

# **NASA Herschel Science Center Users Panel Report for meeting on April 10 & 11, 2012:**

**To:** George Helou, Director of the NASA Herschel Science Center (NHSC) and Bill Latter, Deputy Director of NHSC

**From:** Margaret Meixner, Chair of the NHSC Users Panel (NUP), on behalf of the NUP

Attendance:

NUP:

Margaret Meixner  
Eiichi Egami  
Moshe Elitzur  
Paul Goldsmith, Ex-Officio  
Andrew Harris  
Paul Harvey  
Joe Hora

NHSC:

Phil Appleton  
David Ardila  
Babar Ali  
Colin Borys  
George Helou  
Bill Latter  
Yi Mei  
Pat Morris  
John Rector  
Bernard Schulz  
David Shupe  
Gordon Squires

## **Executive Summary:**

The NUP congratulates the NHSC staff for an excellent job on supporting the US science community. It is clear from the proposal statistics that the US community has been highly engaged with the Herschel mission. This reflects well on how the NHSC has advertised and supported the US community in their efforts to exploit Herschel. We report on several noteworthy activities that the NHSC has performed for the US community, followed by a set of recommendations on challenges we perceive. We end this report

with a concern about the future funding for NHSC which could impact the user support and output of the US programs.

## **NHSC support of the Herschel Mission:**

We were asked whether the NHSC has supported the U.S. community properly; the answer is definitely affirmative. Evidence for our finding is based on the very substantial number of U.S. proposals and time awards in the Herschel program. The NHSC has enabled U.S. community participation by publicizing the mission well, then by making proposing and data reduction readily accessible to the U.S. community. Their collaborations with the instrument and data processing groups have been key parts of this effort, ensuring that the mission has been transparently run by a strong NASA/ESA partnership. NHSC expertise has consistently enabled staff to anticipate user needs, from extensive training to computing facilities.

One of the key areas that makes science possible with the satellite is solving the technical problems with the data that plague all users. There are many examples of excellence in instrument scientist work by NHSC staff and we note just a few examples to show that we are paying attention.

**PACS:** For the past two years there has been a question concerning the extended source emission calibration for PACS that has slowed the publication of papers. In direct comparison between missions, the Herschel/PACS extended source fluxes have appeared systematically higher than Spitzer/MIPS 160 micron fluxes. Also the PACS 100 micron fluxes appear systematically higher than the IRIS100 micron fluxes, which were believed to be calibrated against DIRBE/FIRAS. Understanding this problem requires knowledge of multiple missions and also understanding the subtle aspects of color corrections and interpolation of data in wavelength bands near the peak of the SED. Work led by R. Paladini at NHSC has helped users to understand and reconcile the differences between data obtained by different missions. In particular, her note that the MIPS 160 micron images are non-linear in bright regions ( $>50$  MJy/sr) and that low level fluxes should be ignored in comparisons has helped to resolve the issue to show that the PACS flux calibration is valid for both point and extended source emission.

**SPIRE:** We commend the NHSC SPIRE team for its great contribution to the Herschel science/user community. In particular, we recognize the following efforts:

(1) Development of SPIRE Photometer Interactive Analysis (SPIA) package  
With Bernhard Schultz's initiative, the NHSC SPIRE team has successfully developed a data processing package for SPIRE photometry data that greatly enhances users' ability to inspect data carefully and stream-line data processing procedures. The usefulness and power of this package is clearly demonstrated by the fact that SPIA has been incorporated into the official SPIRE data reduction handbook.

(2) Cross-calibration with the Planck data

By working with the Planck team, the NHSC SPIRE team is leading the effort to cross calibrate SPIRE data with those from Planck-HFI. It is expected that a new module will be incorporated into the SPIRE pipeline to produce zero-point(=sky offset)-corrected SPIRE maps for HSA. This will greatly enhance the value of SPIRE mapping data.

**HIFI:** Baseline issues have plagued the HIFI data, particularly in the higher frequency (HEB) bands. We note the enormous work on the standing wave issues by members of the NHSC (e.g. Boogert & Morris) in tracking down and developing ways to deal with these problems.

We like to give a special thanks to Bill Latter for his effort in creating such a huge momentum forward for the NHSC starting 5 years ago. This forward momentum will clearly carry NHSC forward into post-ops even without his guidance. We wish him well in his new position as the SOFIA Operations Manager at Dryden in Palmdale, CA.

We are impressed with the innovation in communications with the astronomical community. On a limited budget, people often try to just stick to what they know because it is easier and hence cheaper. But this is not the approach of the NHSC. Instead, they push into the new technologies, using webinars to discuss advanced topics in data processing with community members. They provide high powered computing with sufficient RAM to support the data processing for users via virtual machines. These virtual machines were essential for the PIs of small to modest sized programs that have insufficient funds to purchase these high powered computing machines. They provide project pages and Wikis for external users to work on their projects. They are investigating the potential of Cloud computing for future use.

The public outreach continues to impress us. The NHSC has been working closely with the ESA and NASA to help make things happen and to keep Herschel prominent in the eyes of NASA, ESA and the public. Squires' outreach team, and in particular Hurt & Clavin have the ability to communicate the invisible and somewhat esoteric astronomy of the interstellar medium to the public eye with artistically beautiful images.

## **Recommendations:**

1) Priority 2 programs: It is estimated that ~6700 hours of observing time will be available until Feb 2013 while ~4500 hours of priority-1 programs exist in the queue (based on the presentation by D. Ardila). This means that ~2200 hours of priority 2 programs will be executed to fill the observing schedule. This may result in a situation where many priority-2 observers will be left with a fairly small amount of data. Since such observers are not going to receive much financial support from NASA, they will have to rely on assistance from NHSC to extract as much information as possible from whatever data they receive. Because of this, we think that it is important for NHSC to devise an effective strategy to support such priority-2 observers. An obvious strategy would be to make the pipeline-processed products as good as possible, and we recognize that the processing of SPIRE photometry/mapping data is getting close to a level where

the HSA products are almost ready for immediate scientific use. However, the same cannot be said about data products from other observing modes, especially those from spectroscopic observations. We support the NHSC's willingness to work with the project PIs to cover publication costs and assure access to NHSC expertise and virtual computers with large memory for data reduction.

2) User survey: The NUP wants to help the Herschel Users Group (HUG) on the user survey it is conducting. Meixner has emailed the HUG with a cc to Joe Hora, and Eiichi Egami, who have volunteered to help. In particular, adding some NHSC-specific perspective to some questions in the survey planned by the HUG would be valuable. Separating surveys between U.S. and European scientists would likely cause confusion and could unnecessarily polarize a single collegial users group, even if slightly. NHSC members have volunteered to consult with the HUG members who are drafting the survey to ensure that questions that bear on the U.S. experience would be included in the list of questions. Hora and Egami have requested that the HUG circulate the survey to the widest Herschel community possible (i.e. beyond the PIs) in order to get feedback from the people working directly on the data, such as students and postdocs.

3) Direction of software: The NUP recognizes the dramatic improvements in the Herschel data processing tools over the last couple years and the role played by the NHSC in these improvements. Although there will always be new capabilities and features that users might appreciate, when we look ahead to the end of cryogenics and need for the best possible archive, we feel that the most important focus should now be on refining the data calibration as best as possible and enabling the export of data products that have all instrumental signatures removed for easy comparison with data from other observatories. In particular, we recommend strongly against NHSC staff spending too much time on developing higher-level analysis tools such as spectral line-fitting programs which can be done outside of the framework of HIPE by other software tools in the astronomical community. These prioritizations are clearly within the purview of the DPUG and DPMG, and we encourage those groups to consider this view.

4) The Archive: An important legacy of the Herschel mission will be the enduring archive of reduced Herschel data, particularly in light of the very long time before another comparable mission is launched. We heartily applaud the initial efforts of the NHSC to assist users by preparing guidelines for depositing reduced and analyzed Herschel data back into the archive. The NHSC has significant experience and technical expertise in this area from the Spitzer mission, and we suspect that the HSC will welcome any help with this manpower-intensive aspect of making the archive truly useful. As the development of HIPE winds down, it is also possible that the DPUG could shift its focus in this direction as well to provide astronomical guidance to the HSC.

Since it may be several years before the HSC is able to ingest reduced data in ways that make it available to VO tools and search engines, it is possible that the NHSC could also play a temporary role in helping US projects make their data more publically available in the short term without preempting the ultimate role of the HSC in this task.

5) Herschel Science Conferences: Now that the US has responsibility to conduct ~50% of the OT2 science with Herschel, the NHSC needs to help spur the scientific work and publication of the papers. Here are a few ideas that may help these investigators keep a focus on their Herschel projects.

- Work with the HSC to create an “end of cryogen” conference featuring the Legacy of Herschel and what the community will see in the archive at ESAC. The conference could be held in Madrid in one year’s time; approximately after cryogen exhaustion is expected. Perhaps provide incentives by giving featured talks to people who have successfully delivered improved data products to the Herschel archive. It would be nice if the sessions for this last conference were webcasted so people external can watch. Even better would be the ability to participate over the web.

-The ALMA user community should be heavy users of the Herschel science archive; in particular the improved data products archive. NHSC should work with the North American ALMA Center to create a conference in the US to draw attention to US investigators to the Herschel archive.

6) The NUP: The NHSC should start thinking about how long the NUP will be useful to the mission of the NHSC. Perhaps consider a shift in the makeup of the committee. Seriously consider including a NUP member from NRAO/ALMA; this would probably lead to a natural organization of an ALMA/Herschel conference/workshop. Including some younger people such as an assistant professor or postdoc working directly on the data would broaden the NUP

## **Future of NHSC:**

The NUP is concerned about how the future support of Herschel will play out given the lack of a follow-on mission at IPAC. It is important to maintain the tremendous momentum on the NHSC in order to assure the best Herschel archive, which will be the final product of NASA’s large investment in the mission. We urge NASA headquarters to maintain healthy funding during Post-Ops through the completion of the Herschel archive. When the liquid helium of Herschel runs out, it marks the last observation taken by Herschel, but it is not the last time user support will be needed. Indeed, users will only have started hitting their stride on the data and will need 2-3 years to complete the analysis of the data and publish the results. NASA funding of the NHSC will be critical for support of the US investigators who have claimed half the time in the last two calls. The NHSC funding will need to match the timescale of the HSC during the post-ops phase because the NHSC has been key in support of the data processing. The NHSC will also have a lot to offer the HSC during the creation of the Herschel data archive.