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Currents

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Introducing ANTARES 1.0: To prepare for LSST and its coming deluge of time domain events, the Community Science and Data Center (CSDC) at NSF's NOIRLab has been developing the ANTARES alert broker, which is now out of beta and generally available. Users can receive and filter event notifications (alerts) from surveys in real time. ANTARES also hosts a searchable archive of annotated ZTF alerts. Tutorials and documentation are available to help you get started. Read more…

Satellite Constellations Workshop Results: Earlier this month, NOIRLab and AAS hosted a virtual workshop on the impacts of large satellite constellations on astronomy. The workshop's goal was to develop effective solutions to mitigate the identified impacts and to publish the solutions in a white paper that will be widely distributed. This article summarizes the reports of the workshop's working groups and describes the next steps. Read more…

Scheduling of 2020B Proposals: This article describes how NOIRLab proposals awarded observing time in the 2020B semester are being scheduled and the status of any observing time that may be lost as a result of the ongoing COVID-19 situation. Read more…

Welcome Vini Placco: NOIRLab is pleased to welcome Dr. Vinicius (Vini) Placco to its scientific staff. Vini joins the Lab as an Associate Scientist within the newly launched Research and Science Services (RSS) Division, which unites scientific staff across the Lab. He will be based in Tucson and will join the US National Gemini Office within NOIRLab's CSDC beginning September 2020. Read more…

From the Gemini e-Newscast:

- Monster black hole found in the early Universe: Pōniuāʻena is the second most distant quasar known and the first quasar to receive an indigenous name.
- The GOGREEN (Gemini Observations of Galaxies in Rich Early ENvironments) Survey team will hold a virtual workshop on their science results and first public data release **24-25 August**. The recently completed Large Program used GMOS multi-object spectroscopy and multi-band photometry to study galaxies in 21 rich groups and clusters at z=1-1.5. Registration is now open.
- Comet NEOWISE is visible just east of the Gemini North telescope in a spectacular new image of the pre-dawn sky from Maunakea.

Read more in the Gemini e-Newscast…

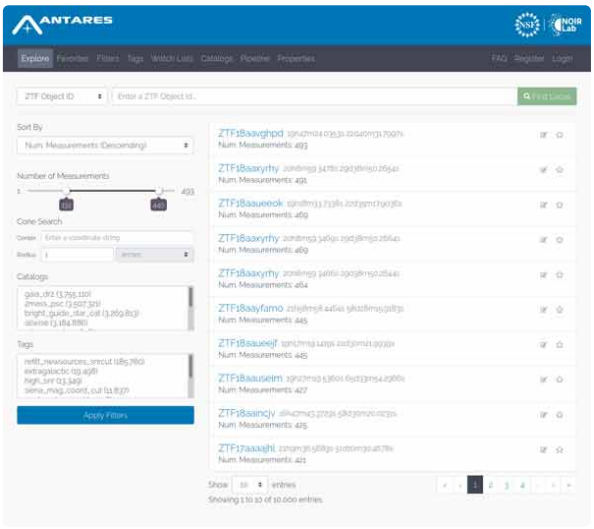
In this Issue

Introducing ANTARES 1.0

Nic Wolf (CSDC/NOIRLab)

To prepare for the Rubin Observatory's Legacy Survey of Space and Time (LSST) and its coming deluge of time domain events, NOIRLab's Community Science and Data Center (CSDC) has been developing an alert broker, ANTARES, that enables astronomers to receive and filter event notifications (alerts) from surveys and allows people who run surveys to distribute their alerts to the community.

The ANTARES team is excited to announce that we are out of beta and ANTARES 1.0 is now generally available at https://antares.noirlab.edu! Thank you to everyone who has used ANTARES over the past years and offered feedback, support and encouragement. This new release comprises a brand-new website, new tools for accessing our data holdings, and database improvements that greatly expand our scientific capabilities.



A web-based search interface allows users to query the ANTARES database along a number of different dimensions: properties of objects (e.g. the number of observations), catalog matches, and annotations added by filters.

About ANTARES

ANTARES is an alert broker that currently processes and distributes data from the Zwicky Transient Facility (ZTF) time-domain survey. Scientists in the community can submit "filters" to ANTARES—bits of Python code that run on alerts in real time. Community members have already submitted filters that do everything from flagging alerts in M31, to identifying transient events with machine learning classifiers, to searching for the source of gravitational waves by cross-matching alerts with LIGO candidates in real time. In the future we plan to ingest data from other surveys, including LSST.

Using a Python library called the ANTARES Client, scientists can stream data that their filters mark as interesting. People are already using this feature to build local databases for their own research interests and to support rapid follow-up observation of short-lived transient events.

The ANTARES team and collaboration has submitted more than 30 ATELs (Astronomer's Telegrams) in the past year, confirming transient objects flagged by ANTARES filters—and discovered many more interesting candidates that have yet to be confirmed spectroscopically.

In addition to real-time processing, ANTARES hosts a searchable archive of ZTF data. The archive includes the original alerts as well as

Table 1. Summary of ATels by ANTARES team and collaborations

ATel#	Name	Classification	Report date	Facilities
12935	ZTF19aazcxwk	SN Ia	07/12/2019	LCO 2m telescope
12943	ZTF19abfqlzi	M31 recurrent nova	07/15/2019	Gemini telescope
12946	ZTF19abdooby	dwarf nova	07/18/2019	LCO 2m telescope
12980	ZTF19abgsssu	dwarf nova	08/02/2019	Shane 3m Telescope, Lick Observatory
13053	ZTF19abpmecl	SN Ia	08/30/2019	Shane 3m Telescope, Lick Observatory
13055	ZTF19abraqpf	dwarf nova	08/30/2019	Shane 3m Telescope, Lick Observatory
	ZTF19abqstxq	dwarf nova	08/30/2019	Shane 3m Telescope, Lick Observatory
13115	ZTF19abxufim	SN II	09/18/2019	Shane 3m Telescope, Lick Observatory
13119	ZTF19abpvysx	SN Ia	09/21/2019	Shane 3m Telescope, Lick Observatory
	ZTF19abrelog	SN Ia-91T	09/21/2019	Shane 3m Telescope, Lick Observatory
	ZTF19abukrfa	SN IIP	09/21/2019	Shane 3m Telescope, Lick Observatory
13141	M31N2019-09b	M31 nova	09/28/2019	Gemini telescope
13149	ZTF19abyukuy	Galactic nova	10/01/2019	Shane 3m Telescope, Lick Observatory
13153	ZTF19abxnerq	M31 nova	10/01/2019	Gemini telescope
13178	ZTF19abzpkss	dwarf nova	10/09/2019	Shane 3m Telescope, Lick Observatory
13183	ZTF19abydbvw	dwarf nova	10/11/2019	Shane 3m Telescope, Lick Observatory
13200	ZTF19acbwmqd	SN IIP	10/18/2019	Shane 3m Telescope, Lick Observatory
13210	ZTF19aclxgog	M31 nova	10/21/2019	Gemini telescope
13231	ZTF19acfsteg	M31 nova	10/28/2019	Gemini telescope
13261	AT2019tsc	M31 nova	11/04/2019	Gemini telescope
13286	ZTF19acmdpyr	SN Ia	11/12/2019	Shane 3m telescope, Lick Observatory
	ZTF19acklbjt	SN Ia	11/12/2019	Shane 3m telescope, Lick Observatory
13317	ZTF19acnfsij	M31 nova	11/28/2019	Shane 3m telescope, Lick Observatory
13358	ZTF19acxrihd	M31 nova	12/19/2019	Gemini telescope
13362	ZTF19acqprad	M31 nova	12/21/2019	Shane 3m telescope, Lick Observatory
13399	ZTF20aahbimu	dwarf nova	01/11/2020	Shane 3m telescope, Lick Observatory
13406	ZTF19acoqctv	SN IIP	01/15/2020	Shane 3m telescope, Lick Observatory
13430	ZTF20aakdppm	M31 nova	01/30/2020	Gemini telescope
13527	ZTF20aahpagw	SN IIn	02/27/2020	Shane 3m telescope, Lick Observatory
13570	ZTF19actabny	SN IIn	03/20/2020	Shane 3m telescope, Lick Observatory
13706	ZTF20aawbodq	Anomalous	05/03/2020	Anomaly filter by Soraisam et al. (2020)

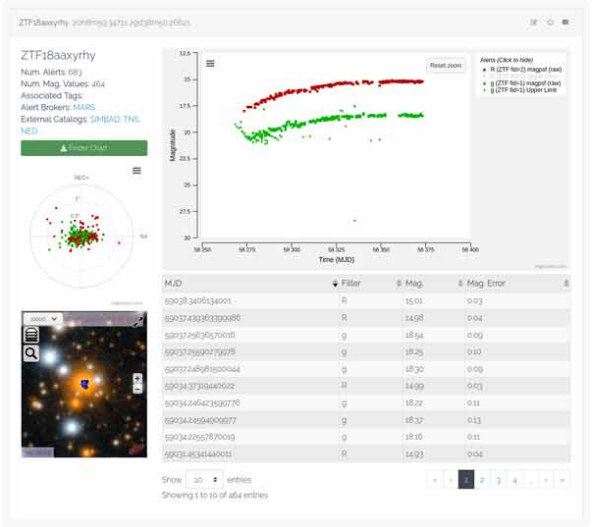
The ANTARES team and collaboration has submitted more than 30 ATELs in the past year, confirming transient objects flagged by the processing pipeline—and discovered many more interesting candidates that have yet to be confirmed spectroscopically.

annotations made by filters and cross-matches with a number of different catalogs.

We've also published documentation and tutorials about streaming data from ANTARES and writing filters for ANTARES.

If you have any questions, comments or feedback, please join our Slack channel or send an email to nwolf@noao.edu.

Acknowledgments. The ANTARES team gratefully acknowledges financial support from the National Science Foundation through a cooperative agreement with the Association of Universities for Research in Astronomy (AURA) for the operation of NOIRLab, through an NSF INSPIRE grant to the University of Arizona (CISE AST-1344024, PI: R. Snodgrass), and through a grant from the Heising-Simons Foundation (2018-0909, PI: T. Matheson).

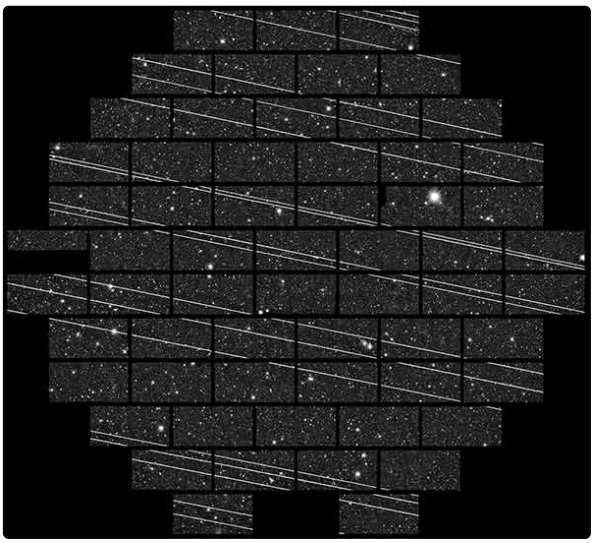


A detailed view of the object ZTF18aaxyrhy shows the complete history of alerts. The page links to entries for the object in other catalogs and provides a finder chart to support follow-up observation.

Results of the SATCON1 Workshop

Connie Walker (NOIRLab) and Jeff Hall (Lowell), SOC co-chairs

Earlier this month, NSF's NOIRLab and AAS, with support from NSF, hosted the Satellite Constellations 1 (SATCON1) workshop (29 June - 2 July 2020). Held virtually with approximately 250 attendees, the workshop brought together astronomers, satellite operators, dark-sky advocates, and other stakeholders to work toward solutions to mitigate the impact of low Earth orbit (LEO) satellite constellations and to develop a white paper reporting the results.



Starlink satellites imaged on 18 Nov 2019 from the Victor M. Blanco 4m Telescope at CTIO. Image Credit: CTIO/NOIRLab/NSF/AURA/DELVE

In the weeks preceding the workshop, four working groups drafted reports summarizing the current state of knowledge in four areas: (1) Results from ground-based observations of satellites and future observing program needs; (2) Current status of and future needs for simulations to assess the impact of satellites; (3) Mitigation strategies through lab measurements of satellite surface reflection and detector performance as well as operational strategies; and (4) Metrics for the protection of optical/IR observations based on the results of the other working groups. Discussions at the workshop are now shaping the final versions of the reports, and summaries of the first three working group reports are provided here.

The **Observations Working Group**, chaired by Lori Allen, summarized observations to date of satellite constellations and looked at how we can ensure the success of future observational programs. The group finds that there are immediate and long-term needs for broad, coordinated efforts between researchers, observers, astrophotographers, and amateur astronomers to conduct observations of satellite constellations and interpret the data. Through a comprehensive satellite constellation observing network, we can connect observers with telescopes, provide coordinated observing protocols and data analysis standards, characterize the brightness of satellite constellations, test the efficacy of mitigation efforts, and prepare for the next generation of LEO satellites.

The **Simulations Working Group**, chaired by Pat Seitzer, reported on their simulations of the visibility of large satellite constellations a starting point for estimating its impact on specific science projects. The simulations show that:

- The fraction of satellites visible at any observatory at any one time is about 5%.
- The number of satellites visible is a function of orbital inclination, with the greatest impact on observatories at latitudes close to a satellite's inclination.
- Satellites at higher orbital altitudes are the most visible, since they are illuminated longer.
- At 550 km and higher, the number of satellites visible between nautical twilight (Sun at -12 deg elevation) and astronomical twilight (Sun at -18 deg elevation) is only marginally smaller than the number visible at sunset. Significant falloff in the number visible occurs only after astronomical twilight in some cases, particularly at elevations above 30 degrees.
  The group recommends future simulations to assess (1) the impact of the satellite constellations on science: how often will a specific observation be lost due to a satellite trail, for example, and (2) the impact of the other two phases of a satellite constellation's lifetime: initial mission phase and deorbit phase.

The **Mitigation Working Group**, chaired by Tony Tyson, reported on efforts to mitigate the effects of satellite constellations on optical astronomy research. Mitigation options include fewer satellites, fainter satellites, smaller satellites, satellites visible in a smaller fraction of the night-time, high-precision satellite attitude information, improved scheduling capabilities for observatories, improved image processing capabilities, and novel sensors for the future. Large aperture facilities with large fields of view and broad science programs appear to be the most impacted, as well as telescope systems aiming for precision astrophysics (photometry, spectra, low signal-to-noise signal detection).

With tens of thousands of satellites already in orbit before the first Starlink launch in May 2019 and nearly a hundred thousand planned within a decade, the group finds that, in general, no combination of currently known mitigations can completely avoid the impacts of satellite trails on the science programs of the coming generation of optical astronomy facilities. Example science cases where mitigation is particularly challenging include fast transients (with long exposure spectroscopic follow-up), optical-infrared gravitational wave follow-up, rapid contiguous monitoring of special sky areas, detection of potentially hazardous asteroids and ultra-deep sky surveys.

The **Metrics Working Group**, chaired by Richard Green, is in the process of developing its summary based on the results of the other working groups and their implications for impact on the science done at various observatories.

The workshop's Scientific Organizing Committee is writing a white paper based on the above working group reports, which will be submitted to NSF by the end of July.

The white paper will be made available to the wider community in August. Future planning and policy events, including SATCON2, are also being developed.

Stay tuned for further details! If you are interested to get involved in future events or in the above topics on the impacts of satellite constellations, please contact Connie Walker (cwalker@noao.edu).

Scheduling of NOIRLab Programs and Status of Observing Time Lost to COVID-19 in 2020B

Gemini Observatory: Gemini North halted operations on 23 March and resumed limited nighttime operations on 19 May. The 2020B schedule for Gemini North was constructed following the usual procedures, with the exception that the planned maintenance shutdown was shortened and moved later in the semester, a result of the impact of COVID-19 on preparations for the scheduled work. Mirror recoating has been postponed to 2021. Gemini South halted operations on 16 March 2020 and remains closed. The 2020B schedule for Gemini South was also constructed following the usual procedures, except that the planned maintenance shutdown was shortened for the same reasons as in the North. Restrictions were also placed on early-semester targets, because Gemini South is not expected to be open at the start of the 2020B semester, which also coincides with the poorer weather of the Southern winter.

All uncompleted (non-ToO) Band 1 programs for 2020B that use facility instruments will rollover into the following semester, as usual for Band 1 programs. No special arrangements will be made for Band 2 and 3 programs, and these programs will come to an end when the 2020B semester closes. Target changes are not allowed, however if this would result in particular hardship (e.g., adverse effects on a student thesis), the NGO or PI should contact the Observatory and request an exception as soon as possible. Additional details are available here.

CTIO has been closed since 18 March 2020, and 2020B programs are being scheduled following the usual procedures. The observatory will rollover time on the Blanco 4m and SOAR telescopes awarded to survey and long-term proposals by the NOIRLab TAC and by the NASA TACs (HST, Chandra, Spitzer, and FERMI) for supporting ground-based observations. Although observing time awarded to standard proposals will not be automatically rolled over, requests for DD time will receive a sympathetic ear especially when observations are time critical or form part of an investigator's thesis research. Questions may be directed to CTIO Director Steve Heathcote (sheathcote@ctio.noao.edu).

KPNO: While KPNO has been closed since 18 March 2020, almost all of the open access time on Kitt Peak is NN-EXPLORE time on the WIYN 3.5m telescope. Due to the ongoing situation in Arizona, science operations at WIYN will not resume in 2020A. We understand this greatly affects those whose science programs have been scheduled during the latter half of the semester. Although we are not able to

reschedule programs that lost time, we are investigating the possibility of allocating a small number of DD nights to time-critical programs such as thesis proposals.

The 2020B WIYN schedule is still in development and will not be finalized until we have a better understanding of when activities can resume on Kitt Peak. Instrument availability at WIYN may also be impacted by (COVID-19 induced) activity restrictions. We will reach out to PIs whose programs will be impacted if necessary. Science operations are expected to resume early in 2020B, although we plan to remain closed in August to perform routine maintenance during our monsoon season. Depending on when science operations restart, we anticipate beginning shared-risk science with NEID late in 2020B. Questions about WIYN scheduling and operations may be directed to Heidi Schweiker (heidis@noao.edu) or Jayadev Rajagopal (jrajagopal@noao.edu).

AAT: All observations have been carried out remotely since 2 June 2020. All NOIRLab programs will be scheduled following the usual procedures, and observations will need to be carried out remotely. Observers with sufficient bandwidth and some previous observing experience will be allowed to observe from home. All NOIRLab observers will be supported by local AAT support astronomers, and observers will be provided with all instructions after completing the Visitor's Form. Questions may be directed to Lucyna Chudczer (lucyna.chudczer@astronomyaustralia.org.au) or the Siding Spring Observatory Director, Chris Lidman (Christopher.Lidman@anu.edu.au).

CHARA: With the continuation of the COVID-19 outbreak, the CHARA Array is continuing operations in remote-only mode. NOIRLab PIs who have been awarded time by the TAC are being notified and will be able to participate in their observations remotely with our staff on site. If the pandemic situation changes such that our policy can be changed to allow on-site observing, the CHARA staff will contact the PIs to discuss options. In the event that the coronavirus situation changes for the worse and the Array is forced to shut down again for the safety of the staff, we will consider options on make-up and priority resubmission of proposals for next year. At the current time, we feel that if another shutdown is necessary, we will again treat the lost time as a "poor weather event" as we do for our internal TAC programs, and request the PIs resubmit their proposals for the next semester as normal. Questions and concerns can be directed to the CHARA Director Douglas Gies (gies@chara.gsu.edu).

Vini Placco to Join NOIRLab Scientific Staff in Tucson

Letizia Stanghellini (US National Gemini Office)

NOIRLab is pleased to welcome Dr. Vinicius (Vini) Placco to its scientific staff beginning September 2020. He joins the Lab as an Associate Scientist within the newly launched Research and Science Services (RSS) Division, which unites scientific staff across the Lab. He will be based in Tucson and will join the US National Gemini Office within NOIRLab's Community Science and Data Center (CSDC).

Vini obtained his PhD in Astronomy in 2010 at the University of São Paulo in Brazil. Following postdoctoral appointments in São Paulo, he held postdoctoral positions at NOAO and as a Gemini Fellow. In 2015 he joined the faculty of the University of Notre Dame as a Research Assistant Professor. His research focuses on stellar archaeology, in particular on the origins of the chemical elements in the Milky Way and the Universe through spectroscopy of the oldest, most metal-poor stars. He is currently involved in efforts to apply machine learning techniques to narrow-band photometric surveys and also has interests in data science and data curation. Vini's depth of experience in user support, science operations, and spectroscopy—at Gemini and beyond—will be a fantastic asset to the US NGO and to NOIRLab.

Dr. Vinicius (Vini) Placco

About the US National Gemini Office: Each Gemini partner, including the United States, has its own National Gemini Office (NGO). The NGOs support the National (or partner) users in all phases of the astronomical observing cycle, from proposal preparation through data analysis. They also represent their user communities within the Gemini Operations Working Group.

Contact Us

We welcome your input on this issue of *Currents*. Please contact us at currents@noao.edu. We look forward to hearing from you!