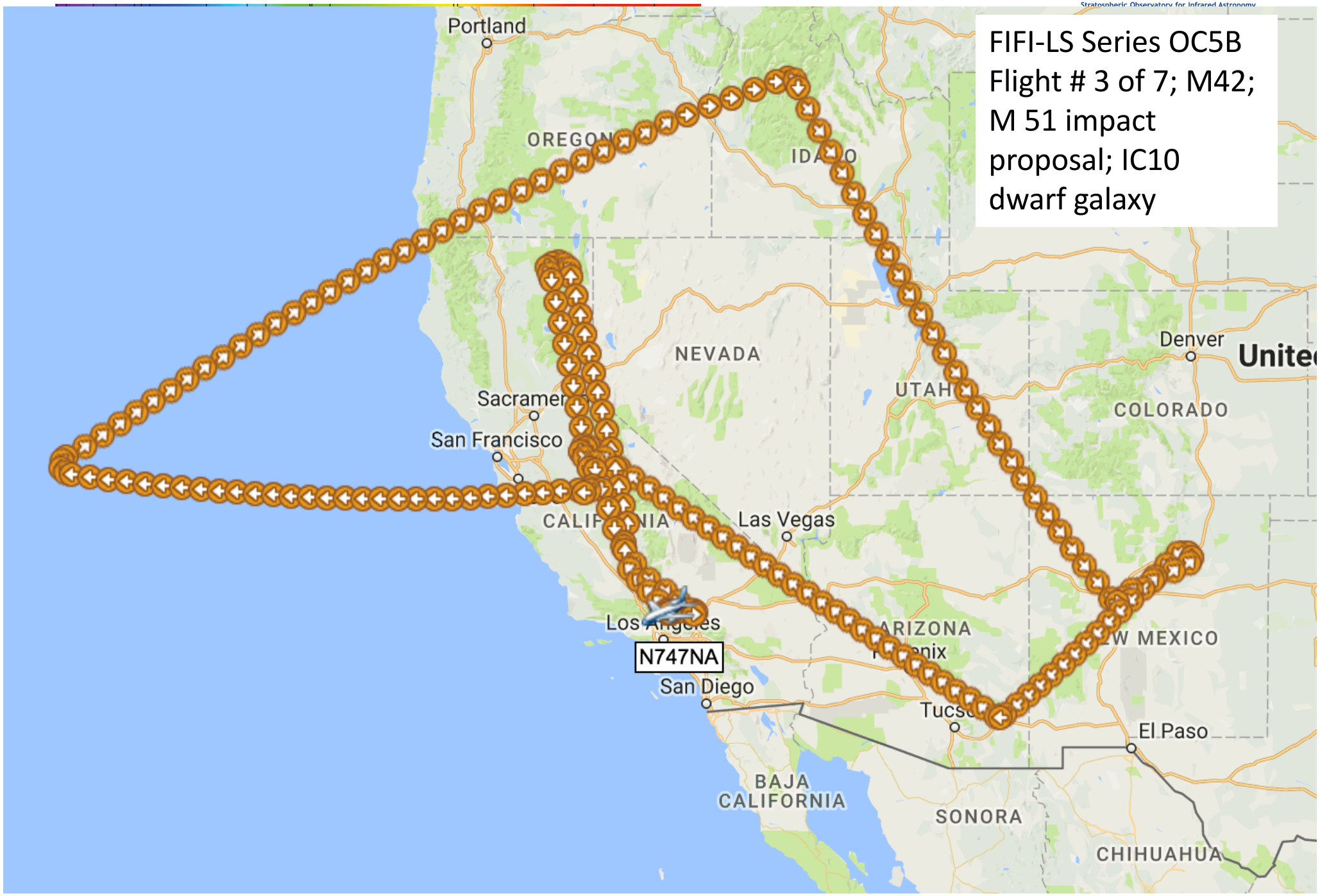
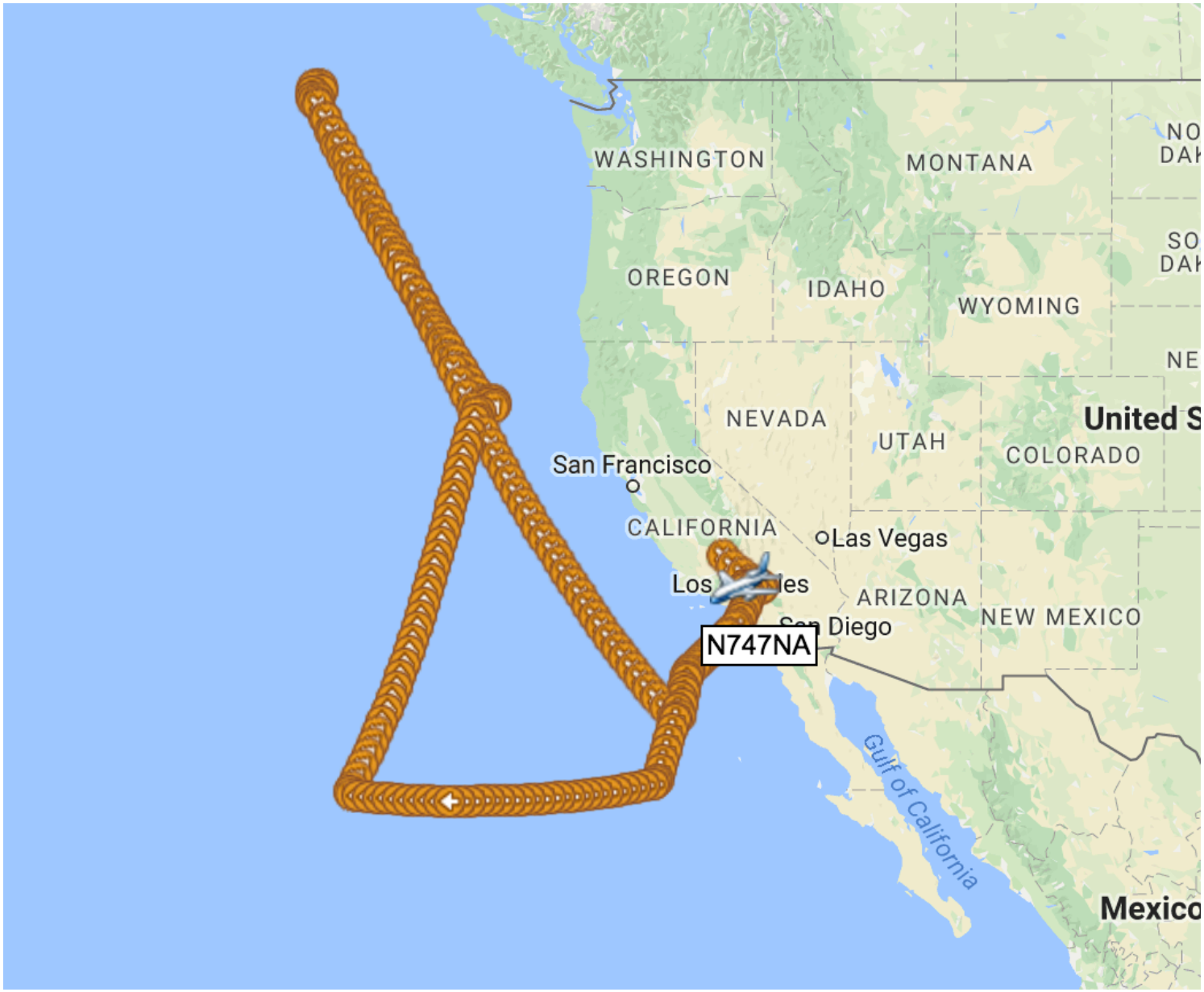
Cycle 5 – at a glance
Feb 5, 2017 – Jan 1, 2018

Kimberly Ennico Smith
SOFIA Project Scientist
2017-03-02
SOFIA International Summit

What happened (Feb 28th - Mar 1st))



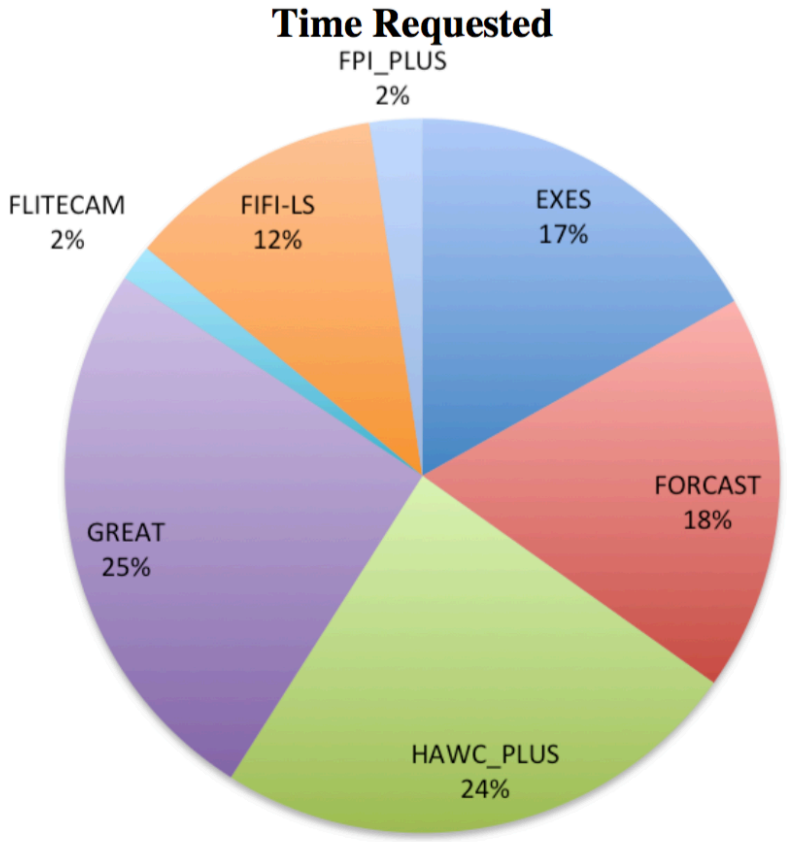
What's happening just now!



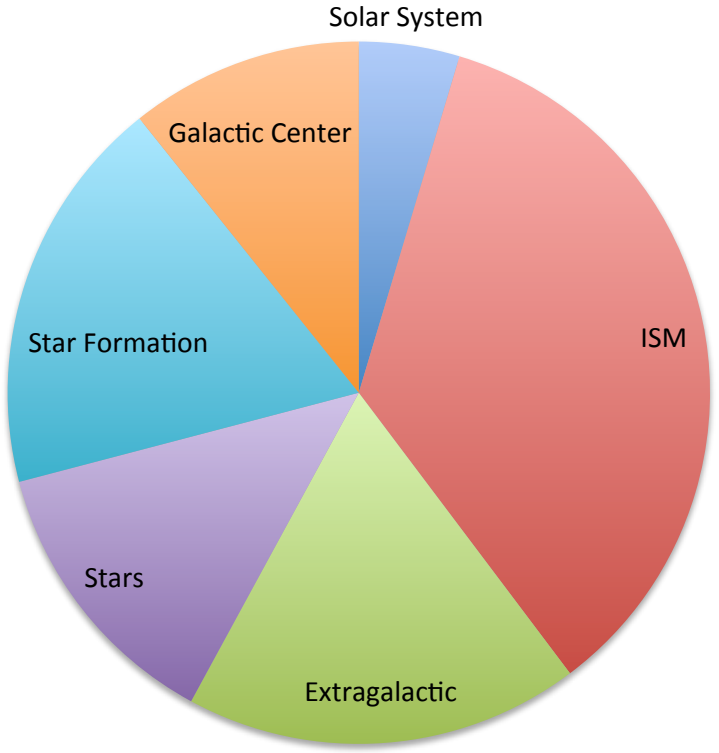
FIFI-LS Series OC5B Flight # 4 of 7; In the air now! M42, NGC1333, S255 M51, NGC 5633, ~Landing 10:30 UT

Cycle 5 – Science Demand

- 206 Submitted Proposals
- 92 Awarded Proposals



1970 hrs (US+DE) requested

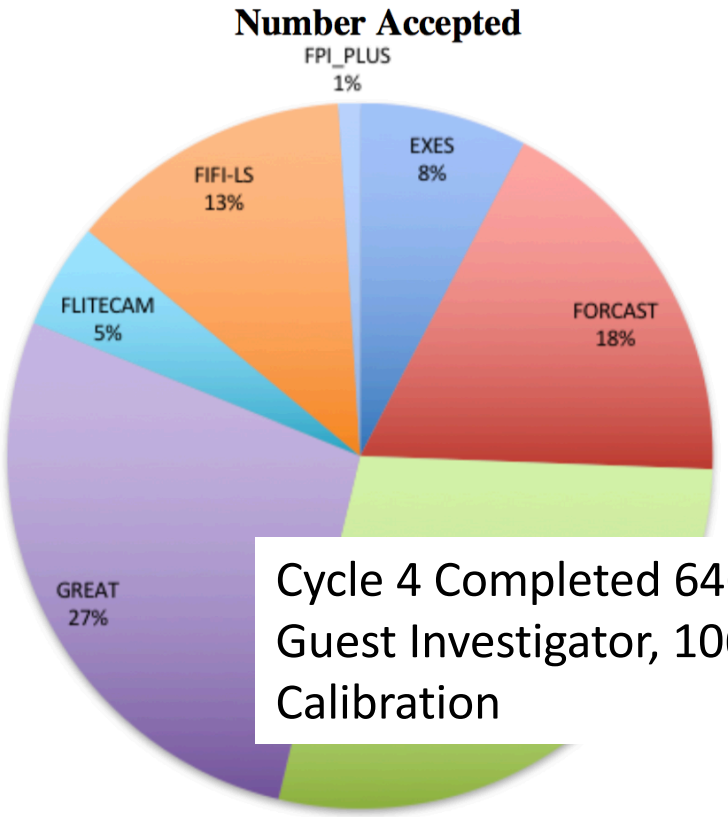


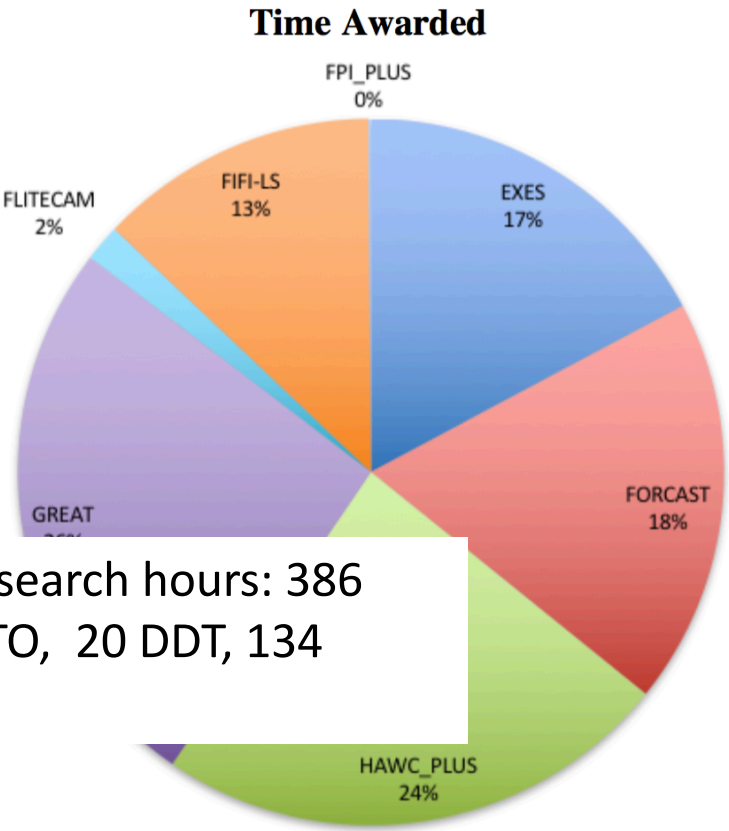
Science area by hours

Cycle 5 – Baseline Plan

- 7 Instruments in Use
- 3 New Capabilities (HAWC+, upGREAT 4G/LFA/HFA*)
- 3 Instrument Southern Deployment (upGREAT, FIFI-LS, FORCAST)
- 102 Science Flights (baseline)
- 758 Research Hours (baseline) 505 Guest Investigator, 100 GTO, 45 DDT, 108 Calibration

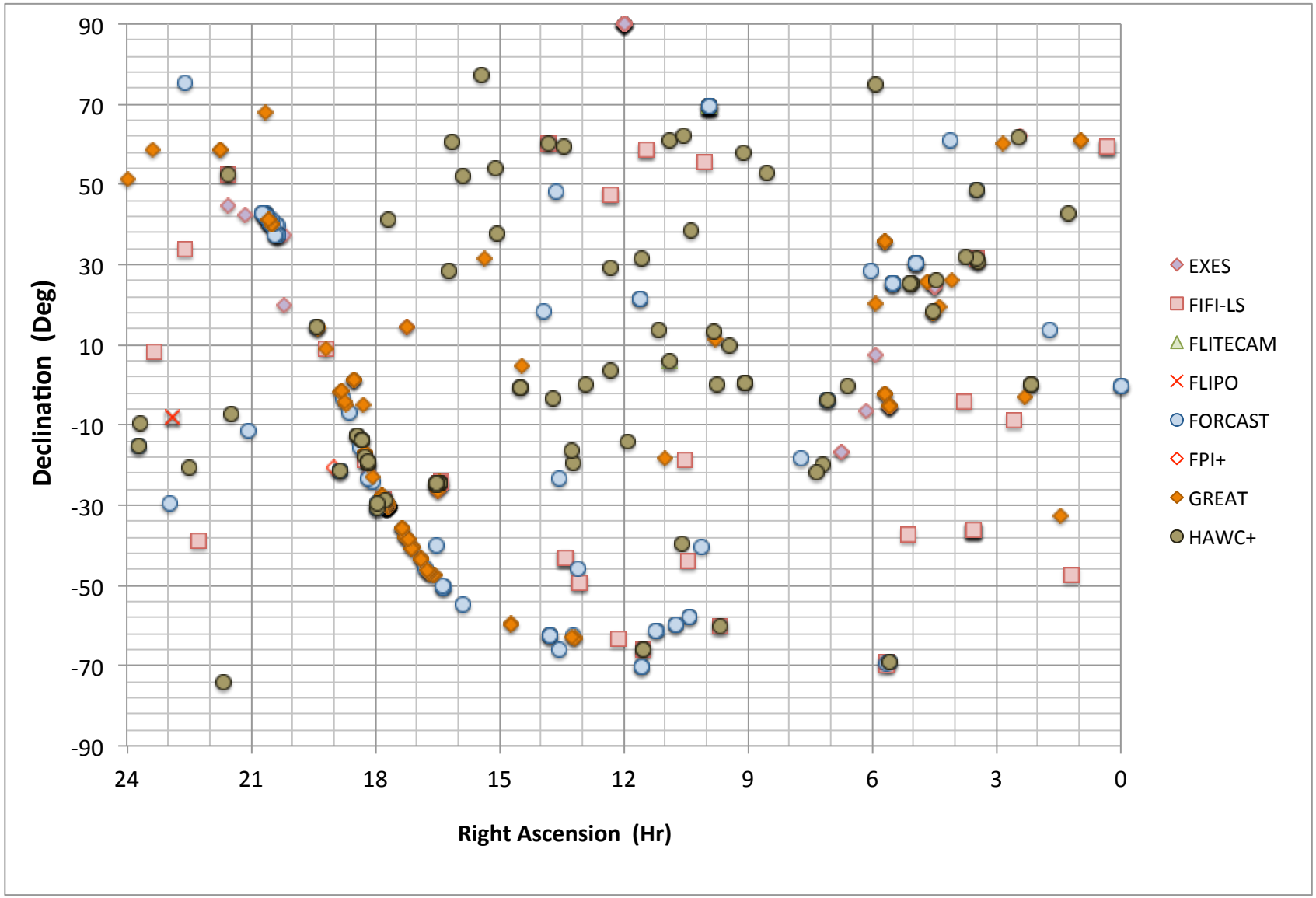
*two cryocoolers





Cycle 4 Completed 646 research hours: 386 Guest Investigator, 106 GTO, 20 DDT, 134 Calibration

Target Distribution: Cycle 5 Selected Targets



Cycle 5 – Large Proposals (>13 hrs)

- 05_0041 (Tielens) – "EXES Survey of the Organic Inventory of Hot Cores"; 27 hours; EXES.
- 05_0043 (Rangwala) – "An EXES High-Resolution Molecular Line Survey towards Orion IRc2"; 30 hours; EXES.
- 05_0008 (De Buizer) – "Revealing the Embedded Structures and Sources within Giant HII Regions: Wrapping up the Survey"; 15 hours; FORCAST
- 05_0022 (Harris) & 05_0033 (Guesten) – "Joint Impact Proposal: Mapping C+ Across the Galaxy's Central Molecular Zone"; 15 hours; upGREAT.
- 05_0076 (Bally) – "Impact Program: The Outer CMZ C+ Survey"; 14 hours; upGREAT.
- 05_0063 (Guzman-Ramirez) – "Understanding the Nebular Abundance Discrepancy Problem with SOFIA"; 14 hours; FORCAST
- 05_0129 (Tremonti) – "Probing Dust-obscured Star Formation and AGN Activity in Massive Ultra-compact Galaxies"; 13 hours; HAWC+.
- 05_0002 (Woodward) – "Comet NEOs 41P and C/2015 V2 – The FORCAST Story"; 13 hours; FORCAST

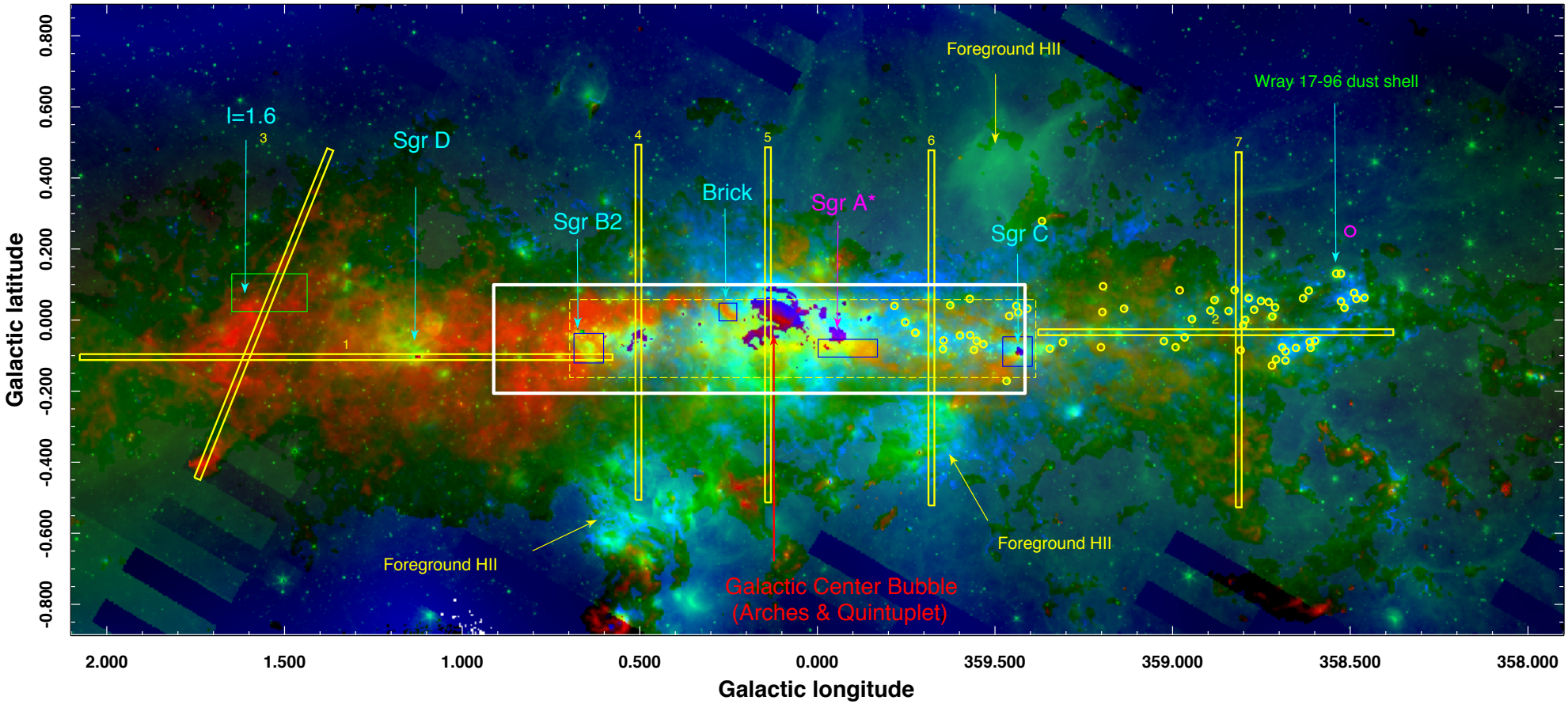
Cycle 5 Highlight – Galactic Center

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"

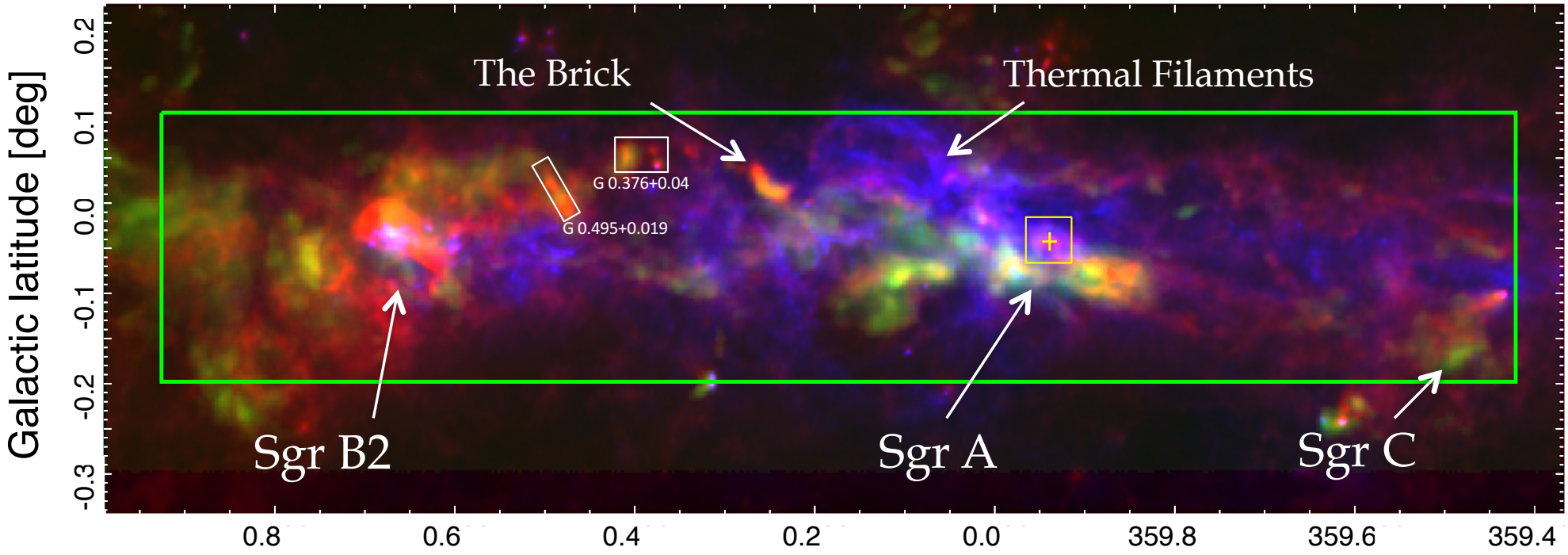
Comparison of Mapped Regions



Yellow: 05_0076 Bally

White: 05_0022/0033 Harris-Güsten

Ragan and Morris Fields



White Boxes: 05_0022 Ragan
Yellow Box: 05_0102 Morris

Cycle 5 Highlight – Water on Europa

- 05_0153 Sparks "Confirmation of Water Plumes on Europa"
- Observations with EXES at 6.27 μm (H_2O vibrational band) to confirm HST observations of water plumes on the moon of Jupiter.
  - SOFIA observations Mar 15 & May 26
  - HST observations Mar 12 & 23
- These observations would provide input to a future Europa probe mission.

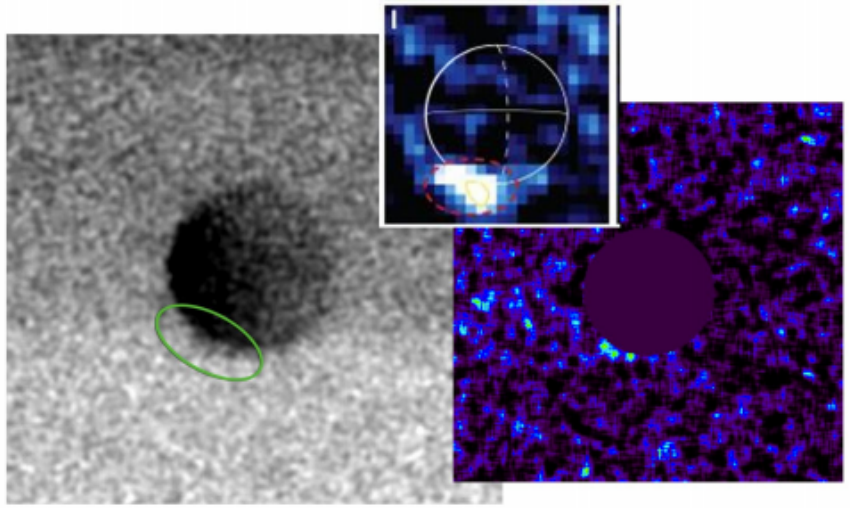
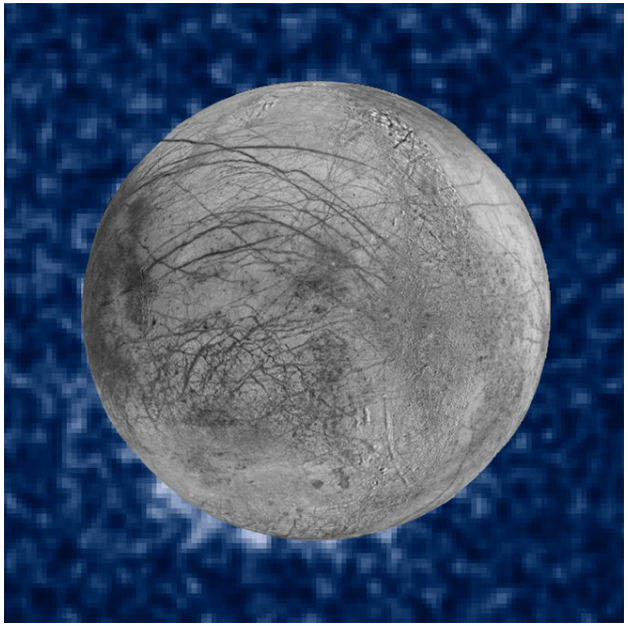
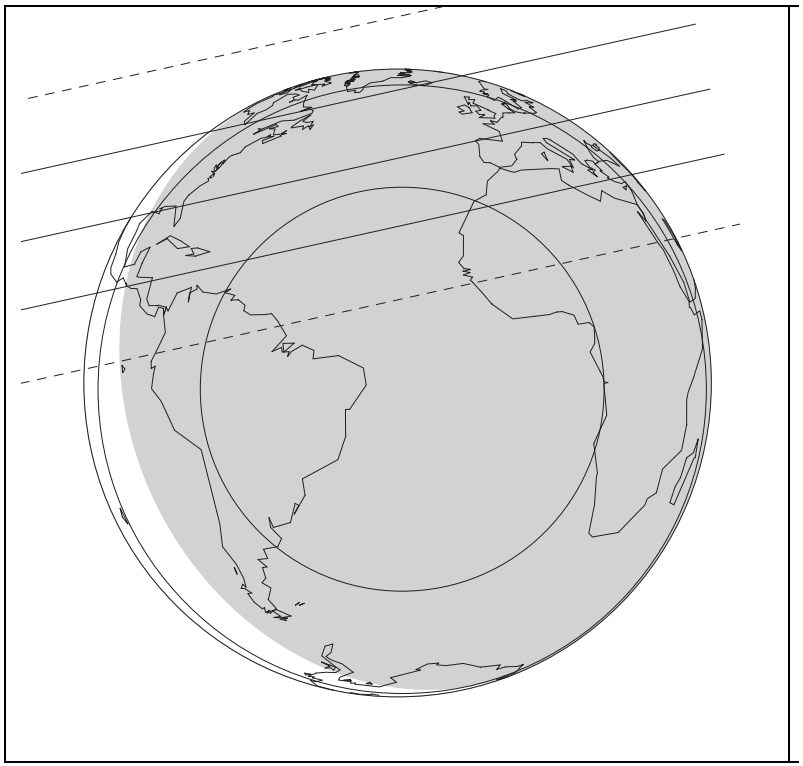


Fig. 1. Left, STIS transit image Jan 2014 with ellipse indicating dark off-limb features. Upper center, "plume" image from Roth et al (2014). Lower right, probability image for transit, indicating significance, formally (Sparks et al 2016). Peak is ~4.0σ.



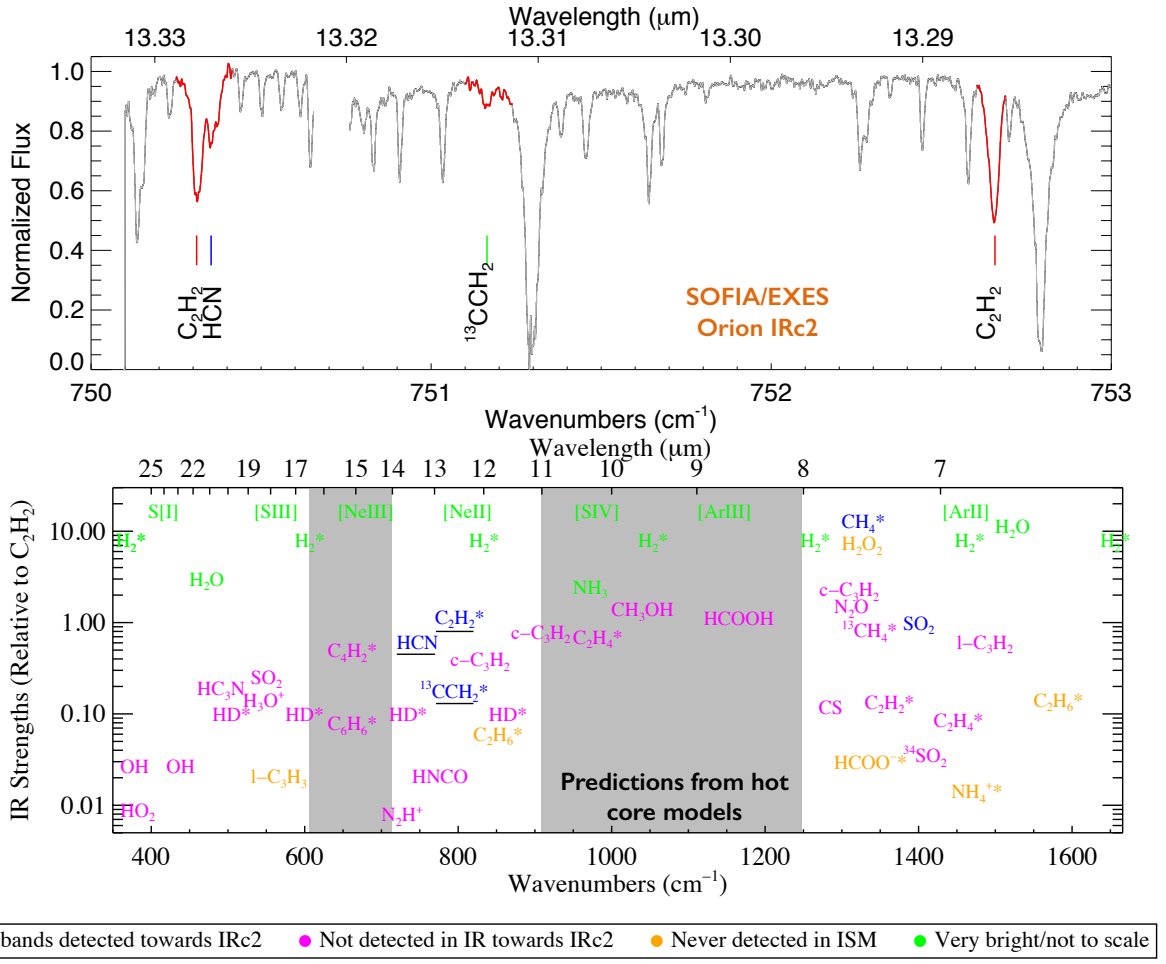
Cycle 5 Highlight - Occultation of Triton

- 05_0125 Person – "A New Look at Triton's Atmosphere"
- To characterize the atmosphere of Neptune's moon Triton. Monitoring of Triton's expanding atmosphere has not been re-examined since 2001.
- FLITECAM/HIPO observations of Trion occulting a R=12 mag star Oct 6, 2017.
- Will be conducted using GTO time.
- Requires a mini-deployment to the US East Coast.



Cycle 5 Highlight - High Resolution Spectral Survey

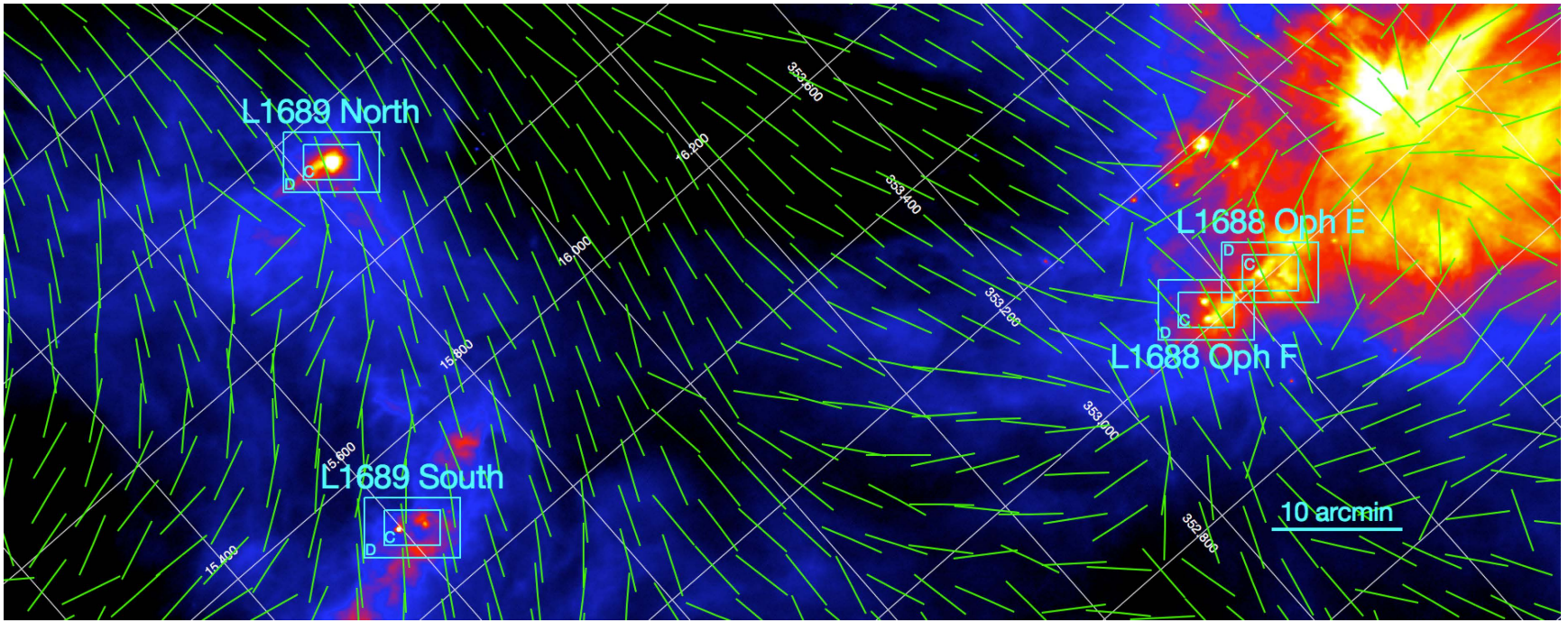
- 05_0043 Naseem Rangwala
  An EXES High-Resolution Molecular Line Survey towards Orion IRc2, a prototypical hot-core source.
- Unprecedented resolving power (R = 50,000) will be 5 to 50 times more powerful than ISO in identifying narrow lines
- Study will provide a wealth of information on hot core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



a) Spectrum from Cycle 3 pilot program toward IRc2
b) Likely molecules from hot core models

Cycle 5 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.

Back-up Charts

FEBRUARY 2017

SOFIA

Stratospheric Observatory for Infrared Astronomy

Cycle 5 Daily Overview – Page 1 of 2

SOFIA
Stratospheric Observatory for Infrared Astronomy

OC#4 N (upGREAT)

Cycle 5 Start

OC#5 A (upGREAT LFA)							
7 Flights							
S	S	M	T 371	W 372	T 373	F	S
4	5	6	7	8	9	10	11
Feburary -- 2017							

Cryo Descision Gate — Europa

OC#5 A (upGREAT LFA)							SI Rem				OC#5 B (FIFI-LS)															SI Rem	OC#5 C (EXES)									
											SI Install	SI Install	7 Flights																SI Install			SI Install	6 Flights				
S	M 374	T 375	W 376	T 377	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Feburary -- 2017																						March -- 2017													

MS

				Eng LO				Maintenance / Upgrades #13								Safety											Chk Flt	OC#5 D (FORCAST)								
				SI Rem	MD Inst.											Day	CR									SI Install	SI Install	Eng LO			LO (H)	6 Flights				
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	
19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
March -- 2017													April -- 2017																							

Europa

					OC#5 E (HAWC+)																						OC#5 F (EXES)									
				SI Rem	SI Install			SI Install	9 Flights																	SI Rem	SI Install			SI Install	3 Flights				
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	
23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		
April -- 2017					May -- 2017																															

OC#5 F (EXES)					OC#5 G (upGREAT HFA/LFA)															OC#5 H (upGREAT) NZ																		
		SI Rem	SI Install	SI Install	SI Install	SI Install	7 Flights													Aircraft Prep						Ferry - 2 flts Time			Media	Orient	8 Flights HFA/LFA				Post	Down
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	
28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1		
May -- 2017					June -- 2017																															

FPI+ MU69

OC#5 H (upGREAT)																OC#5 I (FIFI-LS)															OC#5 J (FORCAST)						
Prep	HFA/LFA				Swap	Down	Prep	MU69	4G/HFA	Post	Prep	4 Flights 4G/HFA			SI Rem.	SI Install		Down	6 Flights			Post	Prep					SI Rem.	SI Install		Down	6 Flights		Post	Prep	
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	S	M	T	W	T	F	S	
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5		
July -- 2017																														August -- 2017						

Key Observing Cycle: 5 Baseline Science Flights: 102 Baseline RHs: 758 Planned Science Flights: 104 Estimated RHs*: 766 (*Year to date + Estimate) *PMB sequence approval: 2/13/17*

- S / 7 — **Weekend day** (black text with no fill)
- *H* / 4 — **US or German Holiday** (day of week box H or GH w/ red fill)
- F / 6 — **Instr. Commissioning Flight** (bold white text, purple fill, bold border)
- F / 6 — **Observing Flight** (bold white text, blue fill, bold border)
- F / 6 — **Ferry/Maint./Non-Sci Flight** (bold white text, green fill, bold border)
- ★F / 6 — **Educator on Flight** (white star on day of week)
- F / 6 — **Return to Base (RTB) Flight** (single slash through day and date)
- F / 6 — **Work day** (black text w/ day box grey fill)
- F / 6 — **Line Operations** (bold border)
- F / 6 — **Contingency Instr. Comm. Flight** (day box with purple fill)
- F / 6 — **Contingency Obser. Flight** (day box with blue fill)
- F / 6 — **Contingency Ferry/Maint./Non-Sci Flt** (day box with green fill)
- ★F / 6 — **Media/VIP on Flight** (yellow star on date)
- F / 6 — **Canceled Flight** (x through day and date)
- F / 6 — **AFRC Regular Day Off** (day and date shown in red)
- F / 6 — **Possible Maint/Up. Check Flt** (day and date box filled with lt. green)
- F / 6 — **Deployment Observing Flights** (bold white text, light blue fill, bold border)
- S / 28 — **Short Flight** (colored fill only lower half, bold bdr.)
- S / 13 — **Half Sci. & Half Ferry/Maint./Non-Sci** (two colored fill)
- ✓ — **Restored Flight** (check mark below day)
- F / 6 — **Strategic Capacity** (orange fill on day of week)

Cycle 5 Daily Overview – Page 2 of 2

Tour Eclipse — MS

OC#5 J (FORCAST)																MD Inst.	Maintenance / Upgrades #14																		OC#5 K (HAWC+
				Prep			Ferry PMD		Crew Rest				SI Rem.			Eng LO	CR													Eng LO	Chk Flt	MD Rem	SI Install	
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9
August -- 2017																										September -- 2017								

Triton Occul

OC#5 K (HAWC+)																				OC#5 L (FLIPO)																OC#5 M (FORCAST)					
	SI Install				9 Flights									SI Rem	SI Install			SI Install	Ferry		Triton	Ferry	3 Flights					SI Rem	SI Install	SI Install										
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14
September -- 2017																				October -- 2017																					

OC#5 M (FORCAST)														OC#5 N (HAWC+)																												MD Inst.
6 Flights												SI Rem	SI Install			SI Install	9 Flights																								SI Rem	FerryHAM
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
October -- 2017														November -- 2017																												

Maintenance / Upgrades #15 w/ 'C Check'																																										
A/C in dock/ prep for maint.						C-Check / Warranty CPCP / Deferred Items																																				
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
November -- 2017													December -- 2017																													

MS — AAS 231st Meeting - National Harbor, MD

Maintenance / Upgrades #15 w/ 'C Check'											OC#5 'O' (EXES)																																
Schedule Margin			Gnd Chk	FCF Flt	Release	FerryPMD			Eng LO	MD Rem	SI Install	SI Install	Ferry DC		Tour -Strategic Capacity			Prep	Ferry							8 Flights																		
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
December -- 2017								January -- 2018																																		

PMB Approved — Cycle 6 Start

OC#5 'O' (EXES)								OC#6 A																								OC#6 B									
				SI Rem	SI Install			SI Install																				SI Rem	SI Install			SI Install									
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3
January -- 2018				February -- 2018																												March -- 2018									

Key

Observing Cycle: 5 Baseline Science Flights: 102 Baseline RHs: 758 Planned Science Flights: 104 Estimated RHs*: 766 (*Year to date + Estimate) *PMB sequence approval: 2/13/17*

S 7	**Weekend day** (black text with no fill)	*H* 4	**US or German Holiday** (day of week box H or GH w/ red fill)	F 6	**Instr. Commissioning Flight** (bold white text, purple fill, bold border)	F 6	**Observing Flight** (bold white text, blue fill, bold border)	F 6	**Ferry/Maint./Non-Sci Flight** (bold white text, green fill, bold border)	★ F 6	**Educator on Flight** (white star on day of week)	F 6	**Return to Base (RTB) Flight** (single slash through day and date)
F 6	**Work day** (black text w/ day box grey fill)	F 6	**Line Operations** (bold border)	F 6	**Contingency Instr. Comm. Flight** (day box with purple fill)	F 6	**Contingency Obser. Flight** (day box with blue fill)	F 6	**Contingency Ferry/Maint./Non-Sci Flt** (day box with green fill)	★ F 6	**Media/VIP on Flight** (yellow star on date)	F 6	**Canceled Flight** (x through day and date)
F 6	**AFRC Regular Day Off** (day and date shown in red)	F 6	**Possible Maint/Up. Check Flt** (day and date box filled with lt. green)	F 6	**Deployment Observing Flights** (bold white text, light blue fill, bold border)	S 28	**Short Flight** (colored fill only lower half, bold bdr.)	S 13	**Half Sci. & Half Ferry/Maint./Non-Sci** (two colored fill)	✓	**Restored Flight** (check mark below day)	F 6	**Strategic Capacity** (orange fill on day of week)