



---

# Scientific Productivity of SOFIA

William T. Reach

SOFIA Users Group #9  
November 2015





# Measuring Productivity

---

## 1. Status of GI Projects

Allows interaction with GIs, assessment of needs, ability to determine corrections to policies

## 2. Publications

Measures rate of production of scientific results and their impact.

## 3. Production split by SI

Allows assessment of scientific production by instrument to inform decisions related to the instrument suite.





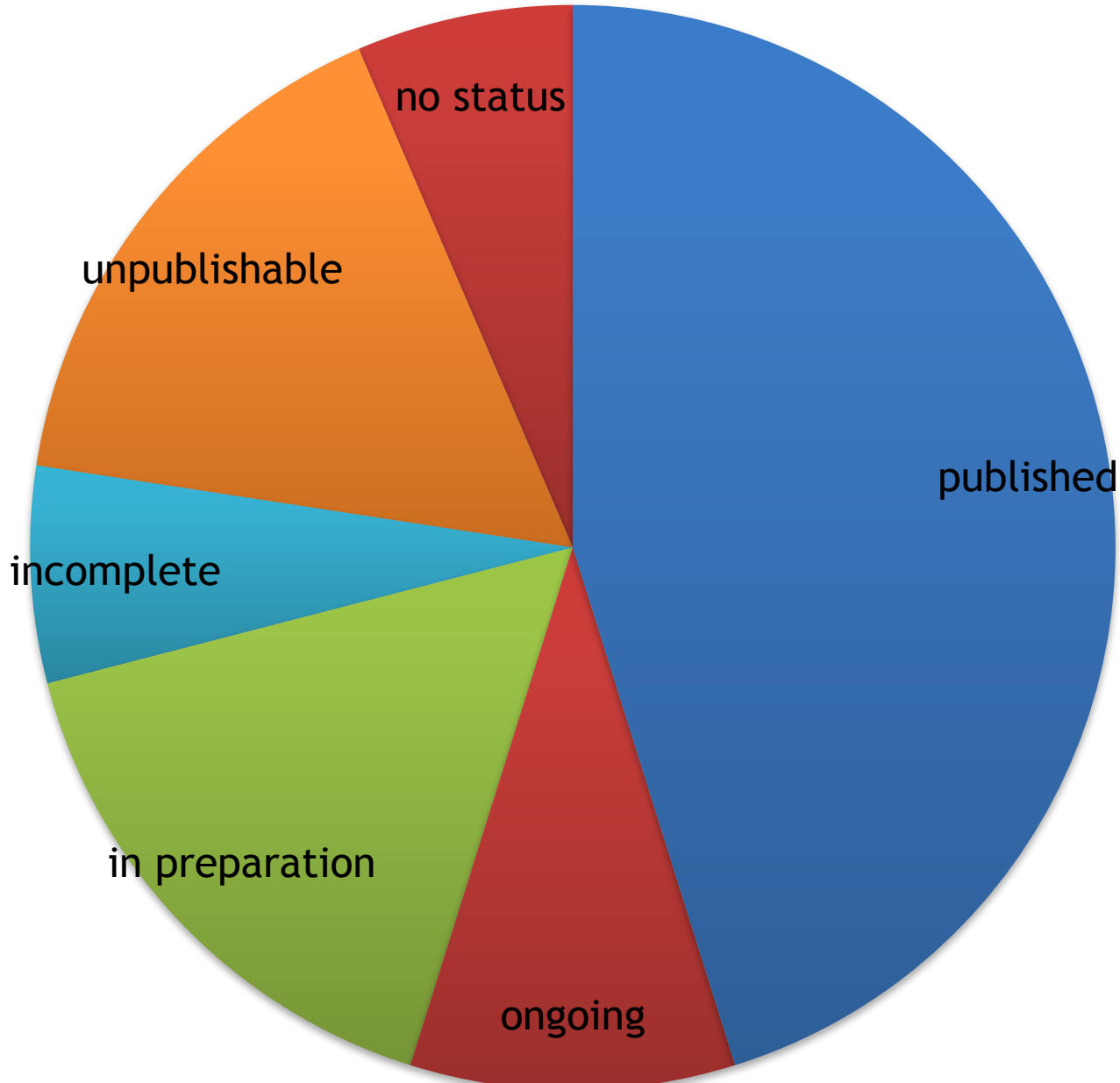
# 1. Status of Guest Investigator Projects

---

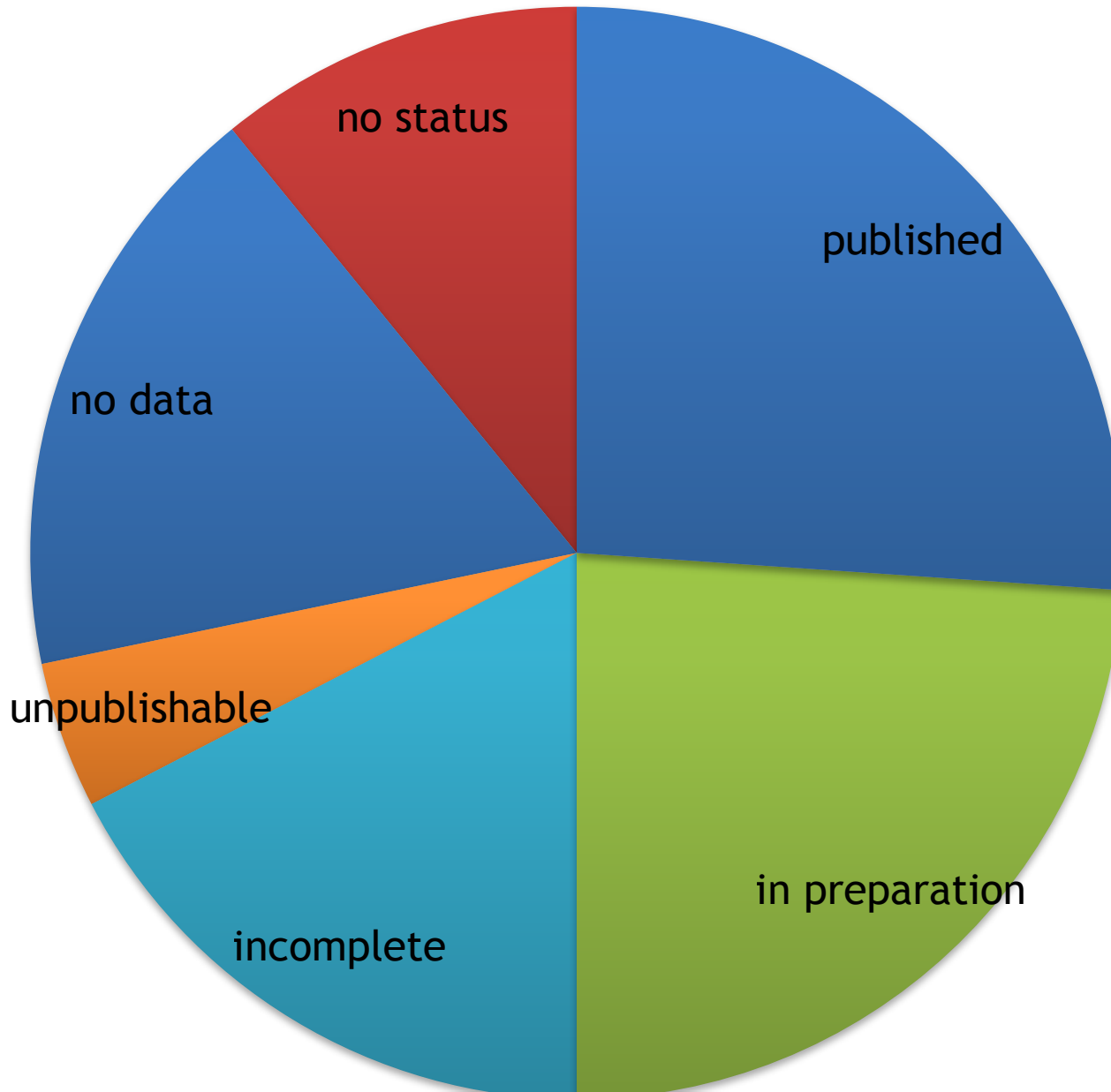
Each project dispositioned into one of these categories:

- **Published:** refereed journal article using data
- **Ongoing:** will be combined with upcoming observations
- **In preparation:** GI working on draft/plans to write
- **Not reduced:** calibrated data not yet available
- **Incomplete:** less than half of proposed observations complete, or GI indicates cannot publish subset
- **Unpublishable:** GI or SMO believe scientific results will never be obtainable with the acquired data

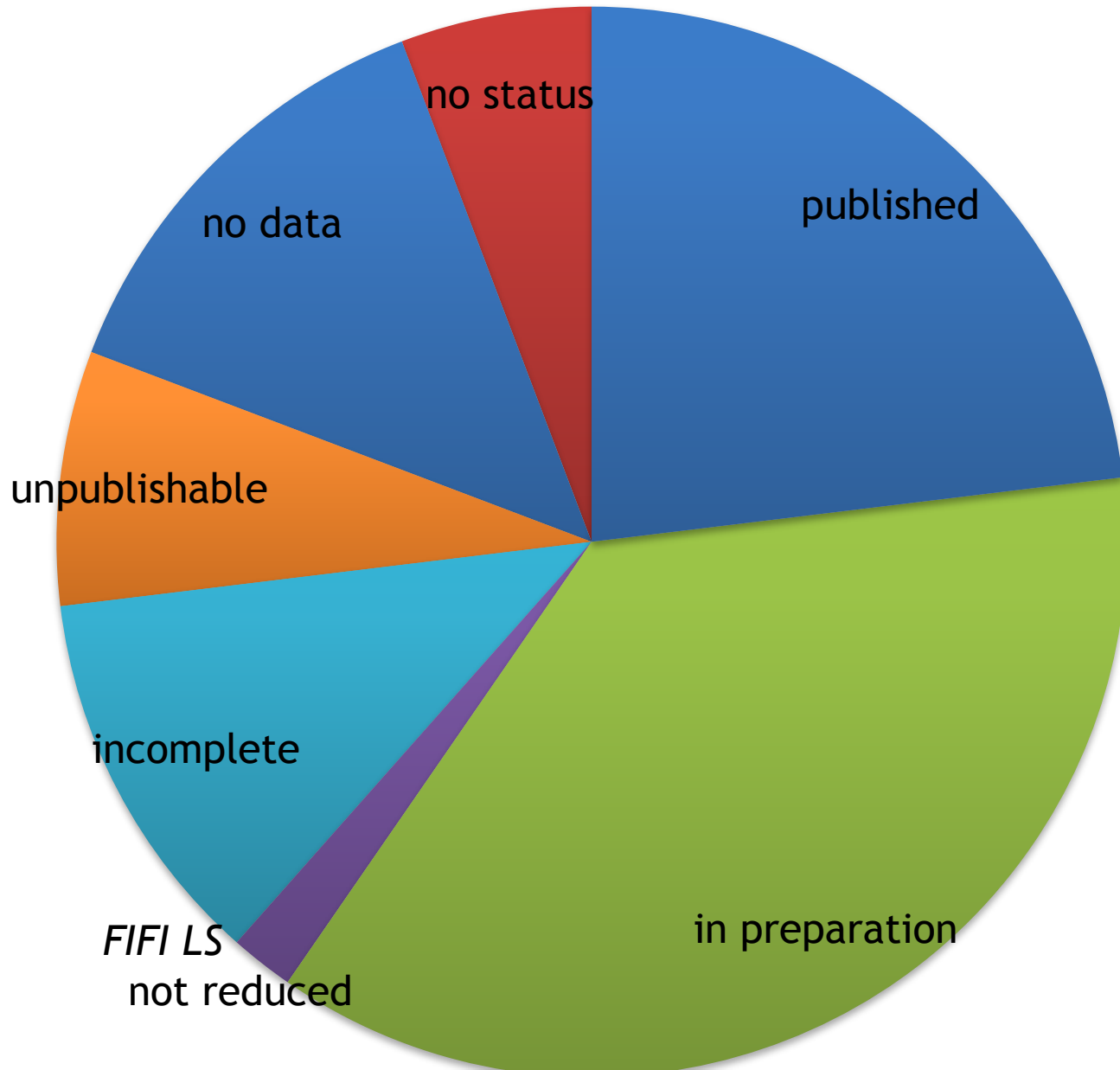
# (accepted projects that got some data)



# Cycle 1



# Cycle 2





# Implications of Project Status Study

- Incomplete projects squandered SOFIA time
  - 12% of BS-Cycle2 proposals incomplete
  - Observatory reliability: 89% dispatch rate
  - If we plan for 100% of time, many programs will be incomplete
- Mitigations are now in place for incompletions
  - For Cycle 4, we scheduled contingency flights, to be used when a flight is cancelled. Including 1 contingency for 10 flights should account for *isolated* missed flights.
    - Contingencies already exercised in OC4A, OC4B, OC4D (*tonight*)
  - For Cycles 3 and 4 we also carry over the highest-ranked observations to following Cycles
    - Top 5% are considered “guaranteed”

# EXAMPLE: actual usage of contingency flight

Baseline  
14 Jan 2016

← Cycle 4 Start

OC#4 A FORCAST																		OC#4 B FIFILS										
SI Install	LO	8 Flights																SI Rem	SI Install	OC#4 B FIFILS								
S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	H	T	W	T	F	S	S	M	T	W	T	F	S
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

February -- 2016

Contingency exercised

Feb 25: electrical bus and UPS problems that could not be fixed in time for flight. Exercised option to fly Mar 3.

OC#4 B FIFILS

9 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
28	29	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

March

HAWC+ Comm Pt 1

LO	PI - SI Work	3 Commissioning Flights						SI Rem./install MD		Safet							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

April -- 2016

OC#4 D upGREAT

10 Flights										OC#4 E upGREAT																		
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	H	T	W	T	F	S	S	M	T	W	T	F	S	
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

May -- 2016

May 26: contingency exercised due to problems last week

OC#4 E upGREAT

GREAT								OC#4 F																				
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	
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

June -- 2016

OC#4 G FORCAST

8 Flights												3 Commissioning 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	
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

July -- 2016

Key		Observing cycle: 4				Planned science flights: 101				RHS*: 808				* Max available research hours				
<b>S</b> 7 Weekend day (black text with no fill)	<b>H</b> 4 US or German Holiday (day of week box H or GH w/ red fill)	<b>F</b> 6 Work day (black text w/ day box grey fill)	<b>F</b> 6 Line Operations (bold border)	<b>F</b> 6 Possible Maint/Up. Check Fit (day and date box filled with lt. green)	<b>F</b> 6 Instr. Commissioning Flight (bold white text, purple fill, bold border)	<b>F</b> 6 Contingency Instr. Comm. Flight (day box with purple fill)	<b>F</b> 6 Deployment Observing Flights (bold white text, light blue fill, bold border)	<b>S</b> 28 Short Flight (colored fill only lower half, bold bdr.)	<b>F</b> 6 Observing Flight (bold white text, blue fill, bold border)	<b>F</b> 6 Contingency Obser. Flight (day box with blue fill)	<b>F</b> 6 Ferry/Maint./Non-Sci Flight (bold white text, green fill, bold border)	<b>F</b> 6 Contingency Ferry/Maint./Non-Sci Fit (day box with green fill)	<b>S</b> 13 Half Sci. & Half Ferry/Maint./Non-Sci (two colored fill)	<b>F</b> 6 Educator on Flight (white star on day of week)	<b>F</b> 6 Media/VIP on Flight (yellow star on date)	<b>F</b> 6 Return to Base (RTB) Flight (single slash through day and date)	<b>F</b> 6 Canceled Flight (x through day and date)	<b>U</b> Notional Unfunded Flight (yellow fill with U below day)
<b>F</b> 6 AFRC Regular Day Off (day and date shown in red)	<b>F</b> 6 Restored Flight (check mark below day)																	





## 2. Publications

---

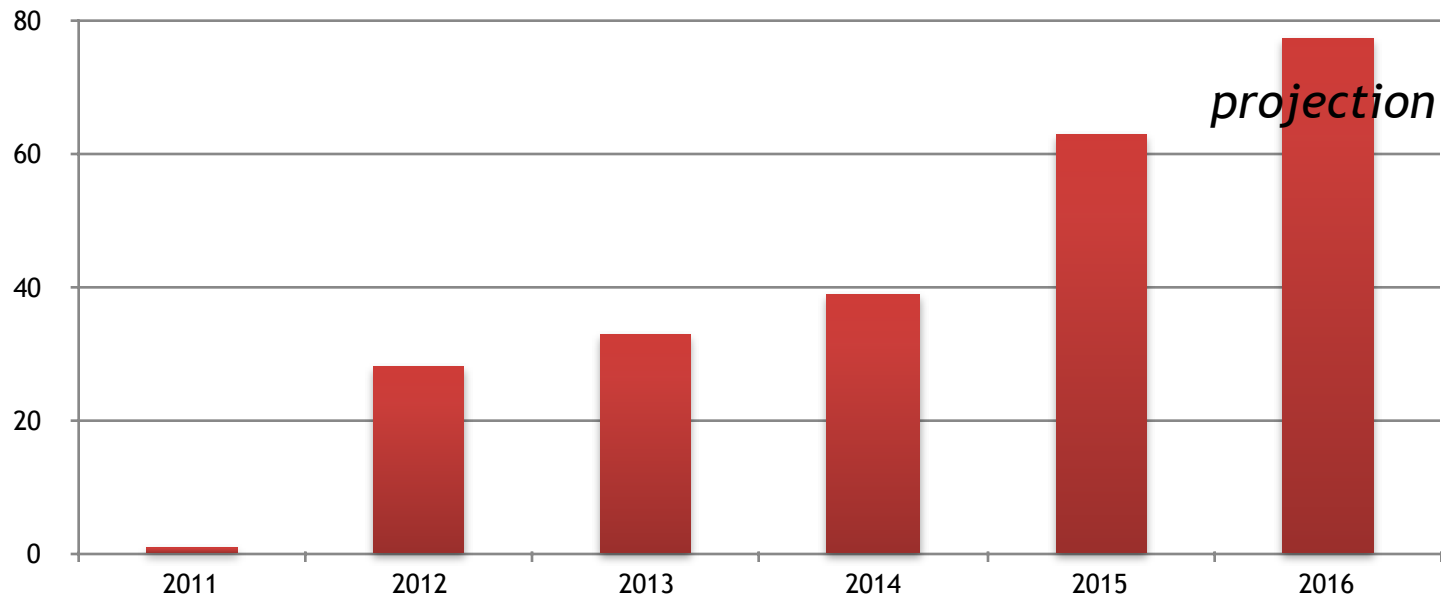
- Publication tracking is on our website; new database
  - <https://www.sofia.usra.edu/Science/publications>
  - <https://dcs.sofia.usra.edu/dataRetrieval/SofiaPublications.jsp>
  - Allows tracking and linkage to features of Data Cycle System
- Target publications per hour
  - Metric in the SOFIA Outreach Plan: 20 hrs/paper
  - Count all science flights with 8 hrs/flight
  - Through end of 2015: Already at 18.9 hrs/paper
  - Maintaining rate, with 808 RH expect 43 papers from Cycle 4







# Publication rate

## Cumulative Publications

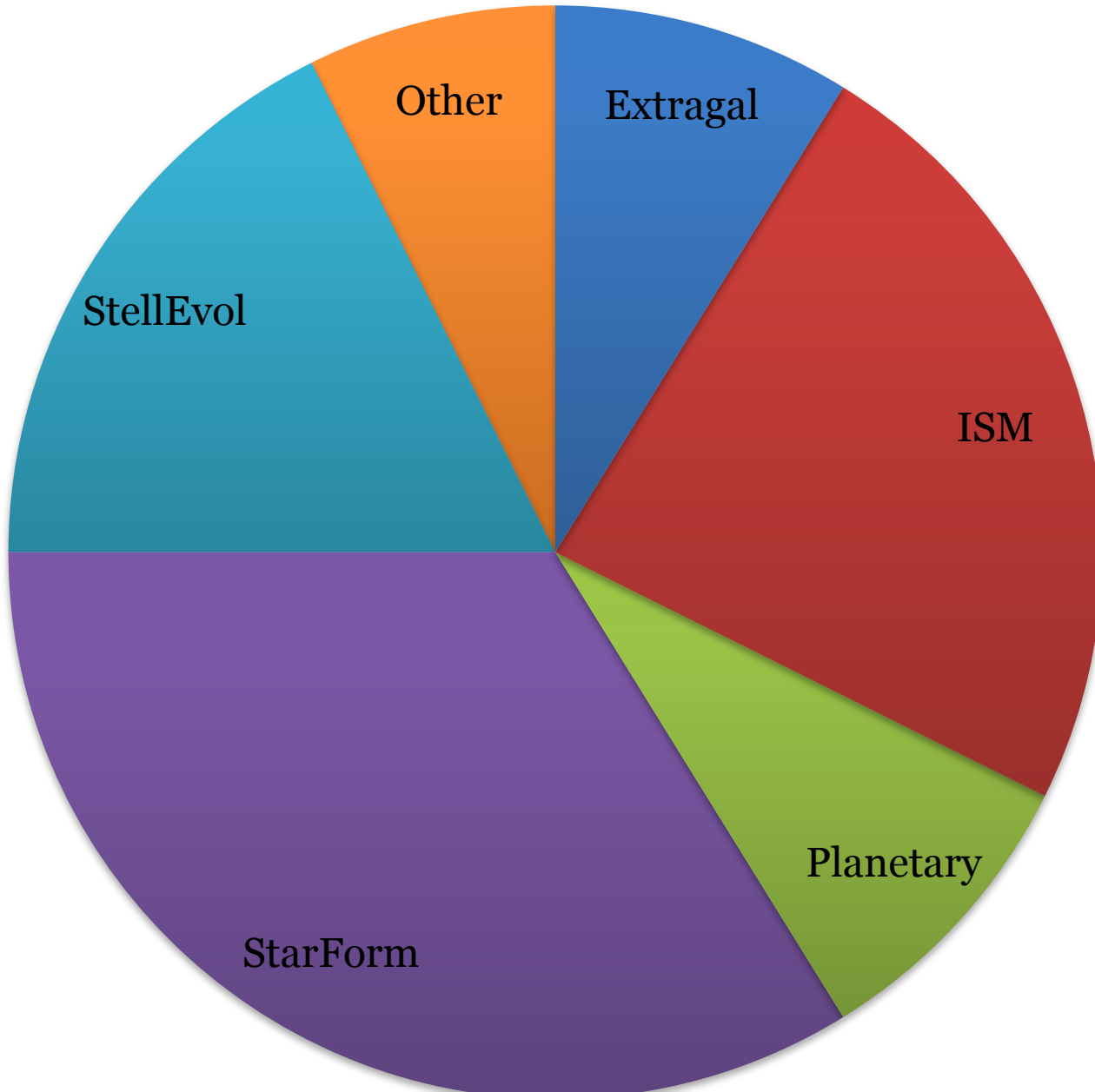


- Prediction for 2016 scales to 12 months from actual publications as of 5/1/16
- Using publications/hour method, predict 10 more papers in CY16



Author ▲ ▼	Title	Date ▲ ▼	Publication	Science Topic ▲ ▼	Keywords	Instruments ▲ ▼	Program	Data Source	Image	Files	Links
Croiset, B.	Mapping PAH sizes in NGC 7023 with SOFIA	2016-03	Croiset et al. (2016) A&A, 590, 26	Interstellar medium		FLITECAM FORCAST	02_0056	CYCLE 2			[astro-ph] [ADS] [Teletalk]
Shenoy, D	Searching for Cool Dust in the Mid-to-Far Infrared: the Mass Loss Histories of The Hypergiants mu Cep, VY CMa, IRC 10420, and rho Cas	2016-03	2016 AJ, 151, 51 [DOI]	Stars and stellar evolution		FORCAST	02_0031	CYCLE 2		PDF	[ADS] [astro-ph]
Encrenaz, T	A map of D/H on Mars in the thermal infrared using EXES aboard SOFIA	2016-02	A&A, 586A, 62 [DOI]	Solar System	Mars	EXES		SI GTO		PDF	[ADS]
Gray, M	The physics of water masers observable with ALMA and SOFIA: model predictions for evolved stars	2016-02	2016 MNRAS 456, 374-404 [DOI]	Interstellar medium		GREAT		THEORY		PDF	[ADS] [astro-ph]
Gusdorf, A.	Challenging shock models with SOFIA OH observations in the high-mass star-forming region Cepheus A	2016-01	2016 A&A 585, A45 [DOI]	Interstellar medium		GREAT	01_0113	CYCLE 1		PDF	[ADS]
Wiesemeyer, H	Far-infrared study of tracers of oxygen chemistry in diffuse clouds	2016-01	2016 A&A, 585, A76 [DOI]	Interstellar medium		GREAT	01_0185	CYCLE 1		PDF	[ADS]
Wyrowski, F	Infall through the evolution of high-mass star-forming clumps	2016-01	2016 A&A 585, 149 [DOI]	Star formation		GREAT	01_0174	CYCLE 1		PDF	[astro-ph] [ADS]
Ricacher, C.	First supra-THz Heterodyne Array Receivers for Astronomy with the SOFIA Observatory	2015-12	accepted to IEEE Instrumentation	Other				INSTRUMENTATION			[astro-ph] [ADSpre]
Lau, R.	An Apparent Precessing Helical Outflow from a Massive Evolved Star: Evidence for Binary Interaction	2015-12	2016 ApJ, 818, 117 [DOI]	Stars and stellar evolution		FORCAST	70_0001	SI GTO		PDF	[ADS] [astro-ph]
Laurini, S.	Spectroscopically	2015-12	A&A 584, A70	Star		GREAT		GREAT		PDF	[ADS]

# Papers by Scientific Category





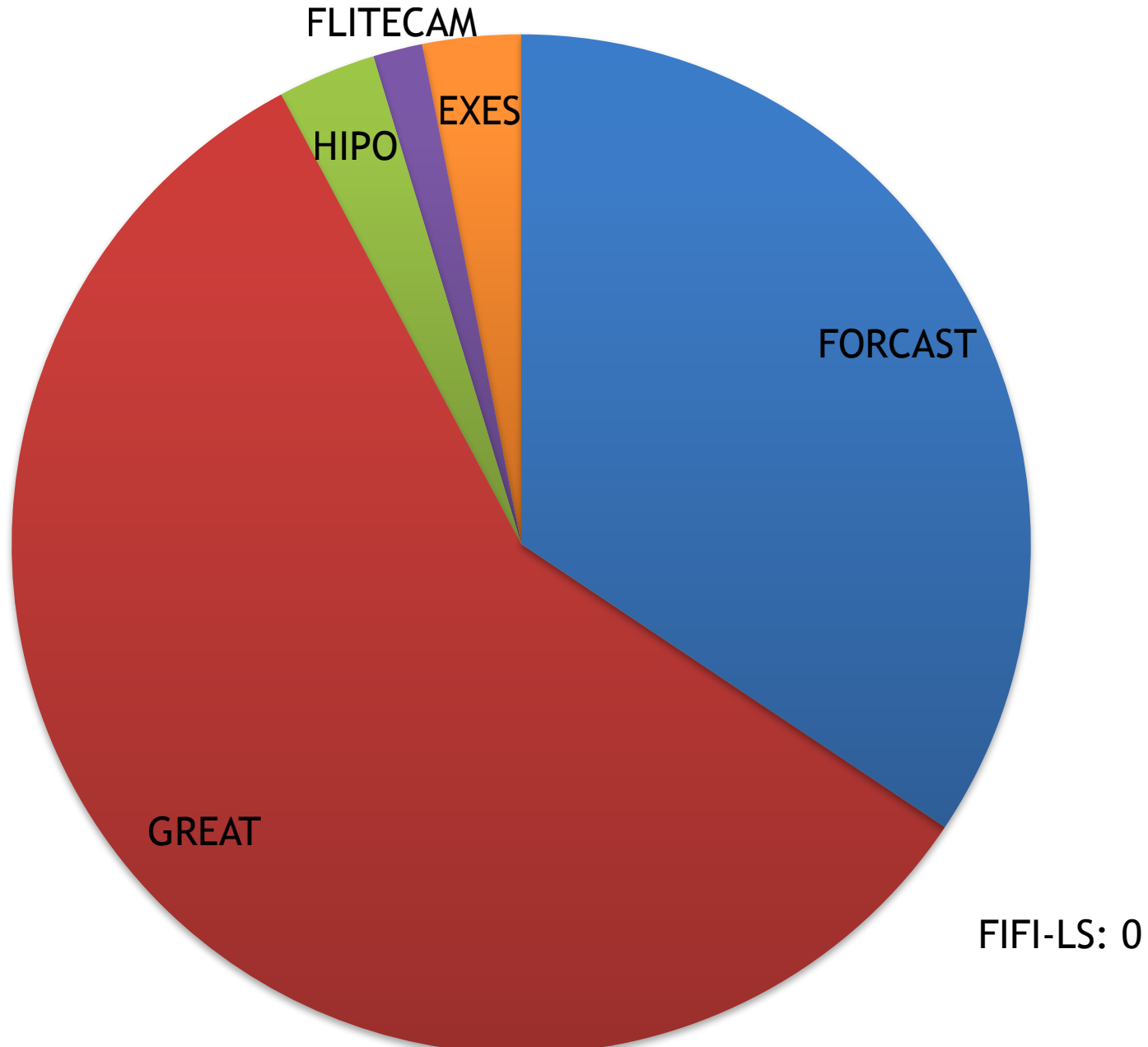
### 3. Productivity by Science Instrument

- GREAT and FORCAST dominate time and publications
- EXES and FIFI-LS relatively new

<b>SI</b>	<b>#Papers</b>	<b>Flights</b>	<b>Hours/ Paper</b>
FORCAST	22	62	19.7
GREAT	37	55	10.4
HIPO	2	3	10.5
FLITECAM	1	5	35.0
FIFI-LS	0	19	$\infty$
EXES	2	7	24.5



# Papers by Scientific Instrument





# Summary: Measuring Productivity

---

## 1. Status of GI Projects

Implemented mitigations to improve GI project completion.  
Beginning to collect status for Cycle 3.

## 2. Publications

Slow by steady increase in SOFIA publications.

## 3. Production split by SI

Publications arise predominantly from FORCAST and GREAT, which have established communities.

