

2018.Nov.27

To: Dr. Harold Yorke, Director SOFIA Science Mission Operations

Re: SOFIA Science Users Group (SUG) Meeting# 13 – Report

The SOFIA Science Users Group (SUG) held its 13th meeting at the NASA Ames Research Center on 16 November 2018. The primary discussion topics between SUG members and the Project (led by Drs. Harold Yorke, Director SOFIA Science Mission Operations and William Reach, SOFIA Chief Science Advisor and SUG Secretary) are captured in the meeting Agenda and expanded in more detail in the presentation charts available at: <https://www.sofia.usra.edu/science/sofia-overview/advisory-groups/sofia-users-group-sug>. Three new members of the SUG rotated on to the committee, including a new Chair.

The SUG was impressed by the positive trajectory of the Project at this juncture, including implementation of new flight scheduling schemes to provide contingency, steady progression in publication output from SOFIA data products, and the dissemination of exciting science results from HAWC+. Production of 34+ PhD theses associated with aspects of the SOFIA mission is noteworthy. Below are highlights and recommendations based on the SOFIA staff presentations and conversations, which were consensus items derived from the SUG's impressions (not necessarily in rank order). We have itemized each highlight for clarity and to enable specific reference to recommendations and actions in future discussions.

[SUG13 – 01]. The Project described efforts to port the SOFIA data science center (DCS) archives into the Infrared Research (IRSA) repository, integrating SOFIA into the broader infrared mission cloud. A more robust staffing level within SOFIA Data Science Group enabled this transition, which should also benefit the SOFIA user community with more timely delivery of high-level data products to proposers. The SUG encourages the Project to strive to meet the NASA requirements of a 15-day turn around, from acquisition to pipeline reduction. The Project should notify observers about data issues and other delays as soon as possible, including possible needs for rescheduled flights. The SUG also recommends that the Project prioritize delivering to the IRSA archive during the first ingestion cycle the large impact and Director's Discretionary Time datasets (i.e., OMC-Horsehead Nebula, LMC-30 Doradus) to enable immediate community access.

[SUG13 – 02]. The Project and the SUG discussed strategies to initiate a broader use of SOFIA datasets to advance archival analysis, leading to enhanced science outcomes and increased publication rates. Full inclusion of SOFIA under the umbrella of mission data products considered with the NASA Astrophysics Data Analysis Program (ADAP) is one means to achieve funding opportunities to exploit SOFIA. The SUG recommends that the Project engage the relevant NASA ADAP program officers to develop a clear memorandum of understanding, wherein SOFIA archival data products are fully included and eligible within the terms of reference for the 2019 call. The SUG also encourages the Project to obtain the statistics (if possible) on the "Primary" and "Secondary Proposed Dataset" identified by the ADAP proposers for 2016-2018, to assess the level at which SOFIA is identified by the proposals submitted to ADAP.

[SUG13 – 03]. The Project requested that the SUG provide guidance on the potential initiation of an independent in-house scheme to support SOFIA-specific archival/theory opportunities. The SUG recommends delay of this initiative and requests that the Project more fully develop this concept, taking into particular account how SOFIA data products might be utilized within NASA ADAP. We urge the Project to be proactive in alerting the SOFIA community about the new opportunities for ADAP-supported SOFIA-based projects during this coming cycle. The Project should then assess the effectiveness of ADAP for supporting SOFIA-based science. The SUG concurs that the Project must carefully weigh the relative merits of being a primary data source for the ADAP program versus hosting an archival program. The latter activity would likely shut off future ADAP funding for SOFIA-primary archival research projects. However, the SUG agrees that the Project’s proposed level of funding for an independent initiative seems excessive given the current archival datasets.

[SUG13 – 04]. The Project must ensure that some of the recent and forthcoming large data sets - for example the LMC HAWC+ data - are published in a timely manner to enhance the value of the SOFIA archive, enabling effective archival/theory investigations. The SUG recommends the Project consider ways of funding the analysis of specific data sets - particularly those obtained through directors discretionary allocations - in a way that would not exclude SOFIA from being a primary data source for ADAP. Such targeted funding may be needed to jumpstart SOFIA archival research until the archive is rich enough to attract ADAP money on a regular basis. Similarly, the SUG requests that the Project advertise the availability of funds for covering page charges on SOFIA papers.

[SUG13 – 05]. The Project continues to expand on its active engagement with the user-community, in order to facilitate SOFIA data analysis. The SUG concurs that user polling is useful in outcomes assessment and noted that user satisfaction is currently quite positive with many aspects the mission (e.g., help-desk support, proposal submission support, staff scientist interaction). The development of “cookbooks” and hands-on SOFIA data workshops provides a high impact opportunity to exchange information and approaches to the reduction and analysis of SOFIA instrument data products. The SUG recommends archiving and posting workshop materials on webpages associated with the “cookbooks” and exploring production of simple accompanying video tutorials (which could also be distributed via social media feeds). Consideration of whether establishing a SOFIA-specific stack exchange forum (like IRAF.net, or the JWST JDOx Quick Links) would benefit the SOFIA community should be explored, as should an FAQ on the SOFIA website and/or hosted on the IRSA website.

[SUG13 – 06]. The SUG noted a renewed approach to public outreach and anticipated positive return from such investments, including the aircraft visitation tours in the Seattle, WA, concurrent with the American Astronomical Society 233rd meeting and associated press coverage of this event. The SUG also recommends that the Project pursue a display of SOFIA art within the SOFIA Science Center building(s) and explore collaborations with digital planetariums by providing three-dimensional fly-through renderings of select SOFIA data to enhance visibility of the Project.

[SUG13 – 07]. The SUG noted the challenge from the SOFIA International Summit (SIS) Committee recommending, “that the SOFIA Users’ Group work with the Project to identify places where science flight time might be gained, including the possibility of more accurate time estimators to improve scheduling precision.” The SUG discussed with the Project potential response options. The SUG noted that there is significant science opportunity in expanding southern deployment blocks for the aircraft independent of occasional “suit-case” deployments. Likely, this shift in operations may be part of options considered by the Project as part of the SOMER (SOFIA Operations and Maintenance Efficiency Review) and the SOFIA 5-Year Flagship Mission Review (FMR). The SUG recommends that the Project consider a quantitative cost-benefit analysis of additional and/or extended southern deployments and estimate how such opportunities may optimize execution of highly ranked science campaigns from a variety of SOFIA

instruments. We expect the Project to stand up an Integrated Product Team (IPT)-like structure for this effort.

[SUG13 – 08]. The oversubscription rates for SOFIA Cycle 7 remain robust, and the requested time from proposers was evenly distributed over the available instrument suite. The SUG was encouraged by the Project’s deliberate efforts to recruit early-career individuals into the time allocation committee (TAC) process and noted demographic information that indicated that approximately 30% SOFIA proposers were women and no selection gender bias was apparent. The Project might consider removing investigator names from the proposal (or at least the front cover) or requiring only initials rather than an individual’s full first name to help further minimize bias-related issues.

[SUG13 – 09]. The “lesson learned” from instrument selection opportunities was discussed at length. It is clear that SOFIA provides a unique opportunity to enhance the technical readiness level (TLR) of technologies and to provide instrument experiences for early career scientists and instrumentationalists that meet the NASA criteria for leadership required to lead mission development projects. The HIRMES project is an example. The SUG notes the Project’s establishment of streamlined and optimized requirements, which include development of templates, for future SOFIA flight instruments. The SUG concurs that the lessons learned identified by the Project should be shared with the large community to stimulate exchange of ideas and expectations. The SUG also recommends that the Project consider which axes of SOFIA performance might best be exploited in future instrument calls and use a community workshop (e.g., similar in format to the 2016 Asilomar Conference) to discuss the merits of a directed call for specific capability versus other models.

[SUG13 – 10]. Efficient, well-documented, data pipelines are a critical component in mission success. The SUG noted the Project’s pivot to use of the Python environment for this purpose, and the continued efforts to improve the data products as mission experience with instruments evolves. The SUG recommends that clear, concise change logs accompany each software delta as pipelines evolve and archive data are re-processed and released. These running change logs should be publicly accessible to enable the SOFIA user community to understand the fidelity and nuances of delivered data products.

The SUG also recommends that the Project query the SOFIA community regarding the potential value of releasing, perhaps on a limited basis, the Python-based pipeline code, as missions such as ISO and Herschel did for their pipelines. The Project should seek to understand whether such a release is of value and what potential value-added packages the community might return to the SOFIA Project. The SUG notes that such a model was highly successful for Spitzer and JWST, at modest impact to the projects.

Further, the SUG recommends the Project query the community regarding an open source approach with community involvement by hosting both the official pipeline and user contributed code on a repository combined with a forum for users. This “sandbox” could target super users with specialized requirements, and it should not supplant the existing pipeline products for most users. Such an approach would be along the lines of the JWST Data Analysis Toolbox/Data Analysis Tools Forum.

[SUG13 – 11]. The Project informed the SUG that there was funding available from USRA for student participation, but it was not clear (a) what the USRA goals/restrictions for use of the funds are and (b) what level of funding is available. While the Project discussed short term student visits to the SSC, SUG members wondered if the funding could be used to support longer engagements by local undergrad and grad students or summer-length visits by students from outside the area. The SUG recommends the Project develop a scope for this engagement, consistent with the budget available and the goals for this funding. If the goal is to increase participation of students who are potential future NASA workforce, then part-time, long-term engagement is preferred. If the goal is to give PhD students working on SOFIA data the time to interact with the SOFIA science team, then short/summer length visits are appropriate.

[SUG13 – 12]. The SUG also expresses ongoing dismay with regard to poor progress in addressing the aircraft water vapor monitor. The Project expressed confidence in the ability to work effectively without an operating device. The committee was not convinced that the Project has sufficient data to support that conclusion. We assert that the Project’s strategy could significantly compromise data quality for some instruments, and the SUG was aghast that there is no identified pathway for eventual success. We also believe that the problems with the water monitor are not primarily technical but instead represent a serious failure of systems management procedures that cannot be addressed by the sorts of studies that have been conducted in the past.

The SUG thanks the SOFIA staff and Director for their efforts at preparing presentations. However, the SUG requests that for future meeting these presentations be made available to the SUG ten (10) business days prior to the meeting – on a best effort basis – to sharpen meeting focus and to enable SUG members to more effectively engage the Project on topical issues.

We thank the outgoing Chair, Dr. Matt Greenhouse for his service.

Respectfully,

A handwritten signature in blue ink, appearing to read 'C. Woodward', with a large loop at the end.

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