

HERSCHEL USERS' GROUP

MINUTES OF FIFTH MEETING ESAC, 6-7 SEPTEMBER 2012

Members attending: D. Elbaz (webex), K. Cramer, L. Hunt, M. Meixner (webex), A. Noriega-Crespo, D. Rigopoulou (chair), G. Stacey, A. Weiss

HSC Staff attending: G. Pilbratt, P. Garcia-Lario, A. Marston, B. Merin, L. Metcalfe, S. Ott

ICC representatives: T. Lim (SPIRE), R. Shipman (HIFI), B. Vandenbusse (PACS)

SUMMARY

The Herschel Users' Group (HUG) notes with great satisfaction the high level of performance of the Herschel satellite, the efficient scheduling of observing time, the high standard of community support and continuing improvements to the instrument calibrations and data processing software.

As we are nearing the end of the active, data collecting, phase of the Herschel mission the focus naturally shifts towards the Post-Operations Plans and ensuring that the final products that will populate the Herschel Science Archive (HSA) are of the highest possible standards and that the tools that will become available will meet the needs of astronomers for years to come.

The main recommendations from the meeting are as follow, the order is roughly the one followed as per the meeting's agenda.

1. Herschel Post-Operations Phase

Based on current estimates, the Herschel mission will officially end the "active data collecting" phase and enter the so-called Post-Operations Phase (POP) sometime during the second half of March 2013. The HUG firmly believes that POP is a very important phase and crucial in solidifying the Herschel legacy and overall success of the mission. Undoubtedly, Herschel is producing unique and unsurpassed photometric and spectroscopic observations that have already revolutionised many scientific endeavours. Thanks to the dedication of individuals within the three ICCs the HSC and the NHSC great strides have already been made in calibrating, processing and archiving these observations but obviously, there is room for improvements. This is especially true in the case of archiving that will serve as the lasting legacy of Herschel for years to come. With facilities such as ALMA in full operation in the near future users will turn to the HSA to motivate their research. It is thus an imperative that sufficient funding is available to the HSC and the ICCs to ensure the best quality products will be delivered to the Archive in order to maximise the mission's impact. **The HUG recommendations focus on three main areas: archiving, manpower and task prioritisation.**

The HUG was pleased to hear that the three ICCs will continue their activities and support the mission for three years into post-operations. While in some cases full funding is still

awaiting confirmation from national agencies, the HUG notes that similar levels of effort exist for PACS and HIFI and slightly lower for the SPIRE team. Following the presentations made by members of the ICC and HSC on their respective POPs and given the financial constraints it became apparent that task prioritisation is very important. The HUG recommends that priorities in work-packages are reviewed by the ICC teams (in consultation with the HSC) on a regular basis taking into account user needs, ‘‘hindsight knowledge’ and available manpower. The HUG recognises that as the project enters a ‘‘ramp-down’’ phase it is inevitable that personnel movements will occur therefore the HUG recommends that ‘‘high-priority’’ work-packages are ‘‘fast-tracked’’ and implemented (when feasible) in the first year of POP.

The HUG encourages the ICC teams and the HSC to continue close interaction and revision of tasks priority lists throughout the POP. Limited funding and manpower means that such close interaction is vital in this phase of the project. This is especially true for tasks undertaken by e.g. the Data Processing Group.

The HUG is concerned about staffing levels and staff retention within the various areas of the HSC. The HUG notes the importance of staff retention and manpower in key areas of the mission, such as data calibration, processing and archiving. To this extend the HUG welcomes the arrangements for staff-share between various ESA missions, as is the case of the agreement between Rosetta and Herschel that will allow a smooth flow of experts amongst the various missions. The HUG is somewhat concerned that staffing levels in certain key areas within the HSC are being ramped down quite sharply. While the budget for Herschel POP has been in place for sometime the HUG stresses the importance of additional resources made available to the HSC and the Mission Manager that could be directed towards areas that see a steep reduction in manpower while demand for various activities remains high.

2. Data Processing/HIPE

The HUG welcomes the new functionalities implemented in HIPE 9.0. and recognises the continuous efforts for improvement of data processing and analysis. The HUG however, notes with concern the gradual reduction in available manpower once the missions enter POP. Following the presentations from the three ICC representatives and members of HSC DP Group the HUG notes the importance of open channels of communication between the lead of DP and the ICCs. The HUG stresses the need for coordinated effort on both sides to ensure that all key aspects/functionalities related to data processing are captured in future HIPE releases in a timely manner. More importantly, such close interaction is necessary given the financial constraints placed both on the HSC and the ICCs. The HUG strongly recommends that the efforts of the Data Processing Group focus primarily on improving the functionalities of HIPE on data processing and less on data analysis (where Users seems to prefer diverging from HIPE functions).

3. Instrument Calibration

The HUG notes with satisfaction the considerable progress towards improving the quality of instrument calibrations. It is necessary however, to continue the efforts in critical areas where improvements are still needed.

The HUG was pleased that calibration workshop of a more specialised topic was organised in mid-September at ESAC and strongly encourages the HSC to continue in the same spirit of bringing together experts from the instrument teams, the HSC and the community to discuss progress and identify areas for future improvements (Section 5).

4. Instruments -- Priorities

4.1 PACS Spectroscopy

PACS spectroscopy is receiving strong attention by the ICC, HSC and NHSC. A number of improvements have already been implemented in HIPE 9.0 resulting in improvements in overall calibration of 10% to 30%. Although a new set of PSF Kernels which will enable users to properly analyse spectra from (semi-) extended sources has been released, there is a clear need for the information to be documented and the relevant tools/scripts to be made available. A number of improvements on corrections for systematics that in many cases affect the spectral shape of lines and detectability of unresolved lines will be implemented in HIPE 10.0.

4.2 HIFI

The HUG notices the many improvements in calibration and data analysis. The HUG notes in particular the availability of beam maps for certain bands and encourages similar measurements to be made available for all HIFI bands. A considerable amount of work has been devoted to improving HEB standing waves but there is clearly need for additional effort in this area. The Sideband gain ratios have been measured for some bands. The results should be properly documented and disseminated. The HUG stresses the importance of this work and encourages the ICC and HSC to continue the work for all bands.

4.3 SPIRE FTS Spectral Mapping

Although considerable effort has been invested in improving the processing of SPIRE spectral maps processing and analysis of such data remains challenging. Although the FTS User Group continues to provide support to users the HUG is concerned about the continuation of the Group in POP when clearly there will still be need for assistance. A new tool for analysis of semi-extended sources (user-choice) will be implemented in HIPE 10.0.

5. Community Support

The HUG notes with satisfaction that all OT2 observations have entered the pool. According to the scheduling the majority of OT2p1 observations (except for those with scheduling constraints) will be completed by the end of the year. The process of implementation and ingestion of user-reduced data (applicable to OTKP, GT) to the Herschel Science Archive (HSA) will begin in earnest early next year. The HSA will be mirrored at the NHSC via links. The HUG stresses the importance of making these user-derived products available to the astronomical community. There are plans for the HSC to host user generated software and the HUG suggests this activity be maintained on a 'best-effort' basis.

6. Data Processing and Interactions with Users:

The HUG notes the many improvements implemented in the new version HIPE 9.0 released in July 2012. In its efforts to reach out to new as well as experienced Herschel Users the DPUG has maintained communication via webex /webinars. Regular workshops have taken place with the latest HIPE Forum organised on October 2012. The HUG stresses the importance of maintaining active communication channels with Users catering for the needs of novice and more advanced users alike.

8. Herschel User Group Survey

As agreed during the 4th meeting the HUG initiated a User's survey to assess the community's experience with the Herschel mission. The questionnaire was constructed in consultation with the HSC and circulated to all Herschel PIs. Out of the 385 PIs, 127 responded. Overall, the community has had a very positive experience with Herschel although several areas related to data archiving, documentation and HIPE-related data analysis could be improved.

Once the results have been fully analysed a separate document outlining the salient findings of the survey will be circulated.

9. Herschel User Group

The HUG has agreed to extend its mission into the post-operations phase. As per the original Terms of Reference four members of the HUG have been rotated, the process was completed in October 2012.

1. INTRODUCTION

The fifth meeting of the Herschel Users' Group (HUG) was held almost nine months after its previous meeting in December 2011. In the intervening period the HUG members held a telecon in June 2012 where matters internal to the Group were discussed.

The format of the 5th HUG meeting was similar to that adopted in the previous meeting with the main group leaders submitting reports/presentations to the HUG in advance so that more time will be available for general discussion. As was agreed in the fourth HUG meeting, representatives from the three Instrument Control Centres (ICCs) were invited to the meeting. As such the focus of the discussion was centred on Post- Operation Plans. A presentation of the first results from the HUG Survey took place and a detailed report will follow the full analysis of the survey.

Copies of the presentations received can be found on the HUG web pages
<http://herschel.esac.esa.int/HUG.shtml>

2. GENERAL ISSUES AND RESPONSE TO PREVIOUS HUG REPORTS

The HUG continues to be impressed with the excellent performance of the observatory and the efficient use of spacecraft time. Program completion is nearing 100% for OT1p1

programs with a similar rate of completion for OT2p1 programs foreseen by the end of 2012.

The new HSA has been in operation since May 2012. HSC has been in contact with teams of GT and OTKP PIs regarding the ingestion of science products into the Herschel Science Archive (HSA) as per the original agreement. A number of users felt that the Archive is not user friendly or that there is adequate infrastructure to upload science products that can be used for further scientific exploitation by others (e.g. source catalogues). The HUG would like to encourage HSC to look into ways of improving the tools for making science products from OTKP/GT programs available to the wider astronomical community.

In response to a recommendation made by the HUG the functionality of the Helpdesk has improved with a list of relevant FAQs available relevant to the topic of choice by the user.

3. ICC Post Operation Plans

It is currently anticipated that the helium will be depleted in Herschel in mid to late March 2013 and the mission will formally enter its Post-Operations Phase (POP). A five-year POP has already been incorporated into the Herschel mission plan. At the fourth HUG meeting preliminary drafts of the plans were circulated to the Group and it was decided representatives of the ICCs, HSC and the HUG would be beneficial.

HIFI ICC POP

The HIFI POP will start in mid-March and extend for three years. The team will remain highly distributed among the contributing institutions with each of them continuing their leading roles in the various work packages.

The HUG fully endorses the team's list of tasks to be carried out over the three year period and notes that the tasks focus on two main regimes focusing on implementing improvements on data products, pipeline and documentation and, improving on instrument calibration and characterisation.

While the lists have been drawn with the Herschel user in mind the HUG cannot stress enough the importance of close coordination between the ICC and HSC, especially in view of the timelines involved in developing/implementing the various work-packages and the ramping-down in manpower.

PACS ICC POP

The PACS team will enter POP at the end of February 2013. Currently the duration of PACS POP activities extend over 3.5 years with a possibility of further extension for another 1.5 year as per the definition on the Herschel Science Implementation and Requirements Document (SIRD). As with the previous plans the HUG found the prioritisation of tasks and work packages well thought-out with the aim of improving the quality of products that will finally enter the archive as well as implementing changes/improvements to specific modes of the instrument. A number of issues

related to specific modes of operation of the PACS instrument are detailed in section 5, the HUG highly recommends that these be taken into account in the work package prioritisation. Given the constraints on manpower but also the limited lifetime of the teams during POP the work-packages and future implementations should take place in close consultation with the HSC teams.

SPIRE ICC POP

The POP plans of the team will come into effect at the end of July 2013 and last for three years. At the end of the three-year period the ESA archive will be the sole repository of data and information. The HUG welcomed the revised SPIRE ICC staffing profile that included an increase in manpower relative to earlier plans. Given the limited resources and lifetime of the team it is evident that very careful planning and prioritisation of tasks is needed to ensure optimal outcome.

The HUG notes that the SPIRE-ICC's prioritised list of tasks was drawn up with users in mind. The tasks focus on improving the quality and ease of handling of existing data (there are plans for common/compatible data analysis tools for PACS-SPIRE data) on the one hand and improving on data analysis tools for modes such as SPIRE Spectral mapping. The HUG notes with concern that funding of computer equipment and support (currently located in the UK) will be withdrawn during Post Operations and urges the team to consult with the HSC for possible transfer of activities to HSC computers.

4. MUST DO ACTIVITY

The Project Scientist Göran Pilbratt reported on the "must do" activity carried out over the summer. In brief, the PS invited the community for input on particular "must do" targets or observations that were overlooked in previous Herschel time allocations and which Herschel should carry out. The call resulted in 58 proposals from the community. The PS together with the Mission Scientists selected a total of six such "must do" programs that after initial technical/feasibility assessment have been released for scheduling. There were 106 hours of DDT time allocated as part of the "must do" activity. The observations taken carry no proprietary time and will be immediately made available to the community. The HUG supported the effort and was pleased to note that all scientific areas/modes of observation of interest have now been looked at.

5. INSTRUMENT CALIBRATION

In preparation for the meeting Tony Marston provided a written summary of the activities of his group. The HUG was very impressed by the considerable progress made on several aspects of calibration of the three instruments. Details of improvements and issues still remaining are discussed in Section

The HUG was pleased to hear that a specialised Workshop on Herschel Calibration was due to take place in mid-September 2012. The HUG would like to stress the importance of

such meetings as it provides a forum for ICC/HSC experts and Herschel users to exchange ideas identify areas for improvement and give useful feedback on calibration documentation. Now that the Herschel mission has reached a mature point it is probably a good idea to hold such meetings with a higher frequency (once or twice a year).

INSTRUMENT SPECIFIC ISSUES AND CALIBRATIONS

HIFI:

The HUG notes the steady improvements on various aspects of calibrating the instrument and improving data quality. A number of such improvements have been incorporated in the latest version of HIPE (v. 9.0) and updates have been included in the documentation. Improving the HIPE tools to handle the HEB standing waves for all observing modes (also load chopping) is still an important issue. Some users are concerned that at least some of the Band 7 data cannot be reliably calibrated in temperature. The approach of creating a database of standing waves, and to select the best fitting-one for removal, should (if time allows) be validated against the predicted waveforms from physical models.

Sideband gain ratios: It is good to see the progress being made in deriving the variation of sideband gain ratios. The results should not only be made available in the data products, but also in the documentation. This will allow the user to judge the possible impact on the calibration error of his/her observations, as the gain ratio is a main source of the calibration uncertainty. We encourage the HSC to continue this effort from bands 2, 5, 1, to the other bands.

Beam maps: The band 2 beam map down to -25dB, and its comparison with the model prediction, is an impressive result. We fully endorse the presented plan on how to continue, to propagate the ILT model to the sky and to eventually deliver synthetic beam maps, comparison with the other two instruments, discussion of beam asymmetry. If the change of beam efficiency in band 2 by 10% is confirmed, the changes may be even larger and more important at higher frequencies.

PACS

Spectroscopy

This instrument mode has received considerable attention by the ICC and HSC and as a result a lot of progress has been made in several aspects of calibration and data processing and analysis. The HUG notes that a number of tasks (related to flux extraction of point sources, convolution kernels) highlighted in previous reports have now been addressed and implemented in the latest version of HIPE. Users, however, are still experiencing difficulties when attempting to measure fluxes in the case of extended sources. Although point source functions (PSFs) have been made available, tools that would enable users to efficiently apply them to their data are not widely available. The HUG notes that there is a need to properly document the products available and also make the tools available so that users can use them according to

their specific needs. In addition the following items have been brought to the attention of the HUG:

Improve corrections for systematics that in many cases affect the spectral shape of lines and detectability of unresolved lines.

Provide clear information (on relevant webpages e.g. cookbooks) on units. Users have reported difficulty with the units of PACS products; in particular there seem to exist some level of confusion on whether the Jansky scale is expressed per pixel, per arc sec or per steradian squared.

Imaging – Extended Emission

The HUG has consistently reported on the difficulties related to PACS extended source photometry. In particular comparisons between MIPS 160um maps and PACS red channel have been the topic of an in-depth investigation where the differences noted earlier are now understood as due to the fact that the MIPS detectors appear to suffer from saturation effects for bright sources. The agreement between PACS 160 micron and previous missions is now within 5—20% for sources <50 MJy/sr. The limiting factor being the response of the Ge:Ga detectors. A similar trend has been noticed also for PACS 70um and MIPS 70um, where the flux non-linearity response of MIPS reduces once again its linear dynamic range.

The various issues related to the analysis of PACS imaging data and in particular the choice of mapper software (Scanamorphos vs MADMAP) will be the topic of a dedicated workshop to take place in early 2013 bringing together instrument experts from the ICC and HSC teams and the community. The HUG welcomes this initiative and encourages the HSC to organise similar such events focusing on various aspects of data analysis.

SPIRE

SPIRE-FTS Spectral Mapping

The change from calibration resolution to high-resolution darks has been implemented in HIPE9.0 and this should improve calibration in particular of faint spectra. Reduction of spectral maps remains challenging although an application-specific tool is being worked on and will be implemented in future versions of HIPE. The FTS User Group is assisting PIs whose programs include FTS spectral maps. A future tool that will allow a user to process their data (and use suitable calibrations) according to point or semi-extended sources was is likely be implemented in future versions of HIPE. The HUG notes that this will be a very useful tool and encourages implementation in HIPE as soon as possible.

6. COMMUNITY SUPPORT AND COMMUNICATIONS WITH USERS

All aspects of community support appear to operate very efficiently. There are no major concerns from the Users or the HUG in this area. A new FAQ facility is now in operation when a new ticket is submitted via the Helpdesk. I was originally suggested by the HUG to

make past tickets available to all Users. To circumvent issues related to users' permission the new system was implemented.

Almost all OT1p1 proposals are now complete. It is anticipated that by the end of 2012 all of OT2p1 proposals will be completed (except for a small fraction with observing constraints). Ingestion of data products to the HSA will start in early 2013. There are plans for the HSA to be mirrored to the NHSC via several links.

As was mentioned previously, the HSC has been in contact with GT and OTKP PIs regarding the collection and archiving of user-generated science products. A large fraction of the PIs are in a position to make products available however, there is concern that the infrastructure currently available is not capable of handling several data formats (e.g. VO tables). The HUG would like to encourage the HSC to make necessary provisions available to PIs to enable them to make their data publicly available, as this will only contribute to the Herschel Legacy by leveraging scientific output. The HSC will also welcome contributions from OT1/2 PIs and will take care of ingesting the products in the HAS but at present this activity will happen on a "best-effort" basis.

7. USER SUPPORT FOR INSTRUMENT CALIBRATION AND DATA PROCESSING

The quality and completeness of information related to calibration, documentation and data processing has improved remarkably throughout the mission. The DPUG group continues dissemination of expertise either via face-to-face meetings and/or Webex telecons. These activities vary in terms of content and are a mixture of general DR workshops and more specialised topics. As the Users become more familiar with the Herschel mission –specific tools for DR and analysis the HUG suggests that the focus of future workshops should shift from general introductory ones to meetings where the topic focuses on a specific aspect/topic. The HUG also encourages the group to continuously improve the documentation especially the availability of "cookbooks" regarding general and more specialised aspects of the instruments.

8. HERSCHEL USER GROUP SURVEY OUTCOME

The HUG survey took place in June-July 2012. The questionnaire was circulated to 388 PIs of Herschel proposals. A third of the recipients (103/388) have responded to the questionnaire. A preliminary analysis of the results was presented during the meeting. A formal report is being prepared and will be made available soon. The survey revealed that overall Herschel users are satisfied with the documentation, products, and support available for the mission. More specifically the responses according to areas can be summarised as follows:

- Documentation: users are satisfied with the general documentation available (cookbooks, webpages) although there seem to be room for improvement on the general content of webpages and ease of finding relevant information on reduction recipes for certain modes/instruments.
- Herschel Science Archive: the new look of the HSA was well received but some of the functionalities could be improved (users found the HSA hard to use). However, the HSA contents – especially SPIRE and HIFI products- are of satisfactory quality.

- Herschel Community Support: users generally satisfied with the level of support provided by the Helpdesk. The ticketing system, contents of responses and help available (through the helpdesk and/or the ICC groups) was highly praised.
- Help- Material available: on-line videos, webinars by HSC and NHSC were found very useful and well considered. A possible exception to this is information available for PACS spectroscopy.
- HIPE: Documentation and data-reduction capabilities (specific to HIPE) have been rated below the other aspects of Herschel functionalities. Users reported that there is a steep learning curve for HIPE and some still encounter problems with memory crashing etc. when running the applications. There was a general consensus that users prefer to use tools outside HIPE for further analysis of their data.

9. HUG MATTERS

The HUG will continue its mission during POPs and will endeavour to advise the Project Scientist and the HSC on matters relevant to Herschel users. The new HUG Chair D. Rigopoulou took over from R. Kennicutt in the beginning of May 2012. As per the terms of reference of the Group a number of members have stepped down. The HUG wishes to thank all outgoing members for their hard work and welcome the four new members, M. Barlow, C. Kramer, D. Elbaz, and L. Decin.

The dates for the next HUG meeting were provisionally set for mid-April 2013 probably at ESAC.

10. ACKNOWLEDGMENTS AND THANKS

The HUG wishes to thank Göran Pilbratt, the ICC representatives and the HSC staff for hosting a highly productive and informative meeting.

11. AGENDA OF THE MEETING

Thursday 6 September 2012

09:00 - HUG internal: Welcome the new members, brief updates

10:00 - Coffee break

10:30 - Herschel Status report (Project Scientist) and discussion

12:00 - Brief presentations of Post-Operations Phase plans by HSC and ICCs

13:00 - POP plans discussion

13:30 - Lunch break

14:30 - Cont'd discussion on POP plans

15:30 - Discussion on presentations/updates from HSC members.
- DP issues (Stephen Ott)

- Calibration issues (Anthony Marston)
- User's f/b & data processing (Bruno Merin)
- Community Support (Pedro Garcia-Lario)

16:00 - Coffee break

16:30 - Discussion cont'd

17:30 - AOBs

18:00 - HUG internal: HUG session

19:00 - End & taxis back to Madrid

Friday 7 September 2012

09:00 - HUG internal: Discussion on first results from the Herschel User Group Survey.

10:30 - Coffee break

11:00 - HUG internal: Discussion cont'd

13:00 - HUG survey preliminary feedback

13:30 - Lunch break

14:30 - HUG internal: HUG matters

16:00 - End of meeting