

To: George Helou, Director of the NASA Herschel Science Center (NHSC)

From: NASA Herschel Science Center's User Panel (NUP)

Membership of NUP:

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Re: Written report for meeting on January 14, 2008

The NUP heard talks from the NHSC staff concerning the status of the Herschel satellite and instruments, the roles that the NHSC and the Herschel Science Center (HSC, in Vilspa, Spain) have in supporting the mission and the plans for proposal calls, observer support and data processing support. This written report summarizes the reactions of the committee to the presentations and their experience with Herschel to date. We split our comments into four areas: NHSC preparedness, pre-launch support, community visibility and interaction, and data processing support.

NHSC preparedness:

The Infrared Space Observatory (ISO) was the last European mission that many of the user panel members experienced. While ISO had many scientific successes, it was difficult to use and the data processing support was minimal to non-existent. Persistent users devised their own data processing programs where needed and published their data while some US investigators abandoned their programs. The model to getting results out was to visit the instrument teams in Europe, which was not always feasible for the small programs with small budgets. After hearing the talks, the committee is relieved to say that Herschel is not heading in the direction of being another ISO, and that we can expect significant improvements over ISO in terms of general user support.

The NHSC staff are clearly embedded in and are part of the Herschel mission, which will ensure that user support is expert. The NUP applauds this effort and encourages the staff to stay involved in the ground testing of the instruments so that they have access to the ground test data for pipeline verification and preparation. Some on the committee are aware of the short test time for the instruments. The panel notes that the NHSC and HSC staff will need to be agile to respond to unexpected changes in instrument performance on orbit. The presentations had a focus on continuum mapping, a strength of the NHSC staff, and less on spectroscopy with Herschel resulting in some concern that support for spectroscopy will be less than for continuum mapping. The NHSC has a really good core team but more staff, funding permitted, will be needed to fully support U.S. community

needs, given the large work load this coming year.

Pre-Launch Support:

NHSC has had a Cycle 0 call for proposals for theory and lab astrophysics and data analysis processing support for Herschel Key programs. NHSC provided HSPOT, which is based on Spitzer's SPOT planning tool, and the sky background calculations for observer's planning.

The users liked the familiarity of the interface. Some improvements to HSPOT and observing proposal submission are recommended:

- Strongly encourage ESA's HSC to provide a way to download (back) an uploaded proposal for verification before final submission.
- Include Spitzer data in HSPOT's images and overlay functions, e.g. pull up GLIMPSE images and data for planning in the Galactic plane or SAGE for the LMC.

The observer support for proposal submission was great, especially the round-the-clock support during the last few days of submission. An Open Time Key Project (OTKP) Planning Workshop, held in July, was well attended. The deadlines for the Herschel key programs were a little inopportune. We appreciate the NHSC's effort to move the Herschel OTKP deadline in advance of the Spitzer deadline. Having the funding proposal due the day after the OTKP was challenging and unpleasant. The plus side is the OTKP program required a management plan with identifiable funding support in the proposal and proposers could honestly note they were applying for support. The minus side is that the concentration on the management and funding issues diverted energy and time from making the science case. Perhaps a week delay would have been more palatable. In future, watch conflicts, also with NSF (November 15 every year). The budget forms for the funding proposal were non-standard, and we are appreciative of the NHSC efforts to revamp them.

Community Visibility and Future Interaction:

Herschel will have a short lifetime – 3.5 years - and advertising it widely now will ensure a strong proposal pool. The fact that there were 500 US investigators involved in Herschel key proposals and 52 OTKP funding proposals indicates that the NHSC had good visibility within the community. The displays and outreach at the AAS meetings is very nice and we encourage them to continue this work. We suspect that many who responded to the call were connected in some way to the NASA space research community, e.g. Spitzer users, who may not appreciate some of the spectroscopic modes, especially HIFI. We recommend outreach to the radio astronomy community, which has substantial experience in heterodyne spectroscopy, in order to encourage some very competitive Herschel proposals for this instrument. Joint science conferences with SMA, CARMA, IRAM, JCMT and ALMA may prove useful in this endeavor.

Plans for workshops on data processing and proposal submission are good. We recommend workshops occur twice a year or at least rotate the date of a yearly workshop to accommodate a broad range of schedules of user base.

Communication with the user community has been done with an electronic newsletter and a website of frequently asked questions. A wiki has been proposed for use by NHSC and this approach has the merit of users posting their ideas and solutions to others problems on a website. This wiki would require a registration step to screen potential users. Such a wiki would require some patrolling to provide structure to the flow of information and to ensure that misinformation does not propagate. We suggest you trade off the effort required in wiki patrolling with having a webmaster for a static website. For the static website, constant information such as user manuals should summarize changes to the manuals on the website without having to read the whole manual to find those changes.

As planned, the archive for Herschel data will be kept at the Herschel Science Center only, i.e. there will be no mirror of this archive at the NHSC. The Panel is concerned that data access from a single server with relatively few fast routing paths will cause delays in data processing for U.S. scientists. NHSC should monitor the experience of the Key Project teams to decide whether a mirror archive on the U.S. West Coast would speed data access by a useful amount during the general observation period. In the HSC archive, it may be useful to have a separate key program archive page, especially if such pages received a lot of use on Spitzer.

Data Processing Tools and Pipeline:

Some two years ago the Herschel Program defined a new data handling software environment for data acquisition and processing, the Herschel Common Software System (HCSS). The programming languages and approach of the system has advantages from the computer science point of view. It does, however, raise major challenges for astronomical data processing, both in writing a complex software package from scratch and in user training.

While the Herschel project is committed to HCSS, the Panel is concerned about its successful implementation within the program's timescale and has the following comments on mitigating some of the risk associated with its introduction.

- Scripting is essential for reducing large and complex data sets. Jython, the HCSS scripting language, is unfamiliar to most scientists. Supporting its use with documentation targeted to users, rather than programmers, will be extremely important. Documentation must include the functional purpose and algorithm description for each module in the data processing pipeline. Cookbooks with examples for simple tasks (e.g. identifying and plotting data from tables) would be very useful. Graphical User Interfaces (GUIs) will be valuable for casual and novice use and will serve an important role in script development when the process steps are captured. The Panel saw good progress in developing suitable GUIs for data analysis.
- Legacy code and user experience cannot be transferred to the new system easily, as extensive rewriting and debugging is needed. NHSC should find a mechanism

for the user community to express its priorities for data processing tasks; this is essential input to the software working groups. The Panel suggests that the software effort generates and makes public standard sets of model and measured data that can be used for cross-checks and training to help programmers and users gain confidence and experience with the new code.

- It is unlikely that the HCSS will be able to offer users all of the tools that they use in or have developed for current standard data reduction packages (e.g. IRAF, CLASS), scripting languages (e.g. IDL), or code. Providing taps along the data processing pipeline with clean interfaces to standard data formats is essential for rapid data reduction, especially early in the mission. Polling potential users would be valuable for finding popular data products and formats. There is a substantial risk that HCSS will be incomplete at launch. Providing taps in the pipelines mitigates the risk that the users will be unable to analyze their data.

The panel believes that NHSC staff have adequately recognized the problems with the user interface to the HCSS. NHSC staff members are active in defining the user requirements and interfaces. Assigning priorities within the software effort is key. Once the Open Time Key Projects have been identified, soliciting input from the KP community and publicizing working group draft requirements would help ensure that the highest priority data processing tasks have the highest priority within the software groups. Some external input will help the small working groups maintain balance and perspective on priorities for key modes across all instruments.

The Panel sees software development and support as the NHSC's dominant task after launch. The NHSC staff has made very good progress in this area, and the community will profit by expanded activity in this area as staffing allows.