

Targets of Opportunity at Gemini Observatory

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References



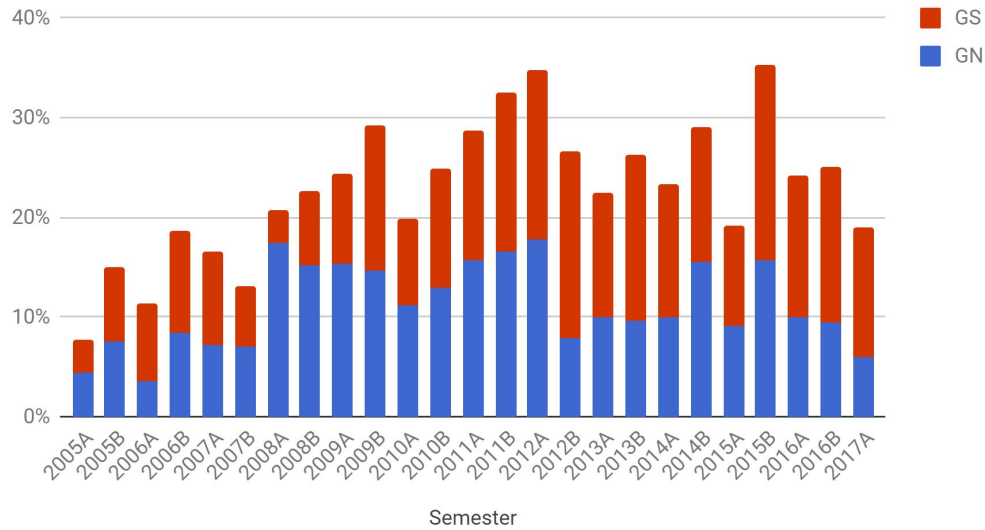
ToO observations started in 2005, to enable follow-up of SWIFT detections.

Useful papers:

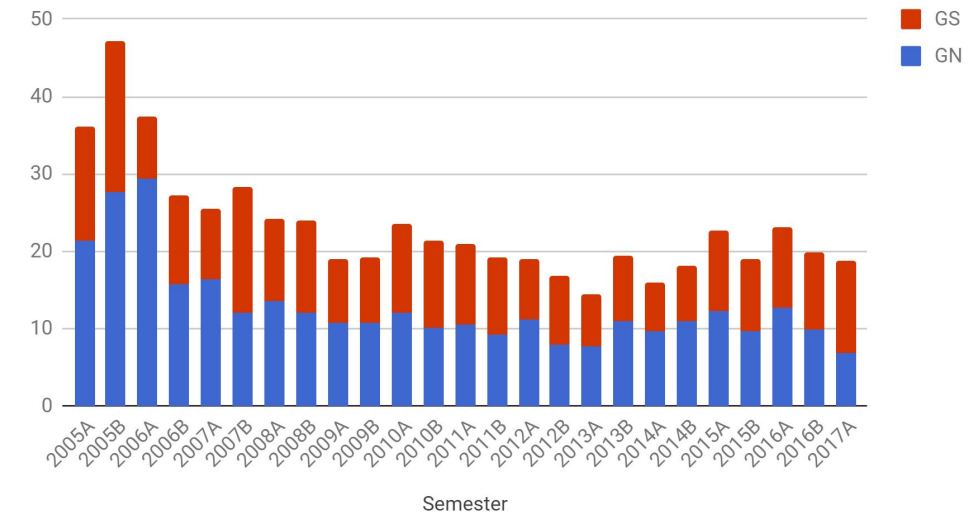
1. **Gillies et al.** SPIE Proceedings Volume 6270, Observatory Operations: Strategies, Processes, and Systems; 62700W (2006); doi: 10.1117/12.672627
2. **Roth et al.** Observatory Operations: Strategies, Processes, and Systems III, Proc. of SPIE Vol. 7737, 77370N

Demand

Fraction of ToO Programs per Semester

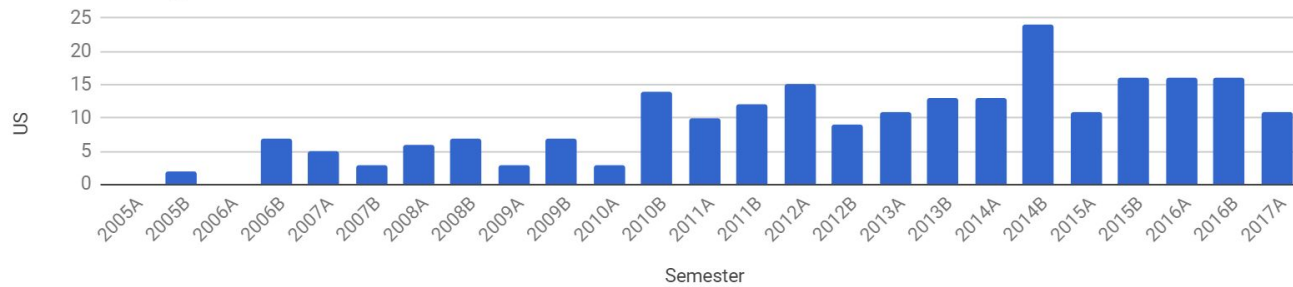


Average time Allocation per ToO Program

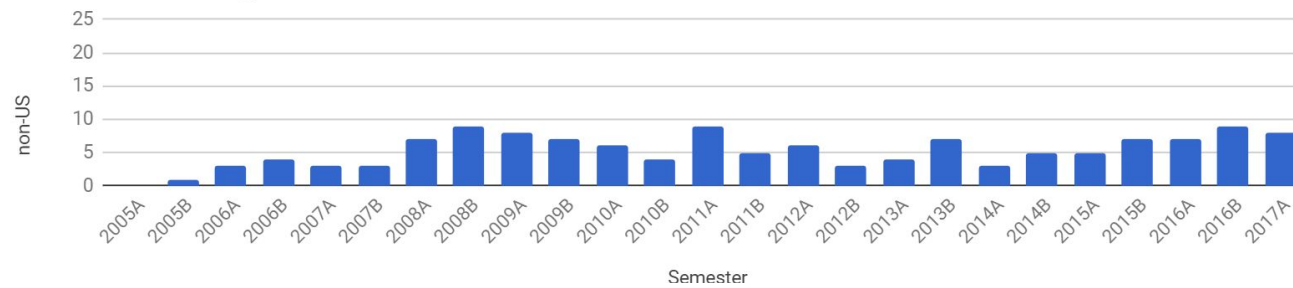


Number of ToO Programs

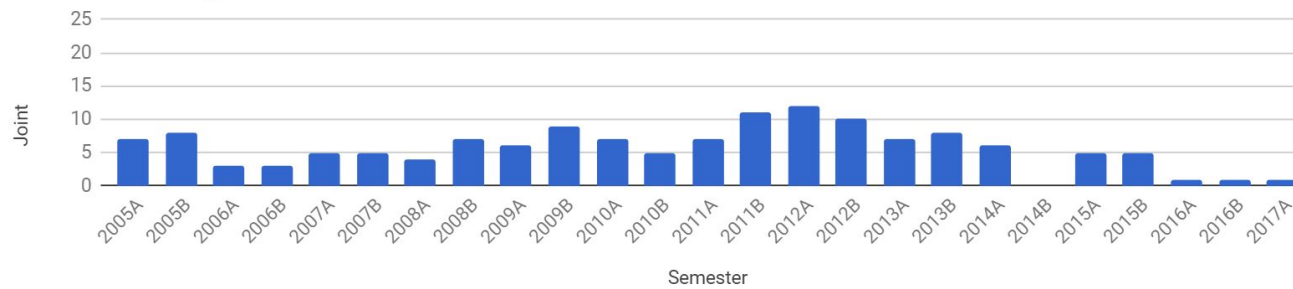
US ToO Programs



Non-US ToO Programs

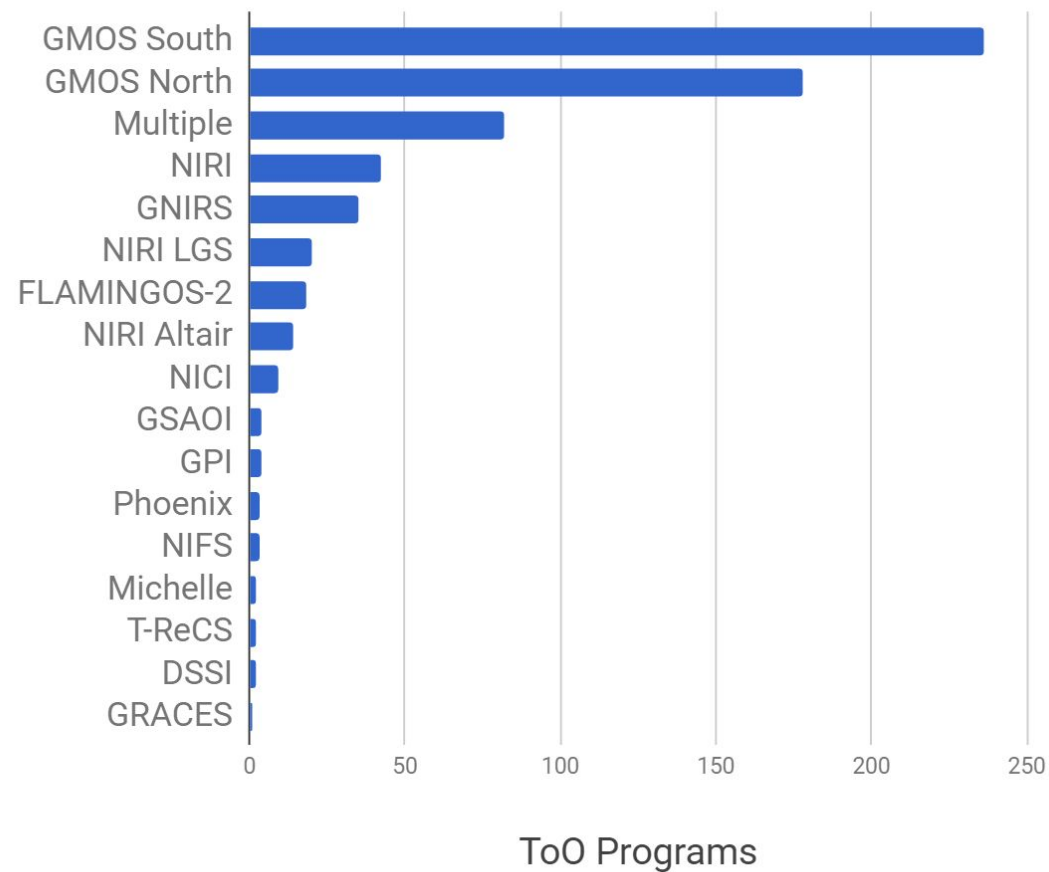


Joint ToO Programs



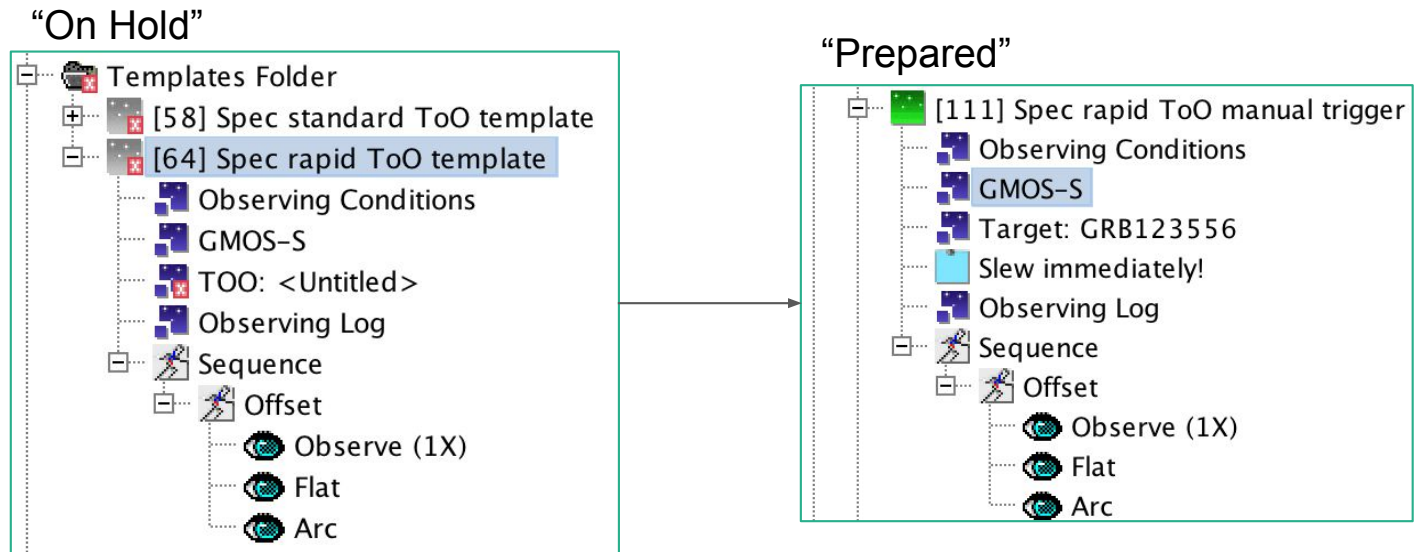
Instruments used

Instruments used by ToO Programs



How ToOs get into the database...

By hand:



Programmatically
via a URL string:

The details of the trigger are formatted as an URL string which can be submitted to Gemini using any browser or URL tool such as wget. The following parameters are available.

prog	- program id
email	- email address for user key
password	- password for user key associated with email, site specific
obsnum	- id of the template observation to clone and update, must be 'On hold'
target	- name of the target
ra	- target RA (J2000), format 'HH:MM:SS.SS'
dec	- target Dec(J2000), format 'DD:MM:SS.SSS'
mags	- target magnitude information (optional)
note	- text to include in a "Finding Chart" note (optional)

...and what happens next

Standard ToOs:

- Email notification to QCs
- Scheduled in the next plan

Observation GS-2016B-Q-41-28 (Standard ToO) is ready

The Standard Target of Opportunity Observation GS-2016B-Q-41-28, "GMOS-S 1" r-band acq" in program "DES Supernova Cosmology (South)", is ready to be observed.

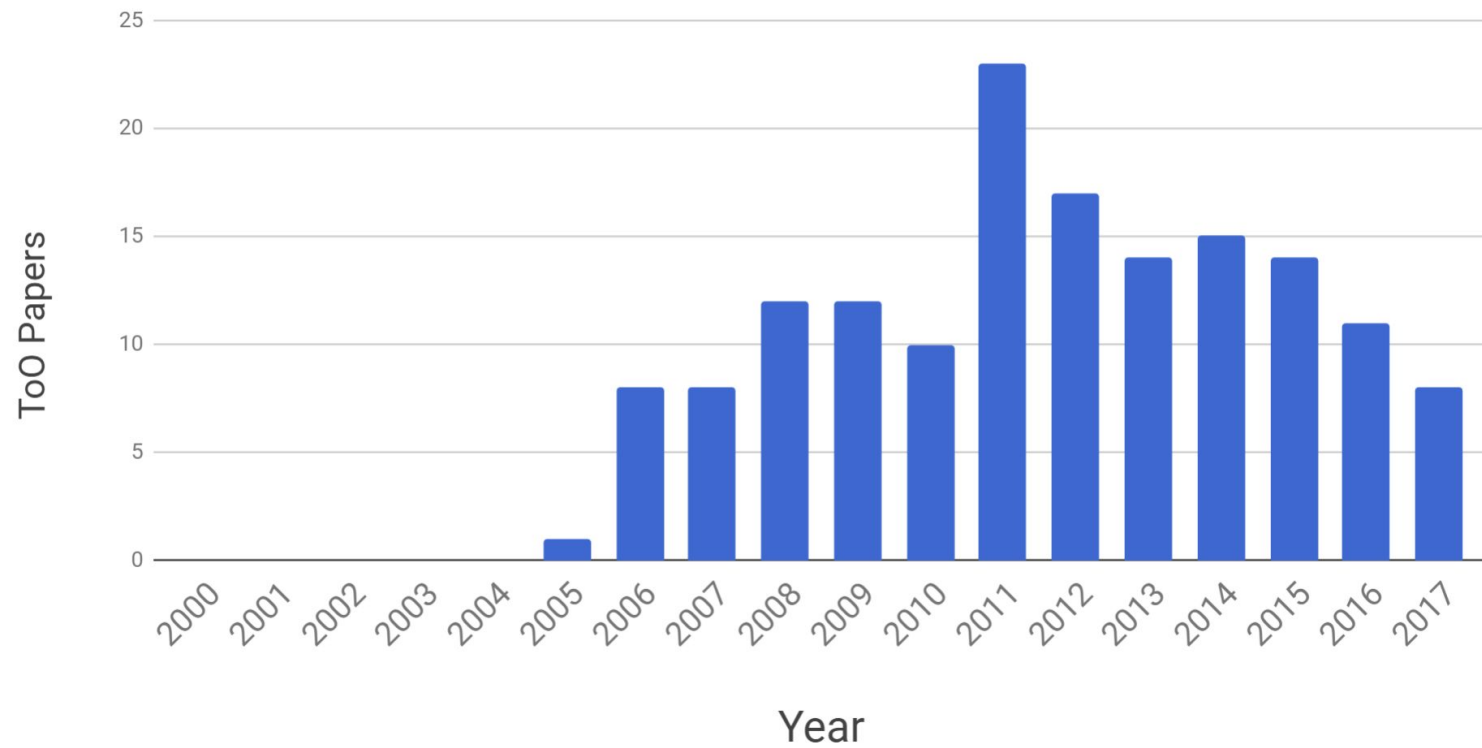
Rapid ToOs:

- Email notification to operations staff
- Popup+audible alert from the observer's OT



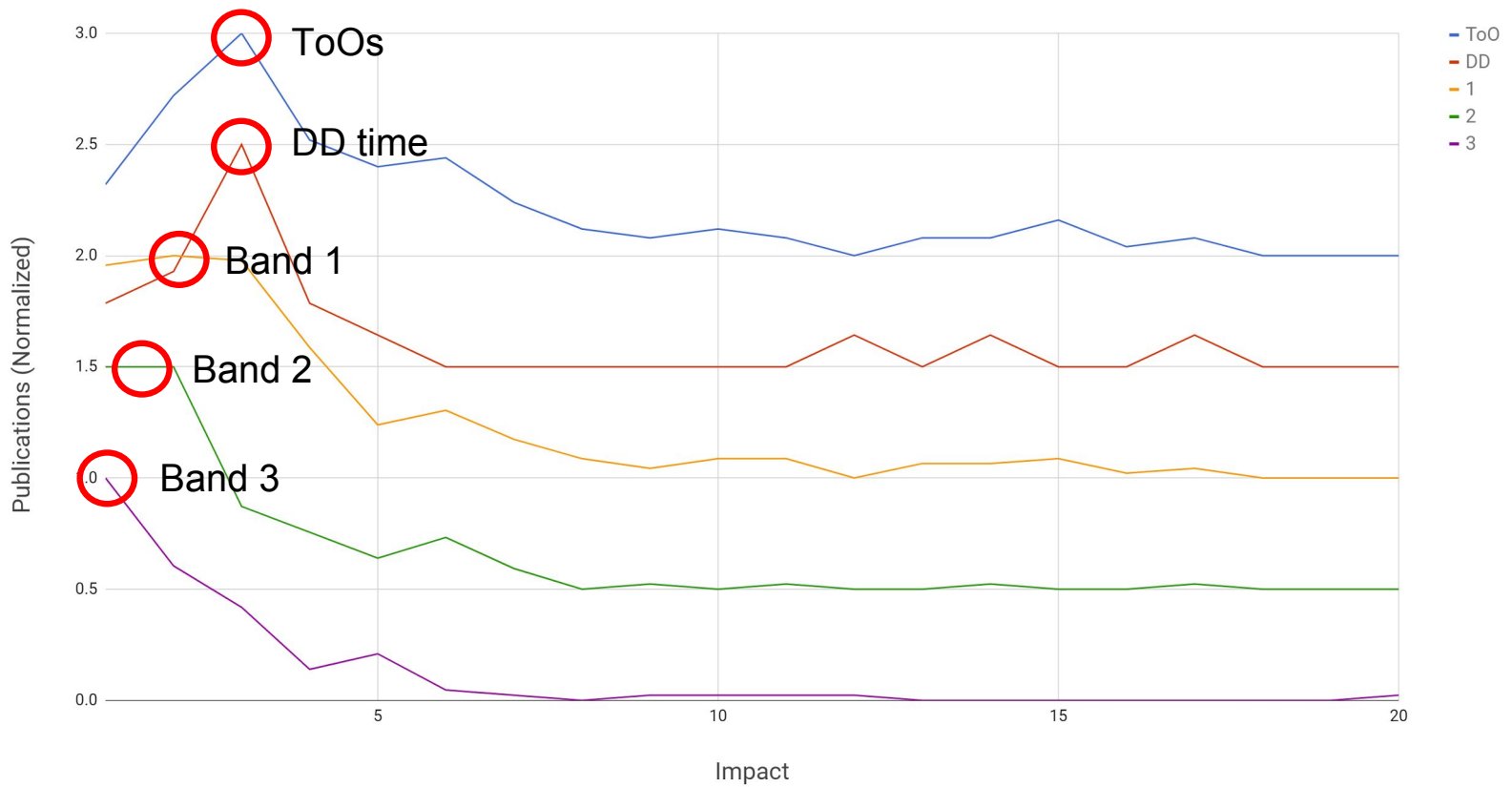
Publications

Publications from ToO Programs



Impact

Normalised Cumulative Impact



Recent Policy Development



The screenshot shows the Gemini Observatory website. The header includes the Gemini Observatory logo and tagline. The navigation bar contains links for Science, Public/Images, About, Careers, and Contact, along with a Google Custom Search box. A sidebar on the left lists various sections, with 'Policies for Competitive ToOs' highlighted in a red box. The main content area displays the title 'Policies for Competitive ToOs' and a breadcrumb trail: Gemini Observatory > Sciops > Observing With Gemini. The text explains that effective November 20, 2017, new policies will regulate the activation of Target of Opportunity (ToO) programs. It details three key areas: Approval of ToO Triggers and DD Time, Prioritization for ToO Triggers and DD Time, and Policies on Data Access Rights for ToO and DD Programs.

Policies for Competitive ToOs

Gemini Observatory > Sciops > Observing With Gemini

Effective November 20, 2017, the policies described below will regulate the activation of Target of Opportunity (ToO) programs, the priorities for their execution as well as the data access rights for the acquired data. *The policies apply when multiple teams activate ToOs on the same target and on the same or subsequent nights.*

Approval of ToO Triggers and DD Time

To be activated, Queue ToOs must be scientifically aligned with the nature of the event for which the trigger is requested. This is a general rule that applies to all ToO programs. DD proposals will not be accepted if they effectively duplicate, in their observational setup, an existing Queue ToO that has been activated to observe the same target. DD proposals that are accepted prior to the activation of an existing Queue ToO will be subject to the Prioritization and Data Sharing Policies discussed in II. and III. below.

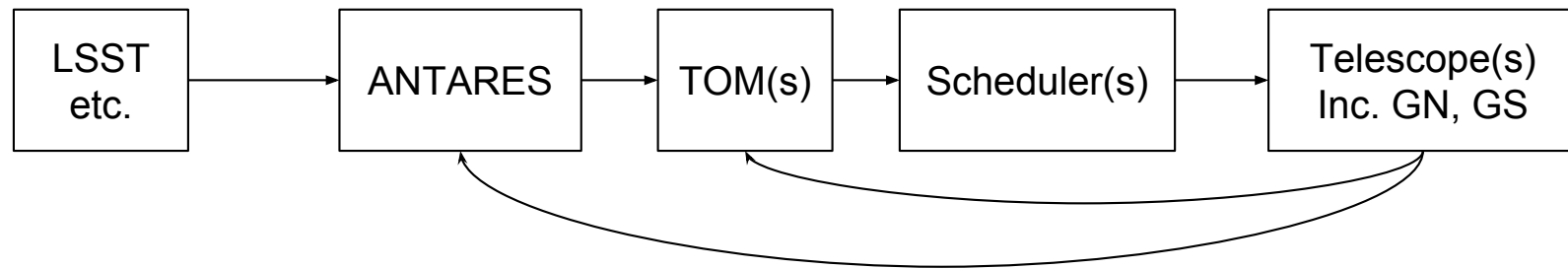
Prioritization for ToO Triggers and DD Time

In case of multiple Queue ToO triggers on the same target and night, the Gemini Observatory will attempt to work with the PIs to prioritize the observations so that the science is maximized. If no consensus can be reached amongst the PIs, or if no coordination is possible, the Gemini Observatory reserves the right to prioritize the observations according to the following criteria, ranked in order of priority: 1) how well the scientific justification of the proposal aligns with the nature of the target; 2) the ITAC ranking of the proposals; 3) the order in which the triggers are activated; 4) additional constraints, such as whether the Gemini observations are coordinated with data from other Observatories (e.g. Chandra, HST). As a rule, all DD programs will be given lower priority than Queue ToO programs. However, DD programs that are awarded to extend a Queue ToO program that has used all of its allocation during the course of an observing campaign will have higher priority than other DD programs.

Policies on Data Access Rights for ToO and DD Programs

The following policies only apply when multiple ToOs (rapid or standard) are triggered on the same target and, for objects that vary significantly on timescales shorter than 24 hours, on the same night. A distinction is made between ToOs approved as part of the regular Queue, and ToO approved using DD time.

Future



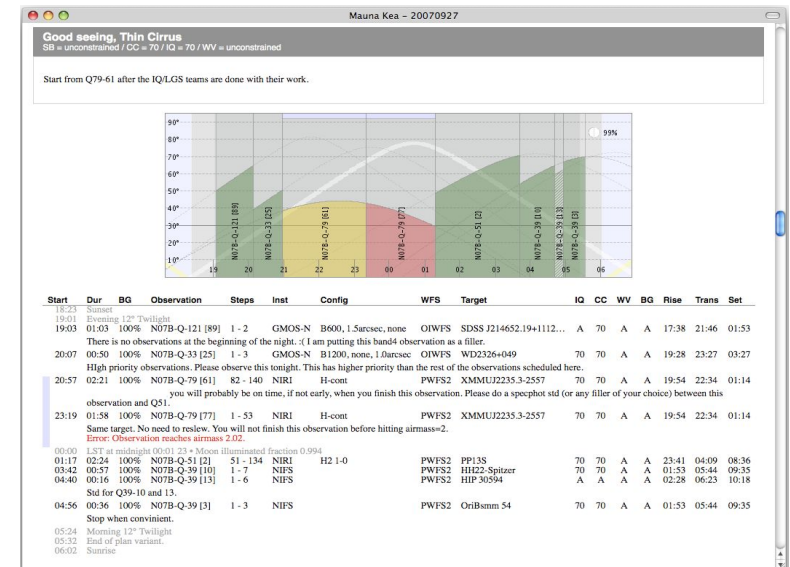
Future

Currently:

- Daily plans are created manually.
- Night-time observers switch plans as conditions change.
- Standard ToOs are planned in.
- Rapid ToOs are not.

Weaknesses:

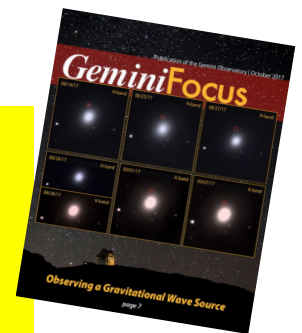
- RToOs disrupt the plan
- Managing timing windows
- We don't cater for complicated follow-up cadences (eg. observe every N days, logarithmic cadences)



With more ToOs & follow-up this will become unmanageable!

Improvements being made under **OCS Upgrade Project**.

See Oct 2017 Gemini Focus & contact bmiller@gemini.edu if you'd like to contribute ideas.



Thank you

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Narrative notes & Takeaway points to accompany slide set

Slide 4

Takeaway - after a ramp early in the program, both the proposal load (currently 10% per telescope) and the average length of a program allocation (currently 8-10 hours) have stabilized.

Slide 5

Total number of US ToO programs (combination of Rapid and Standard) has risen fairly continually. Other partners' ToO numbers have varied slowly with time. Joint ToO programs have recently dropped to zero.

Slide 6

Takeaway: the instrument distribution for ToO programs has been quite similar to that for other programs. Dominated by GMOS, but that is partly because GMOS combines all optical modes in one instrument while IR modes are distributed across multiple cryostats.

Slide 7

Both methods for triggering rely on a template observation being present in the database. By-hand method requires the PI to go into the program, set the target coordinates and set the observation "ready", the programmatic method allows this to be done by a script - e.g. for the case when you need the fastest response.

Slide 8

Standard ToOs don't need immediate observations. They are scheduled in by the QCs, either the following night or subsequent nights. QCs get an automatic email when the observation is set "ready".

Rapid ToOs need fast response - either immediate (drop everything, abort the current observation and observe this - in which case the RToO program is charged for any time lost to the currently executing program) or as soon as the current observation is complete.

Rapid ToOs result in an audible alert in the control room and a popup in the observer's Observing Tool. Hard for observers to miss!

Slide 9

Publications from ToO programs appear to have peaked in 2011, even allowing for publication lag and the fact that 2017 publications were not complete at the time of the search. This plot is representative; but for simplicity, it includes publications resulting from a single ToO program only.

Slide 10

This chart uses D.Crabtree's "impact" parameter for publications, which ratios the number of citations of each publication to the average of Astronomical Journal papers from the same year. It shows that the peak impact for publications arising from Band 1, 2 and 3 programs (again,

single program papers) increases from band 3 through band 1, and that DD and ToO publications peak at a higher impact still.

Slide 11

Points the reader to the new statement of policy on data access rights in the case of "competitive ToOs" - on which multiple programs trigger at the same (or close to the same) time. This policy became necessary because of the LIGO neutron star merger event in 2017.

Slide 12

In the future, we're envisaging the telescope (or telescopes, as we anticipate being in a network with multiple smaller and larger apertures) are sent observations by a software scheduler which in turn receives requests from a TOM (Target Observation Manager); this is a program-specific agent which takes a pre-filtered alert stream from the ANTARES broker and generates its own specific observation requests.

Slide 13

Our current system won't be up to handling a 30-50% ToO rate per night that one might anticipate in the LSST era. This slide, and the next and final one, outline some changes we'll need to make. Input is invited to our OCS upgrades program, which this work will be done in parallel with.