SOFIA Science Newsletter

September 2022

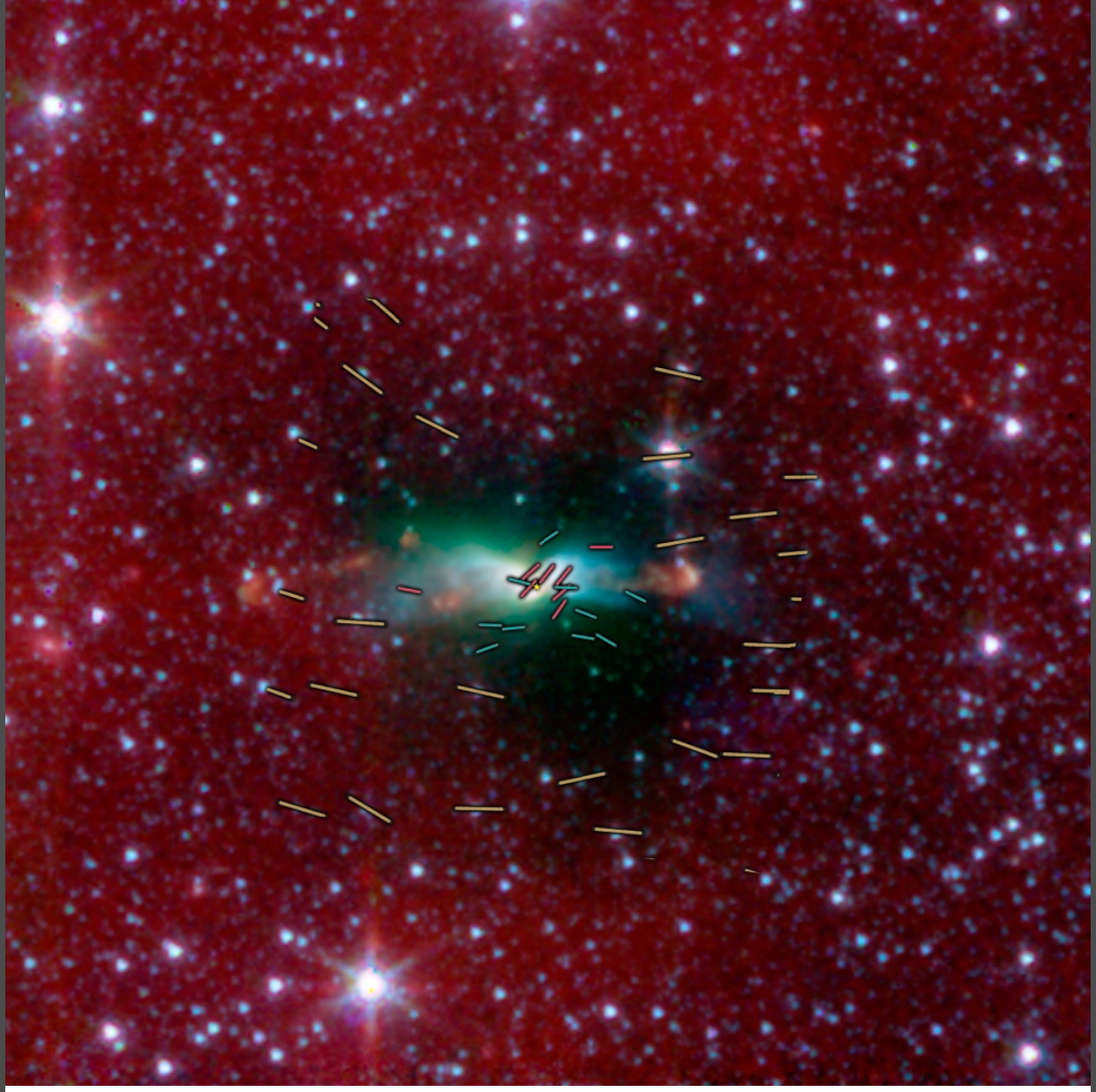
In this issue:

Science Spotlight

Twisted Magnetic Fields Can Reveal How Protobinary Systems, Tatooine Planets Form

Circumbinary planets – planets that orbit around two stars, like the fictional Star Wars planet Tatooine and its two suns – exist in the universe, and are sometimes referred to as Tatooine planets. Systems in which two stars rotate around each other, called binary star systems, are incredibly common, comprising over half the stars in the Milky Way galaxy. But how does a binary system like this happen?

Researchers using the HAWC+ instrument onboard SOFIA were able to see the presence of a twisted magnetic field around a protobinary star system, a very young binary star system that is still growing. This provides a hint about how the system came to be: the protostars may have formed far away from each other before migrating inwards, twisting up the magnetic field in the star-forming cloud in the process. Read more.



A subset of polarization vectors are overlain atop a Spitzer Space Telescope image of Lynds 483. The SOFIA data is shown in red, and the orange vectors were obtained by Pico dos Dias Observatory. The green vectors show data obtained by SHARC C-II Polarimeter at the Caltech Submillimeter Observatory in previous work, shown here as a comparison of scales. Near the center of the image is a small yellow dot indicating the location of the binary protostars. The combined fields show a twist as they approach the protostellar envelope, though they are parallel on larger scales. Credit: L483: NASA/JPL-Caltech/J. Tobin; Vectors: Cox et al. 2022, Chapman et al. 2013

Signatures of AGN Feedback: The Post-SOFIA Era

Thursday, October 20 2022
7:30 - 11:30am PDT

The main goal of this free online workshop is to present recent impactful observational results on AGN feedback from IR observations in particular from SOFIA, and to offer the opportunity for AGN observers to discuss the current status and future approaches for IR AGN research. Six talks will cover topics such as recent advances in MHD modeling, galactic winds, shocks and turbulence, magnetic field structure, and AGN-induced star formation. A panel discussion will focus on the role of IR studies in the current observational landscape.

Confirmed speakers:
Kung-Yi Su (Columbia)
Dario Fadda (SOFIA)
Allison Kirkpatrick (Kansas)
Enrique Lopez Rodriguez (Stanford)
Mark Morris (UCLA)
Sylvain Veilleux (UMD)

Register for the workshop here.

241th AAS Meeting: Call for Submissions

We hope to see many of you at the AAS 241st meeting in Seattle. We strongly encourage everyone in the community of SOFIA users to submit an abstract on your latest SOFIA results -- the **deadline for submissions is on Tuesday, October 11.**

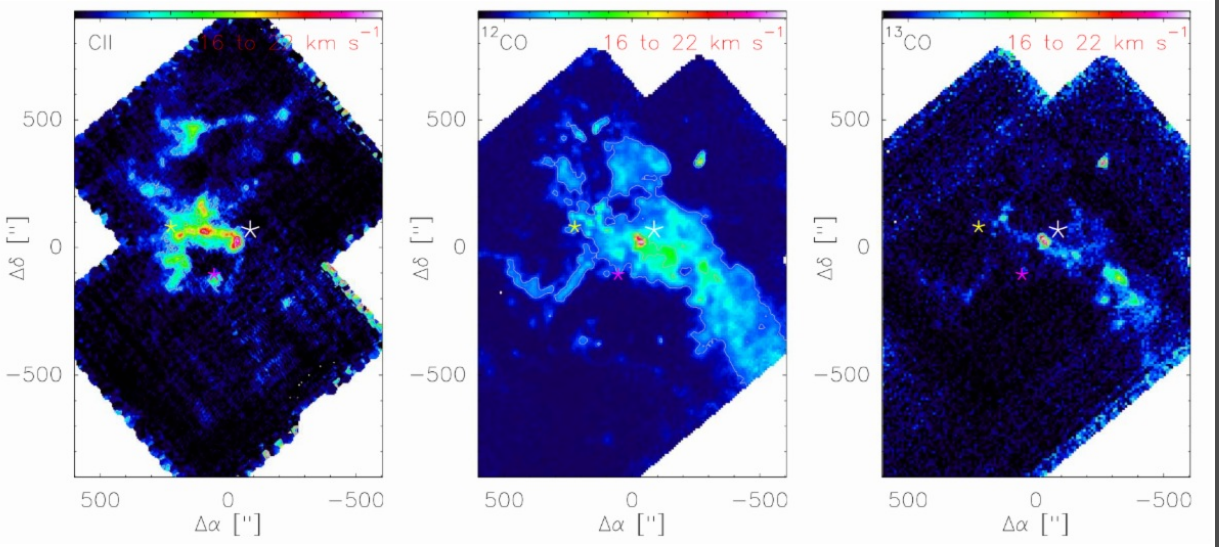
The Outreach team can also help promote your SOFIA science results, and support a press release and press conference at AAS. Please contact the helpdesk at your earliest convenience if you think your contribution at AAS merits a press release. Note that communicating with the SOFIA Outreach team is considered internal communications and does not violate the embargo policies of scientific journals.

Featured Legacy Dataset: FEEDBACK Program

Massive stars strongly influence the chemistry, dynamics, morphology, and thermal structure of their natal environment through a variety of processes globally described as stellar feedback. Feedback is significantly altering these environments, affecting star formation in them, and eventually regulating the evolution of galaxies.

SOFIA's legacy program FEEDBACK, led by co-PIs Alexander Tielens (Leiden Observatory/University of Maryland) and Nicola Schneider (University of Cologne) has recently been completed and will facilitate the identification of driving feedback mechanisms such as stellar wind, radiation pressure, and thermal expansion. The dataset of high-quality, high-spectral resolution GREAT [C II] and [O I] maps from a diverse sample of 11 massive star formation regions (including HII regions of different geometries, single stars, small groups, and star clusters), can be used to characterize the kinematic and physical properties over large spatial scales. Six publications have already been issued based on this dataset, with more to come.

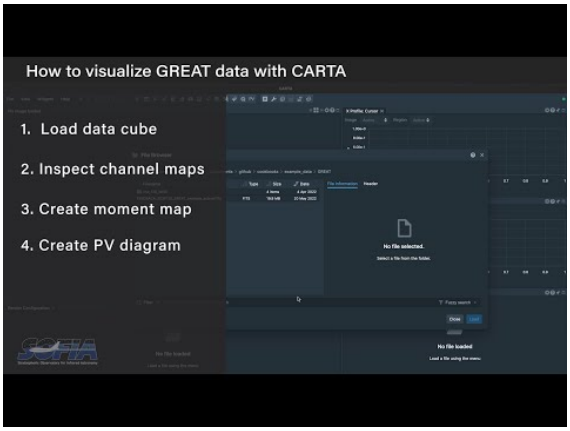
All available data from this legacy program are publicly accessible at the SOFIA Archive under program ID 07_0177, and the community is strongly encouraged to use them for their own research. Several resources are available to facilitate use of the data, including the Cologne team's website and the Maryland team's website which give detailed information on the sources and provide links to the analysis tools, and a presentation at the SOFIA school on how to determine kinematics. Note in particular the PDR Toolbox, a public python-based toolkit for the physical interpretation of PDR environments based on modeling of line data to retrieve properties such as density, temperature, and para-to-ortho ratio. Some functionalities in the PDR Toolbox were designed specifically for the analysis of FEEDBACK data, such as model phase-space plots, and the toolkit continues to be developed. A series of notebooks guides the user through the use of the tools.



Left to right: velocity integrated intensity maps of [C II], 12CO, and 13CO towards star-forming region RCW 49 (ridge) within 16–22 km s−1. The Wd2 cluster's center and the OV5 and WR 20b stars are marked with white, yellow, and pink asterisks, respectively. Credit: Tiwari et al. 2021.

Good to Know

New Cookbook: GREAT Data Visualization with CARTA



This is a new data analysis cookbook for displaying GREAT (or FIFI-LS) data using the Cube Analysis and Rendering Tool for Astronomy (CARTA). As a successor of the astronomy package CASA, this new graphical user interface allows users to easily create channel or moment maps, PV diagrams, or extract spectra from SOFIA datacubes.

You can find the whole suite of SOFIA cookbooks here.

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

- October 12: Andre Beck (University of Stuttgart, DSI); Ionized Gas in NGC253
- October 19: Casey Honniball (NASA GSFC); Map of Molecular Water on the Moon
- November 2: Jeremy Chastenet (Ghent University); FIR Polarization and Dust Properties in the Crab Nebula

Please direct questions and comments to the SOFIA Science Center help desk:

sofia_help@sofia.usra.edu.