

Automating follow up to a SNEWS alert



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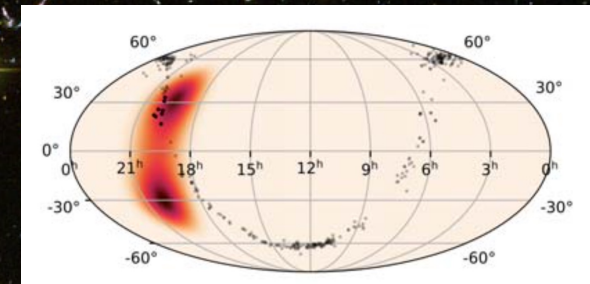
On behalf of the Follow up Working Group

Information Observers Will Need

Phase 1: Immediate alert
Something is happening!



Phase 2: Shortly afterward...
Localization



Phase 3: A little while later...
Information about the nature of the explosion



Information Observers Will Need

Phase 1: Immediate alert

Something is happening!

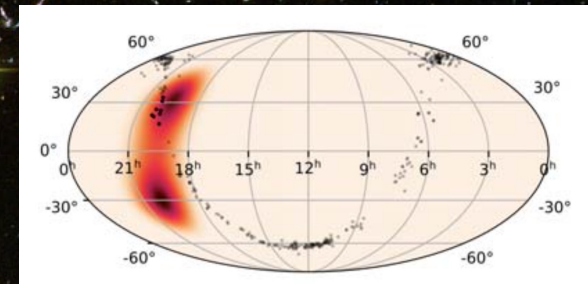
Get the word out fast to many people who are listening.



Phase 2: Shortly afterward...

Localization

Where to look and how (wide versus narrow/targeted)?



Phase 3: A little while later...

Information about the nature of the explosion

Adapt default observing strategy to optimize return.



First priority is to observe shock breakout

We will use ALL information to conduct an intelligent search that patrols likely candidates and conducts wide-field monitoring

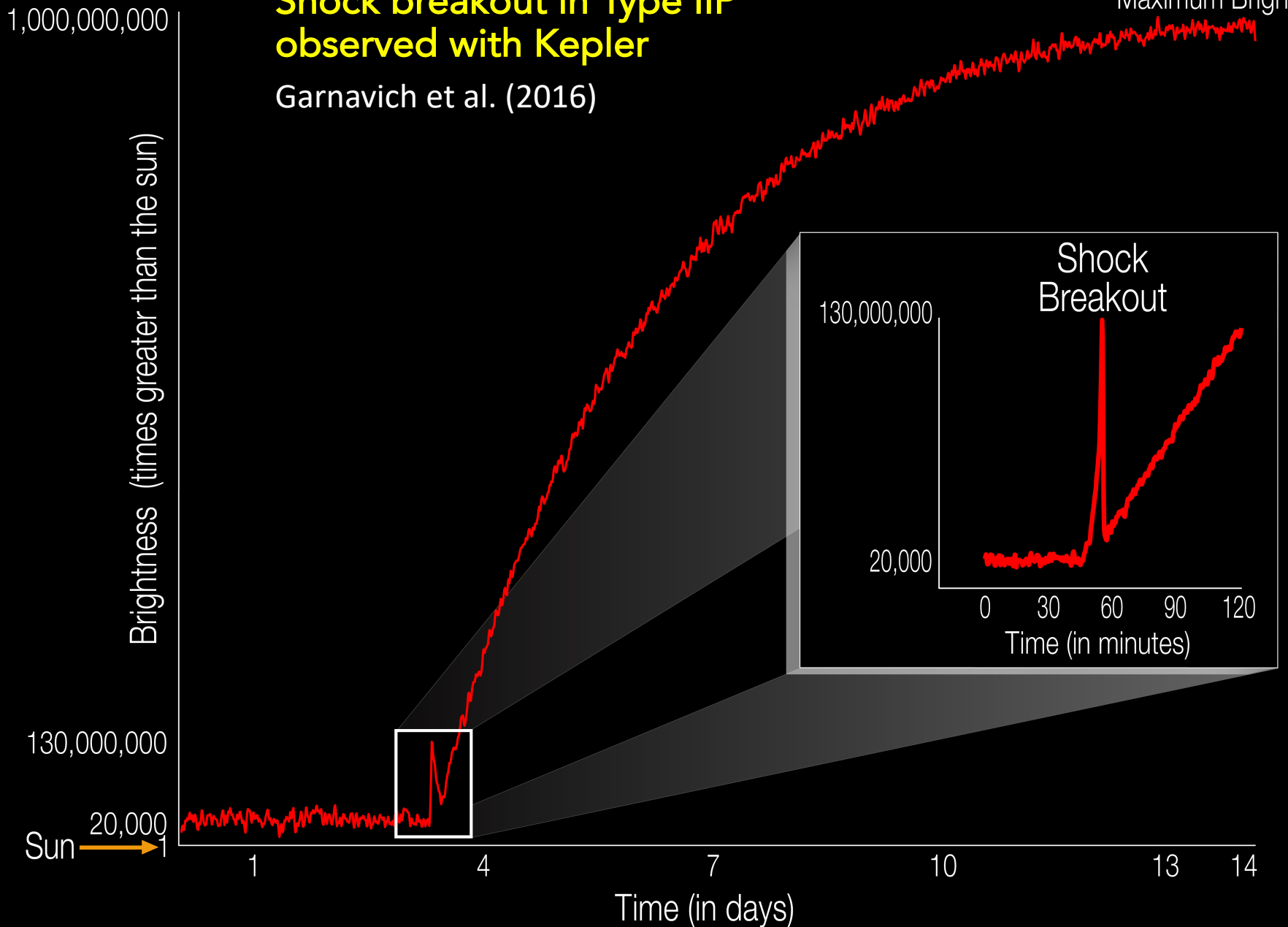
Likely that we will not know which star will explode before shock breakout (SBO) in a large field (tens to hundreds of square degrees) thus intense monitoring is needed that can be analyzed afterwards.

Valuable information could be lost if not conducted properly!

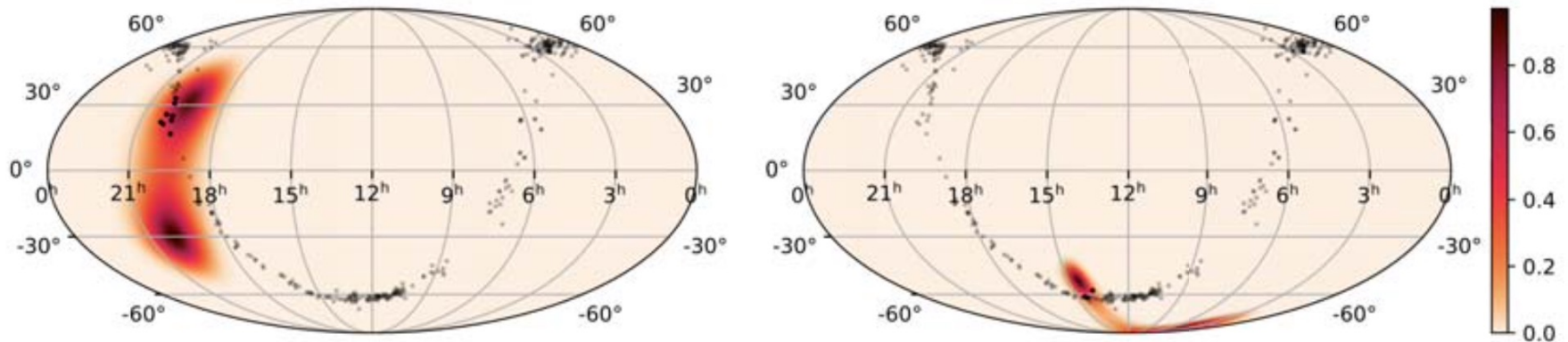
Shock breakout in Type IIP observed with Kepler

Garnavich et al. (2016)

Maximum Brightness



Combining localization with SN Candidate Stars



Python script now takes SNEWPDAG output and checks against SN candidate list to produce plots and an output list that can be used for coordination. This is the first step towards automating the procedure that will send recommendations to observing agents.

Thanks to SNEWPDAG developers, Sarah Healy, Shunsaku Horiuchi, Katie Weil, Faith Bergin ... and now Danielle Dickinson.

Fire Drill for Follow up Response

A fire drill is planned for *September 2022* to practice response to a SNEWS alert and to assess the capabilities of participants.

A “soft launch” mainly utilizing AAVSO members, recruited through a survey.

Participants will be given a 1-2 week window when to expect an alert to be distributed, along with instructions.

Emphasis will be on intense monitoring of candidate stars, but observers with wide-field monitoring capabilities will also be asked to participate.

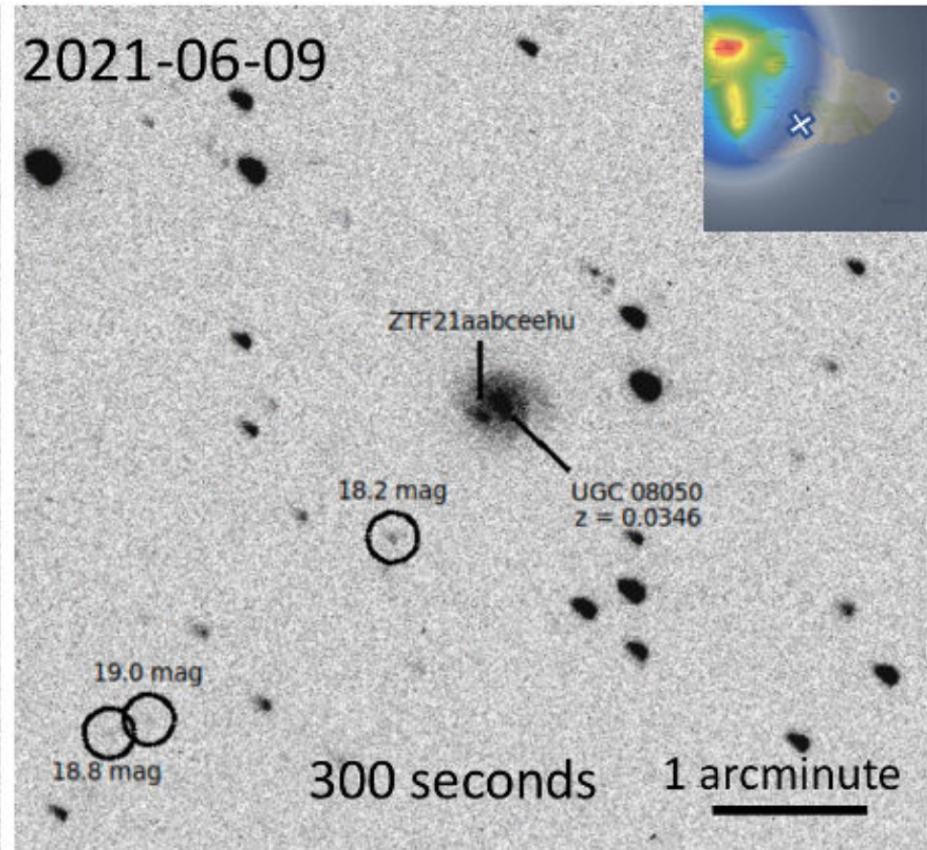
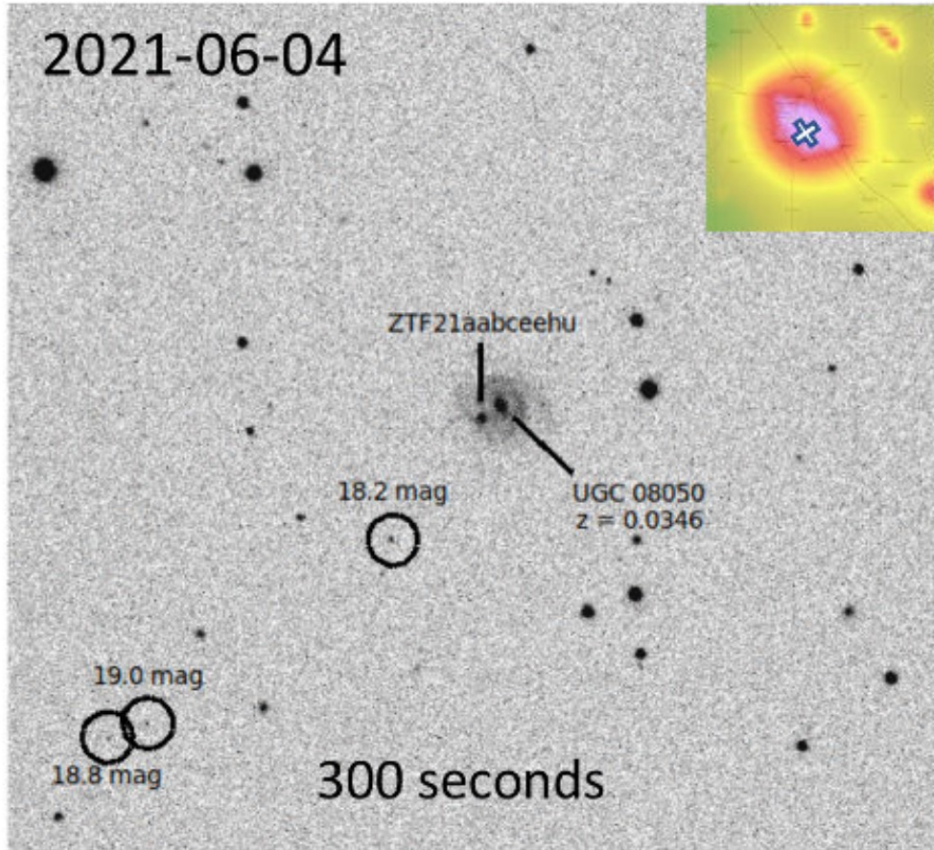
Alert distributed via email and SMS message.

Volunteer astronomers can play a vital role monitoring stars < 10 mag that saturate most professional facilities.

Technological advancements

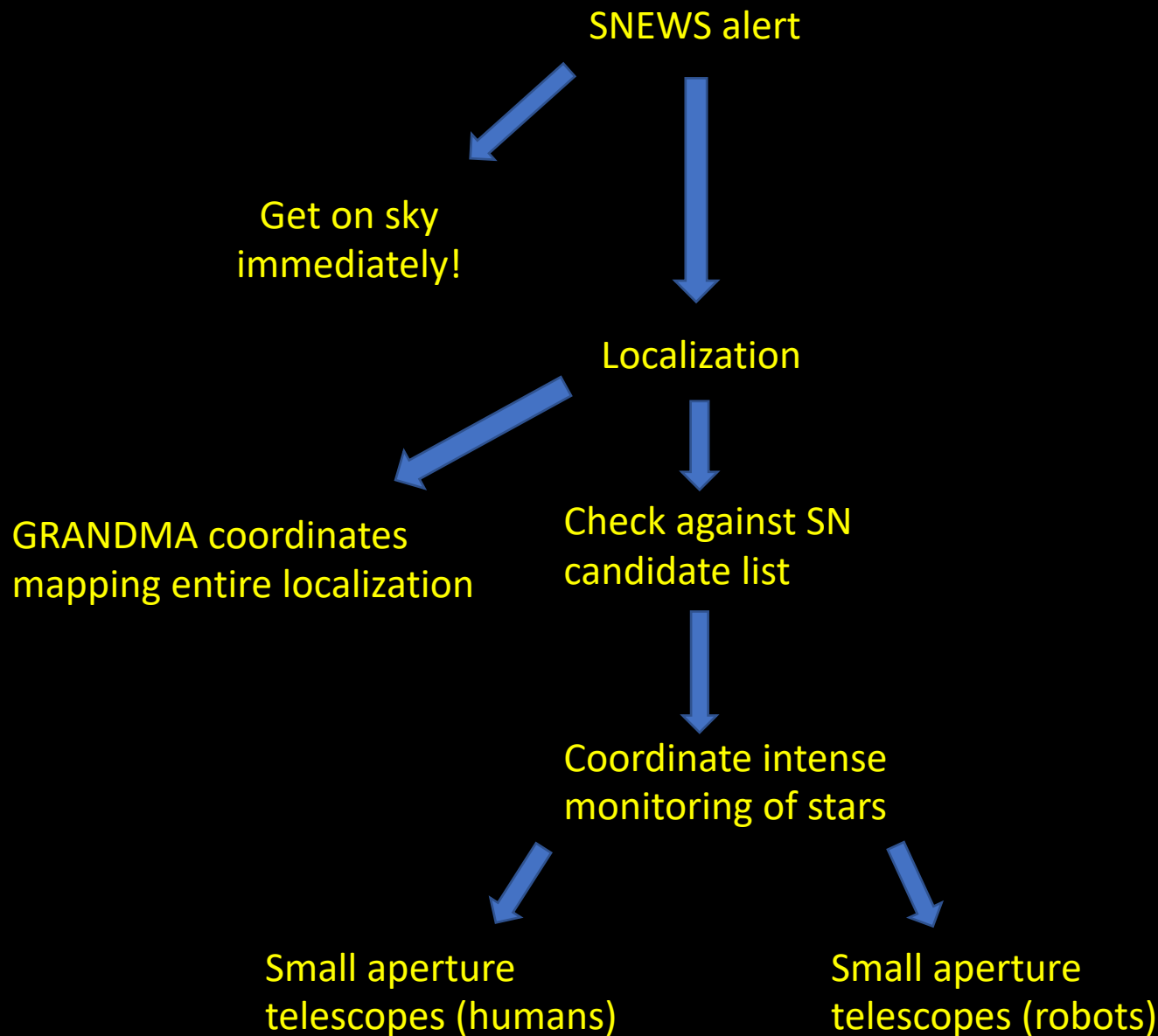
Astro-Boilermaker Telescope (28cm)

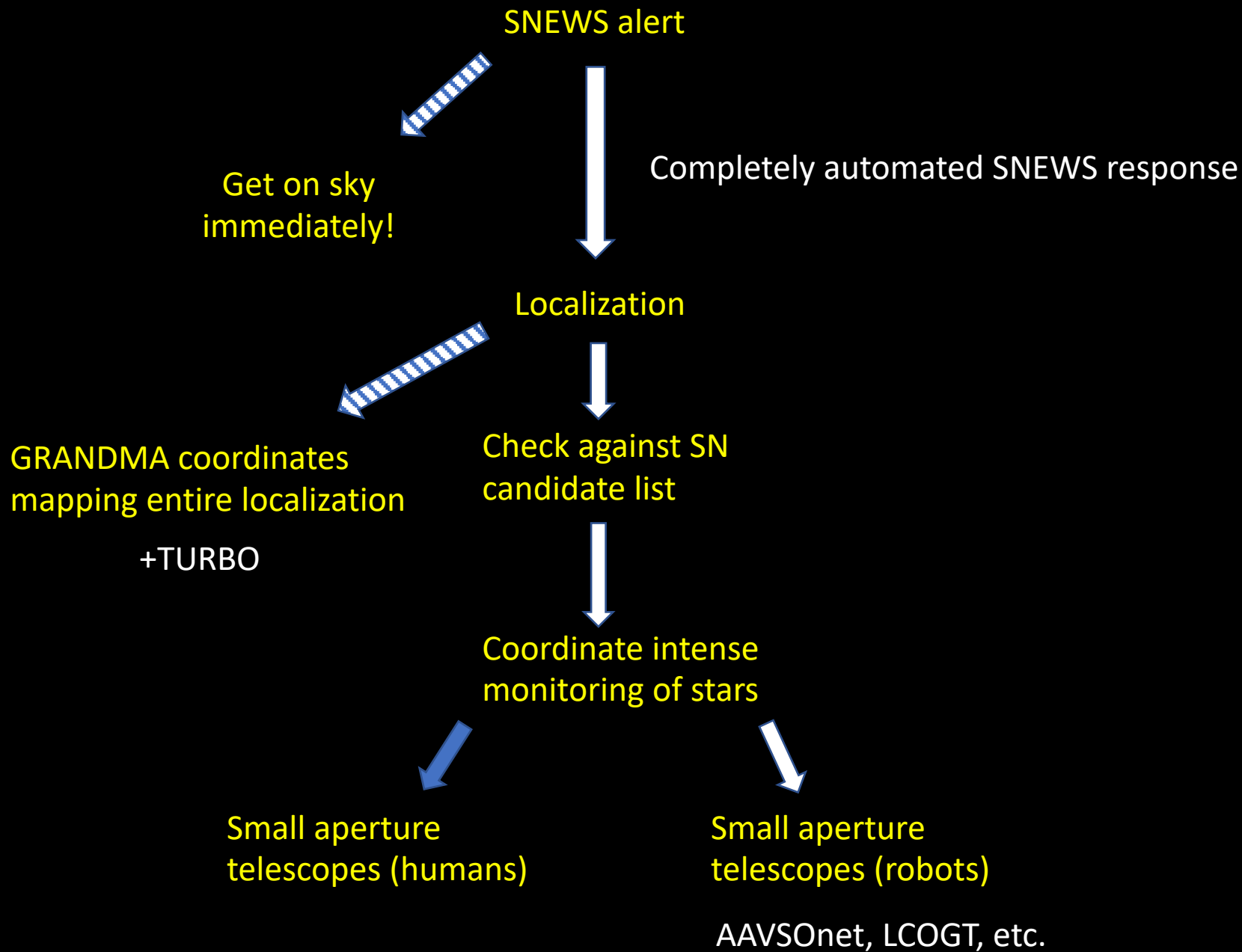
LCOGT 0.4m network (40 cm)



Lafayette, IN (Bortle 8)

Haleakala Observatory (Bortle 2)





Intense SN Candidate monitoring

Coordinating an intense monitoring of SN candidate stars requires a rapid assessment of specific facility observing circumstances:

- Location,
- Aperture size,
- Instrumentation and filters,
- Weather forecast
- Operating?

All of this information needs to be maintained and updated in real time.

Intense SN Candidate monitoring

Additional observing considerations:

- How many stars to monitor?
- Angular separation between stars (and field of view)
- Loop through all or assign subsets among observing agents?
- Exposure times, likely want < 0.1 seconds with fast readout

Example scenario for robotic follow up:

Consider 20 candidate stars (acquisition time of 30 seconds), rotating between two filters (5 sec delay), integration time (2 sec total per filter) = 800 sec for one loop.



Want to avoid “bunchball”

ABOUT

HOW IT
WORKS

GET
INVOLVED

PARTNERS

CONTACT

LOGIN



REFITT

Recommender Engine For
Intelligent Transient Tracking

Crowdsourcing Earth to Watch the Universe

Overall Goal: Enhance public all-sky data.

REFITT (refitt.org) is a service downstream of data brokers that quickly guides users to science-rich targets, coordinates observations, and provides an easy way to submit observations.

Recommender Engine For Intelligent Transient Tracking



[RECOMMENDATIONS](#) - [ADMIN](#) - [PROFILE](#)

Recommendation: *Sad Friendly Shtern (ZTF22aatemqx)*

Observing facility: *supra_solem_0_3m*

ACCEPT REJECT

Facility

supra_solem_0_3m

Current Limiting Magnitude

20.0

GENERAL INFO

MORE INFO

Coordinates (RA, DEC)

Sexagesimal: 16:16:16.25 +34:53:39.03

Decimal Degrees: 244.068, 34.894

Estimated Magnitude

18.77

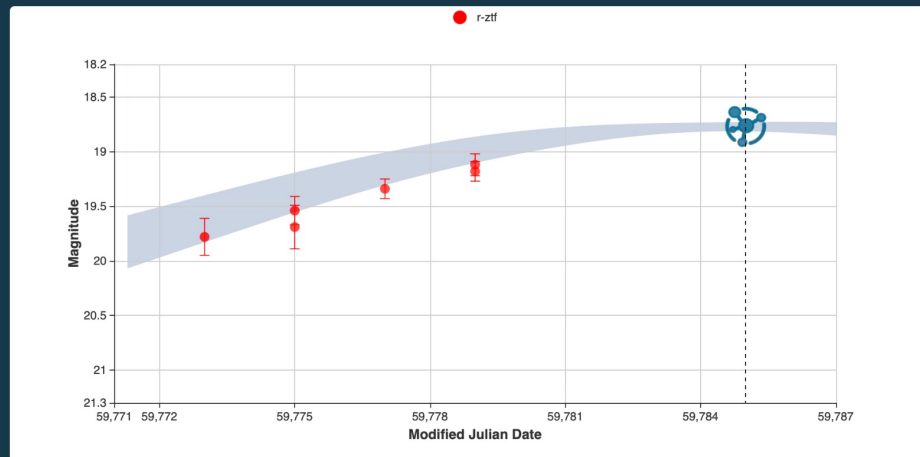
Filter

r-ztf

Culmination for supra_solem_0_3m

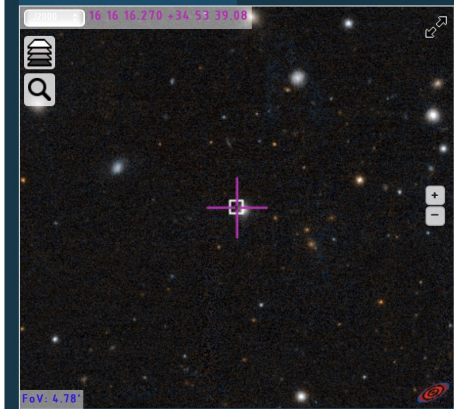
2022-07-24 T21:09:00-07:00

[Antares](#) | [Alerce](#) | [Lasair](#) | [MARS](#) | [Fink](#)



FINDING CHART

SCIENCE IMAGES



Users are coordinated to follow up science-rich targets, and have an easy path to submit data

Recommender Engine For Intelligent Transient Tracking



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[ACCEPT](#) [REJECT](#)

REFITT forecast

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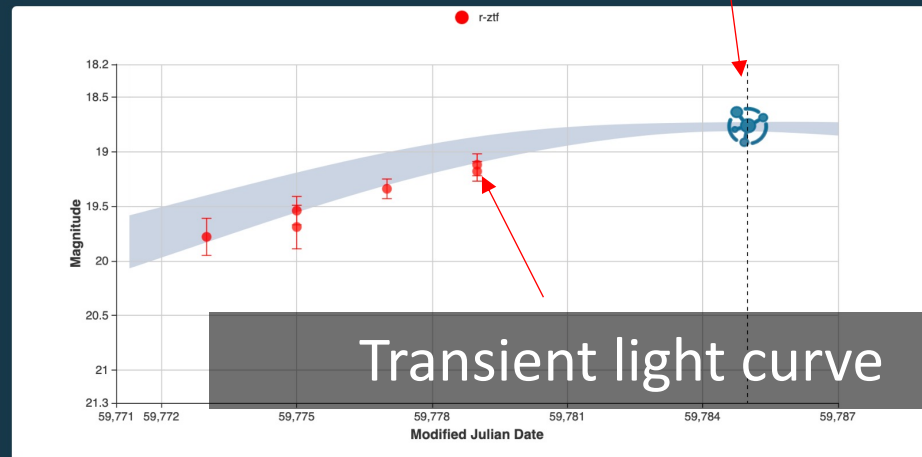
Filter

r-ztf

Culmination for supra_solem_0_3m

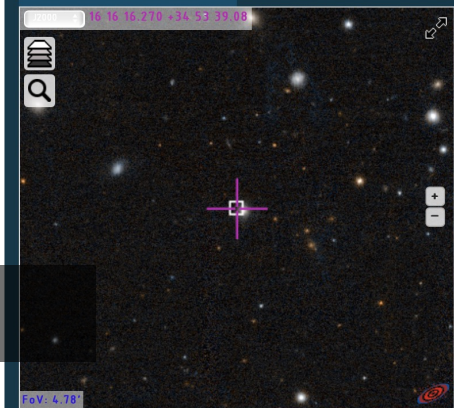
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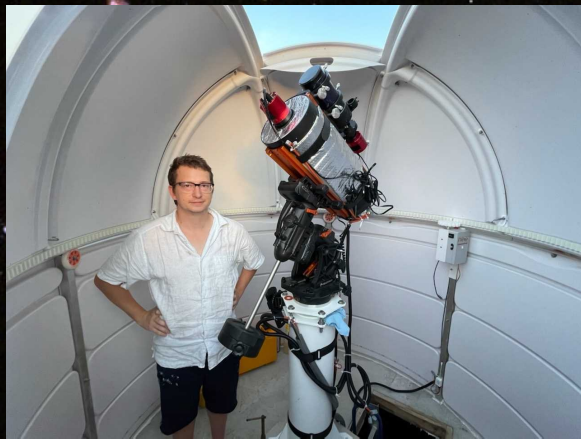
Users are coordinated to follow up science-rich targets, and have an easy path to submit data



Chuck Cynamon



Greg Bock



Shawn Hartley



Patrick Pearl



Stu Parker

Peter Marples



George Silvis



HB Eggenstein



Stan Howerton



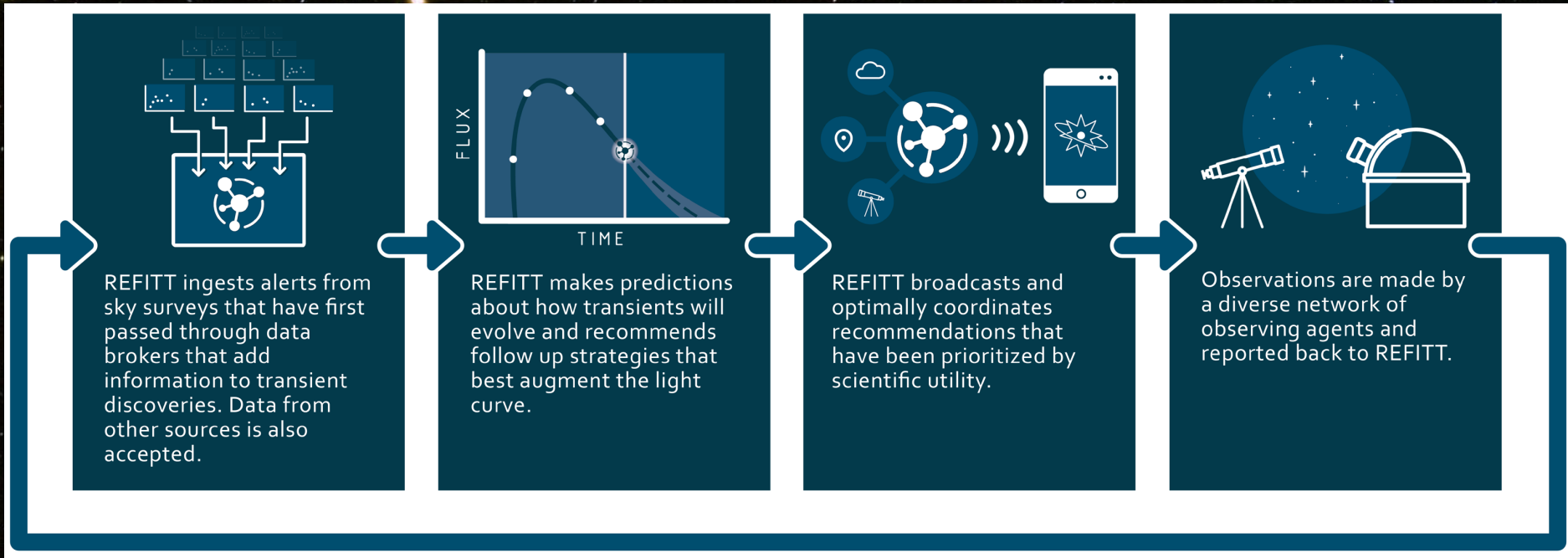


Purdue Wildlife
Area Observatory





Recommender Engine For Intelligent Transient Tracking



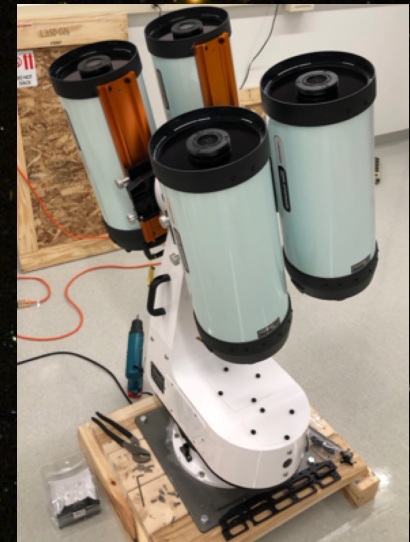
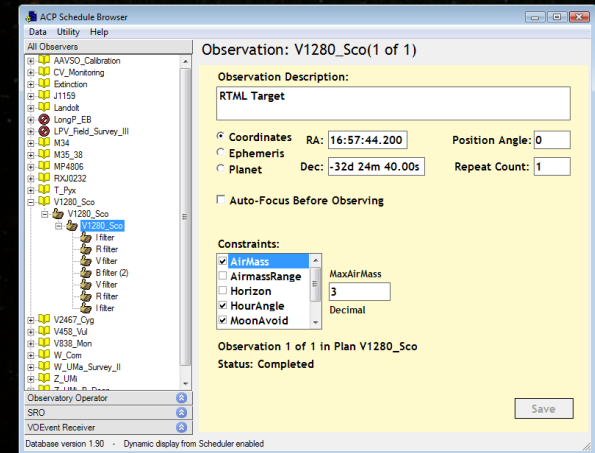
REFITT already has many services in place that SNEWS can leverage.

- **Maintaining database of observing agents**
- **Distributing observer-specific coordinated recommendations**

Towards full automation

We are now able to automate creation of tailored VOEvents for specific observatories that can be ingested by ACP Scheduler, opening up possibilities for dozens of facilities worldwide. Many thanks to Mark Linvill, Chuck Cynamon, and Bob Denny for making this possible!

PI Pat Kelly (UMN) of the Total-Coverage Ultra-Fast Response to Binary Mergers Observatory (TURBO) has agreed to work with us and potentially serve as an observing agent for a SNEWS alert. TURBO boasts a 2 second reaction time, will be located at two sites, each have 16 x 0.2m telescopes, CMOS detectors, simultaneous multi-band imaging, over 100 sq deg.



Thank you!

