



Science Operations Update

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SOFIA Science Center

7 February 2017





SMO Leadership Changes



- Effective October 15, 2016 Hal Yorke became SMO Director
- DSI SMO Deputy Director Hans Zinnecker stepped down effective December 31, 2016
 - Hans will continue to work with the SOFIA project for 2018 Senior Review preparation
 - Hans will organize the German TAC scheduled for September 2017
- Effective January 30, 2017 Holger Jakob became acting SMO Deputy Director
 - DSI is preparing ad for SMO Deputy Director
 - German citizenship is not required

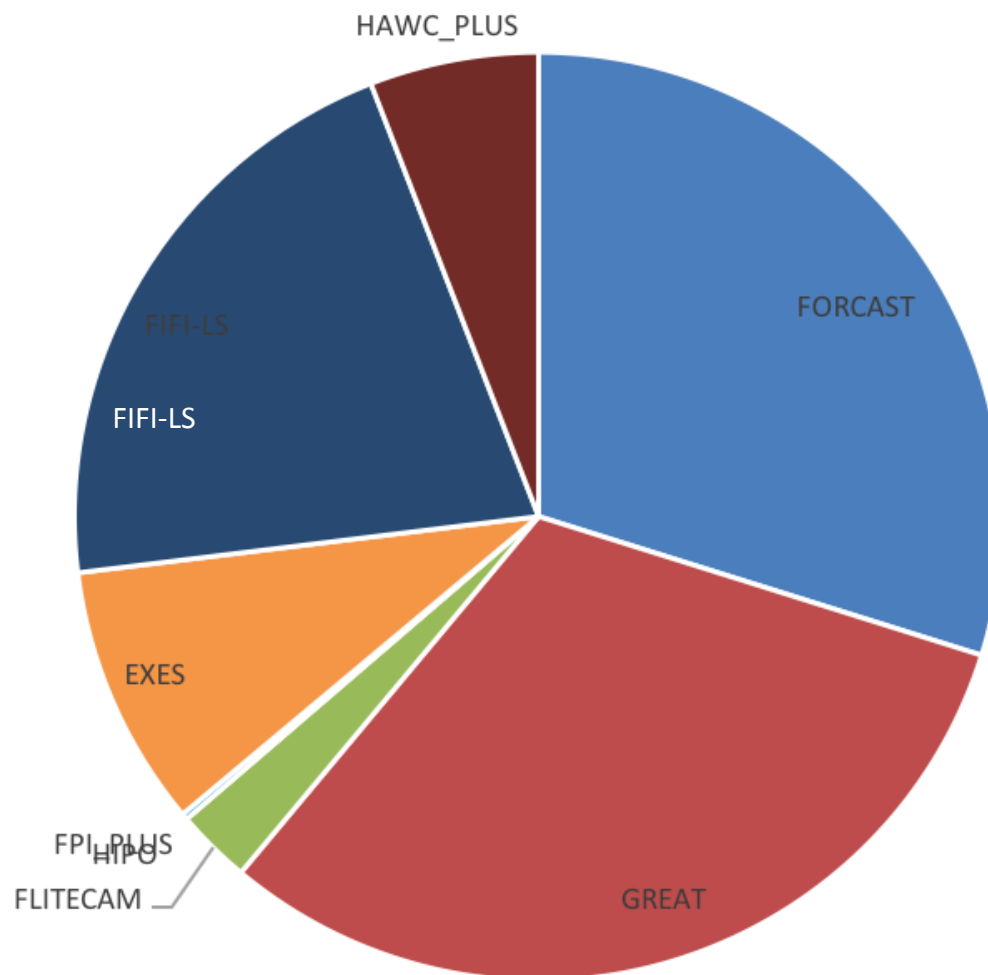




Cycle 4 General Investigator Time Usage



389 hrs were put into flight plans
for 123 awarded proposals



- EXES Echelon-cross-Echelle Spectrograph (PSI)
- FIFI-LS Field-Imaging Far-Infrared Line Spectrometer (FSI)
- FLITECAM First-Light Infrared Test Experiment Camera (PSI)
- FORCAST Faint Object InfraRed CAmera for the SOFIA Telescope (FSI)
- GI General Investigator
- GREAT German Receiver for Astronomy at Terahertz Frequencies (PSI)
- HIPO High Speed Imaging Photometer for Occultations (Special Purpos
- SSMO SOFIA Science Mission Operations





SOFIA Publications



- TOTAL: 76 (2/5/2016) refereed science papers
 - Does not include instrument, calibration, or observatory papers
 - Mostly from Cycle 3 data and earlier
- Most recent published papers:
 - *Different Origins or Different Evolutions? Decoding the Spectral Diversity Among C-type Asteroids*, Vernazza, P. et al. 2017, AJ 153, 72.
 - *Massive Star Formation in the LMC. I. N159 and N160 Complexes*, Gordon, M. S. et al. 2017, ApJ 834, 122.
- Working database of publications:
 - Data Cycle System, short link: <http://goo.gl/1t2uQt>
 - Includes preprints, linkage to SOFIA Instrument, Observing Cycle





goo.gl/1t2uQt

Author ▲ ▼	Title	Date ▲ ▼	Publication	Science Topic ▲ ▼	Keywords	Instruments ▲ ▼	Program	Data Source	Image	F
Gordon, M	Massive Star Formation in the LMC. I. N159 and N160 Complexes	2017-01	Accepted for publication in ApJ	Star formation		FORCAST	03_0049	CYCLE 3		
Vernazza, P	Different origins or different evolutions? Decoding the spectral diversity among C-type asteroids	2017-01	accepted to Astronomical Journal	Solar System		FORCAST	03_0014	CYCLE 3		
Rho, J	Discovery of Broad Molecular lines and of Shocked Molecular Hydrogen from the Supernova Remnant G357.7 0.3: HHSMT, APEX, Spitzer and SOFIA Observations	2017-01	2017ApJ...834...12R	Interstellar medium		GREAT	01_0059	CYCLE 1		
Fahion, K	Disentangling the ISM phases of the dwarf galaxy NGC 4214 using [CII] SOFIA/GREAT observations	2016-12	accepted to Astronomy & Astrophysics	Extragalactic and galactic center		GREAT	02_0063	CYCLE 2		
Lau, R	Evidence from SOFIA Imaging of Polycyclic Aromatic Hydrocarbon Formation along a Recent Outflow in NGC 7027	2016-12	2016ApJ...833..115L	Stars and stellar evolution		FORCAST	81_0015	BASIC SCIENCE		
Caratti o Garatti, A	Disk-mediated accretion burst in a high-mass young stellar object	2016-11	Nature Physics	Star formation		FIFI-LS FORCAST	04_0047	CYCLE 4		F
De Buizer, J	The SOFIA Massive (SOMA) Star Formation Survey: I. Overview and First Results	2016-11	submitted to ApJ	Star formation		FORCAST	02_0074 01_0045	CYCLE 2, CYCLE 1		
Fletcher, L	Jupiter's Para-H2 Distribution from SOFIA/FORCAST and Voyager/IRIS 17-37 μm	2016-11	2016Icar..278..128F	Solar System		FORCAST	02_0012	CYCLE 2		F
Fuller, L.	Investigating the dusty torus of Seyfert galaxies using SOFIA/FORCAST photometry	2016-11	2016MNRAS.462.2618F	Extragalactic and galactic center		FORCAST	02_0035	CYCLE 2		F
Salgado, F.	The Orion HII Region and the Orion Bar in the Mid-Infrared	2016-10	2016ApJ...830..118S	Interstellar medium		FORCAST		SHORT SCIENCE		
Green, J	The Mid-Infrared Evolution of the FU Orionis Disk	2016-09	astroph preprint	Star formation		FORCAST	04_0146	CYCLE 4		





Cycle 5 Progress



- Call issued: April 29, 2016 ✓
- Call update: June 10, 2016 ✓
- US Proposal deadline: July 1, 2016 ✓
- German TAC deadline: July 8, 2016 ✓
- US TAC: 17-19 Aug 2016 ✓
- German TAC: September 1-2, 2016 ✓
- Selections announced: 24 October 2016 ✓
- Nominal Cycle 5 observing period:
4 February 2017 – 1 February 2018.
– First observing series (OC5-A upGREAT starts tonight)





Major Changes from Cycle 4



- HIPO not offered as a Guest Investigator Instrument. Use of HIPO available through Guaranteed Time Observations assigned to PI.
 - High-speed visual photometry still available through the Focal Plane Imager Plus (FPI+)
- FLITECAM not offered for Southern Deployment in Cycle 5
- HAWC+ offered only as a Shared-Risk instrument
- For GREAT, the H-channel operating at 4.7 THz offered as in previous Cycles. The CfP offered the possibility that H-channel observations will be done with the High Frequency Array.





Policies Continued in Cycle 5

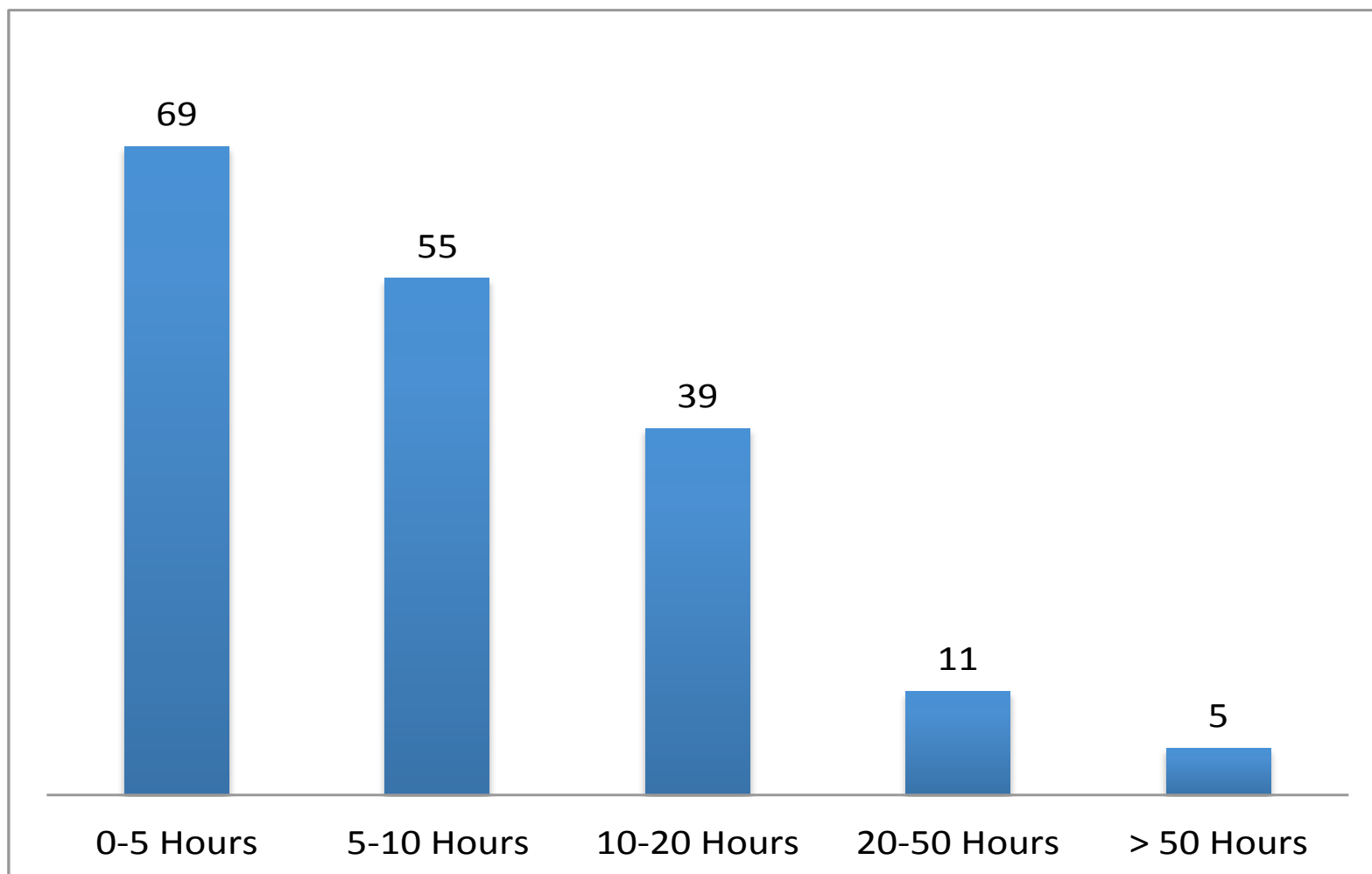


- Large “Impact” proposals were encouraged
 - Mechanism for dividing time 80:20 between US and Germany for large proposals maintained
 - Utility of large impact proposals needs to be reviewed
- High Level of Guest Investigator funding maintained





US Queue Proposal Size Distribution

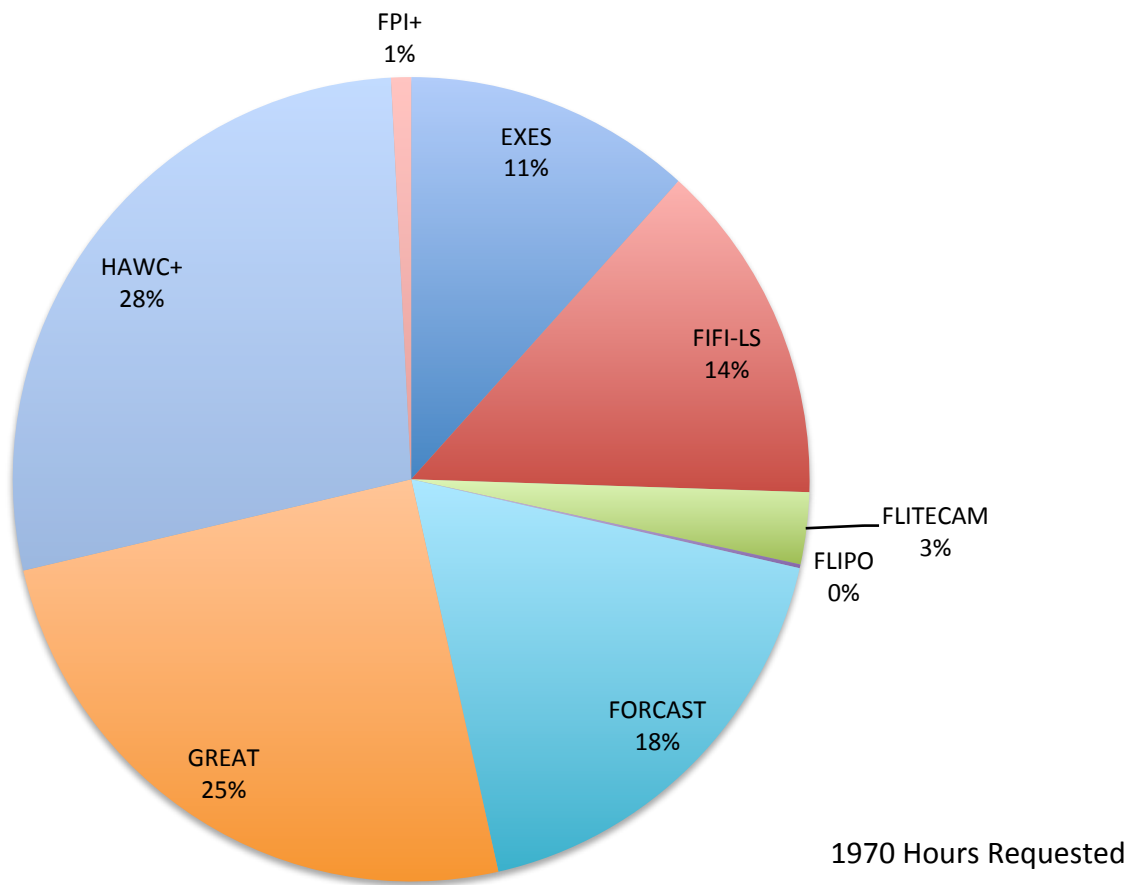




SOFIA Cycle 5



Combined Cycle 5 Requests

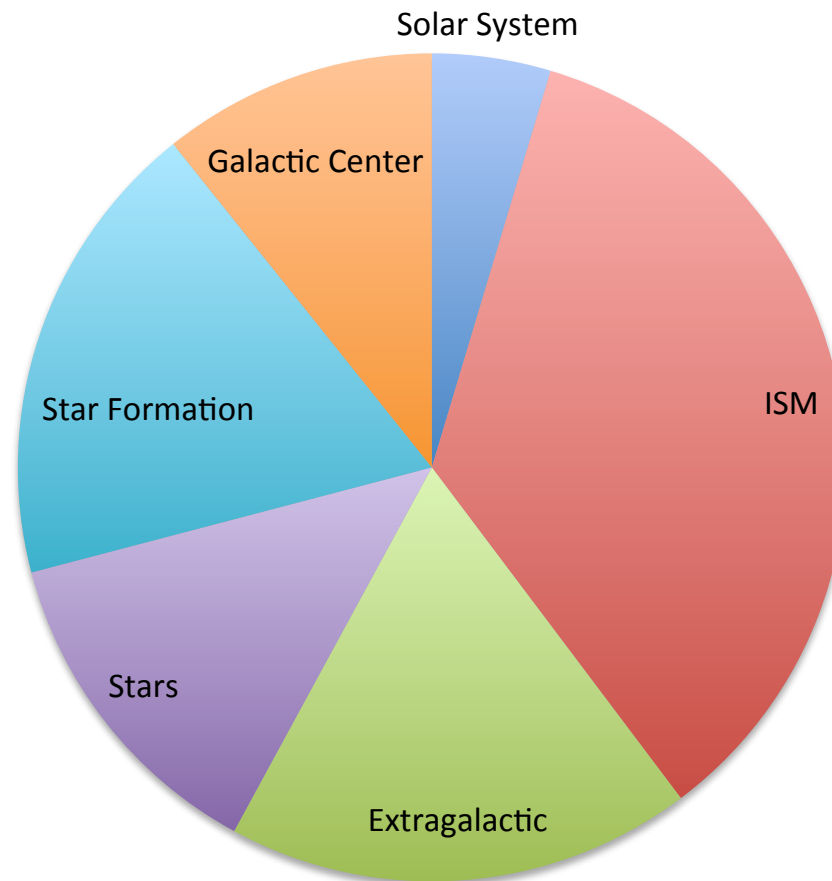




SOFIA Cycle 5

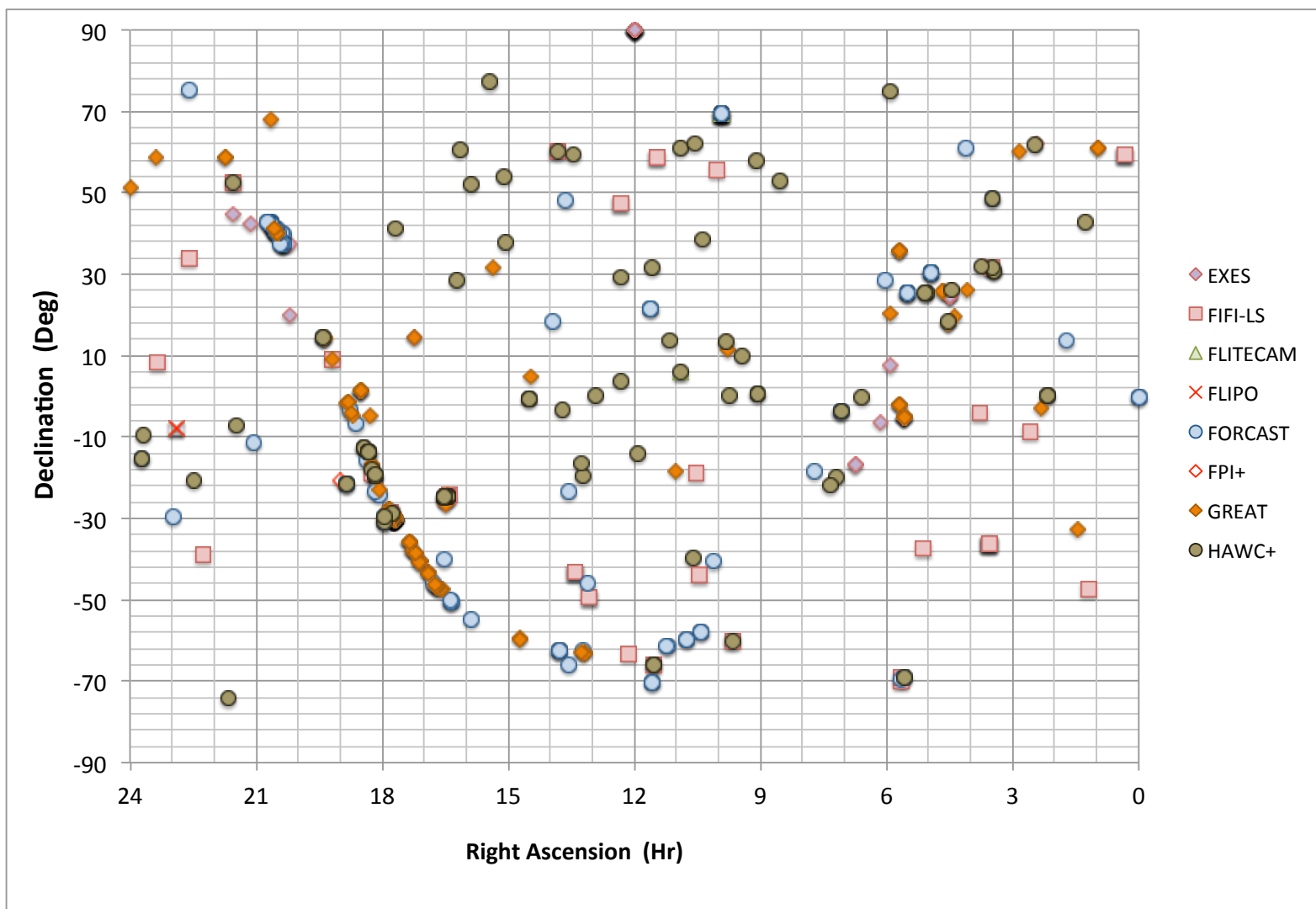


Science Areas by Hours





Target Distribution: Cycle 5 Selected Targets





Hours Awarded vs. Hours Scheduled



Instrument	Award Hours	Needed Flights	PMB Science Flights
EXES	92.1	17	17
FIFI-LS	68.5	12	13
FLITECAM *	9.0	3	3
FORCAST	99.4	18	18
GREAT	138.3	26	24
HAWC+	126.7	25	27
FPI+ *	0.7	0	0
TOTAL	534.6	100	102

Note: Currently, there are no hours planned for deferral to Cycle 6

Note: Needed flights calculated assuming 5.5 hours on-target science observation time (i.e. excluding calibration and setups) per flight for all SI except HAWC+, which assumed 5 hr per flight (due to lower hold time). For FLITECAM we added 1 flight to account for the Triton occultation.

* FLITECAM awards are planned to be performed in the FLIPO configuration. FPI+ observations for accepted proposal 05_0002 will occur during its associated FORCAST flight





Science Highlight: Galactic Center



Four very highly rated proposals were selected to investigate the Galactic Center with upGREAT

- [CII] Mapping

- 05_0076 Bally – “Impact Program: The Outer CMZ C+ Survey”

- 05_0022 Harris & 05_0033 Guesten – “Joint Impact Proposal: Mapping C+ Across the Galaxy's Central Molecular Zone”

- [O I] Mapping

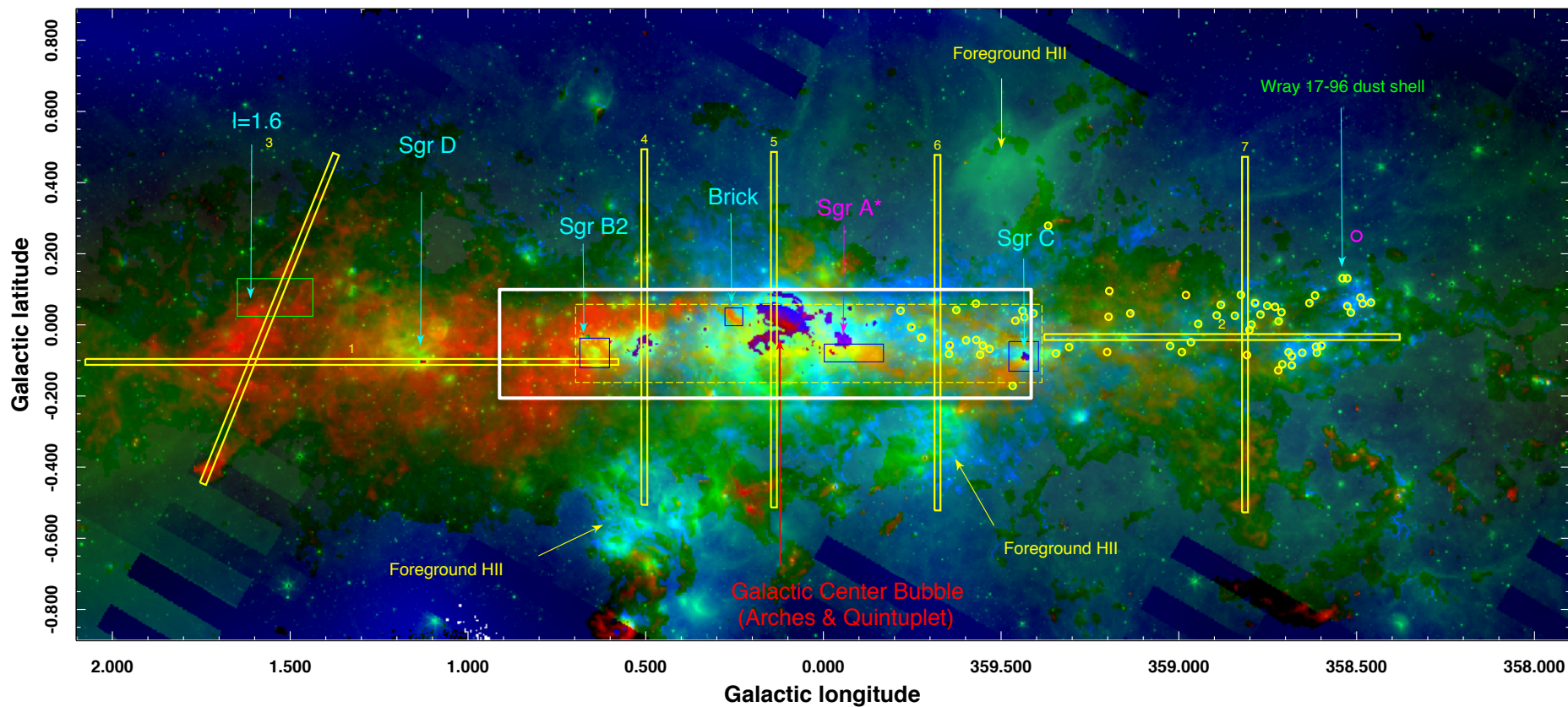
- 05_0021 Ragan – “Cooling and kinematics in the Central Molecular Zone”

- 05_0102 Morris – “Characterizing Neutral Gas in the Central Parsec of the Galaxy”





Comparison of Mapped Regions



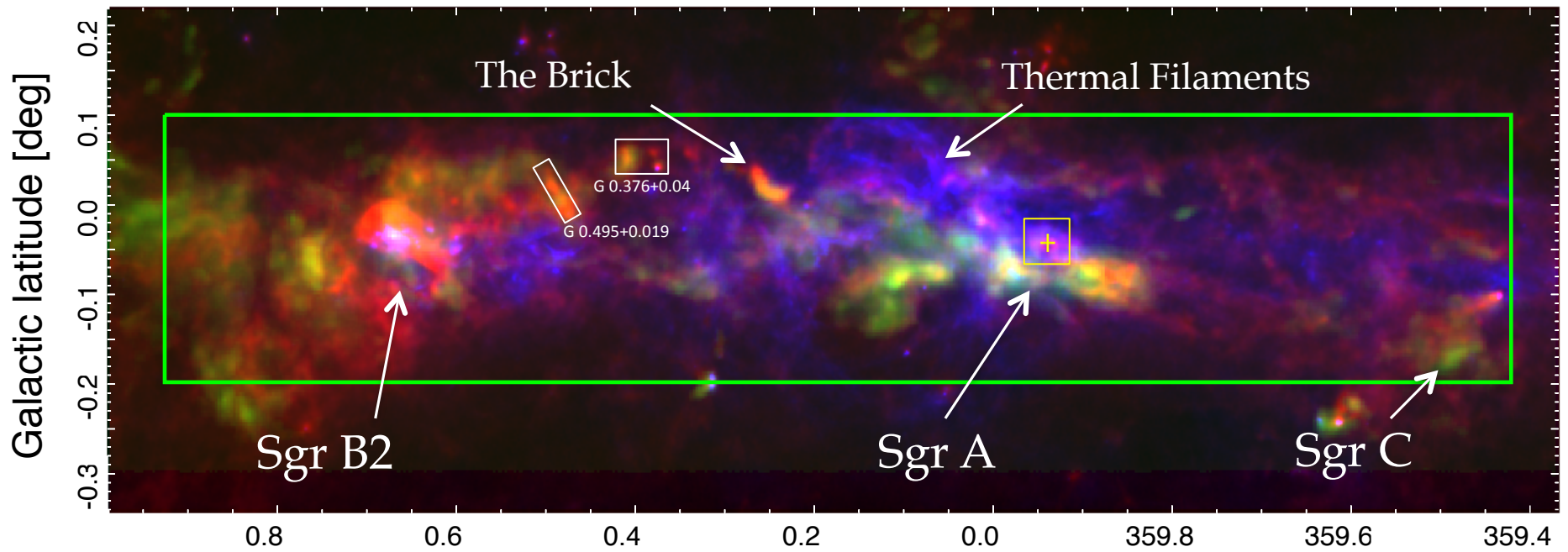
Yellow: 05_0076 Bally

White: 05_0022/0033 Harris-Güsten





Ragan and Morris Fields



White Boxes: 05_0022 Ragan

Yellow Box: 05_0102 Morris

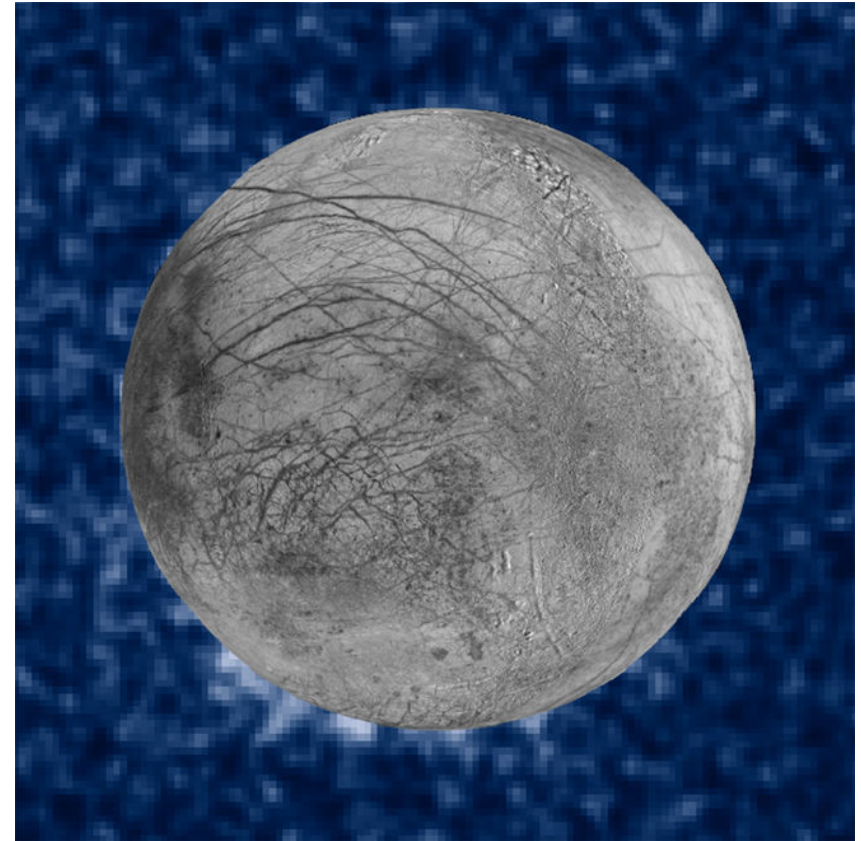




Science Highlight: Water on Europa



- 05_0153 Sparks
“Confirmation of Water Plumes on Europa”
- Observations with EXES at $6.27 \mu\text{m}$ to confirm HST observations of water plumes on the moon of Jupiter
 - Vibrational band of H_2O
- These observations would provide input to planning for mission in development to send a probe to Europa

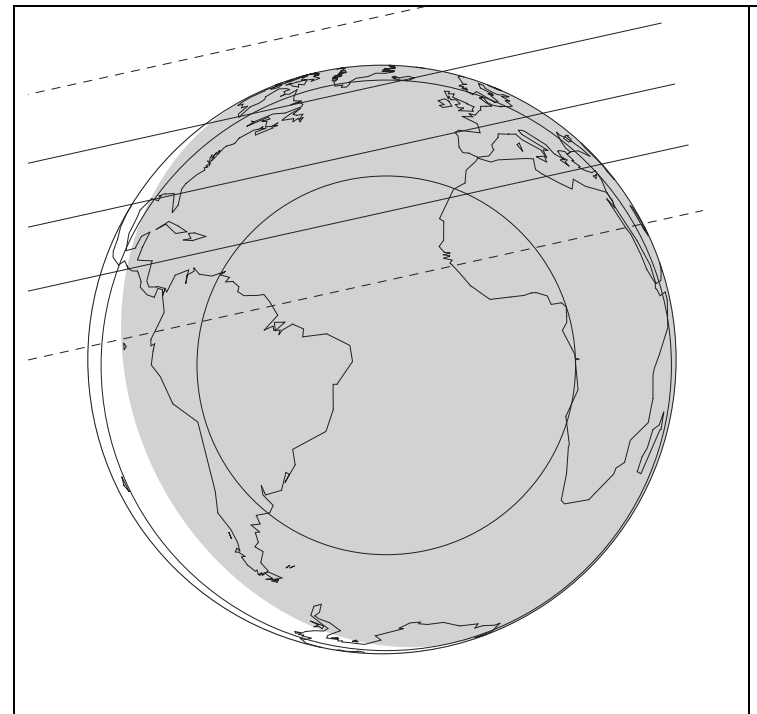




Science Highlight: Occultation of Triton



- GTO observation of occultation of star by moon of Neptune on 2016-Oct-06
- 05_0125 Person – “A New Look at Triton's Atmosphere”
 - Proposal was evaluated by TAC and rated Excellent/Very Good
 - Will be conducted using GTO time
- Requires a mini-deployment to the US East Coast (Daytona Beach?)

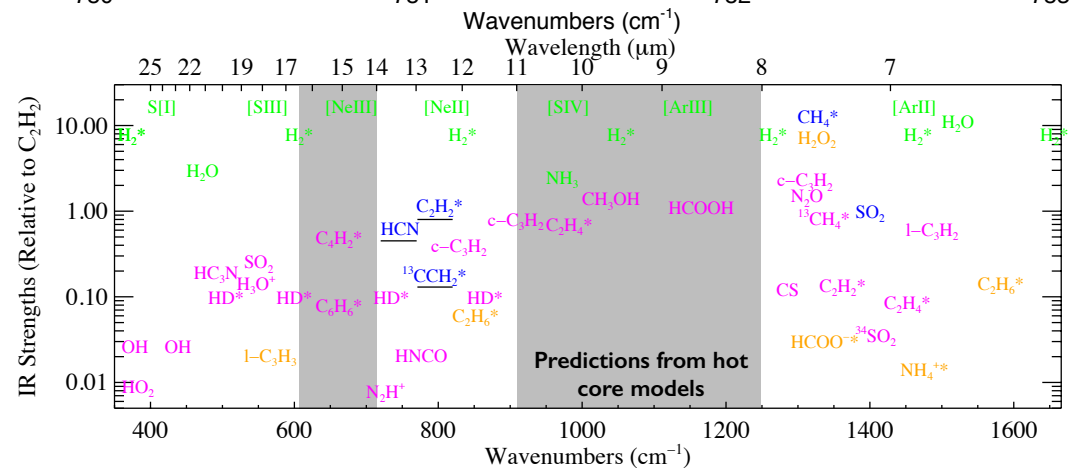
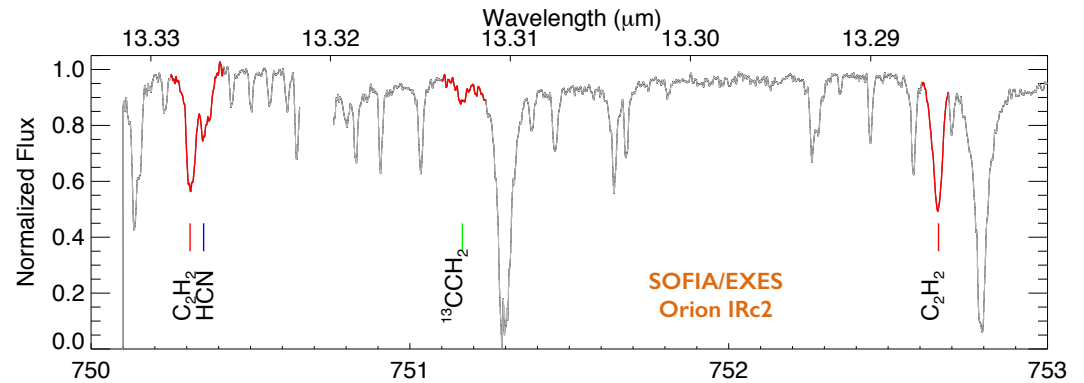




Science Highlight: High Resolution Spectral Survey



- 05_0043 Naseem Rangwala
An EXES High-Resolution Molecular Line Survey towards Orion IRc2
- Mid-infrared survey of the spectrum of gas towards Orion IRc2, a prototypical hot-core source.
- Unprecedented resolving power ($R = 50,000$) will be 5 to 50 times more powerful than ISO in identifying narrow lines
- Study will provide a wealth of information on hot core chemistry



• IR bands detected towards IRc2 • Not detected in IR towards IRc2 • Never detected in ISM • Very bright/not to scale

- Spectrum from Cycle 3 pilot program toward IRc2
- Likely molecules from hot core models

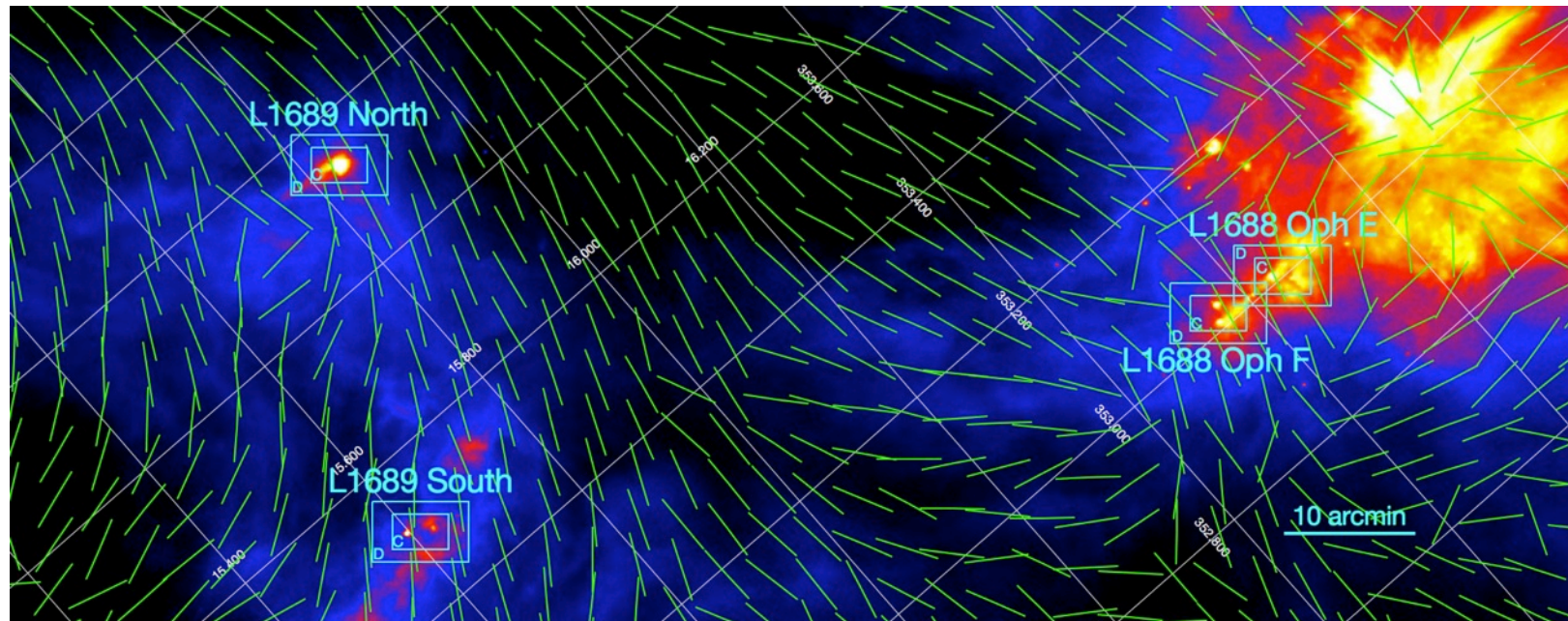




Science Highlight: Studying Magnetic Fields



- 05_0133 Novak - “Joint HAWC+/ALMA study of magnetic fields in Ophiuchus”
- HAWC+ will have 35x better angular resolution than the Planck polarimeter and provides a bridge to the very much higher resolution observations of ALMA



Large scale B-field directions from Planck 850 μm polarimetry superposed on Herschel 160 μm dust emission

Individual targets are being studied using ALMA

