

Dr. Harry Teplitz (IRSA lead)
Dr. George Helou (Director of IPAC)
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Pasadena CA 91125

Dear Harry and George,

This letter reports on the IRSA User Panel meeting held in Pasadena on January 18, 2018. The members of the Panel that were in attendance are Claudia Scarlata (UMN), Mike Person (MIT), David Tholen (University of Hawaii), Mark Lacy (NRAO), Klaus Pontoppidan (STScI, attending remotely), Alexandra Pope (UMass, attending remotely), Stephanie Juneau (NOAO), Bahram Mobasher (UC Riverside). The full day meeting consisted of presentations from Harry Teplitz, David Imel, Steven Groom, Vandana Desai, Sean Carey and Roberta Paladini on the various activities of IRSA. The meeting was also attended by George Helou, director of IPAC. The role of the User Panel is to evaluate IRSA's content and services from the user's perspective, to advise on the priorities for ongoing/planned activities (in light of current funding level), and to suggest improvements or new services, not covered in the current work plan.

In this report, prepared by the Panel, we first overview the presentations delivered by members of the IRSA team and then make recommendations on the current IRSA activities and their priorities. IRSA is NASA's primary archive for infrared and sub-mm astrophysics missions, and serves data from 16 observatories and major surveys. IRSA provides access to more than 100 billion measurements of astronomical sources, including all-sky coverage in 24 bands, from 1.2 microns to 1 cm. IRSA implements the Spitzer Heritage Archive for the Spitzer Space Telescope, one of NASA's four great observatories, and it currently maintains much of the technical expertise from the Cryogenic phase of the mission. It is also the data archive for the WISE and NEOWISE surveys and the US archive for the Planck mission. Finally, IRSA hosts contributed data products, that can be searched in a way consistent with the primary IRSA data.

IRSA is maintaining its crucial role within the astronomical community, both in maintaining existing and new data sets, as well as offering services to facilitate their use. IRSA's impact is demonstrated by the constant increase in the number of refereed astrophysics journal articles that use IRSA holdings (60% growth since 2008), in the steady number of data queries and in the volume and growth of its holding (currently amounting to more than 1 PB of data). About 40% of all approved NASA ADAP programs involve the analysis of IRSA data sets. IRSA is and will remain a crucial resource for new science and future mission planning. The IR/sub-mm wavelength regime allows addressing most of the scientific priorities in NASA's science plan, from the origin of the first stars and QSOs, to discovery of asteroids & NEOs. The IRSA archive will be the foundation of new strategic initiatives, providing targets for SOFIA, ALMA and JWST, complementing JWST, WFIRST and LSST science, and aiding in the observational planning and calibration of future missions.

IRSA is continuing to ingest new data from active NASA missions, as well as newly processed data from completed missions:

- *Spitzer* will continue to acquire data until November 2019; the cycle-14 Call for Proposals has been released. After the end of the mission, all data, documentation and analysis tools will be completely transferred to IRSA, initially to the Spitzer Heritage Archive. Most of the data and documentation are already in IRSA. The closeout will require incremental updates to existing documentation and no data reprocessing. The User Panel believes that IRSA should also transfer the reprocessing tools not already at IRSA well before the closeout. Specifically, the User Panel was concerned about data analysis methods becoming “less effective” with time, if the tools that created the curated data were not also archived with them. The Panel would encourage IRSA to archive reprocessing tools, perhaps not in user accessible form, but at least accessible to the archive maintainers.
- IRSA continuing its archive functions for the latest NEOWISE-reactivation which will extend the mission to at least June 2018. The final release, scheduled for October 2018, will include two complete sky coverages, bringing the total to six coverages since the start of reactivation. The Panel liked the role of IRSA in the NASA ADAP funded CatWISE project, that will produce a full sky catalog of sources found in combined WISE and NEOWISE images. The catalog will be served by IRSA in 2019. The panel would recommend that IRSA serves the full image products as well as the catalogs.
- IRSA should continue to serve the Planck dataset to the astronomical community, and include the ESA’s Planck Public Release 3, when available. The Panel also believes that IRSA should serve the alternate processed dataset by JPL, should it become available, within the limited funding allocated by the Senior Review.
- The committee support the IRSA's effort in serving the AKARI FIS Far-infrared All-Sky Survey Maps. The committee recommends that IRSA consider including a funding request in the next Senior Review proposal to support improving the processing of the AKARI images in future releases (e.g., to account for striping).

The User Panel fully endorsed the plan for releasing the baseline archival interface for the NASA Infra-Red Telescope Facility (IRTF), focussing on raw, new data only and a limited set of instruments. We support the plan to postpone to future releases the integration with the IRSA data discovery tool, and the precovery searches of moving objects.

The User Panel was happy to see the developments in the collaboration between IRSA and SOFIA. We fully endorse the plan of releasing a functional archive serving data from the GREAT and FORCAST instruments first, and with basic functionalities, in time for the Senior Review. The proposed schedule for the data transition to IRSA is appropriate, and the User Panel supports the ongoing negotiations to incorporate the remaining instruments. We recommend that IRSA stays ahead of the game with the SOFIA archive, and initiate collaborations with the teams building the next generation instruments for SOFIA, as soon as they are known.

The User Panel continue to recommend that IRSA maintain expertise on Spitzer, WISE, Herschel and Plank. The data from these missions will be mined by the community for many years to come. Additionally, we recommend that Herschel images and catalogs are added into Finder Chart and IRSA Viewer, because these data cover wide areas and extend the wavelength coverage considerably.

The User Panel believes that VO visibility is improving within the astronomical community, and IRSA is doing an excellent job in the dissemination and documentation of the tools. We believe IRSA's effort in facilitating archival research via VO tools should continue. In particular, any work in developing tools that allow automatic searches of multiple datasets, either hosted at IRSA or elsewhere, will be extremely valuable in the near future, with the JWST, Euclid, LSST and more large surveys coming online. Additionally, the panel recognizes that VO tools are becoming more useful in classrooms settings and as being used as a teaching resource. We recommend to advertise IRSA/VO tools through the Center for Astronomy Education and other astro teaching resources/centers.

Future developments planned at IRSA were presented by Dr. Desai:

- Multi-resolution images. The User Panel endorses the effort to serve multi-resolution images to facilitate science projects that require access to either large areas with few details, or small regions with high level of details. Our recommendation is that IRSA keep the current direction and adapt existing software to the IRSA archive API.
- Data discovery effort. The User panel believes that any effort to increase the visibility of IRSA datasets is well directed. Specifically to the IRSA Data Discovery Service (Radar), we believe that high priority should be devoted to improve the filtering/sorting capabilities of the search output, to improve usability and clarity.
- Technology Initiative. Over the years, the role of IRSA archive has been expanding. Additionally, archives today are increasingly about what kind of services they offer, rather than what specific wavelength range they serve. The Panel believe that in order for maintain its competitive role in supporting scientific investigations it has to invest in how data are served and archive functionality. Going in this direction, the Technology Initiative is fully supported by the User Panel. The Panel believes that if the work scope is limited by funding availability, then IRSA should prioritize the work on "Analysis Near the Data", and explore the technologies that will allow complex queries and user analysis packages to be run at the archive. Implementation of Machine Learning algorithms should be of lower priority.
- Archiving theory/simulation datasets. The panel finds the idea of archiving datasets from numerical simulations useful. Simulations, however, can produce a very large amount data and a selection needs to be applied in what can be archived. The panel recommends that IRSA only archive simulations that are directly related to specific datasets present in the IRSA archive. Additionally, we believe that most of the effort in the data preparation and explanatory material should be performed by the PIs of the theory data. We believe these data could be a very valuable resource for the community.
- 2020 Decadal Survey. With the 2020 Decadal Survey getting closer, the User panel support the ongoing effort to start preparing for a 2019 submission of a white paper addressing NASA's role in facilitating archival access to increasing large datasets.

Concluding remarks

The panel would like to praise the results IRSA accomplished over the past year. The addition of SOFIA and IRTF data, the Technology Initiative as well as the work in the VO tools are all efforts going in the direction of increasing IRSA role in facilitating scientific exploitations of multiple datasets.

Sincerely yours,

Claudia Scarlata,

on behalf of the IRSA User Panel members: Stephanie Juneau, Mark Lacy, Barham Mobasher, Mike Person, Klaus Pontoppidan, Alexandra Pope, David Tholen