



Observing Program Update

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SOFIA Science Mission Operations

SOFIA Users Group

20 October 2014





Outline



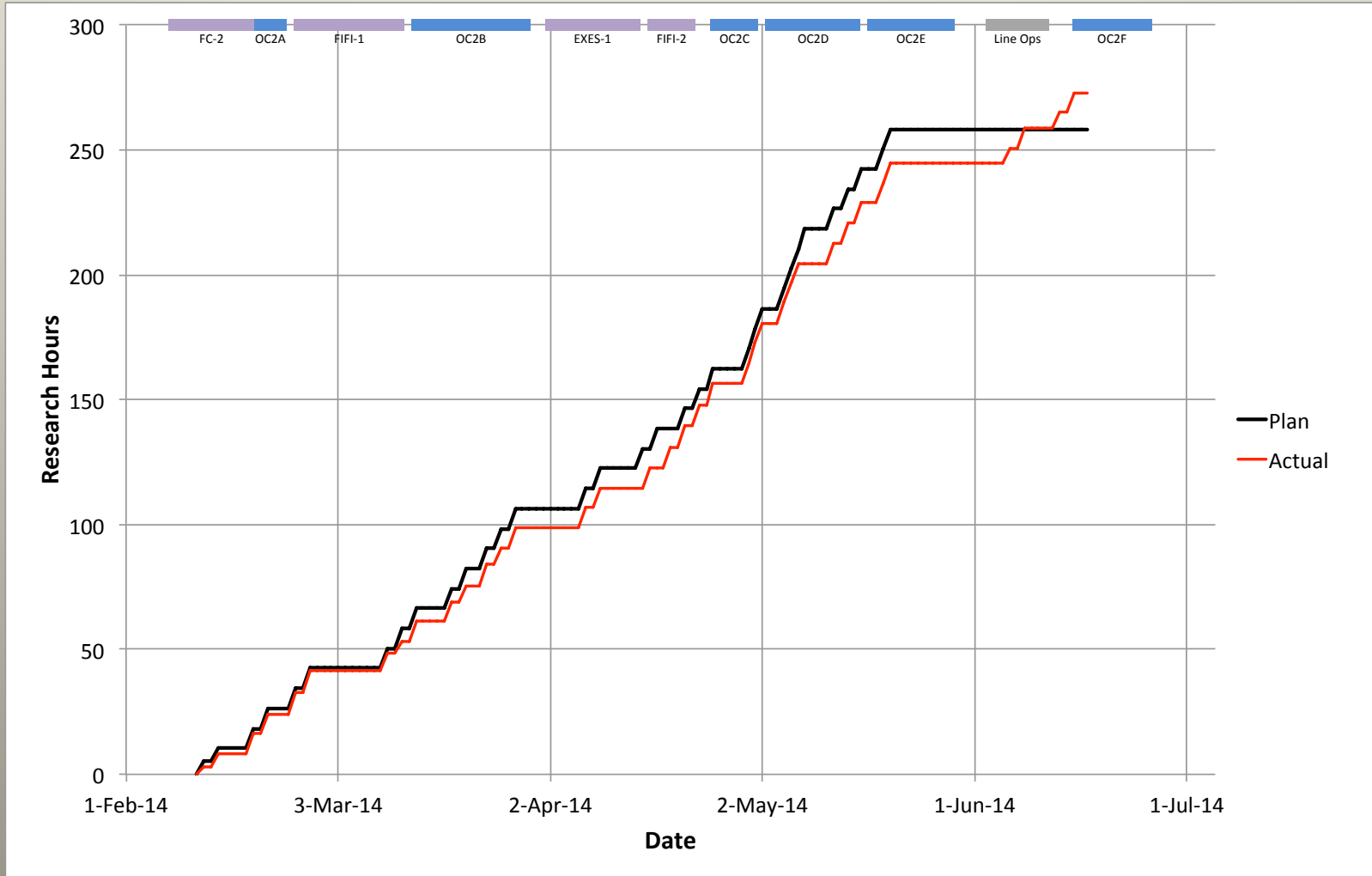
- Cycle 2 Progress
- Highlights since last SUG meeting
- Cycle 3 Progress



Cycle 2 Cumulative Research Hours



As of 20 October 2014



SOFIA Users Group October 20, 2014





Cycle 2 Statistics



| Instrument | US Queue | German Queue | Total |
|------------------------------|-------------------------------|-------------------------------|-------------|
| EXES | 7.8 | 0.0 | 7.8 |
| FIFI-LS | 1.5 | 3.0 | 4.5 |
| FLITECAM | 10.0 | 2.2 | 12.2 |
| FLITECAM/FORCAST | 20.1 | 0.0 | 20.1 |
| FLIPO | 8.0 | 5.3 | 13.3 |
| FORCAST | 95.9 | 0.0 | 95.9 |
| GREAT | 21.8 | 30.3 | 52.1 |
| | | | |
| Total | 165.1 hours | 40.8 hours | 205.9 hours |
| | | | |
| Number of Teams Awarded Time | 30 US GI + 7 International | 14 German GI + 1 DSI Staff | |



General Investigator Program Executed Hours



As of 20 October 2014

| | Cycle 1 | | | Cycle 2 | | |
|--------------|---------------|-------------------|------------------|---------------|-------------------|------------------|
| | US (hours) | German (hours) | Total (hours) | US (hours) | German (hours) | Total (hours) |
| FORCAST | 25.8 | 2.0 | 27.8 | 75.5 | 0.0 | 75.5 |
| GREAT | 39.3 | 35.6 | 74.9 | 6.3 | 9.7 | 16.0 |
| FLITECAM | 0.0 | 0.0 | 0.0 | 4.5 | 0.0 | 4.5 |
| FLIPO | 2.9 | 0.0 | 2.9 | 1.8 | 1.8 | 3.6 |
| FIFI-LS | 0.0 | 0.0 | 0.0 | 2.2 | 4.7 | 6.8 |
| Total | 68.0 | 37.6 | 105.6 | 90.3 | 16.2 | 106.5 |

Guaranteed Time Usage

As of 20 October 2014

| Instrument | Original Allocation (hrs)* | Observing Time Used (hrs) | Remaining Guaranteed Time (hrs) |
|---------------|----------------------------|---------------------------|---------------------------------|
| FORCAST | 50 | 23.3 | 26.7 |
| FLITECAM | 25 | 1.9 | 23.1 |
| HIPO | 15 | 5.5 | 9.5 |
| FLITECAM+HIPO | 25 | 0.0 | 25.0 |

* Science Utilization Policies, SOF-DF-PLA-1087 v. 2.4 (2008)



Post HMV Cycle 2 Plans



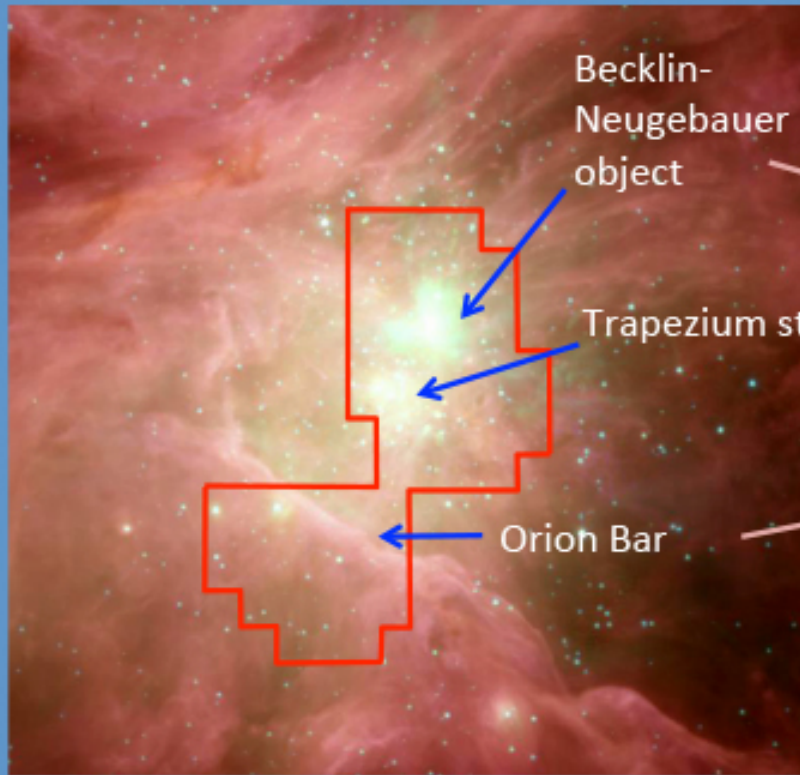
- Schedule for Post-HMV period includes completion of Cycle 2 program
 - GREAT – January 2015
 - 3 GI Flights and 3 GTO Flights
 - FORCAST – January 2015
 - 6 GI flights with some GTO observations
 - EXES – February 2015
 - Completion of Part 2 Commissioning
 - One GI Flight



FIFI-LS Orion Nebula Observations



Orion Nebula

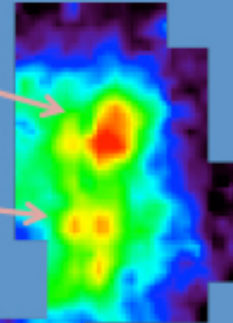


NASA/Spitzer/Harvard-Smithsonian CfA, Thomas Megeath

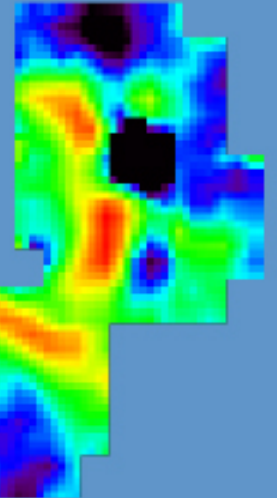
SOFIA / FIFI-LS

FIFI-LS Team

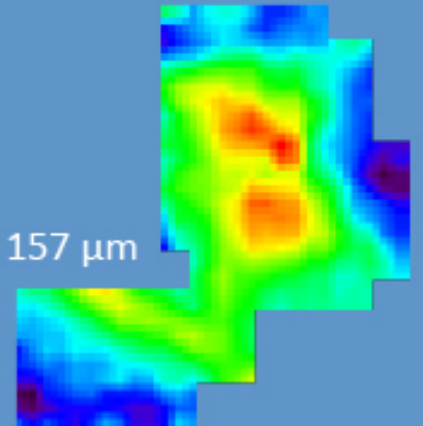
[OI] 63 μm



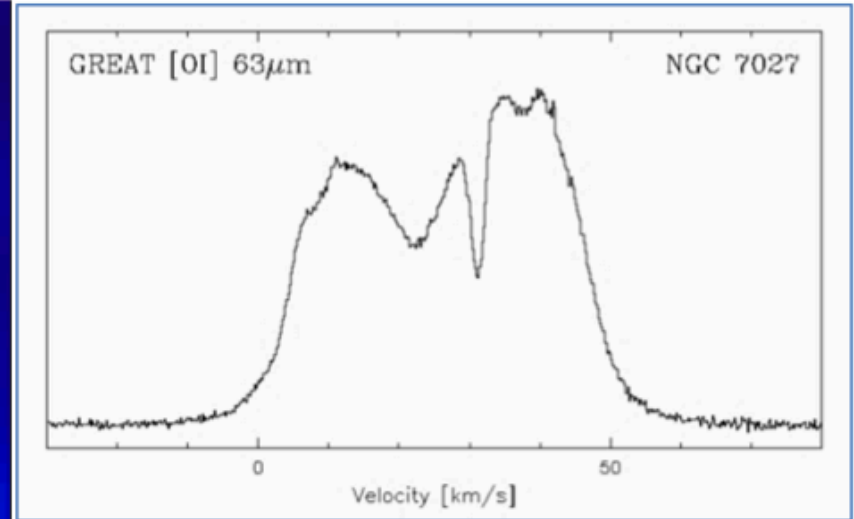
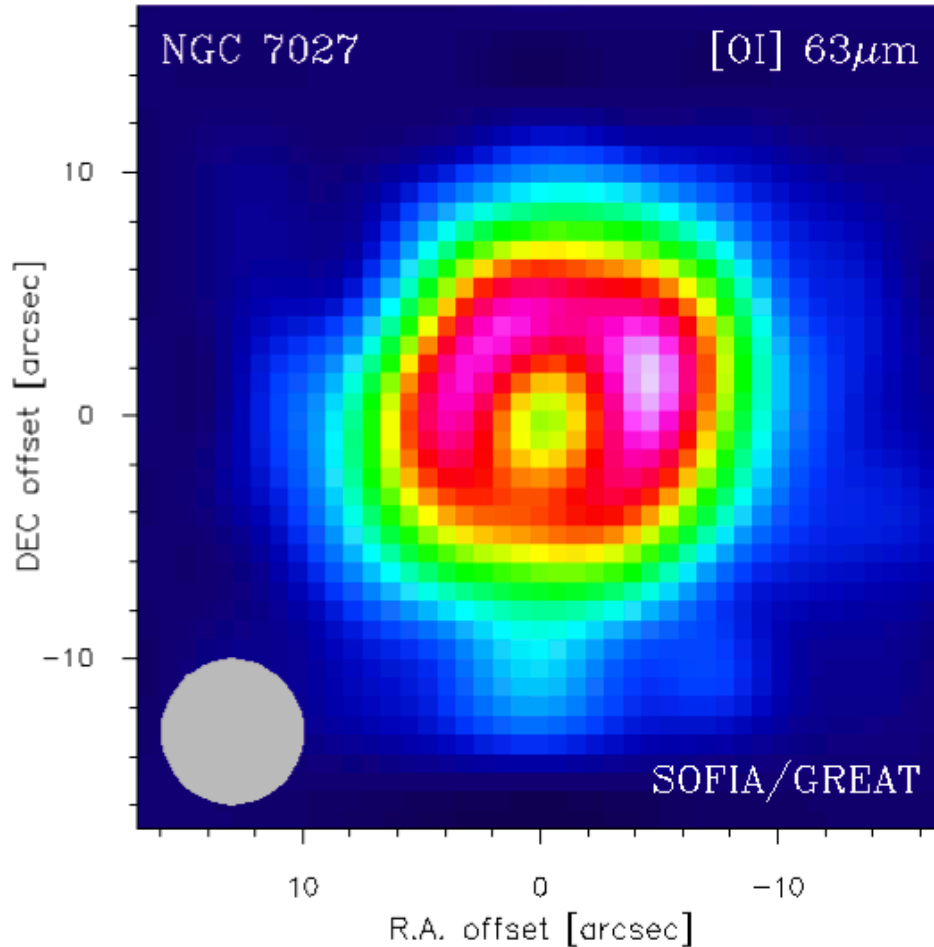
[OI] 145 μm



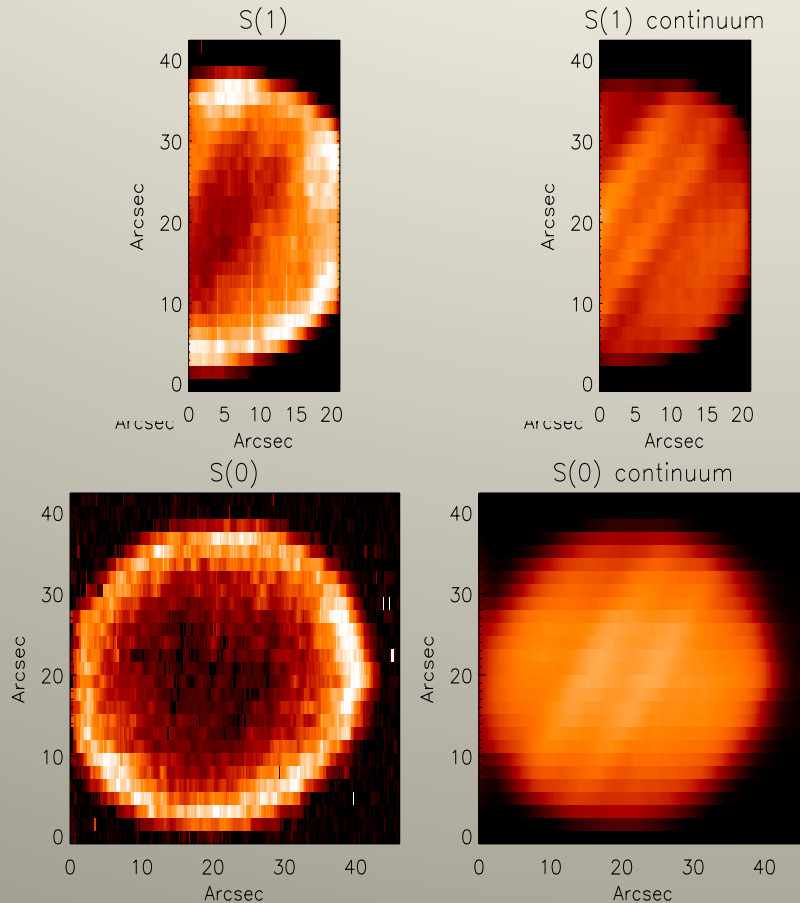
[CII] 157 μm



GREAT 4.7 THz First Light



(Rolf Güsten & the GREAT Team)



- Spectral maps produced by stepping slit position across extended sources
- Stratospheric emission from H₂; limb brightening
- S(0) at 28.3 μ m is unobservable from ground.
- S(1)/S(0) gives temperature, with long latency
- Combined with other temperature measures, maps convective motion into the stratosphere and circulation



Cycle 3 Call for Proposals



- Cycle 3 Call for Proposals Released May 23, 2014
- Submission deadline July 18, 2014
- US Cycle 3 Review Process
 - US TAC met in San Francisco August 27-29
- German Cycle 3 Review Process
 - German TAC met in Stuttgart September 17-19
- Announcement of selections delayed 2 weeks to complete Southern Hemisphere deployment assessment
 - Anticipated announcement of awards on October 28

| Queue | Num Of Propoals | Total Durations (Hours) |
|-------|-----------------|-------------------------|
| DE | 31 | 104 |
| US | 122 | 1075 |

| Instrument | Num Of Propoals | Total Durations (Hours) |
|---------------|-----------------|-------------------------|
| EXES | 16 | 79 |
| FIFI-LS | 20 | 172 |
| FLITECAM | 14 | 128 |
| FLITECAM_HIPO | 6 | 30 |
| FORCAST | 59 | 531 |
| GREAT | 47 | 239 |
| Total | | 1179 |



Cycle 3 CfP New Elements



- Encouragement of large proposals
 - From the Call for Proposals:
 - “For Cycle 3, the SMO encourages substantial investigations with significant impact and plans to allocate at least 20% of the available observing time to high scientific impact proposals in excess of 40 hours. Up to 100% of the time may be assigned to these larger proposals if the Time Allocation Committee judges them sufficiently meritorious.”
 - Results were equivocal
 - TAC did not find any of the larger proposals worthy of a 40+ hour allocation.
 - Because of the budgetary turmoil, the community did not have adequate time to prepare large-scale efforts
 - We plan to make a similar offer for Cycle 4
- New SOFIA capabilities
 - Community response to new SOFIA capabilities (GREAT H-channel, FIFI-LS, and EXES) was strong



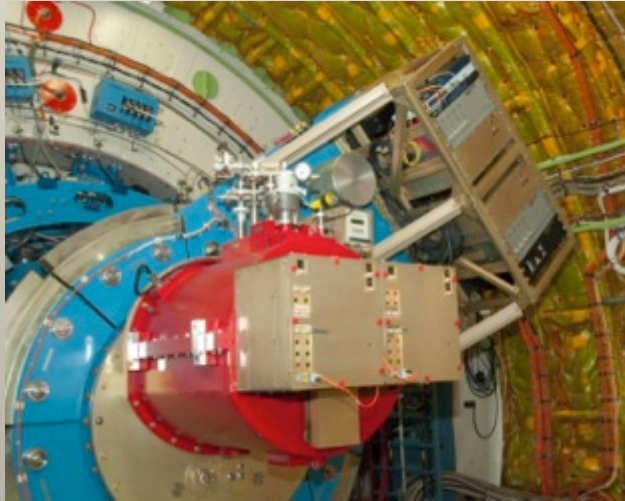
Southern Hemisphere Deployment



- Primary instrument for a Southern Hemisphere deployment will be FORCAST. FORCAST has by far the greatest number of high priority “Southern Hemisphere Only” programs.
 - Enough targets for 9+ flights
- Compelling case to have second instrument GREAT on the deployment
 - Targets for GI and GTO programs are virtually all in Southern Milky Way
 - Most of the highest priority programs use the 4.7 THz H-channel
 - Difference in water vapor (5 mm vs. 20 mm) and elevation (30-degrees vs. 50-degrees) between Palmdale and Christchurch results in a factor of 20X shorter integration times on deployment.
- Currently working the logistical and cost considerations for accommodating a second instrument in the South for Cycle 3



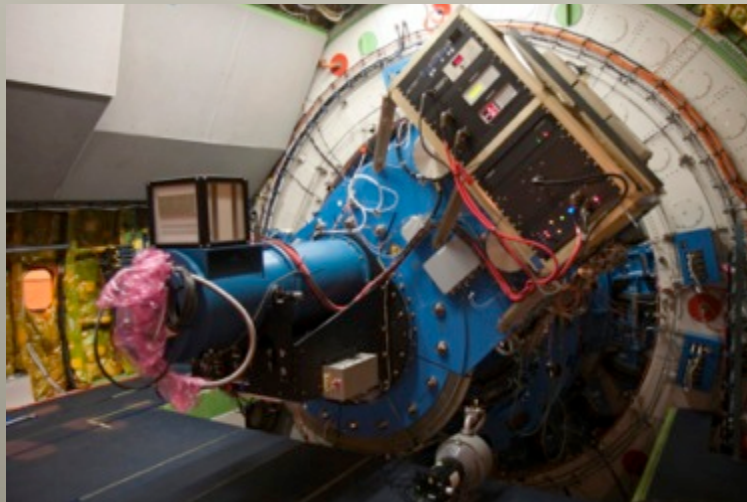
Initial Instrument Complement



FORCAST
Mid-IR Camera



GREAT
Heterodyne spectrometer

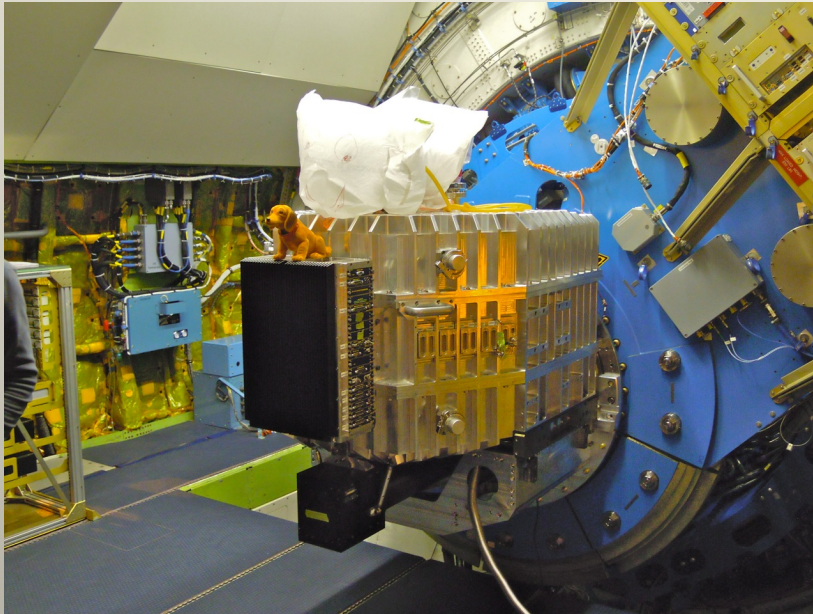


FLITECAM
Near IR Camera

HIPO
Occultation Photometer

FLIPO
(co-mounted on SOFIA)





FIFI-LS on the telescope
First Light Flight 150

EXES Team after installation
First Light Flight 158





Cycle 3 Instrument Modes -1



| Instrument | Observing Modes | Spectral Configurations |
|--------------------------|--|--|
| EXES | 1) Nod along slit 2) Nod off slit | High-med (R~100,000) High Low (R~100,000) Medium (R~20,000) Low (R~4,000) |
| FIFI-LS | 1) Beam-Switch 2) Chop-Offset-Nod 3) Mapping | SW 50-125 um LW 105-200 um |
| FLITECAM Imaging | 1) Stare 2) Nod Off Array | Various Filters. Wavelengths >3 um shared risk |
| FLITECAM Spectroscopy | 1) Nod along slit Choice of 1" or 2" slit width | 3 Grisms each of which can be operated in one of three orders |
| HIPO | Stare | Two CCD bands |
| FLITECAM/HIPO | Stare | Various Filters. No wavelengths > 3 um. |





Cycle 3 Instrument Modes - 2



| Instrument | Observing Modes | Spectral Configurations |
|----------------------|---|---|
| FORCAST Imaging | <ol style="list-style-type: none">1) Two-position Chop-Nod2) Two-Position Large Amplitude Chop Nod | Short Wavelength Camera (5 - 25 um) Long Wavelength Camera (31 - 37 um) |
| FORCAST Spectroscopy | <ol style="list-style-type: none">1) Two-position Chop-Nod2) Two-Position Large Amplitude Chop Nod3) Slitscan | Long Slit SW Camera Cross Dispersed SW Camera Long Slit LW Camera |
| GREAT | <ol style="list-style-type: none">1) Single Pointing Position Switch2) Single Pointing Chopped3) On the Fly Mapping4) Raster Mapping | Band L1 (1.25 - 1.52 THz) Band L2 (1.81 - 1.91 THz) Band H (4.7 THz) Two bands can be observed at the same time. |





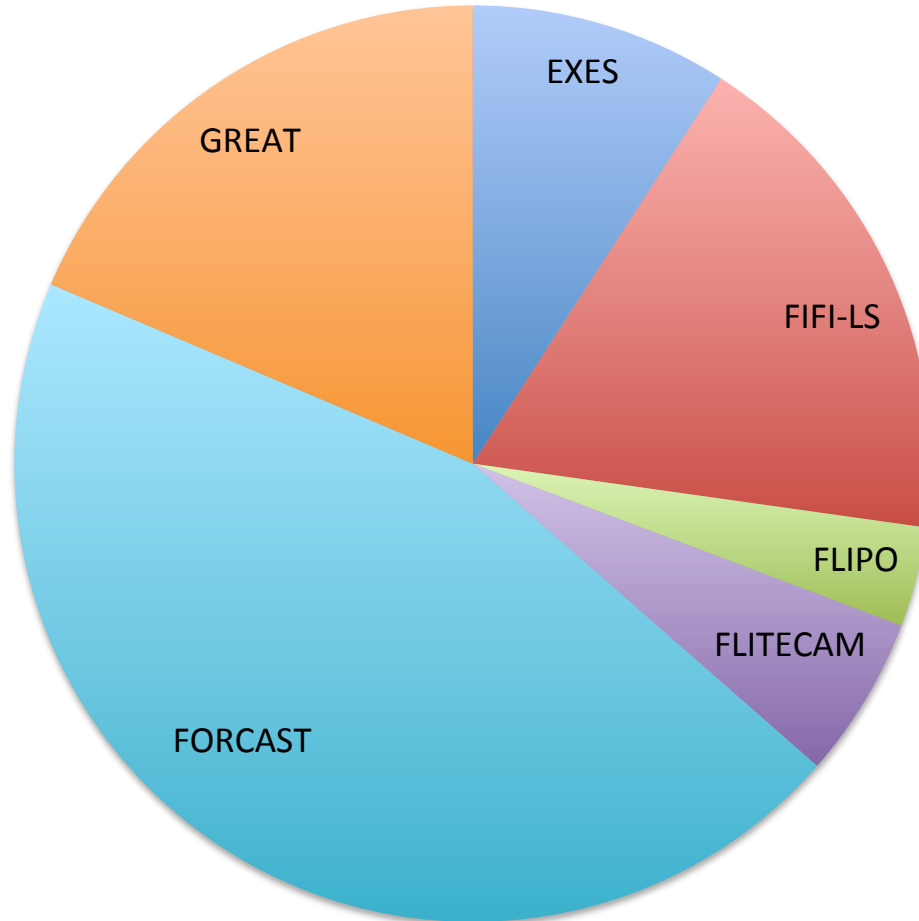
Assumed Global Layout of Calendar



- Cycle 3 period: 1 March 2015 through 31 January 2016
- Maintenance periods of 4 weeks in April, August, and December +/- 2 weeks
- Southern Hemisphere deployment in June-July period
- Need to accommodate upGREAT commissioning
- Need to accommodate HAWC+ commissioning
- Assuming 3 flights/week when flying approximately 70 flights would be available for Cycle 3.
 - Recommend low award rate given past performance
 - Conservatively use 6 hours per flight available for science
 - Award $420 \text{ hours} * 90\% = 378 \text{ hours}$ (US + German)



Cycle 3 High Priority Time Distribution



Assumes 2-instrument deployment

340.5 Hours US + 45.8 Hours DE
= 386.3 Hours Total





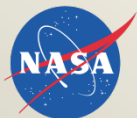
Aggregate GI Statistics



| | Cycle 1 (hours) | Cycle 2 (hours) | Cycle 3 (hours) |
|-------------|-----------------|-----------------|-----------------|
| US Awards | 134.7 | 165.1 | 341.5 |
| US Observed | 68.0 | 116.3 | |
| DE Awards | 46.6 | 42.4 | 45.8 |
| DE Observed | 37.6 | 15.7 | |

- Notes:
- 1) Times do not include GTO observations.
 - 2) Cycle 2 statistics are up to HMV.





Data Delivery Times for Cycle 3



| Instrument | Campaigns | Level 1 | Level 2 | Level 3 | Notes |
|------------------|-----------|---------|----------|----------|--------------------------------------|
| FORCAST Imaging | All | 2 Days | 1 Week | 2 Weeks | |
| FORCAST Grism | All | 2 Days | 1 Week | 2 Weeks | Browe quality calibration |
| FLITECAM Imaging | All | 2 Days | 1 Week | 2 Weeks | |
| FLITECAM Grism | All | 2 Days | 1 Week | 2 Weeks | Browe quality calibration |
| FIFI-LS | Spring | 2 Days | 2 Months | 2 Months | First Science Series with Instrument |
| | Fall | 2 Days | 2 Weeks | 2 Months | |
| EXES | Spring | 2 Days | 2 Months | 2 Months | First Science Series with Instrument |
| | Fall | 2 Days | 2 Weeks | 2 Months | |
| GREAT | All | 2 Days | N.A. | 45 Days | Per MOU |



<http://www.sofia.usra.edu>

