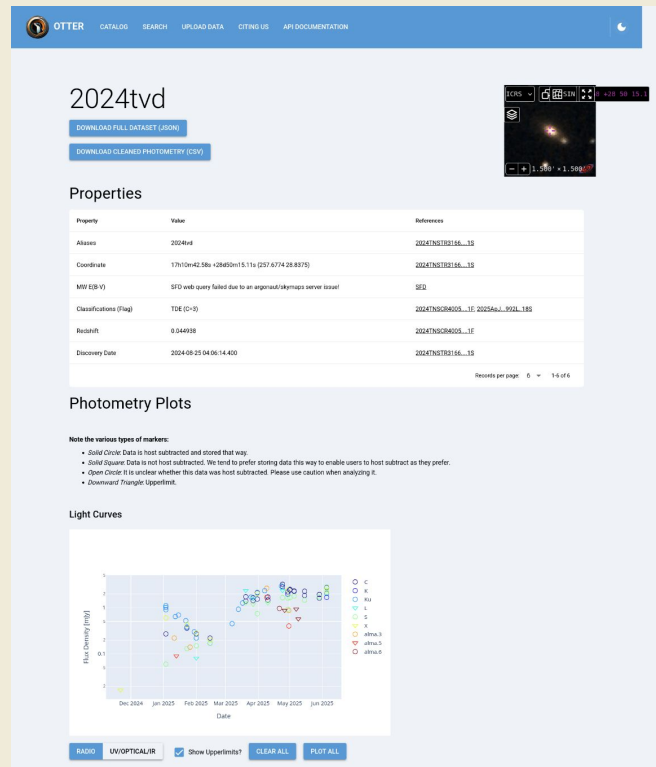
Transient Name

RA Declination (deg.) Search Radius (°) RA Unit

SUBMIT

Search Results

Name	Classification	RA	Dec	Discovery Date
2024tvd	TDE	17:10:42.58	+28:50:15.11	August 25, 2024
2024qab	TDE	18:14:06.19	+36:14:59.69	June 15, 2024
2023juy	TDE	21:40:44.02	+21:00:58.57	October 6, 2023
2023rvb	TDE	19:21:12.55	-22:38:39.61	September 4, 2023
2023mhs	TDE	13:43:15.68	+19:15:00.90	June 30, 2023
2023mfm	TDE	<input type="text" value="Search Initiated..."/>	-04:20:43.02	June 28, 2023
2023lll	TDE	<input type="text" value="Search Completed!"/>	+40:32:40.02	June 23, 2023
2023mss	TDE	+13:50:43.02	+08:06:53.03	June 20, 2023



OTTER CATALOG SEARCH UPLOAD DATA CITING US API DOCUMENTATION

2024tvd

[DOWNLOAD FULL DATASET \(JSON\)](#)
[DOWNLOAD CLEANED PHOTOMETRY \(CSV\)](#)

Properties

Property	Value	References
Alias	2024tvd	2024NST18116...15
Coordinate	17h10m42.58s +28d50m15.11s (237.674288975)	2024NST18116...15
MW E(B-V)	SFD web query failed due to an unhandled/unknown server issue!	SFD
Classifications (Flag)	TDE (C=1)	2024NS028905...1E 2025Aa...302L_185
Redshift	0.044938	2024NS028905...1E
Discovery Date	2024-08-25 04:06:14.400	2024NST18116...15

Results per page: 0 / 14 of 6

Photometry Plots

Note the various types of markers:

- Solid Circle: Data is host subtracted and stored that way.
- Solid Square: Data is not host subtracted. We tend to prefer storing data this way to enable users to host subtract as they prefer.
- Open Circle: It is unclear whether this data was host subtracted. Please use caution when analyzing it.
- Diamond: Triangle: Unreported.

Light Curves

Flux Density (Jy) vs Date

Legend: RA00, LIV, OPTICALIR, Show Upperlimits?, CLEAR ALL, PLOT ALL



OTTER Website: otter.idies.jhu.edu

Summary Points & Open Questions



It seems that most of the community agrees consolidating multiwavelength data is powerful, and as the number of events (and data) increases with Rubin/Roman it becomes increasingly difficult

- How can we maximize the scientific return of large multiwavelength datasets of transients, especially when many may not have spectroscopic classifications?
- How can we encourage the community to assist in maintaining a consolidated multiwavelength dataset?
- How can we make contributing data to OTTER easier? And, is there a way we can leverage large language models (and do we trust them enough for this)?

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Future Plans for OTTER

- Continue to maintain existing catalog
 - Encouraging the community to upload after publication
- Looking for other transient photometry to add (FBOTs?!?)
- Looking for other developers/maintainers (come talk to me!)



JOSS Paper



ApJ Paper

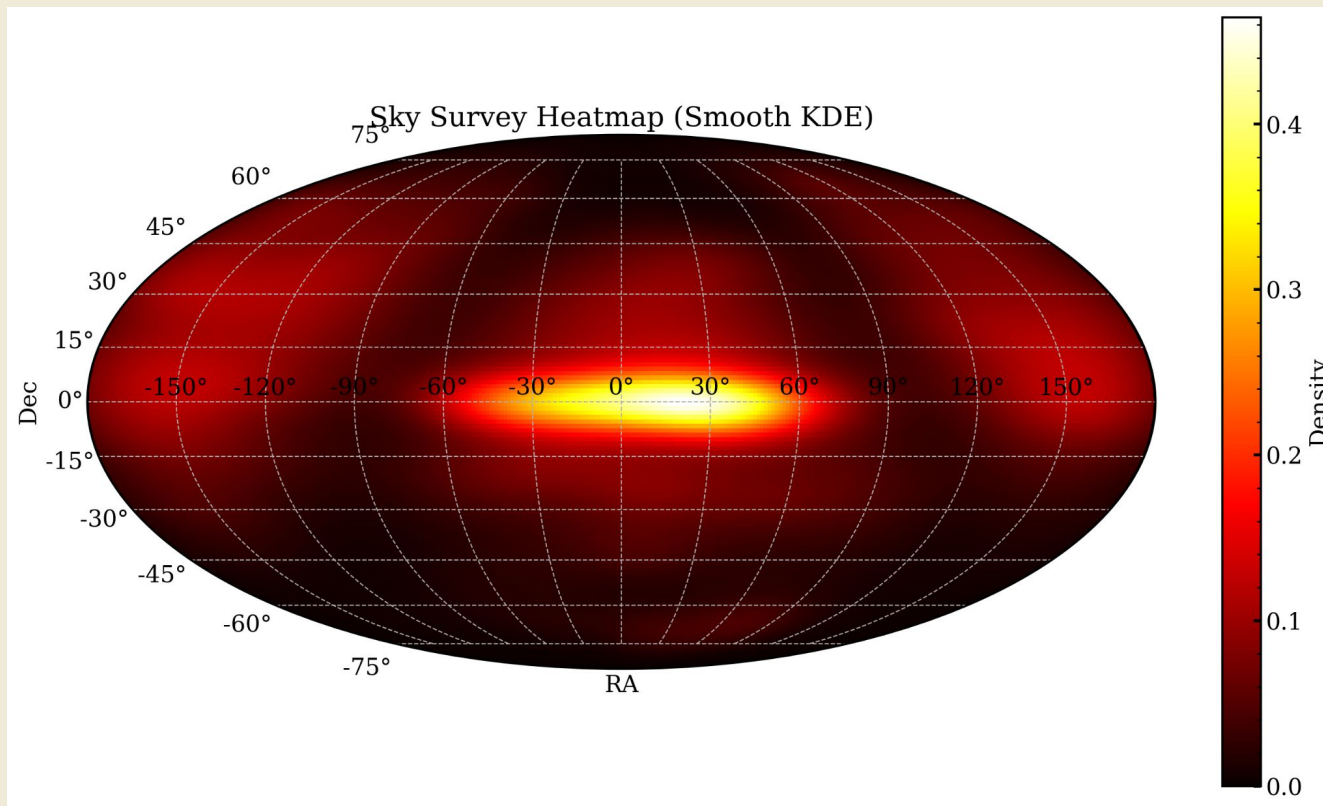
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<CITATION>

Other Slides

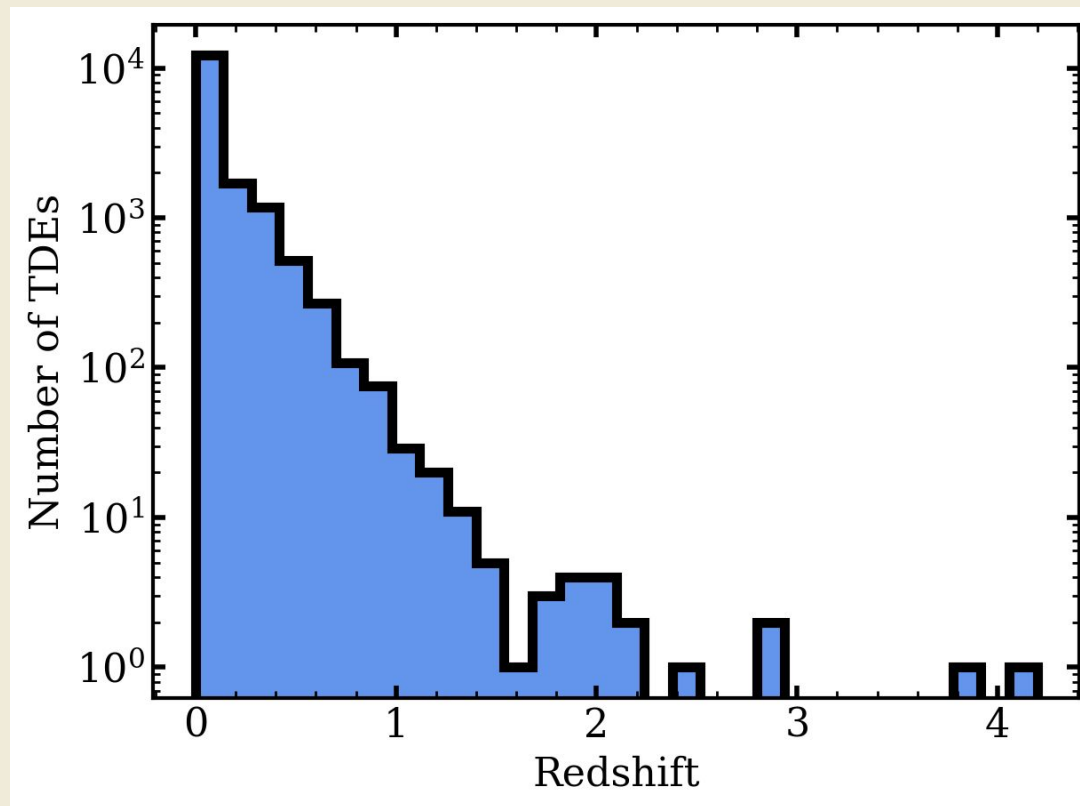


Skymap Density Plot



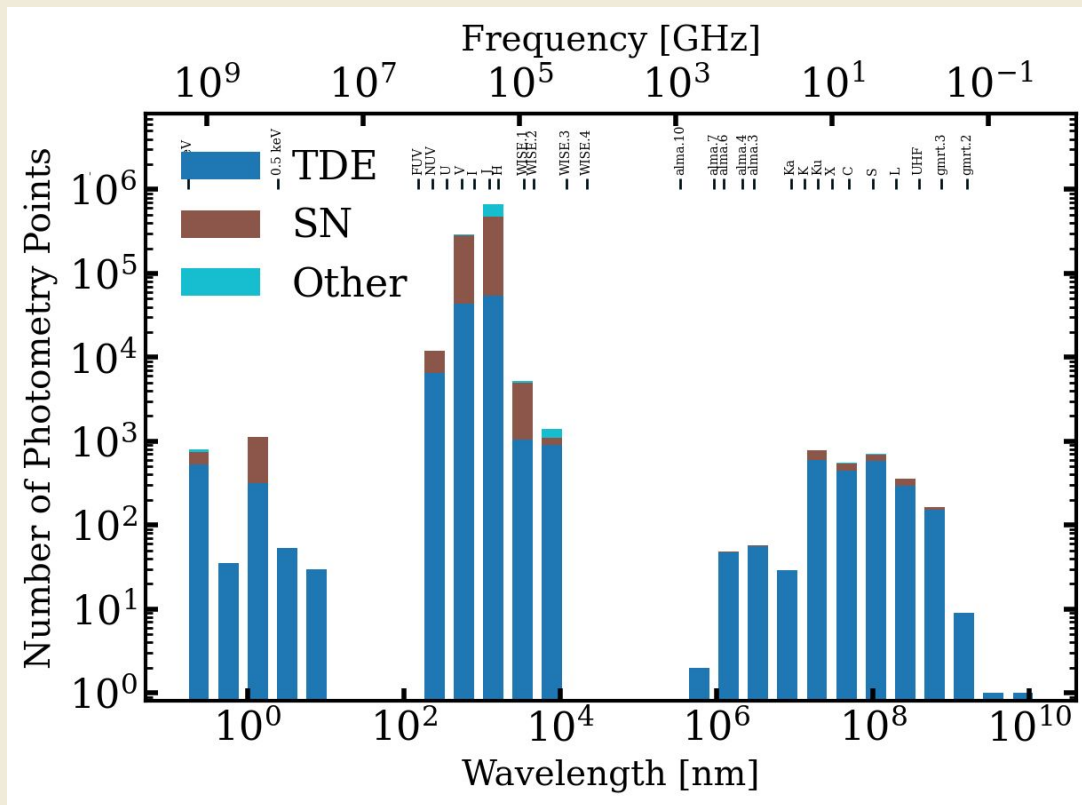
<CITATION>

Redshift histogram



<CITATION>

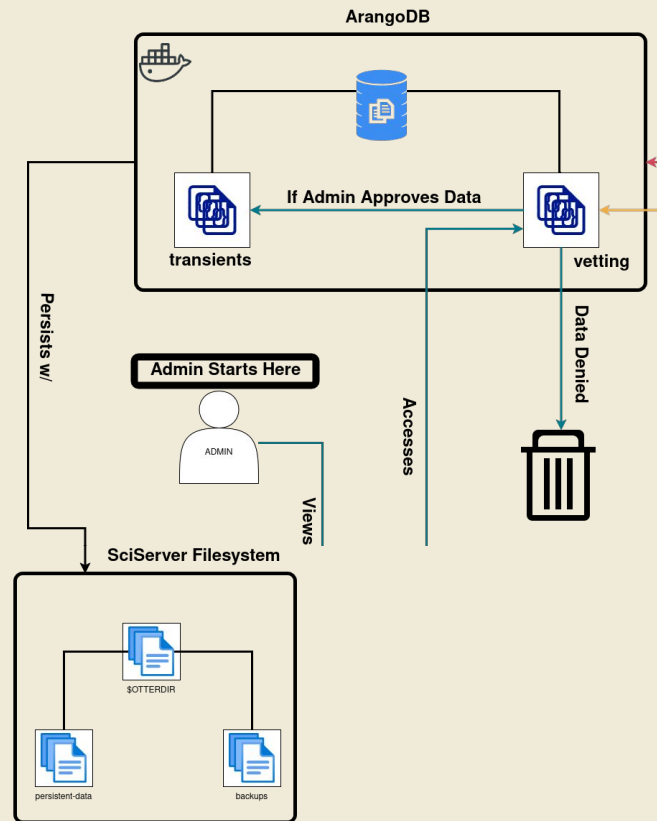
Photometry Histogram Broken Down by Class



<CITATION>

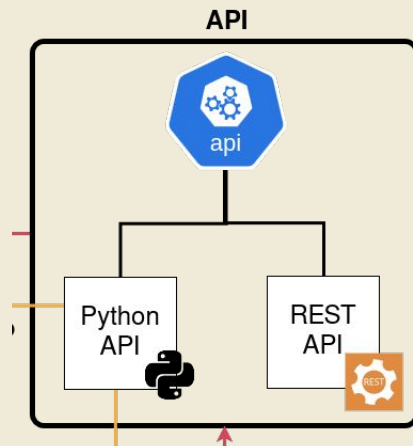
Database Infrastructure

- Data format is relatively standard with well documented schema
- Document Database: ArangoDB
 - Improved data flexibility!
 - Uses less storage
 - Scalable and fast
- Document Collections
 - First, a “pristine” transient catalog
 - Second, a “vetting” catalog with other, messy, data
- Hosted at SciServer



API

- Pip installable Python API -> `pip install astro-otter`
 - Pros:
 - (Hopefully) easy to use
 - Converts and cleans the photometry for you
 - Easy access to metadata properties of transients
 - Cons: Can only be used through Python
- More flexible REST API for access through other languages
 - Pros: Can run queries in a CLI and any programming language
 - Cons: Need to learn Arango Query Language



Website

- Easy access to transient metadata
 - Similar to what TNS stores
- Quick view of transient light curves and SEDs
- Download JSON files of individual transients
- Easily export a bibtex file of all references for transients
- Upload your data after publishing!

