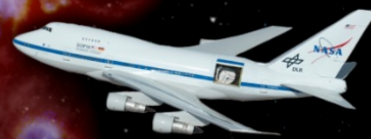


SOFIA

Science Newsletter



July 2022

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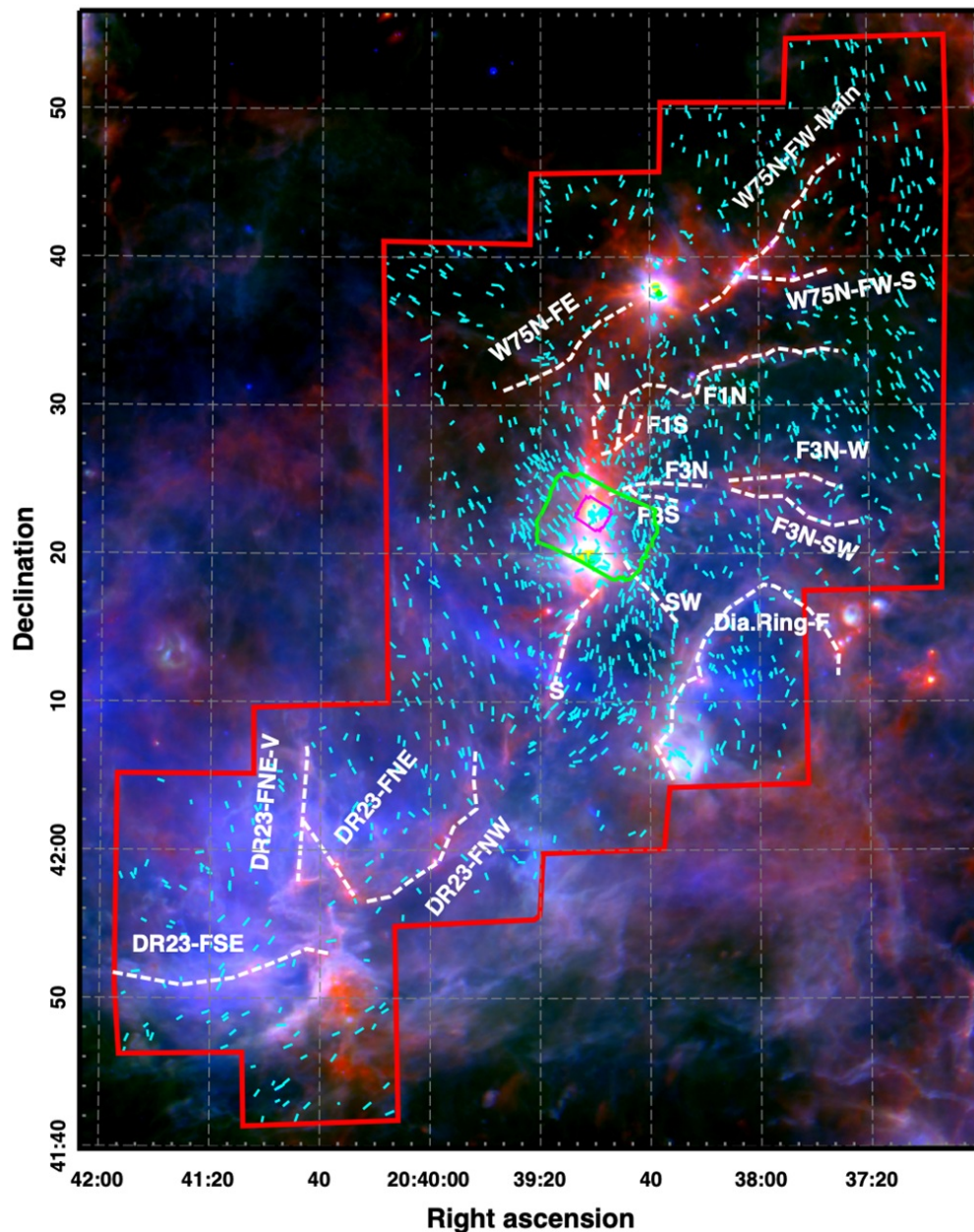
Science Spotlight



Star Formation in the Cygnus-X Complex: Processes at Small and Large Scales

The Cygnus X complex, one of the most active nearby star-formation regions, hosts a large and diverse ensemble of protostars and star-forming environments. It is an ideal laboratory for studies examining the interplay of protostars and their environment on a variety of scales, as demonstrated by two recent studies based on SOFIA observations. FORCAST observations were used to complete the census of protostars started with Spitzer/MIPS, by accessing bright and closely clustered protostars. The improved sample results indicate that the protostellar luminosity distribution shows an excess of high-luminosity sources in high-density gas regions, which may be indicative of the importance of episodic accretion for feeding mass into individual forming stars. [Read more.](#)

A different study examined the role of magnetic fields within the large dense filaments hosting the most intense star formation activity. Using the HAWC+ instrument, the mid-IR dust polarization field was measured in a region where several distinct clouds overlap, indicating the directions of the small-scale magnetic fields. These observations can be used to understand whether the magnetic fields are passive participants in the clouds' dynamics or are helping channeling gas flows toward a central hub. [Read more.](#)



Cygnus-X northeast region. Background image was constructed from Herschel SPIRE 250um in red, Herschel PACS 70um in green, and Spitzer MIPS 24um in blue. Red polygon indicates region surveyed for near-infrared, H-band (1.6um) stellar polarizations. Cyan segments indicate the magnetic field orientations derived from those NIR polarizations. Dashed white curves highlight filaments and sub-filaments cataloged by Hennemann et al. (2012) and new filaments and subfilaments from this study. The green polygon shows the DR21 Ridge region surveyed using SOFIA HAWC+ E-band (214um) polarization and the inscribed smaller magenta polygon shows the corresponding HAWC+ A-band (52um) polarization surveyed region. Credit: Herschel/Spitzer/SOFIA/Hennemann et al./Clemens et al.

Featured Legacy Dataset

The SOFIA/EXES Mid-IR High Spectral Resolution Library

During the very last [EXES observing series](#), observations were carried out with the purpose to complete a high spectral resolution ($R = 50,000$) legacy library on three classical sources over the 5.23 to 28.3 micron range (avoiding regions more easily observed from the ground and/or gaps due to strong atmospheric lines). The chosen sources are known to exhibit an incredibly rich inventory of complex organic molecules, resulting from the interplay of grain surface reactions, UV/cosmic ray processing, and gas phase reactions. The resulting EXES spectra will leverage the interpretation of upcoming lower resolution JWST/MIRI spectra of similar sources.

Two of the observed sources are hot cores associated to massive protostars: NGC 7538 IRS 1 (with spectral data starting at ~ 13.5 microns) and AFGL 2136 (spectrum covering 13.5 - 14.3 microns, targeting hydrocarbons).

The third source, IRC+10216, is a carbon-rich asymptotic giant branch star, and was observed with a higher resolution of $R \sim 85000$. AGB stars and post main-sequence stars in general are typically considered to be among the brightest objects in the universe, and they dominate the IR emission of galaxies.

The legacy team led by E. Montiel (USRA) eventually expects to generate line lists of all identified spectral features as well as versions of the spectra convolved to JWST/MIRI resolution.

All calibrated data are available in the [IRSA SOFIA Archive](#), mostly under project ID 75_0106, with complementary data under project IDs 05_0041, 06_0117 and 75_0024 (more public data to come out soon).



SOFIA Southern Deployment in New Zealand

After a two-year hiatus, SOFIA has returned to Christchurch, New Zealand, for its last Southern deployment. Observations with the HAWC+ and GREAT instruments are being conducted, with [flight plans](#) focused on completing five [legacy programs](#), covering a large variety of science cases spanning from the chemistry of diffuse galactic ISM clouds to magnetic field structure in nearby galaxies. You can see SOFIA's travels by following aircraft NASA747 on your favorite online flight tracker. [Read more.](#)



SOFIA arriving at Christchurch Airport, New Zealand. Credit: Wayne Williams, Port Hills Productions

240th AAS Summary

The [240th AAS meeting](#) in Pasadena, CA (June 12-16) was a long-awaited opportunity for US-based astronomers to reconnect in person. For the SOFIA Science Center, the event was even more meaningful, as it was the last large-scale occasion to engage with the community before the planned end of operations. We were able to meet and support many of our users who are analyzing their latest data. Opportunities for archival research

and the expected science from the [public legacy datasets](#) were presented at several exhibit hall talks. As expected from the amount of publications produced in the past two years, SOFIA results were featured throughout the event, including at three press conferences.

We were also happy to see strong attendance and high engagement at [our events](#). The splinter session 'Mid and Far-IR Observations: Leveraging Science across the Spectrum' introduced examples of synergistic science currently enabled by SOFIA, which may be pursued by future probes and balloons. The lively panel discussion highlighted challenges and scientific priorities in the field. The SOFIA town hall, which included representatives from NASA, gathered 100 attendees who celebrated the SOFIA team and their recent achievements, including the last very successful observing cycles, from which we expect many results to be presented at future AAS meetings.

Good to Know

SOFIA User Group

The SOFIA User Group, led by its chair T. Wiklind (Catholic U.), held its bi-annual meeting on May 24th, 2022. The outcome of this meeting was a list of [recommendations and highlights](#) from the presentations and discussions.

The SUG is one of the advisory groups which provides input to the Science Mission Operations (SMO) Director on a broad range of matters concerning the scientific and scientifically relevant technical aspects of SOFIA. The SUG also serves as a conduit for the interests, priorities and concerns of the astronomy community using, or interested in using SOFIA for their research. All presentations and reports of the past SUG meetings are [accessible online](#).

Virtual Talks

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 a.m. Pacific, noon Eastern. For information on how to participate, check [SOFIA Tele-Talk webpage](#).

Upcoming Tele-Talks

- July 20: Ümit Kavak (SOFIA Science Center); Protostellar Feedback in Orion's Veil
- August 17: Jim De Buizer (SOFIA Science Center); Survey of Giant HII Regions in the Milky Way
- August 24: Le Ngoc Tram (MPIFR Bonn); Magnetic Fields and Gas Kinematics in 30 Dor
- September 14: Rubén Fedriani (Chalmers); SOMA Massive Star Formation Survey

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

