SOFIA Science Newsletter

September 2020

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Instrument Development Roadmap Survey

In response to a request from NASA, the SOFIA Science Center is developing a roadmap on SOFIA's instrument development for 2020-2025. After hosting two workshops this summer to collect community input, we continue to solicit and encourage suggestions and comments to this effort. To help ensure the community's priorities are reflected in the Instrument Roadmap, **please complete this short survey** on science cases and instrument capabilities.

Science Spotlight: Magnetized Filamentary Gas Flows in Serpens South

The vast space between stars is home to filamentary gas and dust features that appear to play a major role in channeling mass into young clusters where stars can form. These formation processes are driven by a complex interplay of several fundamental forces including turbulence, gravity, and the magnetic field. In order to get an accurate description for how dense clusters of stars form, astronomers need to pin down their relative roles.

Recent SOFIA HAWC+ observations of the Serpens South star cluster, a young, nearby star forming region that sits at the center of a network of dense filaments (Pillai et al., 2020), confirmed the trend seen in large-scale Planck observations — that the magnetic field is parallel to low-density gaseous filaments and perpendicular at higher densities. The finer resolution of the HAWC+ instrument, however, also revealed a twist to the Planck story. In the most opaque parts of certain filaments, the observations show that the magnetic field is once again aligned. This transition appears to result as the magnetic field succumbs to the strength of the gas flow, allowing gravitational collapse and cluster formation to occur even in the presence of relatively strong magnetic fields. Read more.

Composite image of the Serpens South Cluster. Magnetic fields observed by SOFIA are shown as streamlines over an image from the Spitzer Space Telescope. This map indicates that gravity can overcome some of the strong magnetic fields to deliver material needed for new stars. The magnetic fields have been dragged into alignment with the most powerful flows, as seen in the lower left where the streamlines are following the direction of the narrow, dark filament. This is accelerating the flow of material from interstellar space into the cloud, and fueling the collapse needed to spark star formation. Credit: NASA/SOFIA/T. Pillai; NASA/JPL-Caltech/L. Allen

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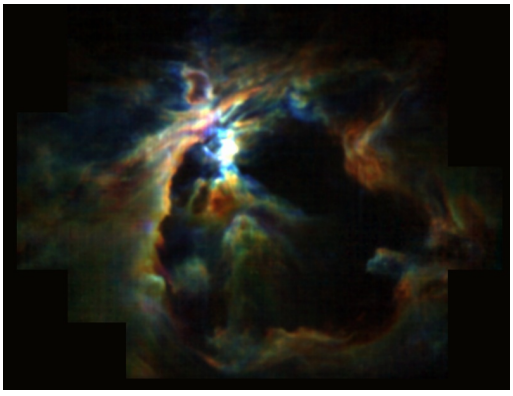
Special Stellar Feedback Session at the 237th AAS meeting



The SOFIA Science Center is organizing the special session 'Assessing the Impact of Stellar Feedback' at the 237th AAS meeting (online). This session will include recent theoretical and observational results which contribute to the understanding of the role of stellar feedback across different scales, from protostellar clouds to galaxies. Observations of the kinematics and temperature gradients in stellar environments (such as the FEEDBACK SOFIA legacy program) will be presented. Get more information.

The oral session will be held on **Tuesday, January 12, from 4:10 pm to 5:40 pm**

(Eastern Time), with invited talks by Alexander Tielens (U. Leiden), Laura Lopez (OSU), Mélanie Chevance (U. Heidelberg), Hector Arce (Yale), Susanna Widicus Weaver (U. Wisconsin-Madison) and Crystal Martin (UCSB).

We solicit and welcome contributions to the associated iPoster special session. **Submit a poster by October 13th.**

Observatory Updates

Cycle 9 Call for Proposals

The Cycle 9 Call for Observing Proposals closed on September 4, 2020. The Time Allocation Committee will meet this fall and selected proposals will be announced this winter. The DDT Call for Proposals continues to be open year-round.

SOFIA Scheduled Maintenance

We successfully returned to science observations in August, completing two series of flights for Cycle 8. The aircraft departed for scheduled maintenance at Lufthansa Technik's facility in Hamburg, Germany, as planned, on September 29, 2020. Lufthansa Technik's 747SP specialists will perform scheduled inspections and maintenance while staff from the German SOFIA Institute (DSI) will implement upgrades to the telescope. The maintenance is expected to be completed early next year.

Featured Public Archival Data: New [C II] Maps in Massive Star Formation Regions

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. To facilitate the identification of driving feedback mechanisms such as stellar wind, radiation pressure and thermal expansion, co-PIs Alexander Tielens (Leiden Observatory) and Nicola Schneider (University of Cologne) are leading the FEEDBACK legacy program on SOFIA.

Across a diverse selection of massive star formation regions (including HII regions of different geometries, single stars, small groups and star clusters), [C II] and [O I] maps will be used to characterize the kinematic and physical properties over large spatial scales. Schneider et al., 2020 presents in detail the scientific context and the observation plans. The Maryland team's website gives detailed information on the sources and provides links to the PDR analysis tools, while the Cologne team's website informs about the current observations status. FEEDBACK observations with GREAT started in 2019, and will eventually produce large spectrally-resolved maps of [C II] and [O I] emission on 11 sources.

Preliminary data have been released for the sources RCW79, RCW49, RCW36, RCW120, NGC7538, NGC6334, the Cygnus X region, W40, M16 and M17, corresponding to FITS data cubes of the observations to date. The data are publicly available for download at the SOFIA Archive. While all maps have varying number of missing spatial fields (see completion rates), the observed fields are already fully sampled for [C II]. These maps will be completed after missing fields are observed during the remainder of Cycle 8.

Join Science Talks Remotely: Colloquia & Tele-Talks

The SOFIA fall colloquium series will begin on September 30. The colloquia will be held via

WebEx on Wednesdays at 3:30 pm Pacific. See the complete schedule and connection information.

Upcoming Colloquia

- September 30: Doug Johnstone (NRC Herzberg)
- October 14: Jürgen Ott (NRAO)
- October 21: Justin Spilker (UT Austin)
- October 28: Che-Yu Chen (UVa)

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 7: First Detection of 13CH; Arshia Jacob (Max Plank Institute for Radioastronomy)
- October 14: 13CII in LMC; Yoko Okada (University of Cologne)
- November 4: PDR structure and kinematics around S235 A and S235 C; Maria Kirsanova (Institute of Astronomy, Russian Academy of Sciences)
- November 18: Polarization Spectrum in OMC-1; Joe Michail (Northwestern University)
- December 2: Radiative Torque Alignment and Interstellar Grain Polarization; Le Ngoc Tram (SOFIA Science Center)

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