Target of Opportunity (and Time Domain) Observations in Queue Mode at Gemini Observatory

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What are Targets of Opportunity?

Broadly speaking, these are any targets whose exact observation details are not known at the beginning of the semester:

- coordinates
- magnitude (exposure time)
- redshift / distance (instrument / configuration)
- timing

Targets include GRBs, supernovae, novae, planetary features, high-z QSOs, host galaxies, tidal disruption flares…

What are Time Domain Observations?

Any target which must be observed within a certain time period in order to be interesting:

- transiting exoplanets
- variable stars / systems
- asteroids / NEOs
- monitoring of fading / evolving transients

Any ToO is also a Time Domain Observation since it could not be observed until it:

- erupted / exploded / brightened to interesting levels
- was discovered
- became interesting

How is ToO / Time Domain Observing Time Allocated at Gemini?

PIs can propose for ToO / Time Domain observing time through any of the normal observing proposal channels:

- Standard queue proposals (generally not classical)
  - Call for proposals every 6 months. ToO observations generally do not carry over beyond semester deadlines. Unexecuted band 1 time domain observations normally carry over 2 subsequent semesters.
- Large / Long Proposals (newly offered mode)
  - Call for proposals once a year, large programs which can extend over several semesters / years though unexecuted ToO observations generally do not carry over beyond semester deadlines.
- Fast Turnaround Proposals (newly offered mode)
  - Proposal deadline every month, accepted observations expire after 3 months (removed from queue).
- Directors Discretionary Proposals
  - Proposals can be submitted at any time.

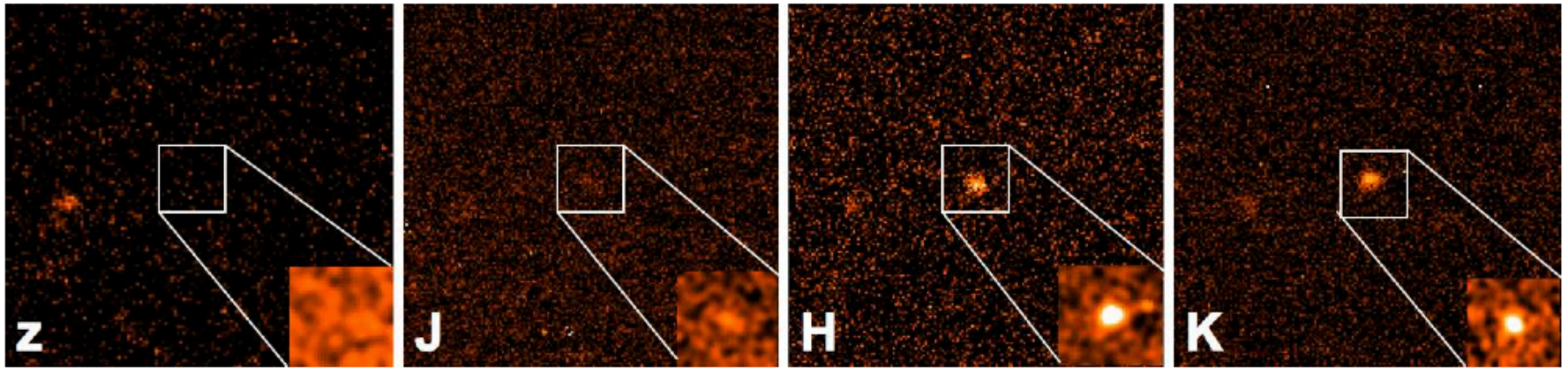
Why not schedule ToO / Time Domain Observations Classically?

- Cannot predict in advance when new phenomena will occur (GRB, SNe, Novae)
- Monitoring observations often interested in long-term behavior: days, weeks, months, years.
- Individual observation can be quite short (minutes to hours)
    - Late-time supernovae light curves / spectral evolution
    - Solar-system object rotation or orbital periods longer than a few hours
    - Transiting exoplanet timings known in advance but multiple epochs required to obtain required S/N ratio

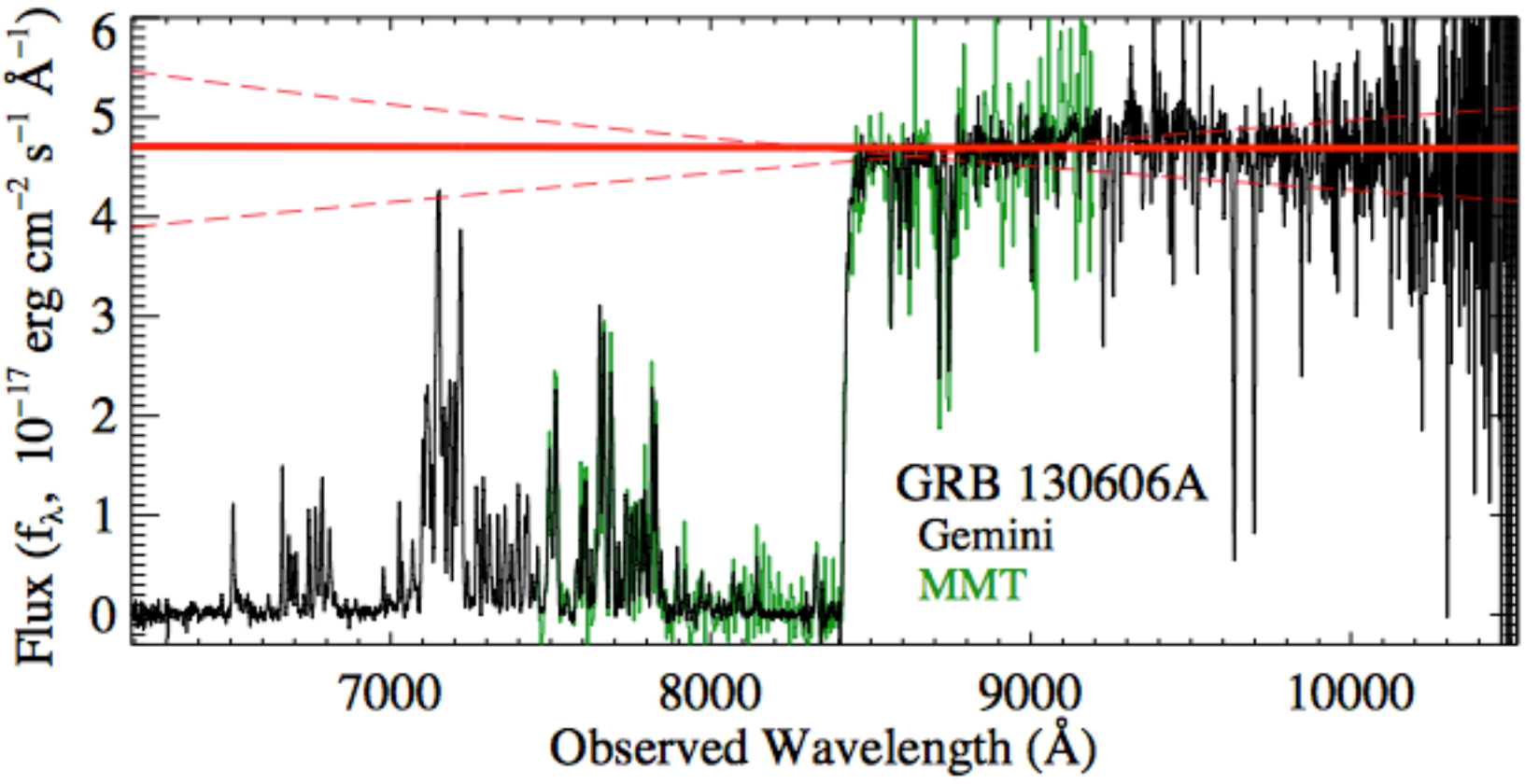
Science Highlights

- GRB Follow-up
  - Optical and IR imaging and spectroscopy
  - Rapid and Standard ToO Queue programs since 2005 - 2014
  - Numerous GCN circulars (redshifts)
  - scientific publications exploring progenitor and host properties -> nature of different classes of GRBs
  - Absorption studies of intergalactic gas and ISM / CGM associated with intervening galaxies

A Photometric Redshift of z ~ 9.4 for GRB 090429B.
Cucchiara et al. (2011), ApJ, 736, p. 7.



GRB 130606A as a Probe of the Intergalactic Medium and the Interstellar Medium in a Star-forming Galaxy in the First Gyr After the Big Bang. Chornock et al. (2013), ApJ, 774, p. 26.



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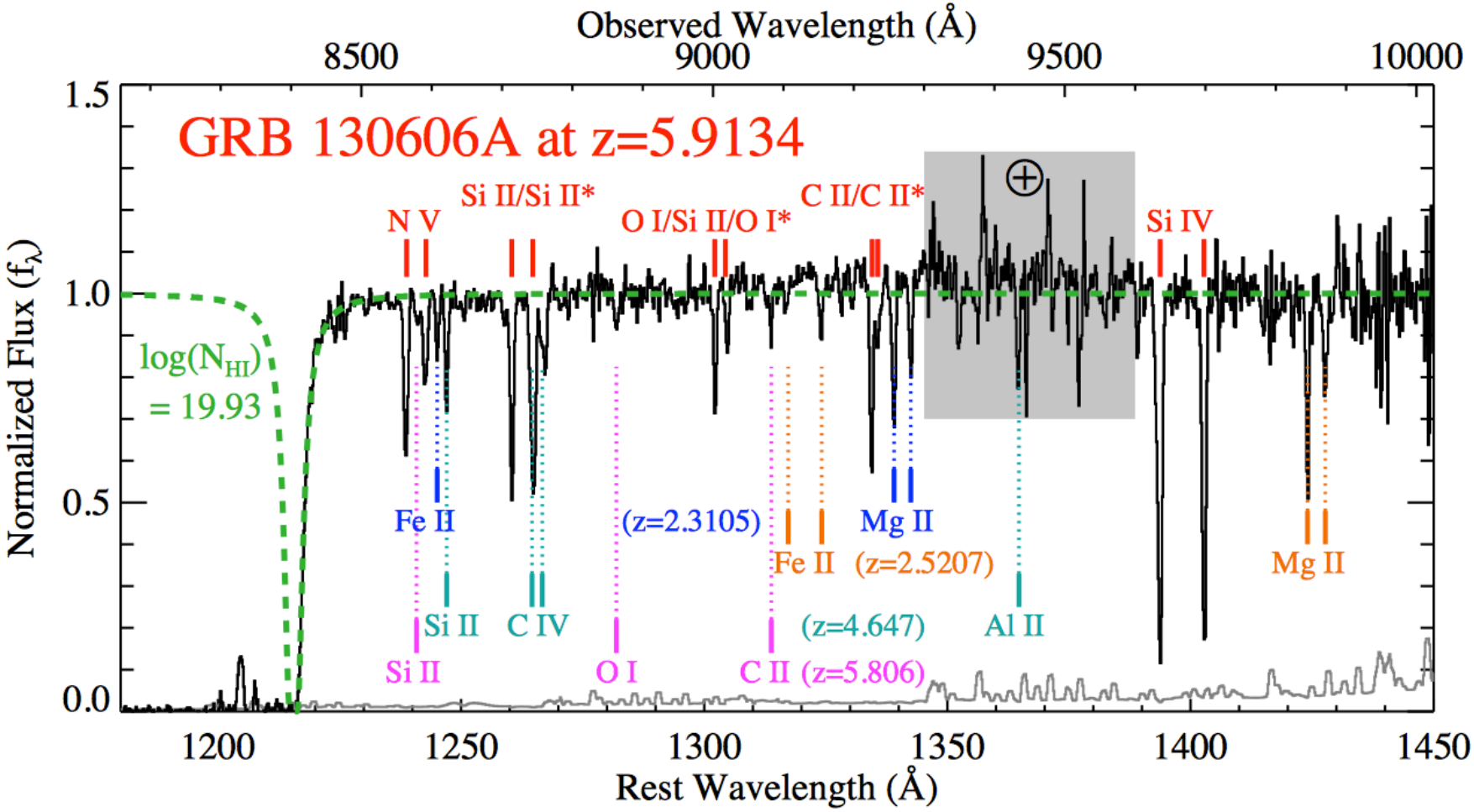
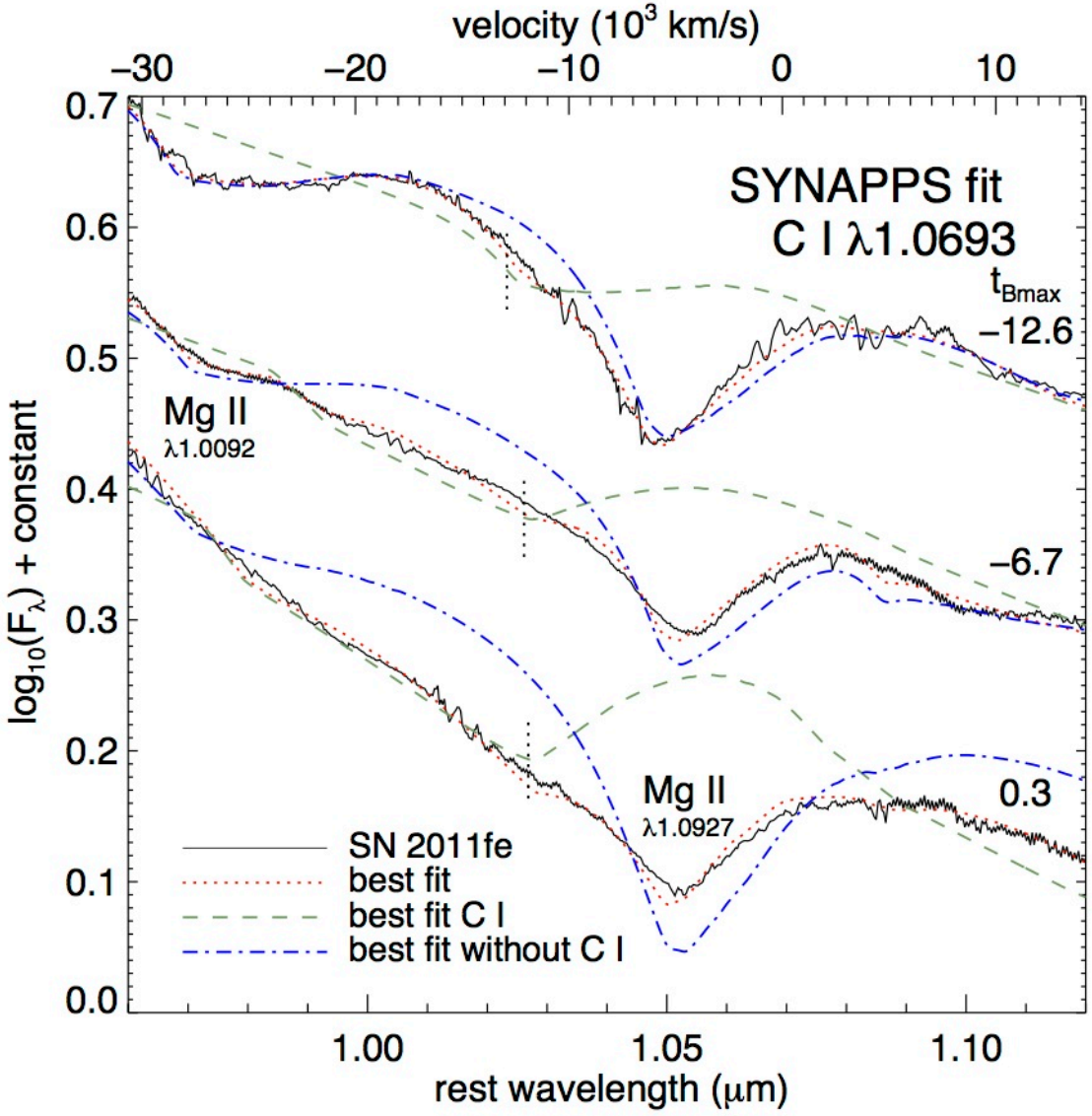


Science Highlights

- GRB Follow-up
- Supernovae
  - Large / Long program awarded for follow-up of intermediate Palomar Transit Factory discovered transients (108 hours at Gemini N/S over 2 years)
  - Queue scheduled Pan-STARRS follow-up
  - Spectral monitoring of evolving supernovae

The Earliest Near-infrared Time-series Spectroscopy of a Type Ia Supernova, Hsiao et al. (2013), ApJ, 766, 72.



Ultraluminous Supernovae as a New Probe of the Interstellar Medium in Distant Galaxies, Berger et al. (2012) ApJ Letters, 755, L29.

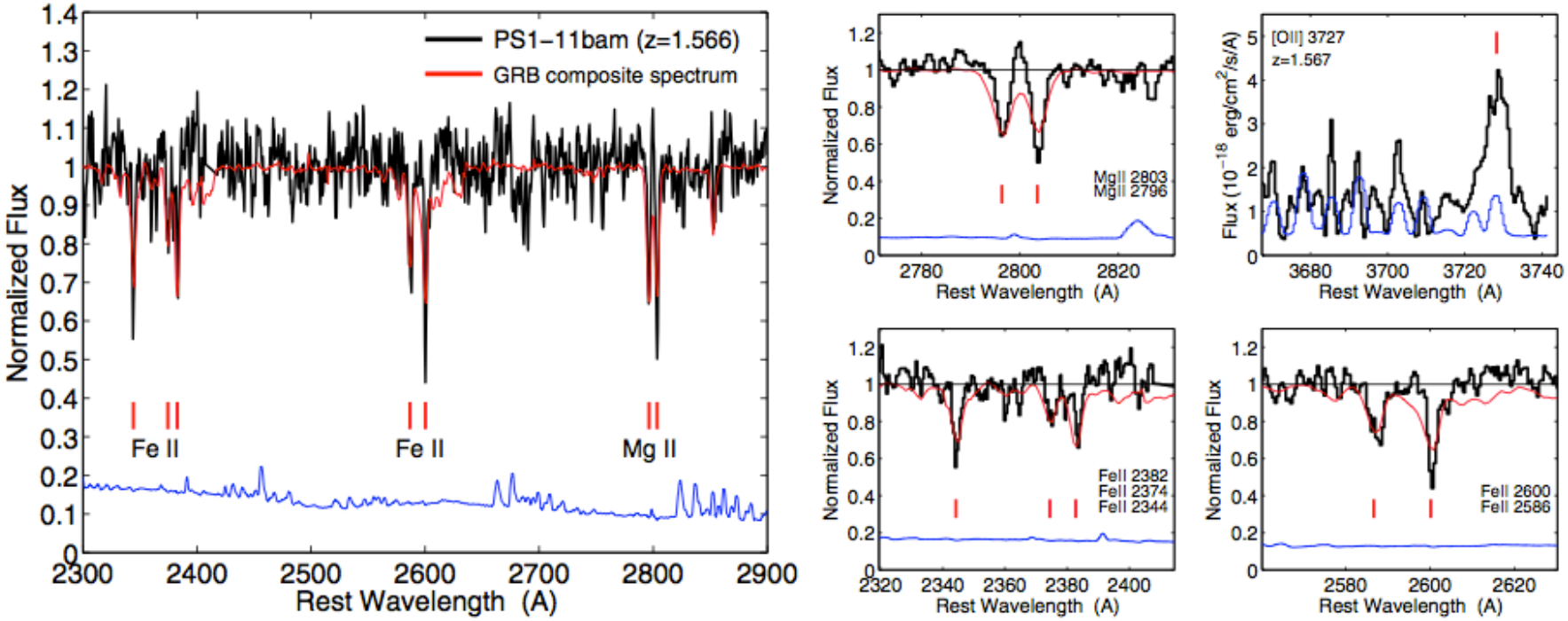


Figure 2. Left: portion of the Gemini spectrum of PS1-11bam from December 5 containing several interstellar absorption features of Fe II and Mg II at $z = 1.566$ (black). The error spectrum is shown in blue. For comparison we plot the GRB composite spectrum of Christensen et al. (2011). Right: a zoom-in on the relevant Fe II and Mg II lines demonstrates the similarity to GRB absorption spectra. Also shown is the [O II]λ3727 emission line at $z = 1.567$ from the January 1 Gemini spectrum.

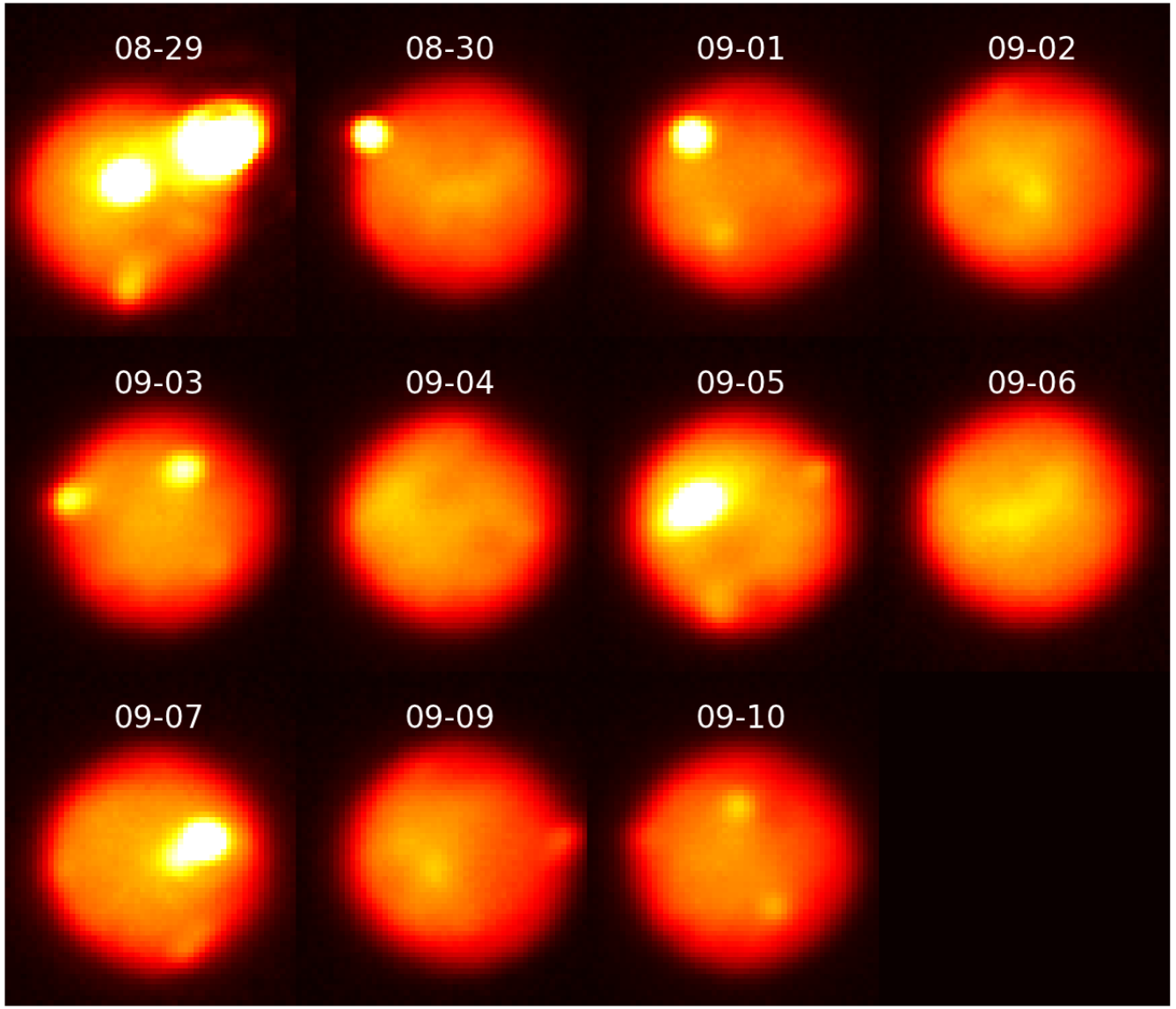
Science Highlights

- GRB Follow-up
- Supernovae
- Weather on Titan
  - Adaptive Optics imaging
  - Non-sidereal observation guiding on target
  - Timing windows give target availability (moon sufficiently separated from parent planet)

Science Highlights

- GRB Follow-up
- Supernovae
- Weather on Titan
- Volcanoes on Io
  - Adaptive Optics Imaging
  - Non-sidereal observation
  - Timing windows give target availability
  - DD time 2013B after IRTF discovery, follow-up queue monitoring 2014A

Near-infrared monitoring of Io and detection of a violent outburst on 29 August 2013. de Kleer, de Pater, Davies, & Ádámkovics (2014), Icarus, 242, p. 352.

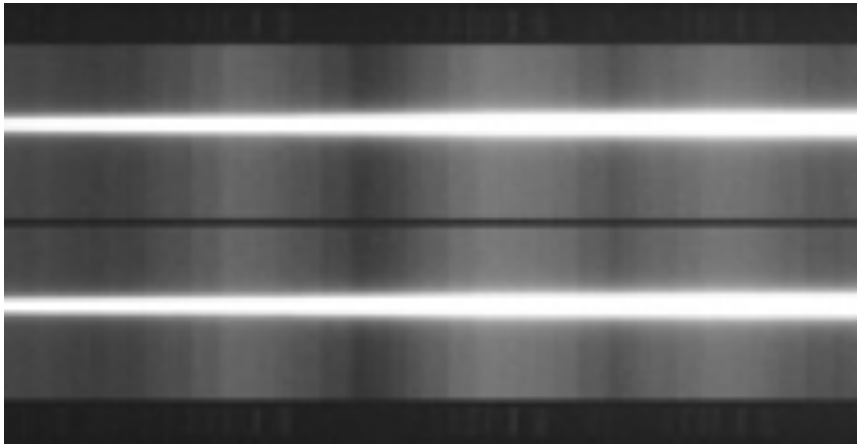


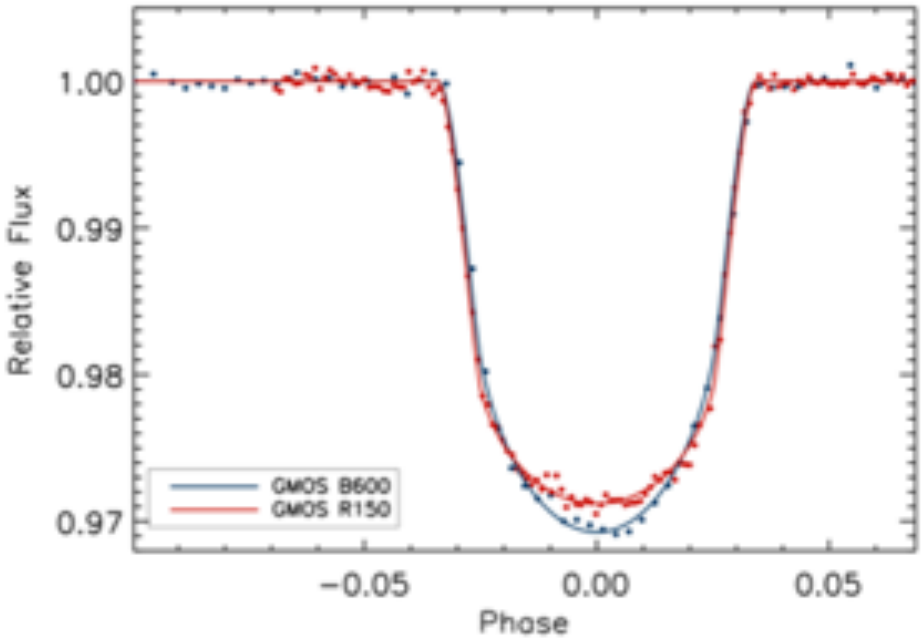
Science Highlights

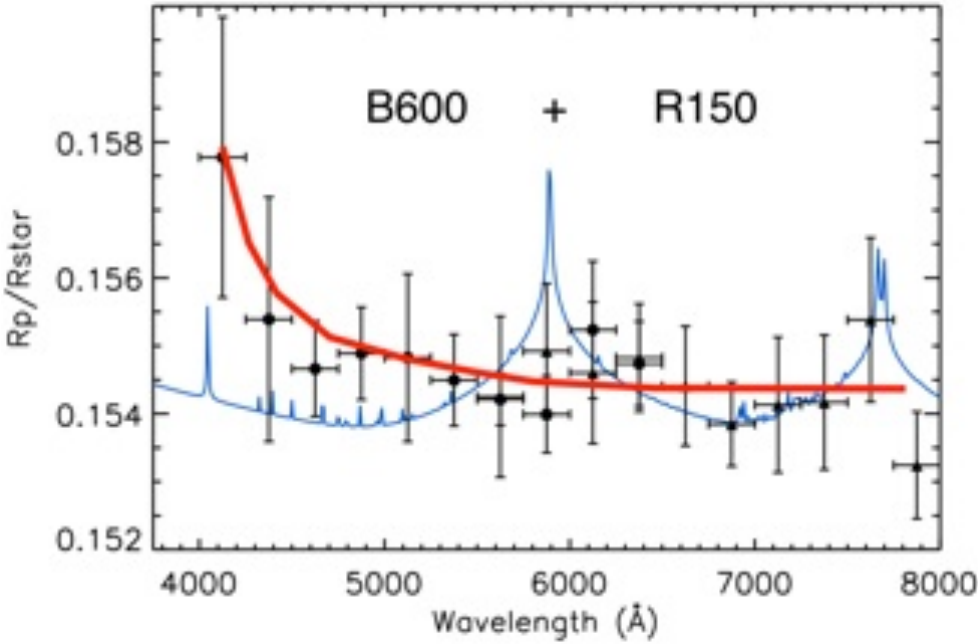
- GRB Follow-up
- Supernovae
- Weather on Titan
- Volcanoes on Io
- Exoplanet transits
  - At least 4 groups pursuing GMOS programs
  - Large / Long program awarded time in 15B (95 hours requested over 2 years – PI Huitson)
  - Simultaneous relative spectroscopy to derive atmospheric properties and composition of the exoplanets

The Gemini-GMOS Exoplanet Atmosphere Survey

http://casa.colorado.edu/~desert/GMOS-Survey.html



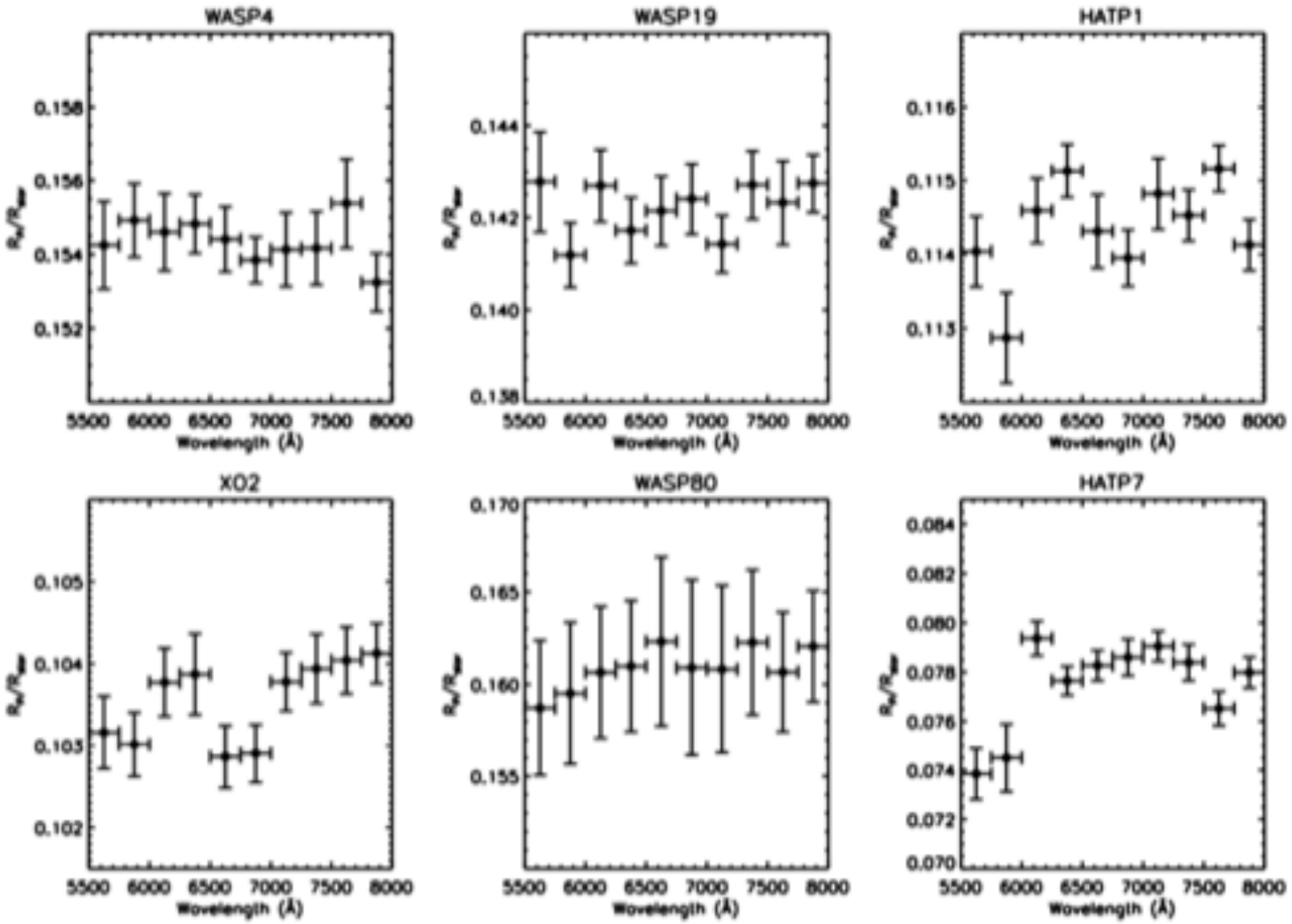




The Gemini-GMOS Exoplanet Atmosphere Survey

http://casa.colorado.edu/~desert/GMOS-Survey.html

Preliminary Results (2014 May 30):



Science Highlights

- GRB Follow-up
- Supernovae
- Weather on Titan
- Volcanoes on Io
- Exoplanet transits
- TransNeptunian Objects in 5:1 Resonance
  - Pike et al. (2015), AJ accepted (thesis project)
  - 1-2 dark time observations separated by a few days for 3-4 months, each observation 1.5-15 minutes long

Target of Opportunity

- Rapid ToOs
  - Always Band 1
  - Generally reserved for new time variable targets that either fade quickly or need to be observed in their early stages
  - Send an audible alert and pop-up an advisory message on the observer and telescope operator terminals as well as staff computers in the office
  - E-mail sent to queue coordinators and support staff
  - Slew Immediately: Note directs observer to interrupt on-going observations and slew to the new target immediately (goal: within 2 minutes)

Target of Opportunity

- Rapid ToOs (continued)
  - Slew When Convenient: Observer is directed to re-plan the queue and observe the new target tonight when it can fit without destructively interrupting the queue
  - Observation automatically expires after 24 hours though PI can extend the timing window as desired, if not observed within 24 hours of being triggered basically treated as standard ToO
  - Rapid ToOs not accepted in exceptional cases:
    - During high-priority time critical observations
    - During certain classical observations (vary by partner / time exchange conditions)
    - During long engineering trials that require special arrangements / support

Target of Opportunity

- Standard ToOs
  - E-mail sent to queue coordinators and support staff
  - Observer not expected to re-plan the queue and take data the same night as triggered
  - Observation considered for inclusion in the nightly plan by queue coordinator during the day
  - No default expiration date
  - Used to trigger observations of both time variable and non-variable objects that have recently become more interesting

Timing Windows

- Timing windows are entered in the OT under Observing Constraints and give the starting time and the duration of the valid window
  - must be longer than the observation execution length minus the acquisition time
  - Rapid ToOs assumed valid from trigger time and expire after 24 hours (can be changed by PI)
  - Any observation may have multiple timing windows
  - Several observations may have the same timing windows
  - Entering timing constraints currently a manual process, can be imported from ASCII text file (contact CS)

Observing Conditions

This component describes the conditions under which this observation can be observed.

Sky Background: Any/Bright

Cloud Cover: 50%/Clear

Image Quality: 85%/Poor

Water Vapor: Any

Elevation Constraint: None –

Timing Windows

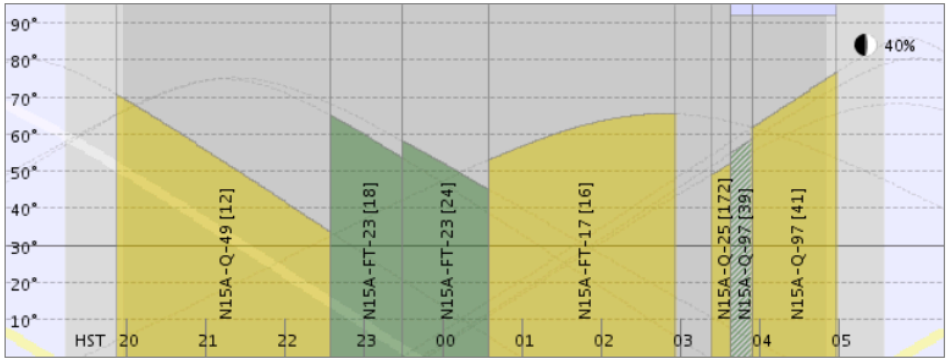
Window	Duration	Repeats	Period
2015-05-22 09:52:00 UTC	07:12	never	
2015-06-04 13:51:00 UTC	05:00	never	
2015-06-06 08:52:00 UTC	05:27	never	
2015-06-25 09:26:00 UTC	11:34	never	
2015-06-29 10:55:00 UTC	13:05	never	
2015-07-08 06:23:00 UTC	06:13	never	

Nightly Queue Plan

- Queue observer follows queue plan generated by the queue coordinator during the day
- Different Queue plan for seeing, cloud cover, water vapor conditions
- Rapid ToOs trigger an alert in the Observing Tool and observers adjust the plan to accommodate
  - Queue coordinator on-call to generate new plan
  - Observers can optionally adjust queue plan manually if they feel comfortable doing so
- No automated Queue Planning exists
- Standard ToOs and time critical observations included in normal queue plan, and generally are not given priority during Classical, Priority Visitor, or Fast Turnaround nights (though this may change, especially regarding Fast Turnaround observations)

WET Good seeing photometric

SB = unconstrained / CC = 50 / IQ = 70 / WV = unconstrained



Start	Dur	BG	Observation	Steps	Inst	Config	WFS	Target	IQ	CC	WV	BG	Rise	Trans	Set
19:13	Sunset														
19:51	02:42	80%	N15A-Q-49 [12]	1 - 10	GMOS-N	IFU-2, B600, g, E2V, No, No	OIWFS	VCC0856	85	70	A	80	14:38	18:44	22:50
	Start science after 20:10 to stay w/i BG constraints.														
	Only part of the sequence scheduled.														
	Warning: Observation reaches airmass 1.79.														
19:57	Evening 12° Twilight														
22:34	00:54	50%	N15A-FT-23 [18]	1 - 2	GMOS-N	IFU-2, B600, r, E2V, No, No	OIWFS	J1455+0446	A	50	A	A	17:14	21:13	01:12
23:29	01:05	50%	N15A-FT-23 [24]	1 - 19	GMOS-N	none, mirror, g, r, i, E2V, No, No	OIWFS	J1504+3439	70	70	A	80	16:55	21:22	01:48
23:51	Moonset.														
00:00	LST at midnight 17:43 09 • Moon illuminated fraction 0.396														
00:34	02:21	20%	N15A-FT-17 [16]	1 - 8	GMOS-N	IFU-2, R831, r+RG610, E2V, No, No	OIWFS	PSR J2030+4415 pos1	70	50	A	50	22:19	02:47	07:15
	Warning: Observation may use blind offsetting.														
03:23	00:14	50%	N15A-Q-25 [172]	1 - 4	GMOS-N	none, mirror, g, E2V, No, No	OIWFS	eMACSJ2327.4-0204	70	50	A	50	01:56	05:44	09:32
	Earlier data ended up with elongation of 10-15% in g band only. So retrying at slightly higher elevation.														
	Take a phot std before this. This way the target rises a bit higher.														
	Warning: Multiple GMOS OIWFS options.														
03:38	00:16	20%	N15A-Q-97 [39]	1 - 4	GNIRS	0.675, 32, J, SXD, SB, λ=1.65	PWFS2	HIP 116886	85	70	A	A	01:51	05:58	10:04
03:54	01:03	100%	N15A-Q-97 [41]	26 - 41	GNIRS	0.675, 32, J, SXD, SB, λ=1.65	PWFS2	TXS2332+154 G4	85	70	A	A	01:39	05:51	10:04
	Partial sequence scheduled. You can take mpore if you can fit.														
	Please take onsky cal at the end of the sequence before moving on.														
	Warning: Observation may use blind offsetting.														
04:50	Morning 12° Twilight														
04:58	End of plan variant.														
05:34	Sunrise														

Queue Planning Tool

- Nice Visual Aid assisting queue coordinator with manual observing plan generation
- Presents candidate observations meeting various observing constraints
- Gives warnings / errors when various constraints violated
  - Invalid instrument configuration (GMOS gratings)
  - Airmass constraint violated
  - Background constraint violated (moon or twilight)
  - Timing Window violated
  - Calibration stars not scheduled
- Exports web product for observer to follow

Gemini North – 20150624 – Gemini QPT 2015B.1.1.1

File Edit Plan Candidate Visit Help

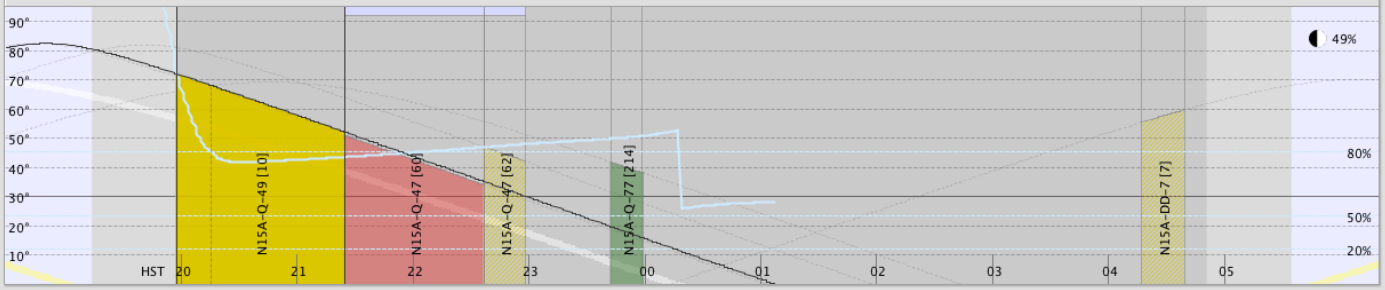
Plan Variants

Name	IQ	CC	WV	Wind	LGS
Photometric, Super Seeing, Dry	20	50	50		no
Photometric, Super Seeing, Wet	20	50	A		no
Thin Cirrus, Super Seeing	20	70	–		no
Photometric, Good Seeing, Dry	70	50	50		no
Photometric, Good Seeing, Wet	70	50	A		no
Thin Cirrus, Good Seeing	70	70	–		no
Photometric, Poor Seeing, Dry	85	50	50		no
Photometric, Poor Seeing, Wet	85	50	A		no
Thin Cirrus, Poor Seeing	85	70	–		no
Terrible Seeing	A	–	–		no
Thick Clouds	–	A	–		no

Double-click a variant to edit it.

Plan Variants | Instruments

Scheduled Visit Visualizer



Candidate Observations

SB	P	Score	Observation	Target	RA	Inst	Dur
3	M	125	N15A-Q-98 [151]	HIP 78017	15:55:...	GNIRS	0:15:57
3	M	125	N15A-Q-98 [153]	HIP94140	19:09:...	GNIRS	0:15:49
3	M	125	N15A-Q-98 [155]	HIP 78017	15:55:...	GNIRS	0:15:57
3	M	125	N15A-Q-98 [157]	HIP94140	19:09:...	GNIRS	0:15:49
3	M	125	N15A-Q-98 [159]	HIP 78017	15:55:...	GNIRS	0:15:57
3	M	125	N15A-Q-98 [161]	HIP94140	19:09:...	GNIRS	0:15:49
3	M	125	N15A-Q-98 [163]	HIP 78017	15:55:...	GNIRS	0:15:57
3	M	125	N15A-Q-98 [165]	HIP94140	19:09:...	GNIRS	0:15:49
3	M	125	N15A-Q-98 [167]	HIP 78017	15:55:...	GNIRS	0:15:57
3	M	125	N15A-Q-98 [169]	HIP94140	19:09:...	GNIRS	0:15:49
1	L	1125	N15A-DD-7 [7]		0:00:00	GMOS-N	0:22:21
1	L	1350	N15A-DD-7 [12]	Abell 1835	14:01:...	GMOS-N	5:20:21
2	L	562	N15A-FT-16 [25]	SGAS2222p2745	22:22:...	GMOS-N	0:37:59
1	L	1125	N15A-FT-17 [7]	HZ44	13:23:...	GMOS-N	0:29:46
3	H	150	N15A-FT-23 [23]	J1347+5453	13:47:...	GMOS-N	1:05:26
1	H	1350	N15A-LP-1 [96]	o3o21	16:10:...	GMOS-N	0:50:33
1	H	1350	N15A-LP-1 [98]	o3o21	16:10:...	GMOS-N	0:37:47
1	H	1350	N15A-LP-1 [186]	o3e23PD	14:21:...	GMOS-N	0:37:40
1	H	1350	N15A-LP-1 [188]	o3e23PD	14:21:...	GMOS-N	0:31:24
1	H	1350	N15A-LP-1 [210]	o3o29	14:21:...	GMOS-N	0:31:17
1	H	1350	N15A-LP-1 [212]	o3o29	14:21:...	GMOS-N	0:31:24
1	H	1350	N15A-LP-1 [254]	o3o11	16:12:...	GMOS-N	0:18:31
2	L	281	N15A-Q-49 [7]	Wolf1346	20:34:...	GMOS-N	0:36:52
2	L	337	N15A-Q-49 [10]	VCC1627	12:35:...	GMOS-N	4:23:04
2	L	316	N15A-Q-62 [45]	A1914 group 8	14:25:...	GMOS-N	1:15:45
2	L	0	N15A-Q-63 [51]	WASP-103	16:37:...	GMOS-N	4:23:58
2	L	281	N15A-Q-63 [57]		0:00:00	GMOS-N	0:21:37
2	L	0	N15A-Q-63 [62]	WASP-103	16:37:...	GMOS-N	4:23:58
2	L	281	N15A-Q-63 [69]		0:00:00	GMOS-N	0:21:37
2	L	0	N15A-Q-63 [73]	WASP-103	16:37:...	GMOS-N	4:23:58
2	L	281	N15A-Q-63 [80]		0:00:00	GMOS-N	0:21:37
3	L	150	N15A-Q-77 [148]	1344+6001	13:44:...	GMOS-N	0:15:41
3	L	112	N15A-Q-77 [150]	1344+6001	13:44:...	GMOS-N	4:19:54
3	L	200	N15A-Q-77 [161]	1044+1600	10:44:...	GMOS-N	0:15:41
3	L	200	N15A-Q-77 [163]	1044+1600	10:44:...	GMOS-N	4:57:36
3	L	150	N15A-Q-77 [166]	1321+5956	13:21:...	GMOS-N	0:15:41
3	L	112	N15A-Q-77 [168]	1321+5956	13:21:...	GMOS-N	4:57:36
3	L	150	N15A-Q-77 [214]	1431-0052	14:31:...	GMOS-N	0:15:41

Double-click an observation to view it in context.

Candidate Observations | Science Program | RA Distribution

Scheduled Visits

Start	Dur	BG	Observation	Steps	Inst	Config	WFS	Target
19:57	01:27	80%	N15A-Q-49 [1...	1–4	GMOS-N	IFU-2, B600, g, E2V, No, No	OIWFS	VCC1627
21:24	01:12	100%	N15A-Q-47 [6...	10–19	NIFS	Z Grating, ZJ Filter, clear	PWFS2	M87
22:37	00:20	80%	N15A-Q-47 [6...	1–6	NIFS	Z Grating, ZJ Filter, clear	PWFS2	HIP65599
23:42	00:15	80%	N15A-Q-77 [2...	1–6	GMOS-N	none, mirror, g, r, E2V, No, No	OIWFS	1431-0052
04:16	00:22	80%	N15A-DD-7 [7]	1–6	GMOS-N	0.75arcsec, R831, none, E2V, No, No		

Properties

Name	Value
Type/ID	Science Visit N15A-Q-49 [10] (Band 2)
Title	IFU: Science with GCalflats
Rem. Program Time	7:07:23
Flags	[OVER_QUALIFIED, SCHEDULED, SCHED_GROUP]
Coordinates	12:35:37.233, +12:22:55.44 J2000
Instrument	GMOS-N / IFU-2, B600, g, E2V, No, No
Constraints	SB = 80 / CC = 70 / IQ = 85 / WV = any
Timing Windows	«none»

Properties | Clearance | Shutter

Problems

Description	Resource
Airmass constraint violated (1.78 > 1.50).	N15A-Q-47 [60] S10–19
Steps 5–15 are unscheduled.	N15A-Q-49 [10] S1–4
Observation may use blind offsetting.	N15A-Q-47 [60] S10–19
Program N15A-Q-47 is over-allocated by 0:18:13.	N15A-Q-47 [60] S10–19
Observation reaches airmass 1.48.	N15A-Q-47 [62] S1–6
Observation uses mean parallactic angle.	N15A-DD-7 [7] S1–6
Variant conditions are better than necessary.	N15A-Q-49 [10] S1–4
Variant conditions are better than necessary.	N15A-Q-47 [60] S10–19
Variant conditions are better than necessary.	N15A-Q-47 [62] S1–6
Variant conditions are better than necessary.	N15A-Q-77 [214] S1–6
Variant conditions are better than necessary.	N15A-DD-7 [7] S1–6

Problems | Comment

Queue Visualization Tool

- Relatively new addition to the OT
- Assists queue coordinators when selecting programs to schedule at night
- Helps queue coordinators plan future instrument configuration changes (gratings / masks in GMOS)
- Shows when observations are schedulable (or not) due to timing windows or airmass / background constraints
- Does not provide any automated queue planning
- Does not give any advice (eg. when last timing window is about to expire, or when there are only as many timing windows as unexecuted observations)

Queue Visualization – Gemini North

Data Share

Filter: Active & Not Completed

Main | Priorities | Conditions | Configurations

Completed	Both	Yes	No
Rollover	Both	Yes	No
Timing Constraints	Both	Yes	No
Elevation Constraints	Both	Yes	No
Pre-Imaging	Both	Yes	No

Semesters
- 2014B (24)
- 2015A (257)
- 2015B (4)

Partner
- Argentina (5)
- Australia (4)
- Brazil (14)
- Canada (21)
- Gemini Staff (26)
- United States (200)
- University of Hawaii (15)

Program Types
- Classical (C) (2)
- Director's Time (DD) (1)
- Fast Turnaround (FT) (10)
- Large Program (LP) (13)
- Queue (Q) (259)

AO
- Lgs (39)
- Ngs (10)
- None (236)

Observation Status
- Ongoing (16)
- Ready (269)

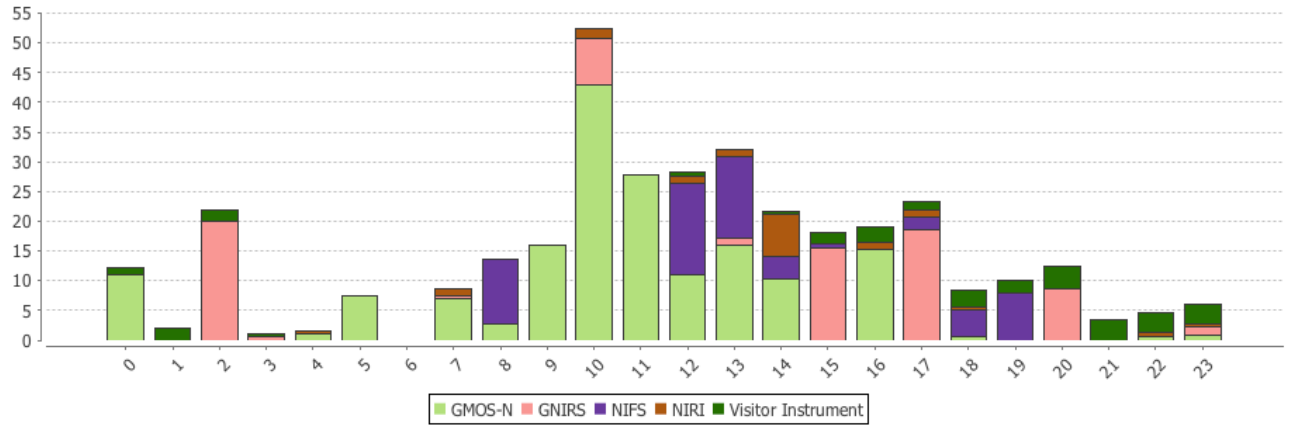
Observation Class
- Science (285)

Instruments
- GMOS-N (80)
- GNIRS (47)
- NIFS (35)
- NIRI (14)
- Visitor Instrument (109)

TOO Type
- None (285)

Histogram | Table | Vis Bar | Vis Elevation | Vis Hours | Vis Set/Rise

Chart: Instruments by RA
x-Axis: RA
y-Axis: Instruments
Function: Remaining Time (Hrs)



Options

Observation ID	Band	RA	Dec	Instrument	AO	LGS	Priority	Status	TOO	Filter	Disp
N15A-C-3 [43]		5:25:11....	1:36:13.46	GMOS-N			High	Ready	None	OG515_G...	R150
N15A-C-4 [12]		7:48:06....	50:13:32...	GMOS-N			High	Ready	None	None	B600
N14B-Q-9 [28]	1	2:17:17....	-5:33:32...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-9 [44]	1	2:18:20....	-5:31:43...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-9 [76]	1	2:17:21....	-5:19:07...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-9 [84]	1	2:19:09....	-5:15:30...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-9 [92]	1	2:17:21....	-5:19:09...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-9 [100]	1	2:18:48....	-5:18:01...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-9 [108]	1	2:19:24....	-4:53:00...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-9 [124]	1	2:19:09....	-5:00:08...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-9 [132]	1	2:19:24....	-4:52:56...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-9 [244]	1	10:47:27...	58:52:17...	GNIRS			Medium	Ongoing	None	x-dispersed	32 l/
N14B-Q-9 [251]	1	10:46:35...	59:07:48...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-9 [258]	1	10:48:03...	58:54:21...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-9 [271]	1	10:47:28...	58:52:12...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N14B-Q-24 [146]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B120
N14B-Q-24 [148]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B120
N14B-Q-24 [150]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B120
N14B-Q-24 [152]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B120
N14B-Q-24 [164]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B120
N14B-Q-24 [166]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B120
N14B-Q-30 [46]	1	8:52:35....	28:19:50...	NIFS+AO	yes		Low	Ongoing	None	Same as ...	J Grat
N14B-Q-30 [62]	1	8:52:35....	28:19:50...	NIFS+AO	yes		Low	Ready	None	Same as ...	J Grat
N14B-Q-30 [64]	1	8:52:35....	28:19:50...	NIFS+AO	yes		Low	Ready	None	Same as ...	J Grat
N14B-Q-35 [168]	1	18:58:08...	1:00:43.00	NIRI			High	Ongoing	None	H2 1-0 S(...	none

Columns | Export

Clear Subselection | Regexp Search (in all columns): | 285 Observations, Selected: 20

Reference date for non-sidereal targets: Jun 23 2015, 06:23 (middle night time) | Today | Observations: Total 285 loaded. | Constraints: All up to date. | Schedule: Loaded.

Queue Visualization – Gemini North

Data Share

Filter: Active & Not Completed

Main | Priorities | Conditions | Configurations

Completed	Both	Yes	No
Rollover	Both	Yes	No
Timing Constraints	Both	Yes	No
Elevation Constraints	Both	Yes	No
Pre-Imaging	Both	Yes	No

Semesters
- 2014B (24)
- 2015A (257)
- 2015B (4)

Partner
- Argentina (5)
- Australia (4)
- Brazil (14)
- Canada (21)
- Gemini Staff (26)
- United States (200)
- University of Hawaii (15)

Program Types
- Classical (C) (2)
- Director's Time (DD) (1)
- Fast Turnaround (FT) (10)
- Large Program (LP) (13)
- Queue (Q) (259)

AO
- Lgs (39)
- Ngs (10)
- None (236)

Observation Status
- Ongoing (16)
- Ready (269)

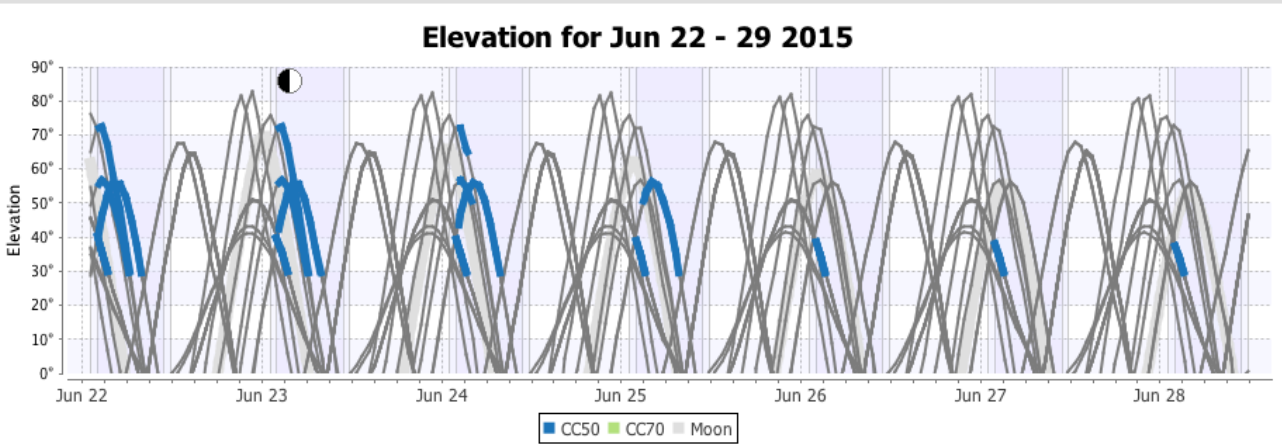
Observation Class
- Science (285)

Instruments
- GMOS-N (80)
- GNIRS (47)
- NIFS (35)
- NIRI (14)
- Visitor Instrument (109)

TOO Type
- None (285)

Histogram | Table | Vis Bar | Vis Elevation | Vis Hours | Vis Set/Rise

Color Coding: Cloud Cover



D | W | M | 3M | 6M | Y | R

UTC | Local | LST

Constraints: Elevation | Sky Brightness | Timing Windows | Minimum Time

Schedule: Instruments | Telescope | Programs

Observation ID	Band	RA	Dec	Instrument	AO	LGS	Priority	Status	TOO	Filter	Disp
N15A-LP-1 [98]	1	16:10:21...	-13:51:3...	GMOS-N			High	Ready	None	r_G0303, ...	Mirro
N15A-LP-1 [186]	1	14:21:31...	-13:22:3...	GMOS-N			High	Ready	None	r_G0303, ...	Mirro
N15A-LP-1 [188]	1	14:21:31...	-13:22:3...	GMOS-N			High	Ready	None	r_G0303, ...	Mirro
N15A-LP-1 [210]	1	14:21:31...	-13:22:3...	GMOS-N			High	Ready	None	r_G0303, ...	Mirro
N15A-LP-1 [212]	1	14:21:31...	-13:22:3...	GMOS-N			High	Ready	None	r_G0303, ...	Mirro
N15A-LP-1 [254]	1	16:12:56...	-14:05:5...	GMOS-N			High	Ready	None	r_G0303, ...	Mirro
N15A-LP-3 [52]	1	12:45:11...	33:56:10...	GMOS-N			Medium	Ready	None	None	R400
N15A-LP-3 [57]	1	12:45:11...	33:56:10...	GMOS-N			Medium	Ready	None	None	R400
N15A-LP-3 [62]	1	12:45:11...	33:56:10...	GMOS-N			Medium	Ready	None	None	R400
N15A-Q-26 [10]	1	10:05:06...	66:33:30...	GMOS-N			Medium	Ready	None	None	B120
N15A-Q-26 [17]	1	9:57:03....	68:35:30...	GMOS-N			High	Ready	None	None	B120
N15A-Q-31 [33]	1	10:21:42...	12:45:18...	GMOS-N			Low	Ongoing	None	None	B120
N14B-Q-55 [251]	2	3:44:41....	32:17:54...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N15A-FT-15 [28]	2	11:10:28...	64:59:04...	GMOS-N			Low	Ongoing	None	None	B600
N15A-FT-15 [32]	2	11:10:28...	64:59:04...	GMOS-N			Low	Ready	None	None	B600
N15A-FT-16 [25]	2	22:22:08...	27:45:32...	GMOS-N			Low	Ready	None	g_G0301	Mirro
N15A-FT-21 [42]	2	15:52:26...	-18:01:1...	NIFS+AO	yes		High	Ready	None	HK Filter	K Gra
N15A-FT-21 [58]	2	15:49:46...	-17:56:0...	NIFS+AO	yes		High	Ready	None	HK Filter	K Gra
N15A-Q-41 [9]	2	10:46:34...	13:45:02...	GMOS-N			Low	Ongoing	None	g_G0301 ...	B600
N15A-Q-47 [60]	2	12:30:49...	12:23:28...	NIFS			High	Ongoing	None	ZJ Filter	Z Gra
N15A-Q-49 [10]	2	12:35:37...	12:22:55...	GMOS-N			Low	Ready	None	g_G0301	B600
N15A-Q-49 [12]	2	12:25:57...	10:03:13...	GMOS-N			Medium	Ongoing	None	g_G0301	B600
N15A-Q-50 [10]	2	9:34:57....	21:42:18...	GMOS-N			Low	Ready	None	None	B600
N15A-Q-50 [17]	2	11:40:16...	17:43:40...	GMOS-N			Low	Ready	None	None	B600
N15A-Q-50 [36]	2	9:13:39....	29:59:34...	GMOS-N			Low	Ready	None	None	B600

Columns | Export

Clear Subselection | Regexp Search (in all columns): | 124 Observations, Selected: 36

Reference date for non-sidereal targets: Jun 23 2015, 06:23 (middle night time) | Today | Observations: Total 285 loaded. | Constraints: All up to date. | Schedule: Loaded.

Queue Visualization – Gemini North

Data Share

Filter: Active & Not Completed

Main | Priorities | Conditions | Configurations

Completed	Both	Yes	No
Rollover	Both	Yes	No
Timing Constraints	Both	Yes	No
Elevation Constraints	Both	Yes	No
Pre-Imaging	Both	Yes	No

Semesters
- 2014B (24)
- 2015A (257)
- 2015B (4)

Partner
- Argentina (5)
- Australia (4)
- Brazil (14)
- Canada (21)
- Gemini Staff (26)
- United States (200)
- University of Hawaii (15)

Program Types
- Classical (C) (2)
- Director's Time (DD) (1)
- Fast Turnaround (FT) (10)
- Large Program (LP) (13)
- Queue (Q) (259)

AO
- Lgs (39)
- Ngs (10)
- None (236)

Observation Status
- Ongoing (16)
- Ready (269)

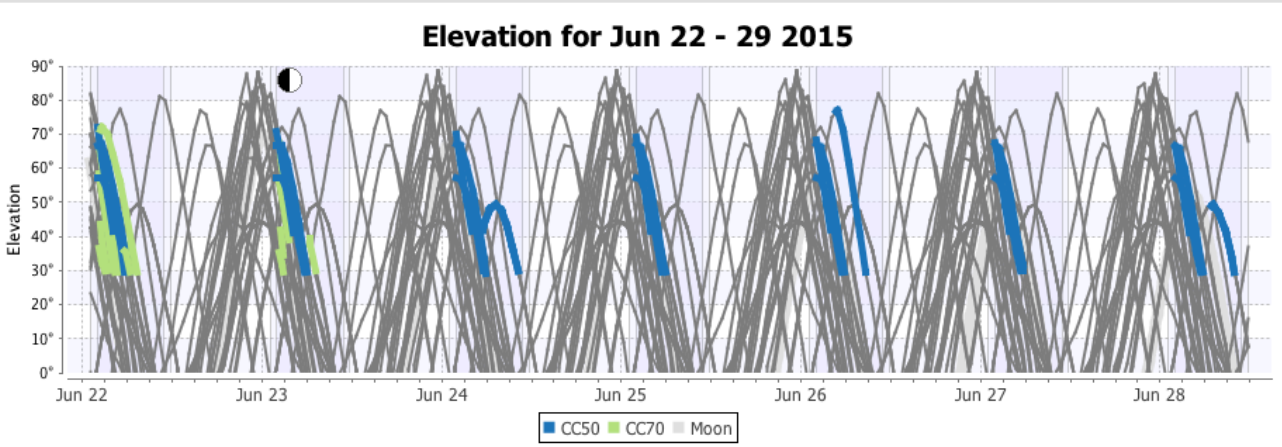
Observation Class
- Science (285)

Instruments
- GMOS-N (80)
- GNIRS (47)
- NIFS (35)
- NIRI (14)
- Visitor Instrument (109)

TOO Type
- None (285)

Histogram | Table | Vis Bar | Vis Elevation | Vis Hours | Vis Set/Rise

Color Coding: Cloud Cover



Options

D | W | M | 3M | 6M | Y | R

UTC | Local | LST

Constraints: Elevation | Sky Brightness | Timing Windows | Minimum Time

Schedule: Instruments | Telescope | Programs

Observation ID	Band	RA	Dec	Instrument	AO	LGS	Priority	Status	TOO	Filter	Disp
N15A-Q-86 [15]	3	9:42:57....	18:03:28...	GMOS-N			Low	Ready	None	g_G0301	Mirro
N15A-Q-89 [232]	3	20:48:56...	46:06:50...	GNIRS			High	Ready	None	order 5 (J)	111 l
N15A-Q-89 [233]	3	20:48:56...	46:06:50...	GNIRS			High	Ready	None	order 5 (J)	111 l
N15A-Q-89 [241]	3	20:48:56...	46:06:50...	GNIRS			High	Ready	None	order 5 (J)	111 l
N15A-Q-89 [242]	3	20:48:56...	46:06:50...	GNIRS			High	Ready	None	order 5 (J)	111 l
N15A-Q-97 [41]	3	23:34:58...	15:45:49...	GNIRS			Medium	Ongoing	None	order 5 (J)	32 l/
N15A-Q-98 [44]	3	17:13:42...	59:39:20...	GNIRS			Medium	Ongoing	None	x-dispersed	32 l/
N15A-Q-98 [56]	3	17:12:12...	59:48:46...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N15A-Q-98 [68]	3	17:13:25...	60:07:20...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N15A-Q-98 [80]	3	17:11:35...	60:03:01...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N15A-Q-98 [92]	3	17:17:54...	60:09:13...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N15A-Q-98 [104]	3	17:17:09...	60:10:08...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N15A-Q-98 [116]	3	17:16:12...	59:39:14...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N15A-Q-98 [128]	3	17:13:42...	59:39:20...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N15A-Q-99 [18]	4	23:08:33...	33:03:11...	GMOS-N			High	Ready	None	None	B600
N15A-Q-99 [20]	4	0:24:25....	33:00:07...	GMOS-N			High	Ready	None	None	B600
N15A-Q-99 [22]	4	14:41:10...	25:16:58...	GMOS-N			High	Ready	None	None	B600
N15A-Q-99 [28]	4	0:24:33....	32:58:46...	GMOS-N			High	Ready	None	None	B600
N15A-Q-401 [87]	4	10:37:11...	-11:55:4...	GMOS-N			High	Ongoing	None	None	B600
N15A-Q-403 [68]	4	17:18:44...	60:00:26...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N15A-Q-403 [80]	4	17:15:27...	59:45:33...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N15A-Q-403 [92]	4	17:17:50...	58:47:45...	GNIRS			Medium	Ready	None	x-dispersed	32 l/
N15A-Q-404 [11]	4	11:28:13...	10:23:08...	GMOS-N			Low	Ready	None	g_G0301	B600
N15A-Q-406 [10]	4	20:32:25...	40:57:27...	GNIRS			Medium	Ongoing	None	order 5 (J)	32 l/
N15A-Q-406 [16]	4	20:32:25...	40:57:27...	GNIRS			Medium	Ready	None	order 5 (J)	32 l/

Columns | Export

Clear Subselection | Regexp Search (in all columns): | 124 Observations, Selected: 38

Reference date for non-sidereal targets: Jun 23 2015, 06:23 (middle night time) | Today | Observations: Total 285 loaded. | Constraints: All up to date. | Schedule: Loaded.

Queue Visualization – Gemini North

Data Share

Filter: Active & Not Completed

Main | Priorities | Conditions | Configurations

Completed	Both	Yes	(•) No
Rollover	(•) Both	Yes	No
Timing Constraints	Both	(•) Yes	No
Elevation Constraints	(•) Both	Yes	No
Pre-Imaging	(•) Both	Yes	No

Semesters
- 2014B (24)
- 2015A (257)
- 2015B (4)

Partner
- Argentina (5)
- Australia (4)
- Brazil (14)
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- Classical (C) (2)
- Director's Time (DD) (1)
- Fast Turnaround (FT) (10)
- Large Program (LP) (13)
- Queue (Q) (259)

AO
- Lgs (39)
- Ngs (10)
- None (236)

Observation Status
- Ongoing (16)
- Ready (269)

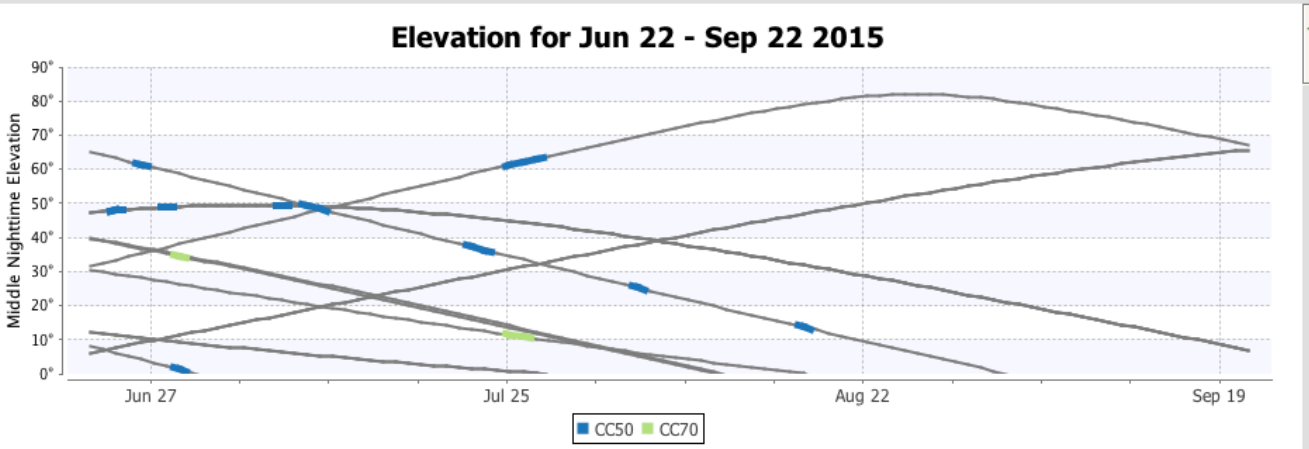
Observation Class
- Science (285)

Instruments
- GMOS-N (80)
- GNIRS (47)
- NIFS (35)
- NIRI (14)
- Visitor Instrument (109)

TOO Type
- None (285)

Histogram | Table | Vis Bar | Vis Elevation | Vis Hours | Vis Set/Rise

Color Coding: Cloud Cover



D | W | M | 3M | 6M | Y | R

UTC (•) Local LST

Constraints: ✓ Elevation | ✓ Sky Brightness | ✓ Timing Windows | ✓ Minimum Time

Schedule: ✓ Instruments | ✓ Telescope | ✓ Programs

Observation ID	Band	RA	Dec	Instrument	AO	LGS	Priority	Status	TOO	Filter	Disper
N14B-Q-24 [146]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B1200_
N14B-Q-24 [148]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B1200_
N14B-Q-24 [150]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B1200_
N14B-Q-24 [152]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B1200_
N14B-Q-24 [164]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B1200_
N14B-Q-24 [166]	1	0:45:19....	41:45:05...	GMOS-N			High	Ready	None	None	B1200_
N15A-FT-10 [12]	2	12:29:34...	8:03:28.84	NIFS+AO	yes	yes	Low	Ready	None	Same as ...	K Gratin
N15A-FT-10 [30]	2	12:29:34...	8:03:28.84	NIFS+AO	yes	yes	Low	Ready	None	Same as ...	K Gratin
N15A-FT-15 [28]	2	11:10:28...	64:59:04...	GMOS-N			Low	Ongoing	None	None	B600_G
N15A-FT-15 [32]	2	11:10:28...	64:59:04...	GMOS-N			Low	Ready	None	None	B600_G
N15A-FT-16 [25]	2	22:22:08...	27:45:32...	GMOS-N			Low	Ready	None	g_G0301	Mirror
N15A-FT-21 [42]	2	15:52:26...	-18:01:1...	NIFS+AO	yes		High	Ready	None	HK Filter	K Gratin
N15A-FT-21 [58]	2	15:49:46...	-17:56:0...	NIFS+AO	yes		High	Ready	None	HK Filter	K Gratin
N15A-Q-63 [51]	2	16:37:14...	7:11:07.00	GMOS-N			Low	Ready	None	OG515_G...	R400_G
N15A-Q-63 [62]	2	16:37:14...	7:11:07.00	GMOS-N			Low	Ready	None	OG515_G...	R400_G
N15A-Q-63 [73]	2	16:37:14...	7:11:07.00	GMOS-N			Low	Ready	None	OG515_G...	R400_G
N15A-Q-66 [68]	2	18:59:12...	-20:45:3...	NIFS+AO	yes		High	Ready	None	JH Filter	H Gratin
N15A-Q-66 [76]	2	18:59:12...	-20:45:3...	NIFS+AO	yes		High	Ready	None	ZJ Filter	J Gratin
N15A-Q-66 [86]	2	18:59:12...	-20:45:3...	NIFS+AO	yes		High	Ready	None	HK Filter	K Gratin
N15A-FT-13 [11]	3	9:36:20....	0:46:49.20	GMOS-N			Medium	Ready	None	None	B600_G
N15A-FT-13 [13]	3	8:30:30....	16:54:44...	GMOS-N			High	Ready	None	None	B600_G
N15A-FT-23 [23]	3	13:47:09...	54:53:11...	GMOS-N			High	Ready	None	r_G0303, ...	Mirror

Columns | Export

Clear Subselection | Regexp Search (in all columns): | 22 Observations, Selected: 22

Reference date for non-sidereal targets: Jun 23 2015, 06:23 (middle night time) | Today | Observations: Total 285 loaded. | Constraints: All up to date. | Schedule: Loaded.

Tracking Timing Windows

- Web application lists timing windows
- Lists timing windows active for the current night, time until expiration, execution time
- Gives warnings when required instrument configuration not installed, or when timing window is about to expire

Windows Open Tonight 2015 Jun 23 05:57 → 2015 Jun 23 14:50 UT						
Observation ID	**Target**	**Window**	**Length**	**Status**	**Config**	**IQ,CC,BG,WV**
GN-2015A-FT-10-12	VCC1199	9.8 days	2:43:15	READY	NIFS LGS	70,50,ANY,ANY
GN-2015A-FT-10-30	VCC1199	9.8 days	2:43:15	READY	NIFS LGS	70,50,ANY,ANY
GN-2015A-FT-13-11	SDSS J0936+0046	9.7 days	0:48:30	READY	GMOS B600	ANY,70,50,ANY
GN-2015A-FT-13-13	SDSS J0830+1654	9.7 days	0:48:30	READY	GMOS B600	ANY,70,80,ANY
GN-2015A-FT-15-28	SGAS1110+6459 slit center	39.9 days	4:19:24	ONGOING	GMOS B600	70,70,50,ANY
GN-2015A-FT-15-32	SGAS1110+6459 slit center	39.9 days	2:17:42	READY	GMOS B600	85,50,50,ANY
GN-2015A-FT-16-25	SGAS2222p2745	38.3 days	0:47:48	READY	GMOS imaging	70,50,50,ANY
GN-2015A-FT-23-14	J1351+0816	70.6 days	0:47:20	FOR-REVIEW	GMOS B600 I F U - 2	ANY,50,ANY,ANY
GN-2015A-FT-23-18	J1455+0446	70.6 days	0:47:20	READY	GMOS B600 I F U - 2	ANY,50,ANY,ANY
GN-2015A-FT-23-20	J1505+1944	70.6 days	0:47:20	FOR-REVIEW	GMOS B600 I F U - 2	ANY,50,ANY,ANY
GN-2015A-FT-23-23	J1347+5453	70.6 days	1:14:36	READY	GMOS imaging	70,70,80,ANY
GN-2015A-FT-23-24	J1504+3439	70.6 days	1:14:36	READY	GMOS imaging	70,70,80,ANY
GN-2015A-Q-8-16	ASASSN-14lp	∞	1:14:26	ON-HOLD	GNIRS	ANY,ANY,ANY,ANY
GN-2015A-Q-8-21	PTF15ku	∞	1:26:14	ON-HOLD	GNIRS	ANY,ANY,ANY,ANY
GN-2015A-Q-8-58	CSP15aak	∞	0:44:26	ON-HOLD	GNIRS	ANY,ANY,ANY,ANY
GN-2015A-Q-8-77	ASASSN-15hy	∞	1:02:38	ON-HOLD	GNIRS	ANY,ANY,ANY,ANY
GN-2015A-Q-8-109	SN275	∞	0:39:03	ON-HOLD	GNIRS	ANY,ANY,ANY,ANY
GN-2015A-SV-1-17	Pupil @ CR=0	8.8 days	0:06:30	READY	NIRI	ANY,50,ANY,ANY
GN-2015A-SV-1-41	Sky at zenith	8.8 days	0:07:30	READY	NIRI	ANY,50,ANY,ANY
GN-2015A-SV-51-8	BD+28 4211	∞	0:21:36	READY	GMOS R150	ANY,50,ANY,ANY
GN-2015A-SV-51-11	Hz 44	∞	0:24:06	READY	GMOS R150	ANY,50,ANY,ANY
GN-2015A-SV-51-14	G191B2B	∞	0:27:06	READY	GMOS R150	ANY,50,ANY,ANY
GN-2015A-SV-51-20	G191B2B	∞	0:28:00	READY	GMOS B600	ANY,50,ANY,ANY
GN-2015A-SV-51-74	Feige 34	∞	0:27:06	READY	GMOS R150	ANY,50,ANY,ANY
GN-2015A-SV-51-78	G191B2B	∞	0:30:24	READY	GMOS R400	ANY,50,ANY,ANY
GN-2015A-SV-51-81	G191B2B	∞	0:27:06	READY	GMOS R150	ANY,50,ANY,ANY

Windows Open Tomorrow 2015 Jun 24 05:57 → 2015 Jun 24 14:50 UT						
Observation ID	**Target**	**Window**	**Length**	**Status**	**Config**	**IQ,CC,BG,WV**
GN-2015A-FT-10-12	VCC1199	8.8 days	2:43:15	READY	NIFS LGS	70,50,ANY,ANY
GN-2015A-FT-10-30	VCC1199	8.8 days	2:43:15	READY	NIFS LGS	70,50,ANY,ANY
GN-2015A-FT-13-11	SDSS J0936+0046	8.7 days	0:48:30	READY	GMOS B600	ANY,70,50,ANY
GN-2015A-FT-13-13	SDSS J0830+1654	8.7 days	0:48:30	READY	GMOS B600	ANY,70,80,ANY
GN-2015A-FT-15-28	SGAS1110+6459 slit center	38.9 days	4:19:24	ONGOING	GMOS B600	70,70,50,ANY
GN-2015A-FT-15-32	SGAS1110+6459 slit center	38.9 days	2:17:42	READY	GMOS B600	85,50,50,ANY
GN-2015A-FT-16-25	SGAS2222p2745	37.3 days	0:47:48	READY	GMOS imaging	70,50,50,ANY
GN-2015A-FT-23-14	J1351+0816	69.6 days	0:47:20	FOR-REVIEW	GMOS B600 I F U - 2	ANY,50,ANY,ANY

Summary

- ToOs and Time Domain Observing: A Gemini Success Story
  - ToOs and time domain observations very well suited to multi-instrument queue operations
  - Have led to numerous high visibility science publications
  - Rapid ToOs send immediate alerts to queue observer and normally disrupt the nightly plan
  - Standard ToOs and other time domain observations integrated into the queue manually during the day by the queue coordinator
  - Recent software improvements (Queue Visualization) improve reliability for scheduling time domain observations
- With Room For Improvement
  - Automated queue scheduling not supported
  - Time constraints not considered when initially filling the queue
  - Timing Windows not fully integrated into queue planning