

# SOFIA

## Program Update

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SOFIA AAS Splinter Session





# Outline

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- Recent Achievements
- 1-year Look Ahead
- Early Science
- First-generation Instrument Status
- Program Status Summary

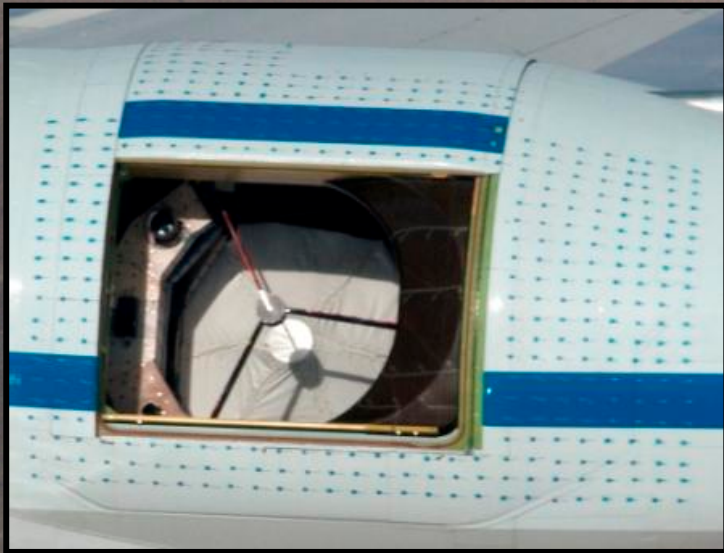
# SOFIA

## Stratospheric Observatory for Infrared Astronomy



Boeing 747SP

2.7-meter



International partnership:  
80% -- NASA (US)  
20% -- DLR (Germany)



# Progress Since the Last AAS Splinter

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The program has successfully completed:

- **First Light: May 25-26, 2010**
- **Science Instrument workshop: June 6-8, 2010**
- **Basic Science proposals selected: Nov 2010**
- **FORCAST Short Science (3 flights): Nov 30-Dec 8, 2010**
- **2<sup>nd</sup> Generation Science Instrument Call for Proposals draft release: Dec 15, 2010**



# Progress Since the Last AAS Splinter

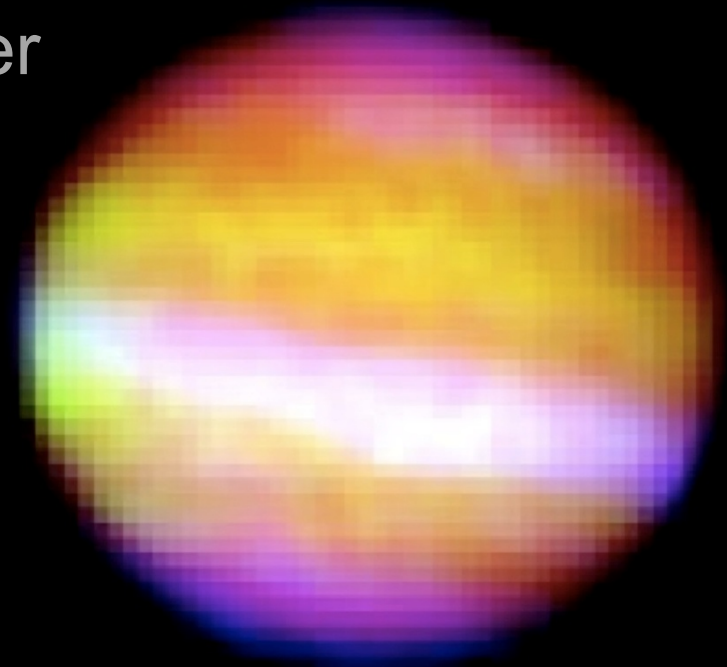
## FIRST LIGHT!

Jupiter



**VISIBLE**

Image credit: Anthony Wesley



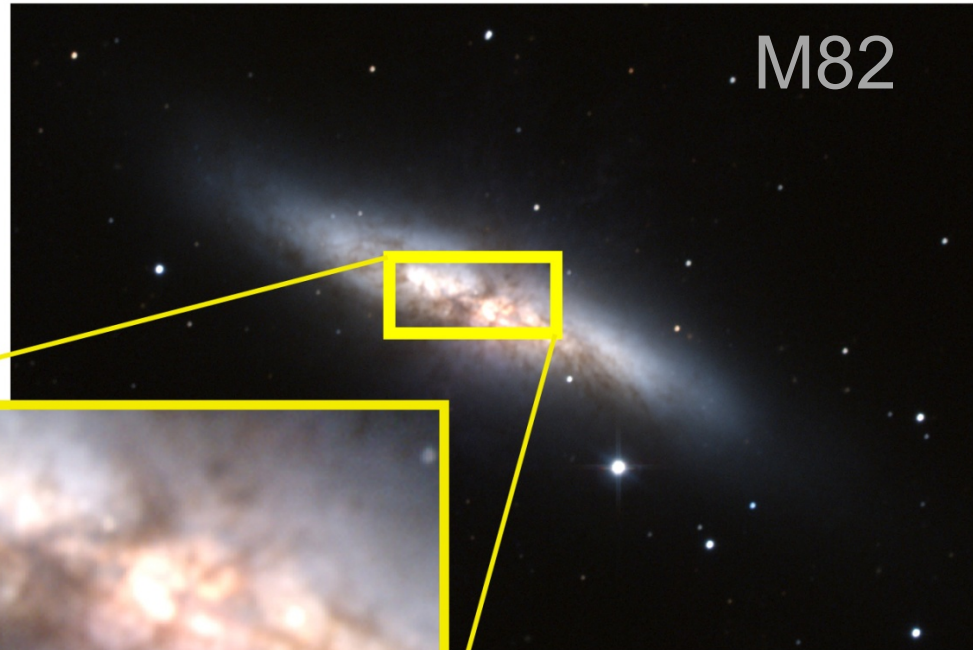
**SOFIA / FORCAST**

(5.4, 24.2, 37.1  $\mu\text{m}$ )



# Progress Since the Last AAS Splinter

FIRST LIGHT!



M82



SOFIA / FORCAST

(24.2, 37.1  $\mu\text{m}$ )

1/11/2011

AAS SOFIA splinter (Seattle, WA)



# Recent Activities and ~1 Year Look Ahead

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- ✓ First Light; May 2010
- ✓ **Science Instrument workshop, Asilomar, CA; June 2010**
- ✓ **Basic Science proposal awards; Nov 2010**
- ✓ Short Science #1 flights (FORCAST); Dec 2010
- Short Science #2 flights (GREAT); Mar 2011
- **Proposal call for new instruments;**
  - **Draft: Dec 2010**
  - **Final: mid 2011**
- **Basic Science flights; late spring 2011**
- **Next call for SOFIA observing proposals: late 2011**



# Early Science Definitions

- **Early Science flights occur ~~before the flight envelop is fully cleared and~~ while some onboard mission systems are still in development.**
  - a shared-risk activity
  - the science community gains earlier access to SOFIA
  - early tests of astronomical observing

	<b>EARLY SCIENCE</b>	
	<b>SHORT SCIENCE</b>	<b>BASIC SCIENCE</b>
<b>FORCAST mid-IR imager (US)</b>	3 flights <b>COMPLETED</b>	12 flights -- <b>80% NASA share</b> (US Guest Investigator Program)
<b>GREAT sub-mm heterodyne receiver (German)</b>	3 flights	3 flights <b>20% DLR share</b> GREAT consortium





## TWO EARLY SCIENCE INSTRUMENTS

### **FORCAST** (Faint Object infraRed Camera for the SOFIA Telescope)

- Facility-class instrument
- Mid IR, two-channel camera for simultaneous imaging
- Selectable ( $\Delta\lambda \sim 2\mu\text{m}$ ) filters in 4-8  $\mu\text{m}$ , 16-40  $\mu\text{m}$  regimes
- 0.75 arcsec/pixel
- 3.2x3.2 arcmin field-of-view

### **GREAT** (German REceiver for Astronomy at Terahertz frequencies)

- Principal Investigator instrument
- Heterodyne spectrometer
- Dual-channel, 3 frequency bands

- Low frequency:

- 1.25-1.50 THz (200-240 microns)
- 1.82-1.92 THz (156-165 microns)

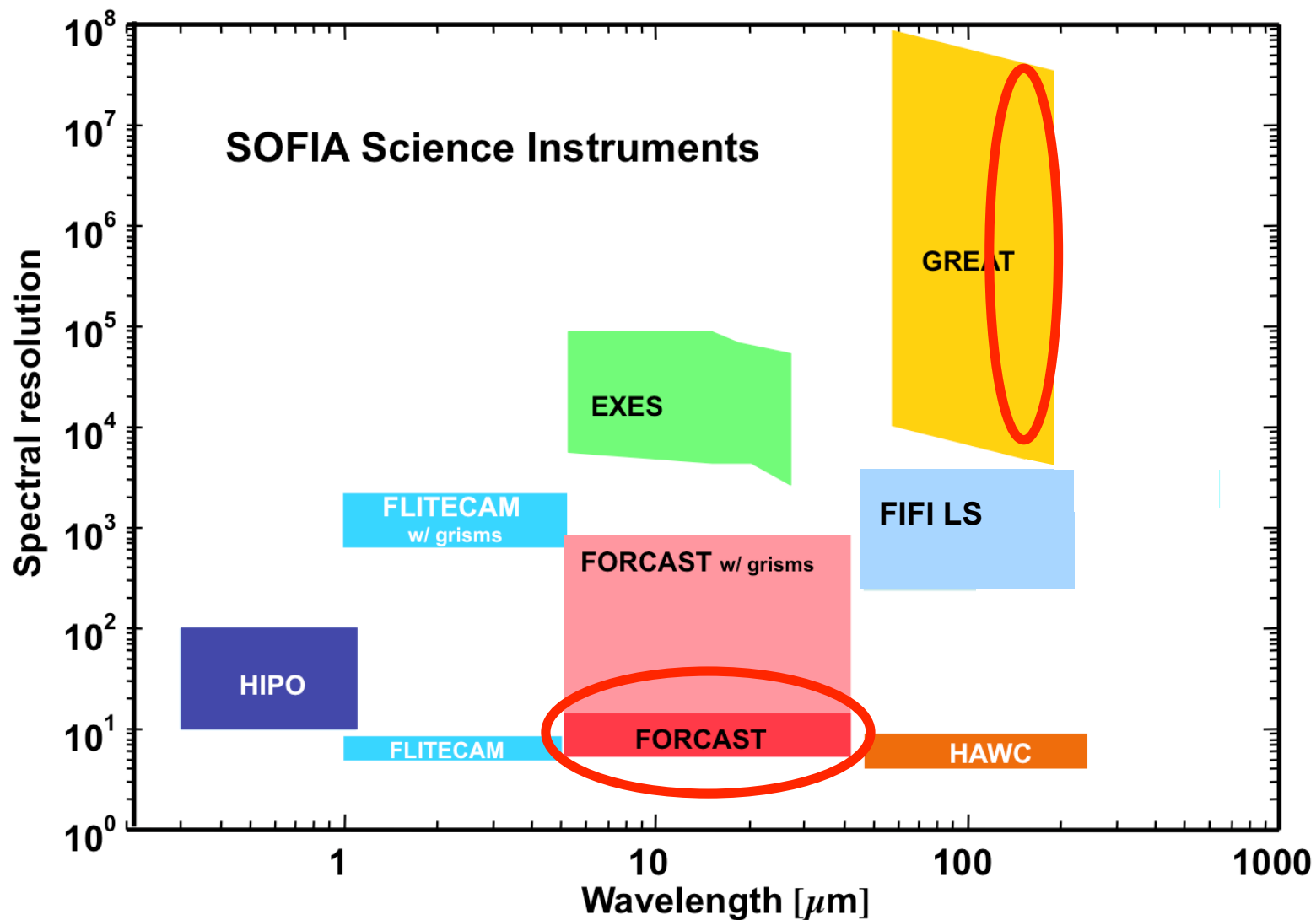
- mid-frequency:

- 2.4-2.7 THz (111-125 microns)

Available to Basic Science  
Guest Investigators

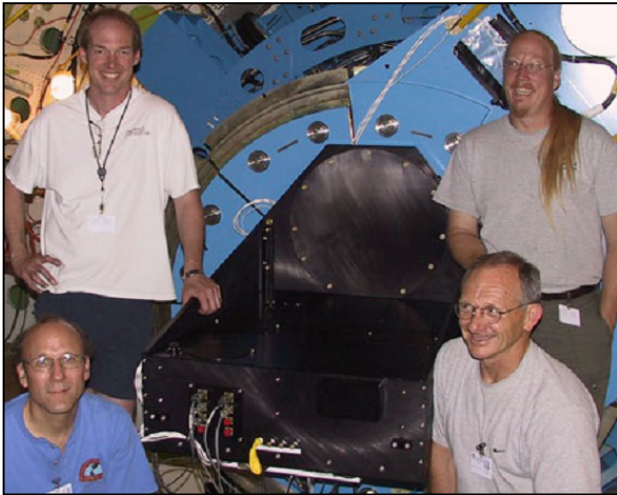


# Instrument Capabilities Available to Early Science GIs



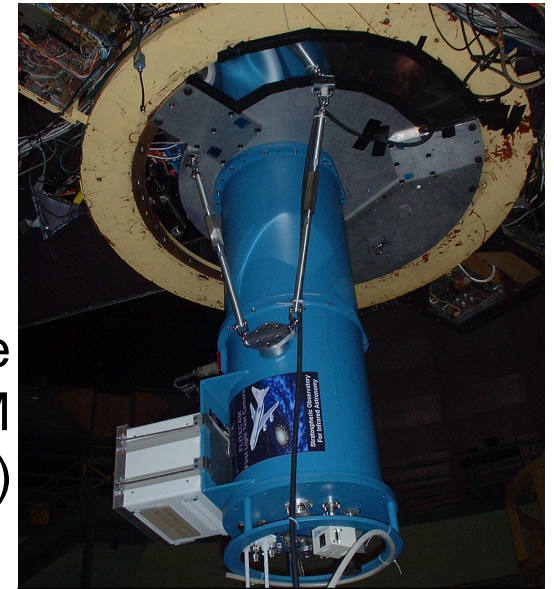


# FOUR OF THE 1<sup>st</sup> GENERATION INSTRUMENTS



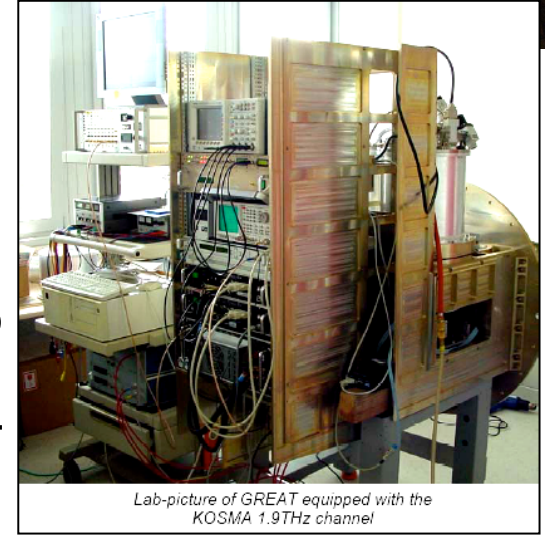
Working/complete  
HIPO instrument  
(on SOFIA)

Working/complete  
FLITECAM  
(Lick observatory)



Working/complete  
FORCAST  
(on SOFIA)

Successful lab  
demonstration  
of GREAT



Lab-picture of GREAT equipped with the  
KOSMA 1.9THz channel



# Science Instruments: Recent Changes

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- FIFI-LS
  - Far IR integral field spectrometer
  - One of the two 1<sup>st</sup>-generation German instruments
  - Replan underway:
    - Funding/management transfer from MPE to University of Stuttgart
    - Facility-class status
  
- CASIMIR
  - High-resolution far-IR/submm heterodyne spectrometer
  - Science instrument development ceased Dec 2010
  - Cancellation was motivated by budget pressures and the science contributions from current and planned high-resolution submillimeter spectrometers on other facilities.
  - High resolution spectroscopy remains an important priority for SOFIA, and the ongoing rapid advancements in technology may make an advanced heterodyne spectrometer a compelling option in the future.



## Aircraft/observatory performance

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- Observations to an altitude of 45,000 feet now fully cleared.
- FORCAST Short Science demonstrated that:
  - duration of observing window of at least 8 hours/night.
  - typical observing legs were ~1 hr; could have been as long as ~4 hrs.
  - telescope cool-down time for operations was ~1.5 hours.
- Presently, in order to have full access to all available US airspace, the aircraft must fly at an altitude of 43,000 ft.
  - Some restricted areas, such as military zones, remain off-limits at any flight altitude.



# Program Summary

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## **The SOFIA Program has made significant progress:**

- First Light achieved
- Initial series of science observations successfully completed.
- Half of the suite of first-generation instruments ready for installation.
- By about this time next year, selections for the 2<sup>nd</sup> generation instruments will have been made!

## **Upcoming events/activities to watch for:**

- Basic Science flights; starting **late spring 2011**
- Final solicitation for new instruments; **mid 2011**
- Next call for observing proposals; **late 2011**

