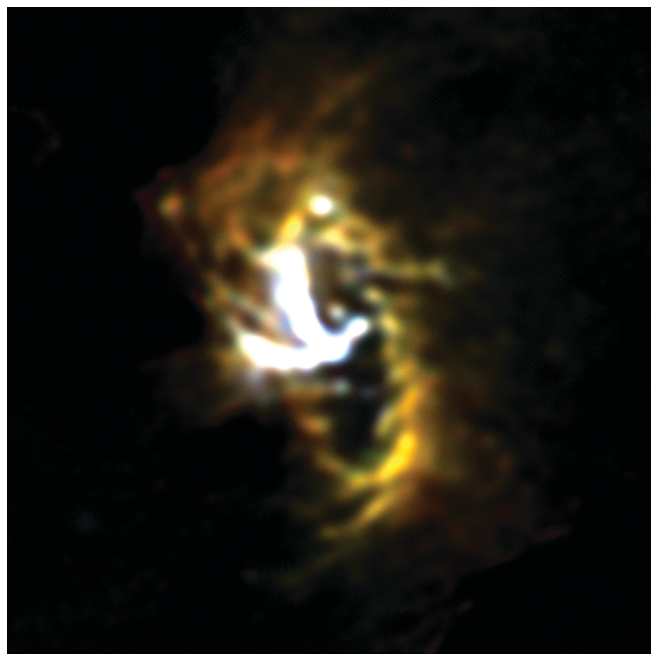


## Faint Object infraRed Camera for the SOFIA Telescope

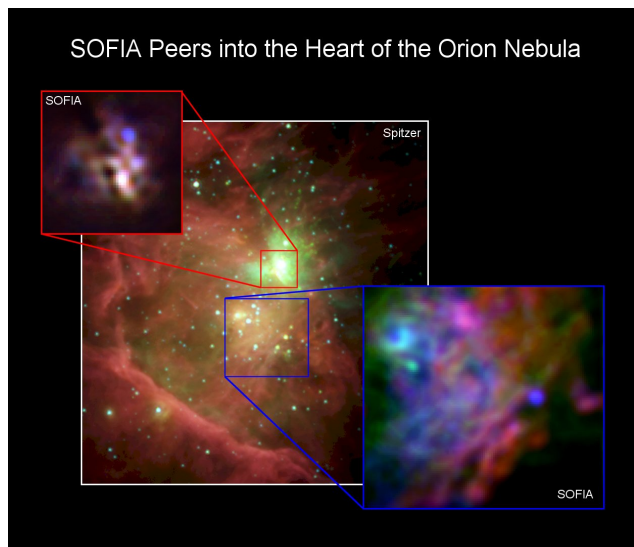
## FORCAST

FORCAST is a facility-class, mid/far-infrared camera and spectrograph for SOFIA. The instrument has two cameras that operate from  $\sim 5 - 25 \mu\text{m}$  and  $25 - 40 \mu\text{m}$ , with several filters available in both cameras. The cameras can be used individually over the whole wavelength range, or together for simultaneous imaging of the same field of view. Spectroscopy is also possible using a suite of six gratings.

FORCAST is of great value to the SOFIA community for imaging protostellar environments, young star clusters, molecular clouds, and galaxies. Multicolor information allows determination of dust properties (temperatures, optical depths, masses, composition), location of ionizing sources, and the morphology of star forming regions.



SOFIA/FORCAST mid-infrared image of the Milky Way Galaxy's nucleus showing the Circumnuclear Ring of gas and dust clouds orbiting a central supermassive black hole. The bright Y-shaped feature is believed to be material falling from the ring toward the black hole that is located where the arms of the "Y" intersect. (Lau+ 2013, ApJ 775:L37)



SOFIA/FORCAST 3-color mid-infrared images (blue box: 20, 31, and  $37 \mu\text{m}$ , red box: 8, 20, and  $37 \mu\text{m}$ ) of the M42 star-forming region in Orion shown as insets on a Spitzer image. These images show a complex distribution of interstellar dust and protostars in the Orion nebula. The SOFIA images were made at combinations of wavelengths and angular resolutions unavailable to any other ground- or space-based observatory. (J. De Buizer/FORCAST team; Spitzer image: NASA/Caltech-JPL)



## FORCAST Specifications

Principal Investigator: Dr. Terry Herter, Center for Radiophysics & Space Research, Cornell University

SOFIA Instrument pages - <http://www.sofia.usra.edu/Science/instruments>

FORCAST has a short wavelength camera (SWC) and a long wavelength camera (LWC). The cameras can be used individually or together for simultaneous imaging of the same field of view.

Camera	Wavelength Range	Detector
SWC	5 - 25 $\mu\text{m}$	Si:As (BIB)
LWC	25 - 40 $\mu\text{m}$	Si:Sb (BIB)

Each channel consists of a 256x256 pixel array that yields a 3.4'x3.2' instantaneous field-of-view with 0.768" pixels.

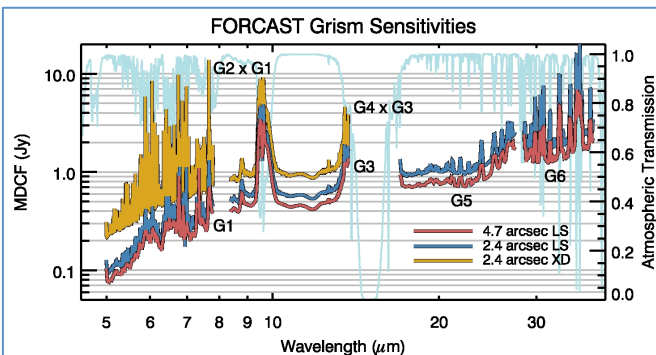
### Imaging

The PSF in FORCAST images is consistent with the diffraction limit of the plus the 1.3" rms jitter of the telescope. When in dual channel mode, a dichroic is used to split the beam into the SWC and the LWC. This decreases the throughput of the system by 40-85% relative to the single channel mode.

SWC Filters		LWC Filters	
$\lambda_{\text{eff}}$ ( $\mu\text{m}$ )	$\Delta\lambda$ ( $\mu\text{m}$ )	$\lambda_{\text{eff}}$ ( $\mu\text{m}$ )	$\Delta\lambda$ ( $\mu\text{m}$ )
5.4	0.16	24.2	2.9
5.6	0.08	25.3	1.86
<b>6.4</b>	<b>0.14</b>	<b>31.5</b>	<b>5.7</b>
<b>6.6</b>	<b>0.24</b>	<b>33.6</b>	<b>1.9</b>
<b>7.7</b>	<b>0.47</b>	<b>34.8</b>	<b>3.8</b>
8.6	0.21	<b>37.1</b>	<b>3.3</b>
<b>11.1</b>	<b>0.95</b>	Entries in bold font are the default filter set for Cycle 4.	
11.3	0.24		
11.8	0.74		
<b>19.7</b>	<b>5.5</b>		
<b>25.4</b>	<b>1.86</b>		

### Spectroscopy

FORCAST gratings provide coverage from 5 - 40  $\mu\text{m}$ . Blazed diffraction gratings are used in transmission and stacked with blocking filters to prevent order contamination. Two long slits (2.4" x 191", 4.7" x 191") and a short slit (2.4" x 11.2") for cross-dispersed modes are available.

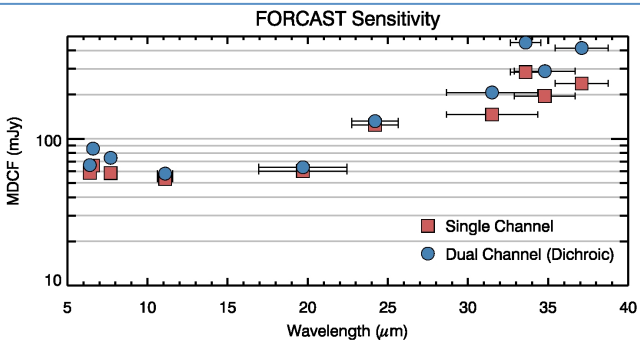


Grism continuum point source sensitivities for all three slits overlaid on an atmospheric transmission model (light blue). Values are for S/N = 4 in 900 s, a water vapor overburden of 7  $\mu\text{m}$ , an altitude of 41K feet, and a 60° zenith angle.

Grism	Groove Sep. ( $\mu\text{m}$ )	Prism Angle	Order	Coverage ( $\mu\text{m}$ )	R ( $\lambda/\Delta\lambda$ )
G1	25	6.16°	1	4.9 - 8.0	90/180 <sup>a</sup>
G2xG1	87	32.6°	15-23	4.9 - 8.0	1200 <sup>b</sup>
G3	32	15.2°	1	8.4 - 13.7	150/300 <sup>a</sup>
G5	87	6.16°	1	17.6 - 27.7	70/140 <sup>a</sup>
G6	142	11.07°	2	28.7 - 37.1	110/220 <sup>a</sup>

<sup>a</sup> For the 4.7" x 191" and the 2.4" x 191" slits, respectively

<sup>b</sup> Only available with the 2.4" x 11.2" slit



Continuum point source sensitivities for single and dual channel modes for default Cycle 4 filters. Values are for S/N = 4 in 900 s, a water vapor overburden of 7  $\mu\text{m}$ , an altitude of 41K feet, and a 60° zenith angle.