

SOFIA

Science Newsletter



July 2021

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Science Spotlight



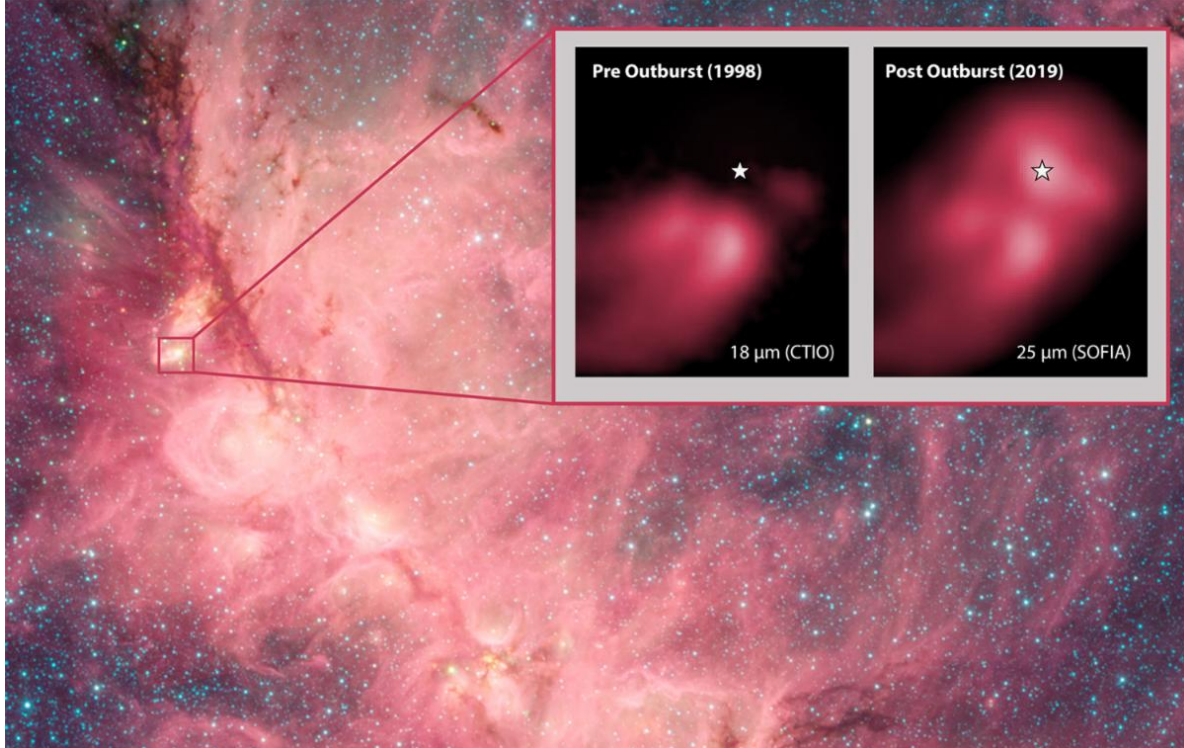
Detecting Episodic Accretion in the Cat's Paw Nebula

While monitoring NGC 6334 I, a well-studied proto-cluster, a team led by Todd Hunter (NRAO) discovered a millimeter continuum outburst from a massive protostar with the Atacama Large Millimeter/submillimeter Array (ALMA). Unlike its proto-cluster companions, this source was so deeply embedded that prior to the outburst, it was too obscured to be observed at infrared wavelengths.

Using SOFIA's FORCAST and HAWC+ instruments, the region was revisited after the discovery of the millimeter outburst. The observations revealed that not only could the protostar now be seen in the infrared, but it was also now the brightest infrared source in the entire proto-cluster.

Combining the fluxes obtained from SOFIA mid- and far-infrared data with ALMA millimeter data, protostellar radiative transfer models were used to determine that the protostar had an outburst luminosity 16 times higher than its pre-outburst value. Such an increase may result from a large uptick in the accretion rate -- an accretion burst -- possibly created by a massive clump from the disk falling onto the forming star.

Read more [here](#). Also watch Todd Hunter's presentation for the SOFIA/ALMA Summer series [here](#).



The Cat's Paw Nebula (NGC 6334), imaged here by NASA's Spitzer Space Telescope using the IRAC instrument, is a star-forming region inside the Milky Way Galaxy. The dark filament running through the middle of the nebula is a particularly dense region of gas and dust. The inset shows the region of the high-mass protostar with pre- and post-outburst luminosity. *Credit: Cat's Paw Nebula: NASA/JPL-Caltech; Left inset: De Buizer et al. 2000; Right inset: Hunter et al. 2021*

Observatory News

SOFIA's New Blog Takes Off

The [SOFIA blog](#) has launched! This is our new home for the latest SOFIA news and science stories. Our first blog posts include the mapping of ionized carbon in the Fireworks galaxy (NGC 6946), and results from the FEEDBACK Legacy program on the expansion speed of nebula RCW 120.

Revised Grant Funding Distribution Plan

Starting with Cycle 9, a revised [funding distribution plan](#) is now in place. In particular, there is now a minimum grant award threshold value of \$40,000 for Priority 1 and 2 projects. Guest Observers of such proposals will be contacted shortly by the SOFIA Science Center Contracts & Grants Manager about their revised awards.

Cycle 9 in the Starting Blocks

[Cycle 8](#) concluded on July 1st, wrapping up with a FORCAST series which included several [lunar water](#) observations. Observations resumed on July 6th, inaugurating the start of [Cycle 9](#). With a planned end date of September 30, 2022, this cycle will be longer than any previous SOFIA cycle. The first of the three Southern Deployments planned in Cycle 9 during July-September 2021, carrying GREAT and HAWC+ instruments, will be conducted from Tahiti, French Polynesia. Considering the cycle timeline, the Cycle 10 Call for Proposals is anticipated to be issued at the end of October 2021, with a deadline in January 2022.

Upcoming Events

SOFIA/ALMA Summer Series Thursdays June 10-July 22, 2021



This Summer, the SOFIA Science Center and the [North American ALMA Science Center](#) are carrying out their first [joint Summer seminar series](#), exploring synergies between radio/millimeter and infrared observations, spanning a large range of astrophysical topics.

Four exciting events were already held, with recordings available [here](#). Two more talks are scheduled in July, each **Thursday at 3:30 pm EDT/12:30 pm PDT**, until July 22, 2021. A Q&A/discussion session will follow each 40-45 min talk.

Upcoming Talks

- July 15: Kate Su (University of Arizona); Tracing the Formation and Evolution of Planetary Debris Disks with Multiwavelength Approaches
- July 22: Katherine de Kleer (Caltech); Mapping the Surfaces Properties of Icy and Rocky Solar System Worlds

[Registration is free but necessary to attend.](#)

The Future of Airborne Infrared/Submm Astronomy: Prospects and Opportunities July 26-28, 2021 (3pm-7pm CET)

This online workshop organized and hosted by DSI (Deutsche SOFIA Institut) is the first of two, intended for all those interested about the short-term and mid-term future of Infrared and Submm astronomy. This first workshop aims to identify the main scientific interests in this field, in preparation for a second workshop that will focus specifically on supporting instrumental solutions that can be contributed from the European side. The [program](#) is now available, and registration is open until July 20.

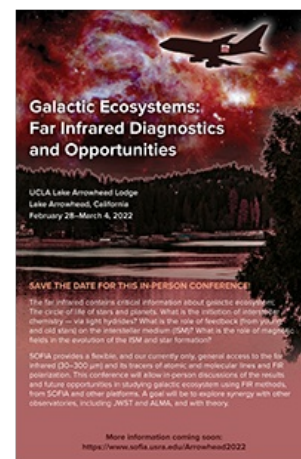


More details are available at the [workshop homepage](#).

Galactic Ecosystems: Far Infrared Diagnostics and Opportunities February 28 - March 4, 2022 UCLA Lake Arrowhead Lodge, CA

The far infrared contains critical information about galactic ecosystem; The circle of life of stars and planets. What is the initiation of interstellar chemistry -- via light hydrides? What is the role of feedback (from young and old stars) on the interstellar medium (ISM)? What is the role of magnetic fields in the evolution of the ISM and star formation?

SOFIA provides a flexible, and our currently only, general access to the far infrared (30-300 μm) and its tracers of atomic and molecular lines and FIR polarization. **This conference will allow in-person discussions of the results and future opportunities**



in studying galactic ecosystems using FIR methods, from SOFIA and other platforms. A goal will be to explore synergy with other observatories, including JWST and ALMA, and with theory.

[Sign up to be notified when registration is open.](#)

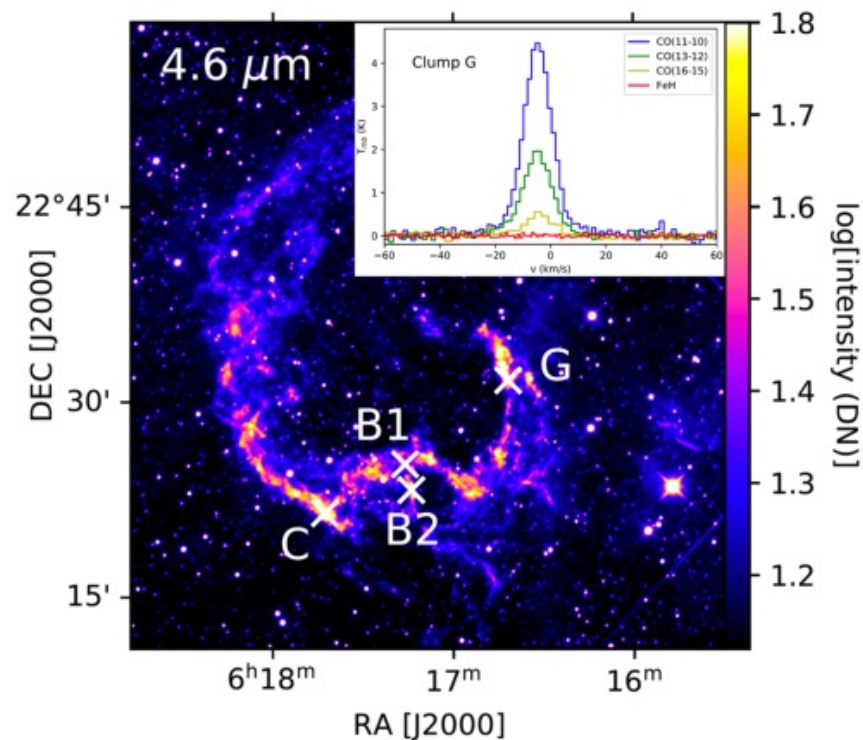
Featured Public Archival Data

The Impact of a Supernova Remnant on a Molecular Cloud

Supernovae send copious amount of energy into the interstellar medium and are an important driver of its chemical evolution. IC 443, at a distance of 1.5 kpc, is one of the best studied supernova remnants interacting with a molecular cloud. It is thus an excellent target to investigate the physics and chemistry of shock models.

SOFIA observed a variety of molecular lines that trace shocks. The data, all publicly available in the [IRSA SOFIA Archive](#), can allow an in-depth study of the shocks that interact with the molecular cloud.

- GREAT observations towards clump C and G (see figure below), provide velocity resolved CO(11-10), CO(13-12) and CO(16-15) lines which are well suited to study the warm molecular gas of a shock (Project ID: 01_0156).
- GREAT also did a deep integration (noise rms = 0.031 K) to detect line emission from iron hydride (FeH) towards clump G (Project ID: 02_0076). As a supernova can provide a high Fe abundance when interacting with the molecular cloud, the non-detection can be a constraint on shock models.
- The H₂ S(5) pure rotational line was observed and spectrally resolved with EXES towards the clumps B1, B2, C and G and is a good tracer of the shocks in the region (Project ID: 75_0018; Reach et al. 2019).



A view at 4.6 micron with WISE of the supernova remnant IC 443, combined with high-J CO spectra from the SOFIA upGREAT receiver towards the bright clump G.

Join Science Talks Remotely: Tele-Talks

Tele-Talks are scientific presentations given via phone, with slides distributed ahead of time. The talks are held approximately twice a month on Wednesdays at 9:00 am Pacific, noon Eastern. For information on how to participate, check the [SOFIA Tele-Talk webpage](#).

Upcoming Tele-Talks

- July 21: Enrique López-Rodríguez (KAVLI/Stanford); The Magnetic Field in the Warped Molecular Disk of Centaurus A
- August 4: Thomas Sperling (Thüringer Landessternwarte); Atomic Gas in Low Mass Outflows
- August 11: Matteo Luisi (West Virginia University); Stellar Feedback in RCW 120

[See full list of Tele-Talks.](#)

Please direct questions and comments to the SOFIA Science Center help desk:
sofia_help@sofia.usra.edu.

