SOFIA Science Mission Operations

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Introduction to the Science Mission Operations

- SOFIA Science Mission Operations (SMO) is the organization responsible for operating SOFIA as a scientifically productive observatory

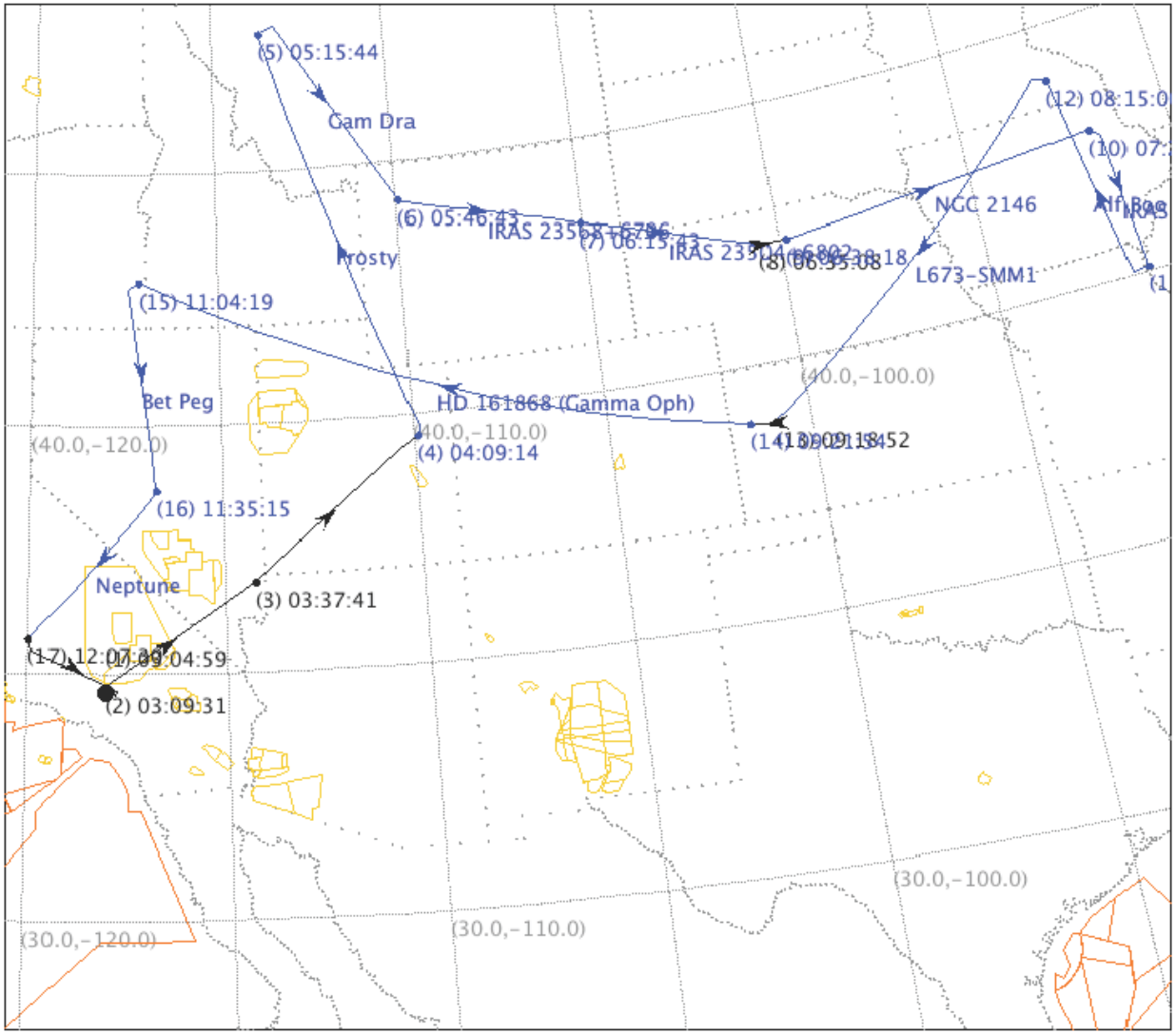
- The SMO is a collaboration between the US and Germany, forming a single organization that has staff from both countries.
  - From the US, most of the staff come from the Universities Space Research Association (USRA)
  - The German members are from the Deutsches SOFIA Institut (DSI) at the Universität Stuttgart.

SOFIA SMO Components

- SOFIA Science Center (NASA Ames Research Center)
  - Data Cycle System
    - Proposal generation
    - Data Pipeline
    - Data Archive
  - Mission Planning
  - Guest Observer support

- SOFIA Operations Center (Dryden Aircraft Operations Facility)
  - Instrument Support
  - Telescope Maintenance
  - Flight Science Operations

Sample Mission Plan



Basic Science 1
Flight #3

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SOFIA in the Dryden Aircraft Operations Facility

SOFIA Early Science

Short Science has 3 flights each with FORCAST and GREAT to allow the instrument teams to get on the sky at the earliest possible opportunity.

FORCAST flew in Dec 2010
GREAT flew in April 2011

Basic Science is a series of 15 flights (12 US & 3 German) that was open to the astronomical community

- US time was openly competed via a call for proposals
- German time will be used by the GREAT consortium

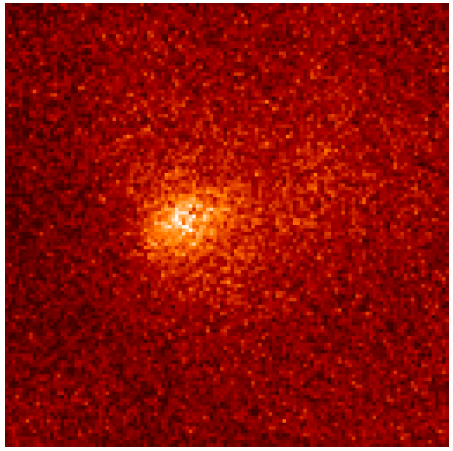
Began May 5, 2011

German Demonstration Science Time

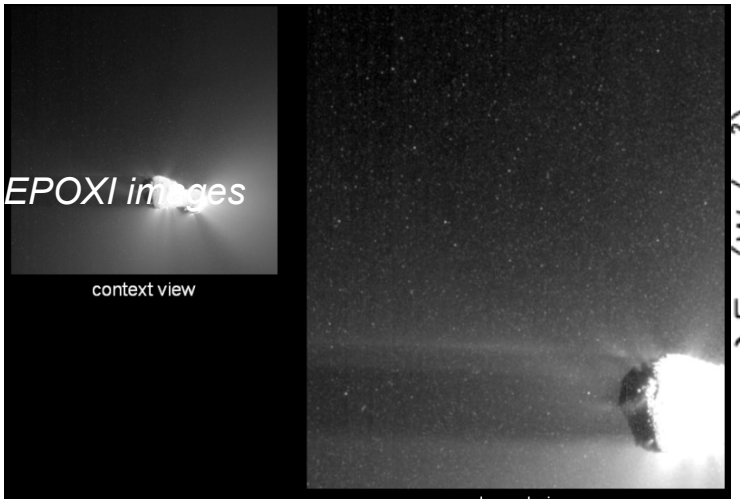
- 3 Flights openly competed in the German Community
- Results announced in April 2011
- Observations are being scheduled now

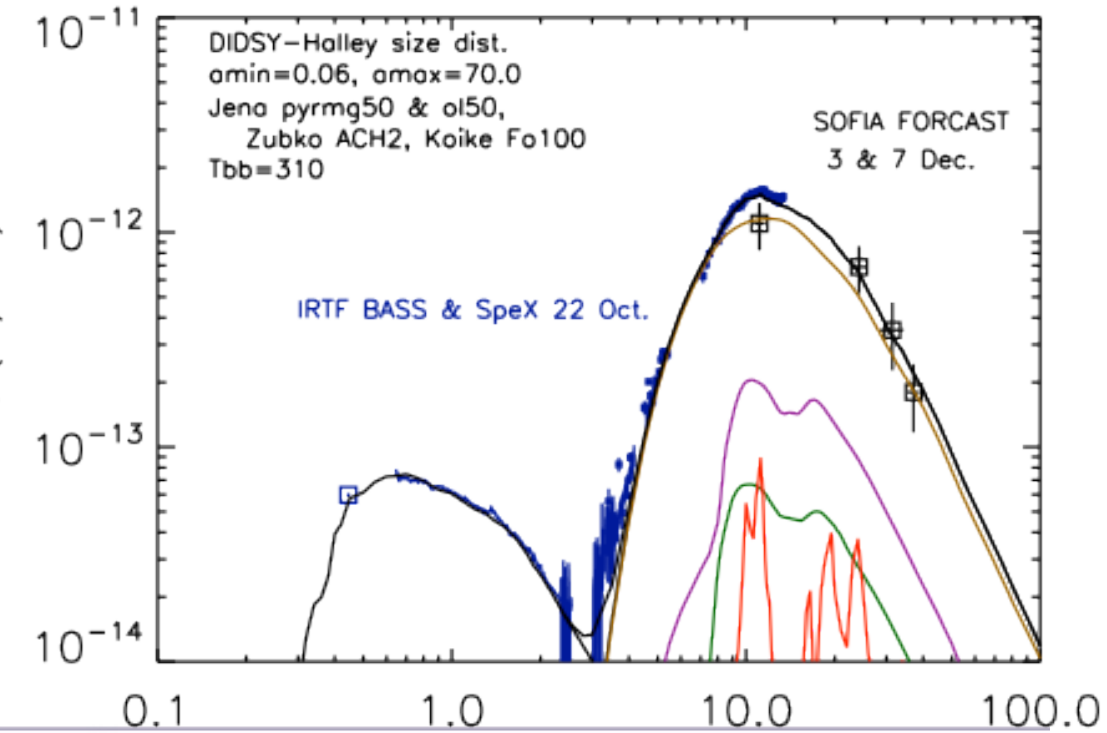
FORCAST Short Science

Comet Hartley 2



- Supporting NASA/EPOXI mission
- Filled in SED at wavelengths otherwise inaccessible
- Will address significance of the discovery of large ice chunks in comparison to large dust grains

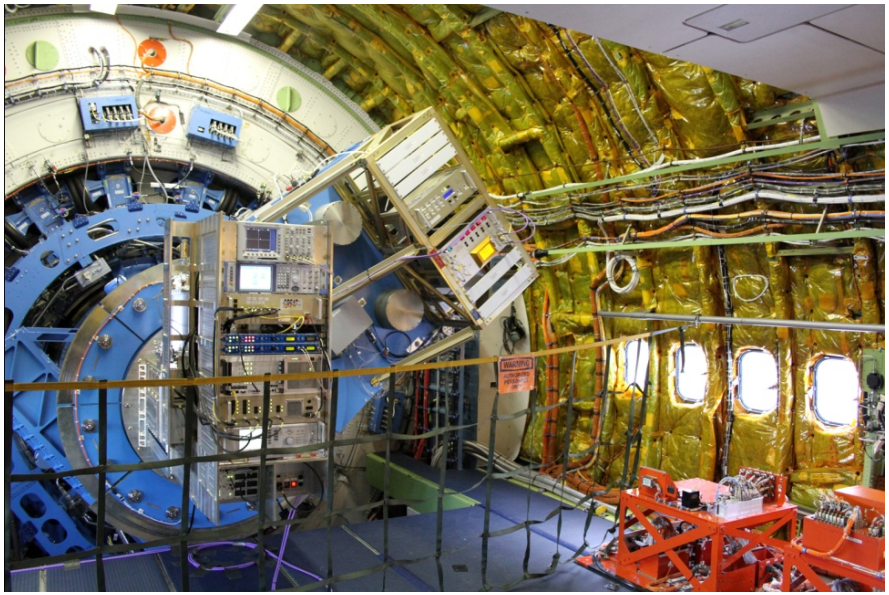




See: Meech et al. 2011, ApJL, 734, 1.

Successful Short Science with GREAT

- German heterodyne spectrometer
  - Dual Channel
    - 1.25 – 1.50 THz
    - 1.82 – 1.92 THz
- Flights on April 5, 12, & 14



Basic Science

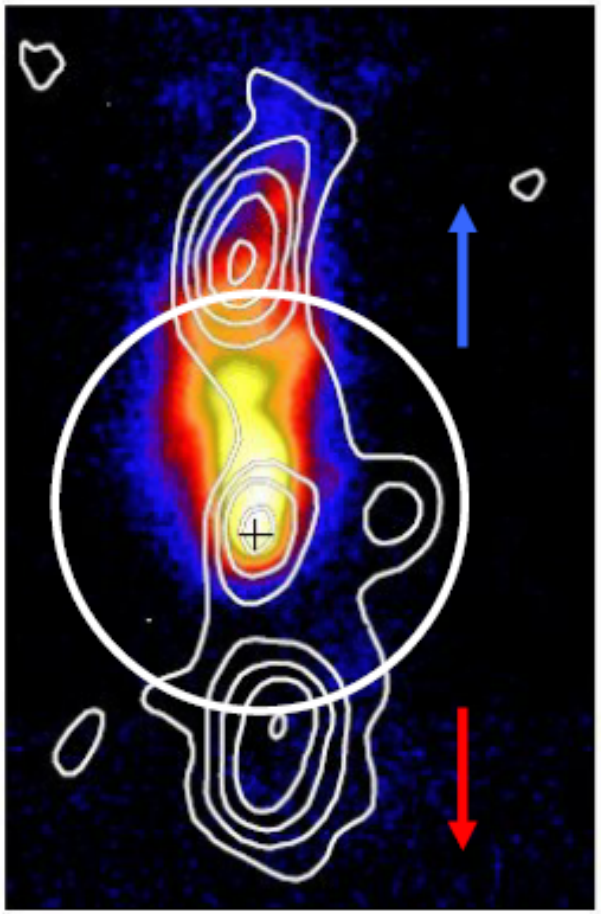
- Proposal Review Conducted in October 2010
- Selected Proposals announced in November 2010
- Flights began 5 May 2011

Layout of Basic Science

	FORCAST	GREAT
US Basic Science Time	8 Flights	4 Flights
German Basic Science Time		3 Flights
German Science Demonstration Time	1 Flights	2 Flight
Total	9 Flights	9 Flights

Example FORCAST Science

81-0013 Johnathan Tan



G35.20-0.74 observed at 18 micron with TRECS with 15 GHz contours overlaid. Note dust emission is only detected on near side because of extinction.

Peering to the Heart of Massive Star Birth

The program consists of FORCAST imaging of massive protostars at 11, 19, 24, 31 and 37 microns.

They will examine how the MIR SED varies along the outflow axes, and they will compare these observations to detailed radiative transfer calculations of massive protostars

Example GREAT Science

$S^+ + H_2 \longrightarrow SH^+ + H - 0.85$ eV

$S + H_2 \longrightarrow SH + H - 0.83$ eV

$SH^+ + H_2 \longrightarrow H_2S^+ + H - 0.65$ eV

81-0014 David Neufeld

Search for interstellar mercapto radicals (SH) with SOFIA

The plan is to observe the 1.383 THz (ground-state) transition of SH toward six bright submillimeter continuum sources - Sgr B2 (M), W49N, W51, G34.3+0.1, G29.96-0.02 and G10.6-0.4 (W31C)

Complements previous studies of H_2S and SH+, which indicate that the abundances of sulfur-bearing hydrides are much greater than the predictions of standard chemical models.

Upcoming Events of Note

- Announcement of Opportunity for 2nd Generation Instruments
  - The Draft Announcement of Opportunity was released last year for public comment
  - Comment period is now closed and NASA HQ is finalizing the AO
  - Expect release later this summer
  - Anticipated selection late this year with funding in 2012.
- Call for Observing Proposals
  - Probable release in October 2011
  - Instruments expected:
    - FORCAST – (GRISMS in shared risk mode)
    - GREAT
    - HIPO
    - FLITECAM – (GRISMS in shared risk mode)

S-SPOT Development

- In generating proposals for SOFIA, it became clear that we needed an AOR editor, a visualization tool, and general observation manager
- Initiated subcontract with IPAC to customize SPOT to SOFIA
  - SPOT is a tool well known to the Spitzer and Herschel communities
  - Plan is to have the tool ready to support Phase II submissions for the next observing cycle

A Busy 2011

- April 2011 GREAT Early Science Flights
- May 2011 FORCAST Basic Science Flights
- June 2011 Observatory Engineering Flights
- July 2011 GREAT Basic Science
- Aug 2011 Upgrades to Airplane Systems
- Sept 2011 Deployment to Cologne Air Show
- Oct 2011 Cycle 1 Call for Proposals
- Nov 2011 SOFIA Data Workshop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