

Spitzer Science Users' Panel #15 Committee Report (March 31/April 1, 2005)

1. General Comments

As Cycle 1 observations draw to a close the SUP finds the SSC organization impressively able to manage the various aspects of user interaction from proposal processing, scheduling, and data acquisition through to broad dissemination of data products to the community. The concerns expressed at SUP14 have largely been addressed and users of the observatory are consistently receiving data ripe for scientific analysis while the observatory itself operates at peak efficiency. Given the limited resources available, our assessment of the SSC staff's achievement remains "heroic" and we hope that members of the user's community will take time to express their appreciation for this level of commitment and for the high quality data products emerging from SSC when the opportunities arise. Many of the concerns raised at SUP14 derived from the transient response to the start of observatory operations and user support, as well as the first exposure to the idiosyncrasies of the data and the data pipelines. At this meeting there was a noticeable transition from putting out fires toward methodical improvement of the BCD data pipelines products and user support.

Scientific productivity is the ultimate metric of the utility of the Observatory. Although the committee did not make an in-depth assessment of the present scientific output of Spitzer, it could not help but be impressed by the range topics being address by the Observatory and highlighted in the recent press releases and the lunchtime science talks. In particular, the revelation of the direct detection of flux from extra-solar planets through precise broadband photometry with the IRAC camera demonstrates the scientific exploitation of the facility in a mode not imagined at launch.

2. The Proposal Process

This SUP meeting occurs following the completion of the Cycle 2 proposal process and prior to proposal review and time allocation. The SUP was pleased to hear that, thanks to lessons learned, Cycle 2 proceeded even more smoothly than Cycle 1, which itself was fairly efficient and uneventful. Dropping the requirement for simultaneous submission of AORs with medium and large proposals has been cited by a number of proposers as a significant improvement. Small proposers still must submit AORs at the time of proposal. Although this procedure represents an extra burden on proposers, the benefits to the resource-constrained SSC are positive and SSC

has noted a decrease in technically poor proposals in Cycle 2. Users are clearly becoming more astute and comfortable with the technical aspects of operating the instruments and observatory.

Cycle 2 saw an oversubscription rate of 3.3:1 in terms of hours requested vs. hours available. At first glance this oversubscription rate may seem low compared with the other great observatories - HST and Chandra. The committee noted, however, that the hours available on Spitzer are more than double those on these other facilities (and in this cycle have increased to 6000 hours from the 3700 hours available in Cycle 1). The science content per hour may be arguably larger for Spitzer as well, as much of the foundation science now being pursued with the observatory yields new results in far shorter exposure times than is routine on the HST or Chandra. If anything, oversubscription at the 3:1 rate may be optimal since, when oversubscription reaches 10:1, many meritorious proposals go unsupported and the distinctions between the top-ranked supported and unsupported proposals is exceptionally fine.

3. Data Pipelines

The delivery of the S11 software pipeline and its products has resulted in a significant improvement in BCD data quality, particularly for the IRS. As SSC continues to improve the pipeline the committee believes that SSC should advertise the specific pipeline features being addressed in the pending software development cycle and rank those improvements by their priorities for implementation.

Specific pipeline issues:

a) IRS Background subtraction

Users have requested access to IRS quick-look background subtracted spectra. SSC should provide an explicit background subtracted frame with BCD products (or an independent background frame which users may subtract from the raw spectrum image).

b) IRS Rogue pixels

The increasing number of rogue pixels in the IRS arrays will present problems for users. We encourage the SSC to proceed quickly on the planned interpolation tools for their removal.

c) IRS/SPICE aperture corrections

Users extracting spectra with SPICE may wish to use apertures

which are not identical to the flux-calibrated aperture provided with SPICE. SSC should provide aperture corrections so that users may quickly and consistently calibrate extractions using various aperture sizes.

d) Imaging tools and source extraction

MOPEX, APEX, and BANDMERGE continue to be difficult packages for users to implement and operate. The complexities of MOPEX are such that even experienced users have had problems with source fluxes being affected by the mosaicing process (e.g. the SWIRE team's first data delivery). In addition, the original expectation that BCD products would contain source extractions has yet to be realized. The ability to extract sources from Spitzer images continues to be a lagging feature of the post-BCD suite, and significant benefits would accrue from users being able to consistently extract source fluxes with a validated piece of post-BCD software. SSC should place some priority on validating all three packages and delivering effective and easily operated versions of APEX and BANDMERGE during Cycle 2.

e) Platform dependence of software tools

The Solaris operating system is rapidly taking a secondary role in astronomical computing as departments switch to Linux architecture and individuals increasingly use the MacIntosh operating system. To the extent possible, software development should take place in a platform-independent environment and code now restricted to the Solaris operating system should be ported to other operating systems.

4. Reprocessing and Archiving

Reprocessing plan:

The reprocessing of the archive data with the S11 pipeline has been successfully completed. In response to an earlier SUP request, SSC presented a plan to execute subsequent full reprocessings only when the pipeline improvements yield significant improvement in data quality. Between full reprocessings, new data will be processed using the latest pipeline version, with incremental reprocessing (e.g. on-demand as data is requested from the archive) to be implemented at some point in the future. The committee endorsed this approach to future reprocessing.

Archive capacity:

At its previous meeting the committee expressed concern that the archive might become oversubscribed upon its population with a significant volume of data. At this meeting we were pleased to be proven wrong. After resolution of the initial issues with the commissioning of the archive the archive has operated smoothly and the computing resources have been adequate to satisfy user demand. The appointment of a new archive scientist, Mark Lacy, addresses the SUP's earlier concern that there be an individual with full-time responsibility for archive issues.

Legacy datasets:

As the Legacy projects culminate in the delivery of enhanced data products one of the primary motivations for the Legacy program is being realized - the creation of "substantial and coherent databases of archived observations that can be used by subsequent Spitzer researchers." Legacy teams have had to balance their unique scientific access to Spitzer with the demands of producing documented and validated data products for the Spitzer community. The latter has been a challenging and time-consuming task. Given that Legacy work has been as much "service" as it has been "science," the Legacy teams also deserve significant community recognition for their efforts. As major Legacy deliveries enter the archive SSC should advertise their availability and content to the Spitzer community. Given the success of the Legacy program, the SUP is eager to hear the outcome of the upcoming mid-term science review in which the potential for large projects in the culminating years of Spitzer will be discussed.

GO processed datasets:

The SSC archive currently serves processed data products from the Legacy teams in addition to BCD data products. Some users have expressed interest in also providing "value-added" data products for the SSC archive. In principle, such an augmentation to the archive is desirable. In practice, SSC has limited resources to support user-generated datasets. The SUP encourages SSC to develop a policy for limited archive support of user datasets and a plan for informing the user community of this opportunity. For example, the committee discussed the possibility of encouraging large projects to define modest value-added products as part of the proposal process.

Availability of formerly proprietary data:

As the one-year anniversary of the opening of the archive

approaches (and thus the public availability of the significant volume of proprietary data which initially populated the archive) SSC should draw community attention to the impending availability and content of these datasets. Data obtained during IOC/SV in particular may contain some "hidden treasures" and we encourage a modest effort to document the contents and purpose of these data.

5. Workshops and Community interaction.

At this SUP meeting the SSC staff reported on the results of the first Spitzer community data workshop. The workshop evaluations were shared with the committee. All indications are that workshop was quite successful in educating Spitzer users in hands-on data reduction techniques. The workshop also provided valuable direct feedback on users' wants and needs to the SSC staff. This extremely valuable two-way dialog will continue as SSC plans a regular data workshop schedule.

The primary significant user complaints received through workshop feedback (as well as directly to the SUP) involved the requirement that users appear at the workshop with a complete computer system capable of running the software tools (and thus IDL). The notably positive aspect of this requirement is that users arrive well prepared to discuss data reduction as opposed to computer configuration. On the other hand, some attendees were surprised when their systems/preparation prevented their full participation while other users did not attend the workshop, despite desiring to do so, because of the computer pre-requisites. Future workshops should provide some accommodation for a limited number of attendees who are not able to arrive with the necessary resources in hand.

Users appear pleased with the data cookbooks and demonstrations. Additional demonstrations, particularly filling in the gaps in the existing library (IRAC point source extraction, IRAC ch3/4 mosaicing) will no doubt be welcomed. Now that SMART has become available for IRS users, and given user interest in this tool, SSC should develop similar quality support for SMART.

6. General user feedback

The conclusion of the GO-1 cycle provides an opportunity to poll the users community on their satisfaction with the Spitzer experience (proposals, scheduling, data products, post-BCD support, etc). A broad survey sent to all GO-1 investigators could uncover issues not apparent from the usual feedback channels (e.g. the email helpdesk). If such a survey is implemented now (mid-2005)

feedback could be incorporated in time to influence GO-3. The SUP is eager to work with SSC in developing a suite of queries to evaluate user satisfaction with the goal of implementing any changes as early as the proposal call for GO-3.

7. Gauging instrument mode productivity

SSC currently records publications produced with Spitzer data. To the extent possible, this record should include the primary instrument and instrument modes contributing to the publication. Longer term it may become possible to recognize bottlenecks in the throughput from data acquisition to science from this empirical measure of system productivity.

8. SSC response to budget reductions

The SUP examined options for applying anticipated FY05/06 budget reductions and concurs with the SSC view that activities associated with continued data acquisition and delivery both in the short term and through the end of the cryogenic mission should receive highest priority as they are essential to the subsequent exploitation of the facility by the broader scientific community. Among the remaining choices, discussed in turn below, the SUP was hesitant to suggest quantitative guidelines. Instead, we report an assessment of relative priorities. In all cases, the primary criteria for consideration involved the impact on the science yield of Spitzer through the end of the cryogenic mission. Under consideration were the following areas:

- 1) GO funding
- 2) Education and Public Outreach (EPO)
- 3) Spitzer Fellows program
- 4) Archival analysis program
- 5) Theory program
- 6) Legacy support
- 7) GTO support

Priorities (in order from lowest to highest)

EPO: Even though the committee recognizes the fundamental importance of Education and Public Outreach, this activity received the lowest

priority in our assessment for two reasons. First, it has the least impact on the scientific yield of the remaining mission, and, second, there is an EPO function within SSC which, although it cannot duplicate the opportunities provided by the current GO EPO component, does provide a conduit through which the excitement of GO results can be conveyed to the general public.

Archive/Theory support: Second lowest priority was assigned, reluctantly, to both the Archival Research and Theory programs. Both programs do provide analysis which can contribute to the exploitation of the observatory in the remaining years of the cryogenic mission, but have lesser potential than GO observations for doing so. Since both archive analysis and theoretical support can both be viewed as enhancing the science yield of Spitzer during the cryogenic mission by feeding back results to subsequent GO proposals, the SUP cannot distinguish priority between the two categories. For this reason, as well, we cannot support cutting either program completely.

GO/GTO funding: The committee ranked GO and GTO support at equal priority. Both are at the forefront of the scientific exploitation of Spitzer. The SUP notes that the GO support reduction suggested at the SUP meeting (\$3M over FY05/06) amounts to a disproportionate burden of the budget reduction being placed on GO's. If feasible, however, the pain of budget reduction should be shared between the GO and GTO communities. Should GO funding be cut, the SSC should examine the possibility of adjusting the calculation used to establish the conversion between assigned hours and financial support as an alternative to an across-the-board percentage reduction in GO funding. During the committee meeting, for example, there was some discussion of no longer funding the smallest proposals (e.g. <10 hours) as one means of reducing costs. Although the committee did not reach any clear conclusion on that issue, there was a strong sentiment that proposers should still be permitted to make small time requests even if the funding policy changes.

The committee believes that the Legacy and Fellows programs should receive the highest priority for continued funding. The Legacy programs are drawing to a close and are facing critical deliveries which represent their ultimate payoff to the astronomical community. Last minute budget reductions are likely to be disproportionately damaging to Legacy teams. The Spitzer Fellows program recruits the best and brightest young astronomers to the Spitzer scientific arena assuring a multiplier effect through high quality use of Spitzer time as well as fostering of a generation of scientists deeply experienced in mid-infrared imaging and spectroscopy.

