



Herschel – status update

Göran Pilbratt/A.Marston
Herschel Uplink Workshop, ESAC,
3-4 June 2010

→ Herschel First Results Symposium

4-7 May 2010

ESA ESTEC, Noordwijk, The Netherlands

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Herschel orbit



Two LEOP manoeuvres



- OCM 2009-05-15T15:28:20.654 9.01 m/s
- Touch-up OCM 2009-05-18T18:13:02.5666 1.01 m/s

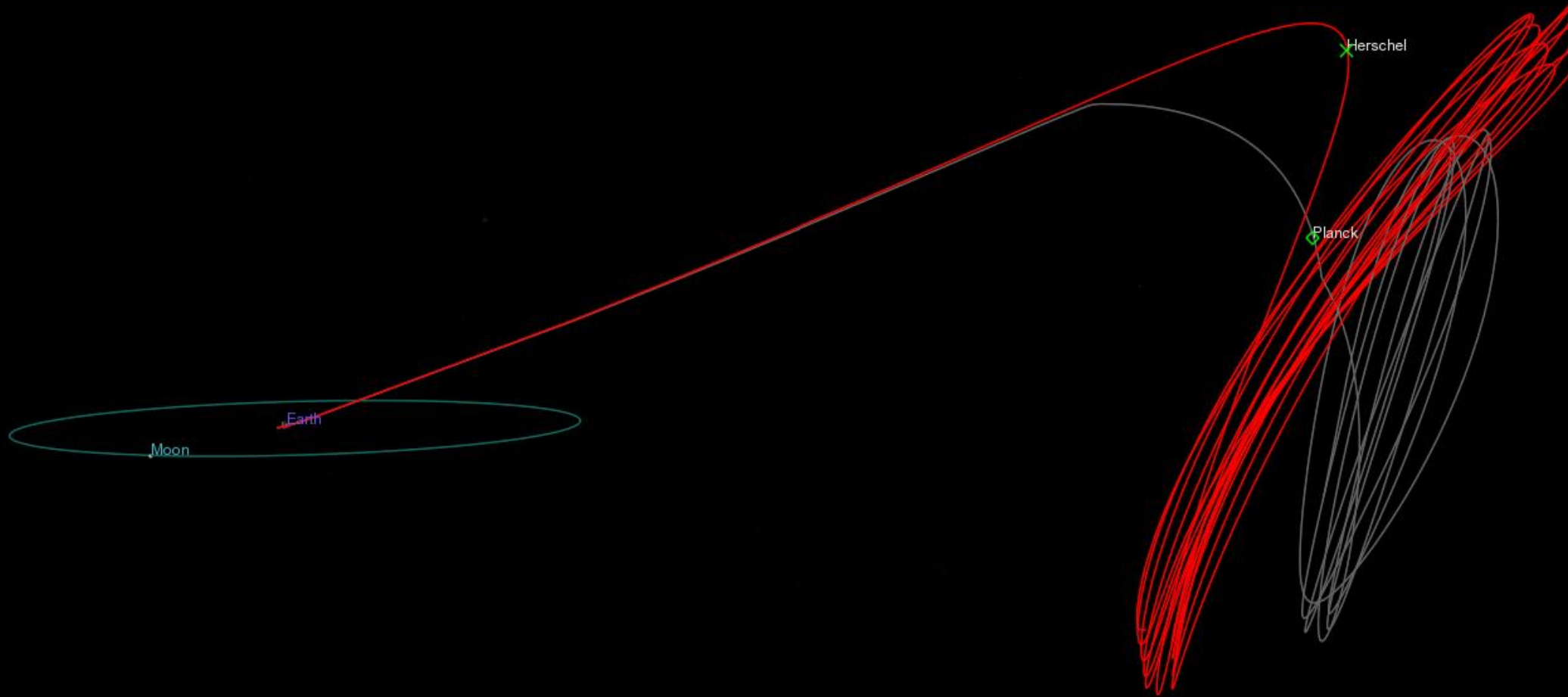
Since then nine manoeuvres

- Transfer OCMs 1 & 2 total 0.90 m/s
- Station keeping OCMs 1-7 total 1.27 m/s
- Typical OCMs 4-6 weeks apart with typical Δv ~0.1-0.2 m/s

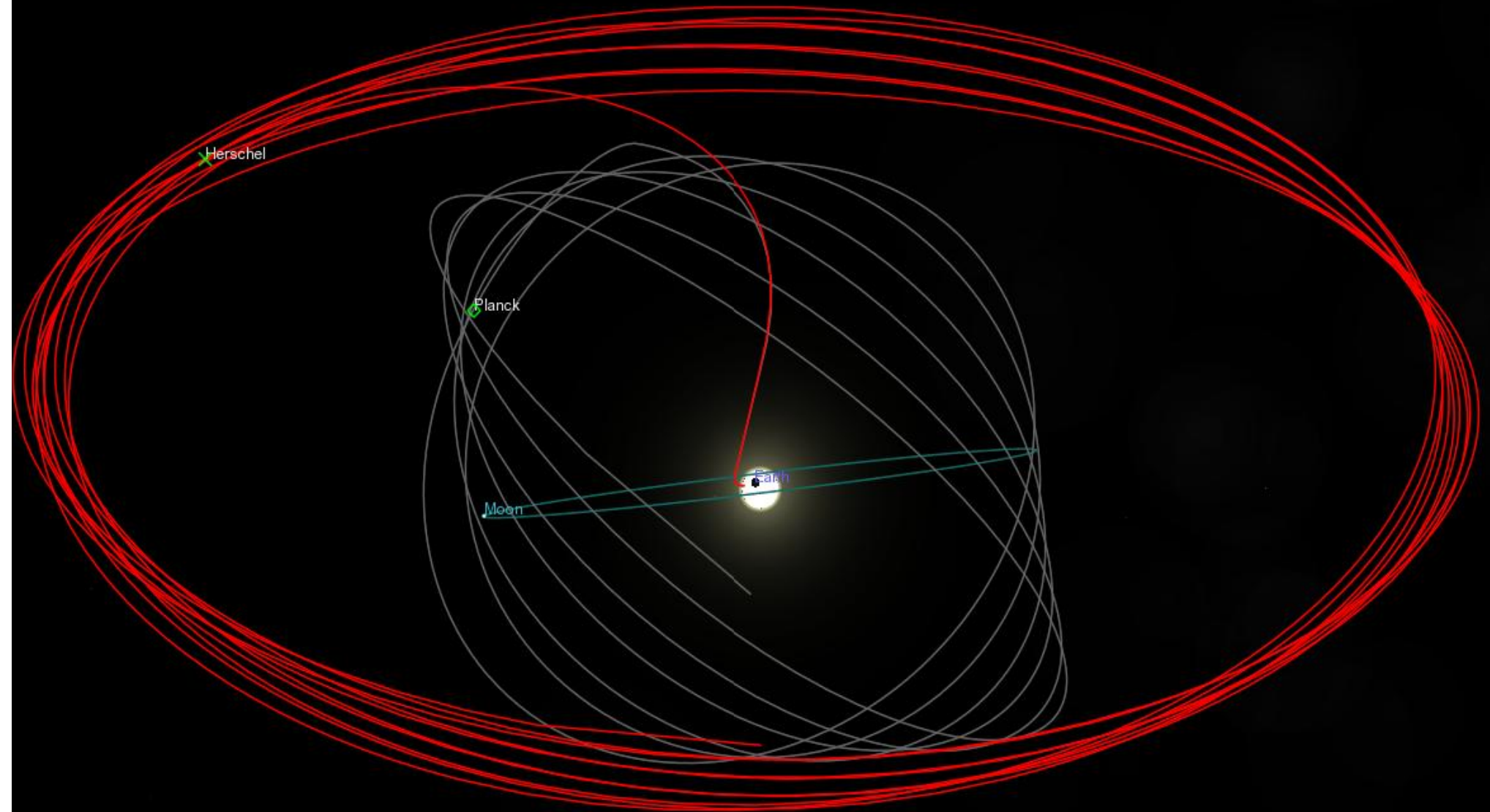
Herschel has been in final 'orbit' since day#2!

- Orbit maintenance, but no orbit insertion (as opposed to Planck)
- LEOP OCM put Herschel on 'stable manifold' for large amplitude 'semi halo' orbit

Herschel orbit



Herschel orbit



Mission (cryostat) lifetime



At In-Orbit Commissioning Review (IOCR)



- Mid-July – just reached stationary conditions
 - Amount of He at launch known at 333.5 kg
 - Transient phase use modelled/estimated
 - Stationary conditions
 - CVV average stationary outside temperatures measured
 - Stationary average dissipation
- ⇒ Average He mass-flow modelled at 2.668 mg/s
- ⇒ Mission lifetime estimated at 3.78 years

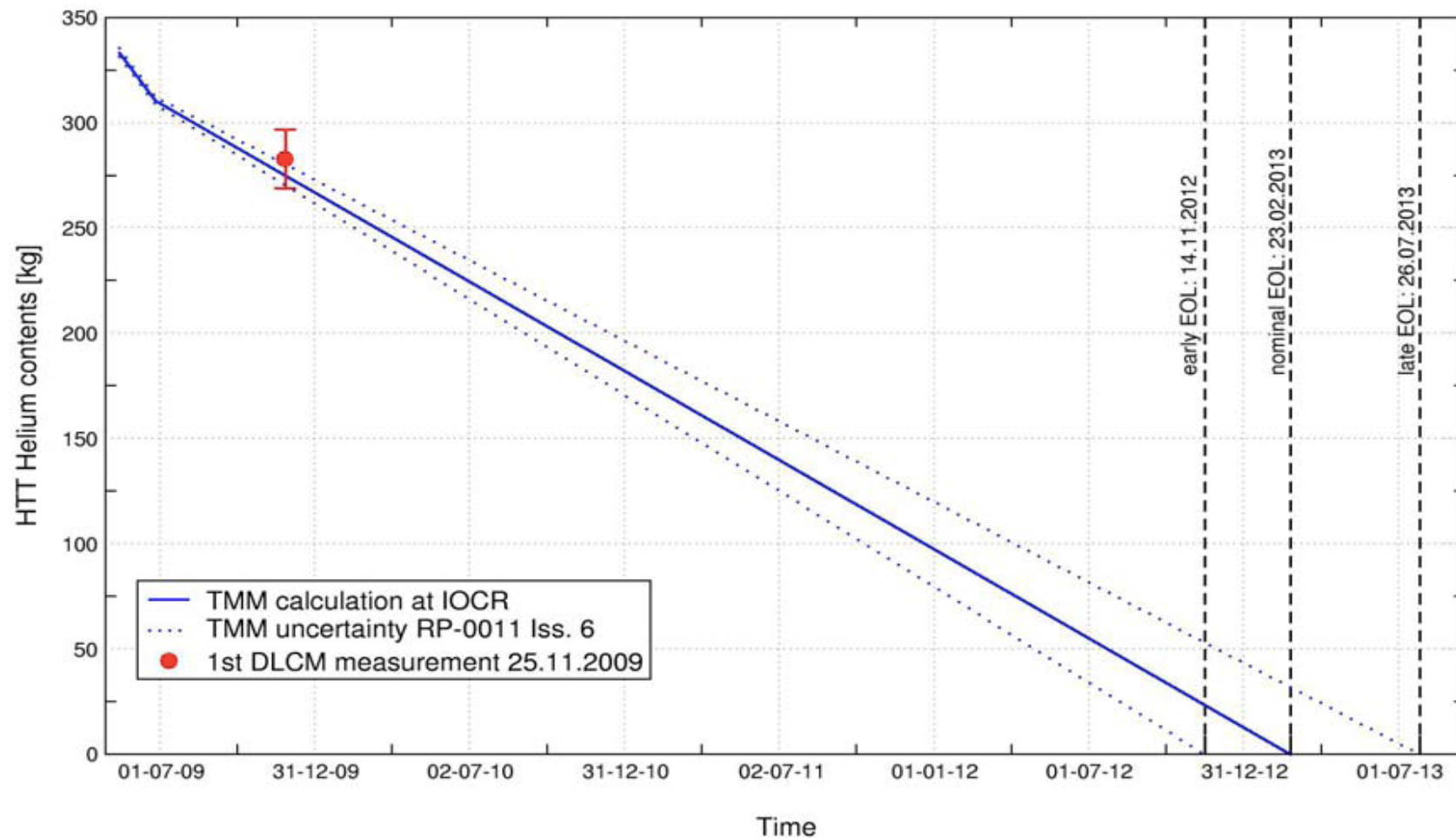
First DLCM on OD#195 (25 November 2009)

- Remaining amount He measured at 283 ± 14 kg (269-297 kg)
 - Use 2.668 mg/s $\Rightarrow 1228 \pm 50$ days (1168-1288 days)
 - Compute total mission lifetime $\Rightarrow 3.65$ -3.98 years
 - Estimated amount of He was 275 kg (consistent)
- ⇒ Mission lifetime given as 3.8 years (end ~March 2013)

Mission (cryostat) lifetime



Large uncertainties remain, but confidence in ≥ 3.5 years



HERSCHEL SPACE OBSERVATORY

Herschel/PACS Images of M51 (“Whirlpool Galaxy”)



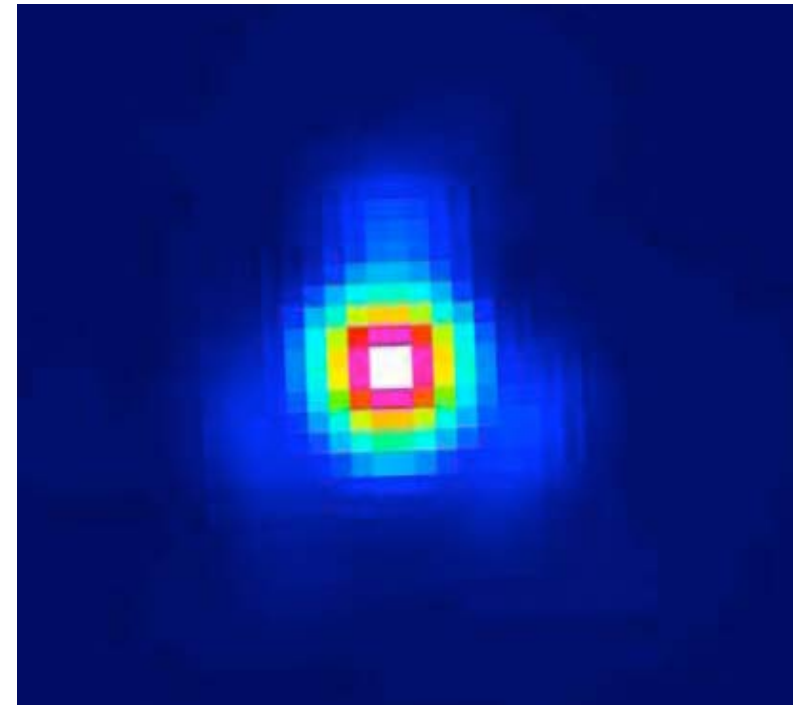
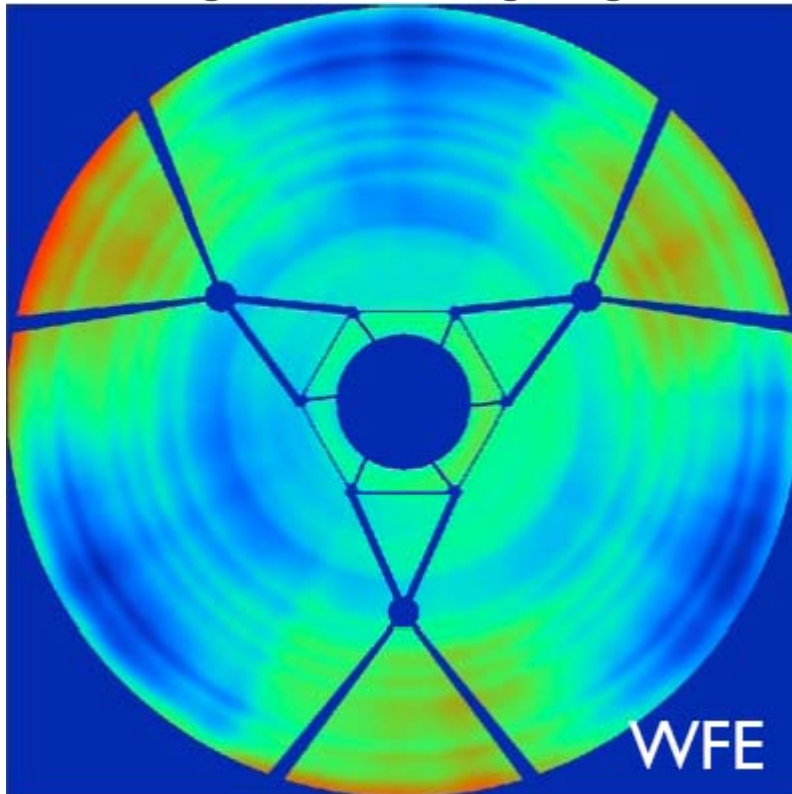
160 μm

100 μm

70 μm

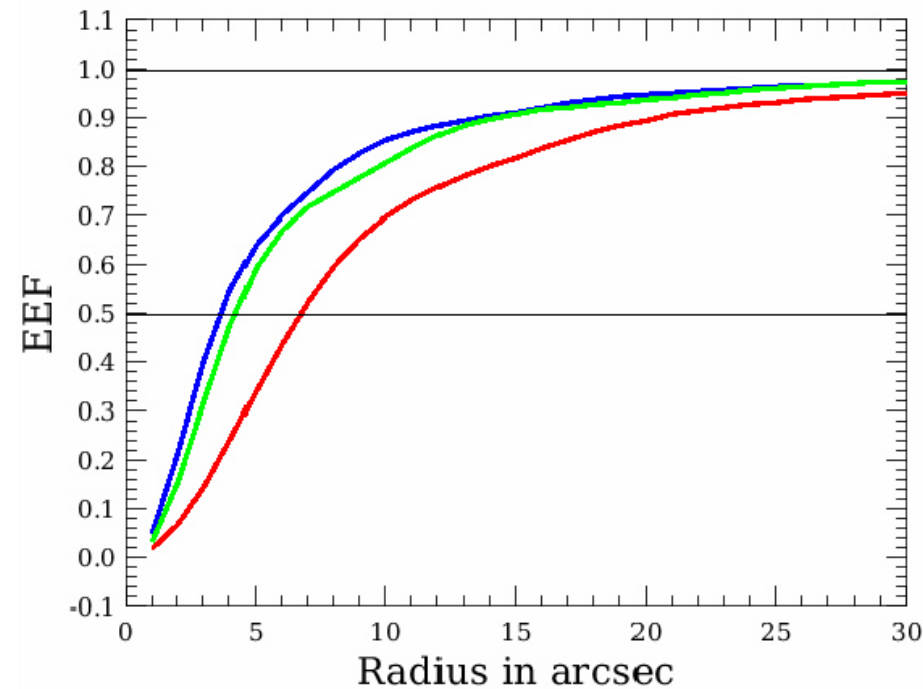
PSF as predicted

- Measurements of PACS PSF match optical models (wave-front error).
- Diffraction-limited almost down to the shortest Herschel wavelengths.
- Scan speeds of 10" or 20"/s show almost identical PSF. PACS/SPIRE PSF elongated when going at 60"/s (parallel mode -- fast).



PACS "blue" PSF based on images of Vesta.

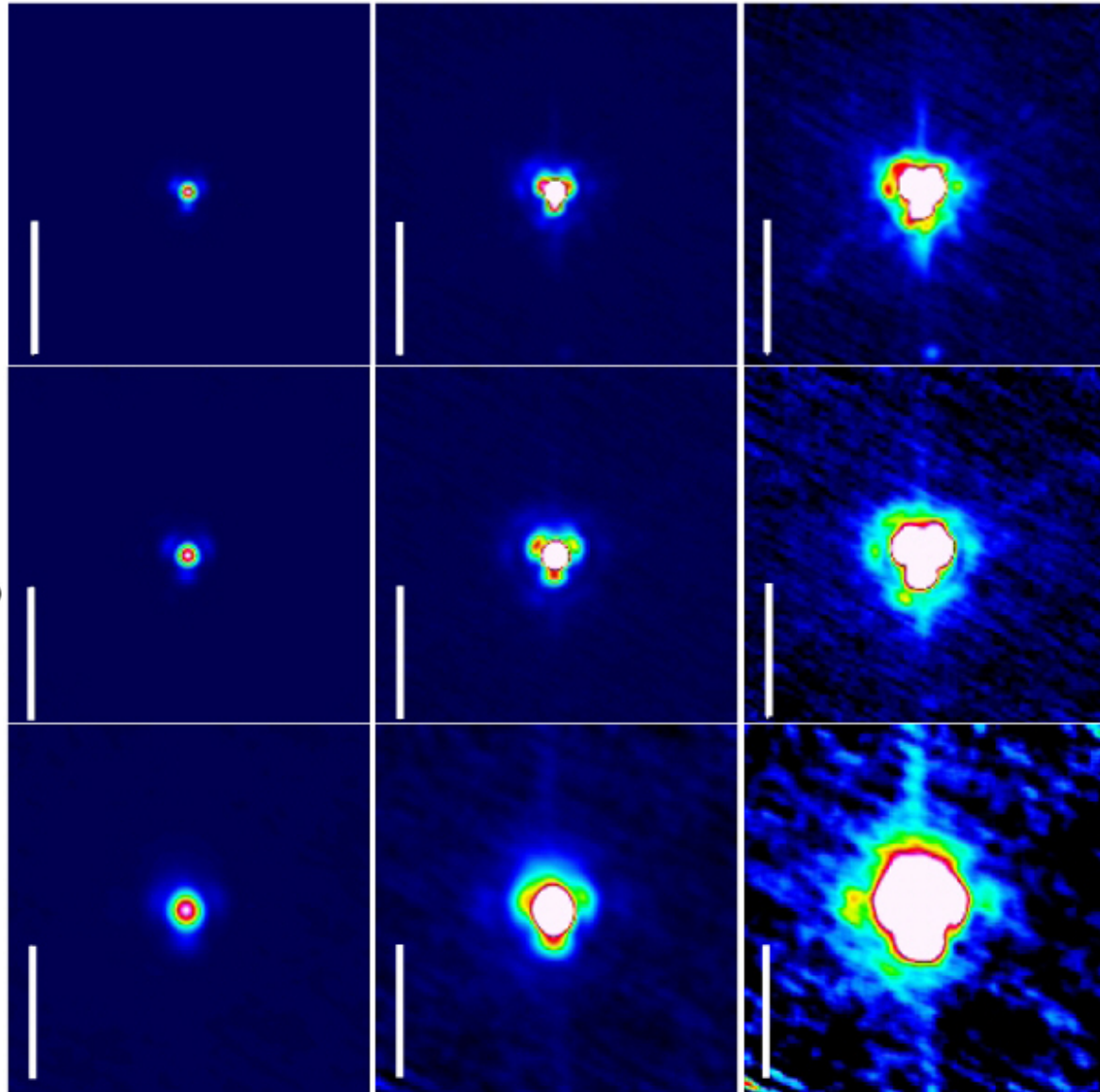
Encircled energy and PSF by PACS



EEFs in blue (70), green (100), and red (160) μm bands

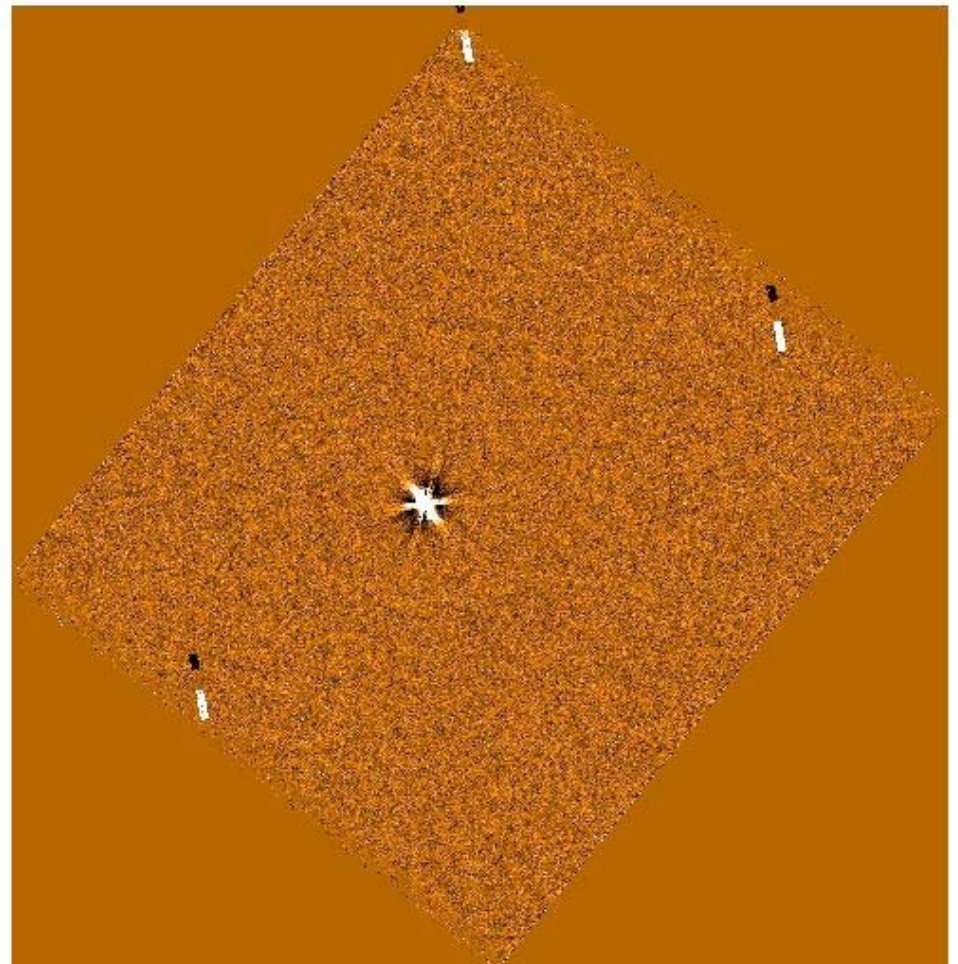
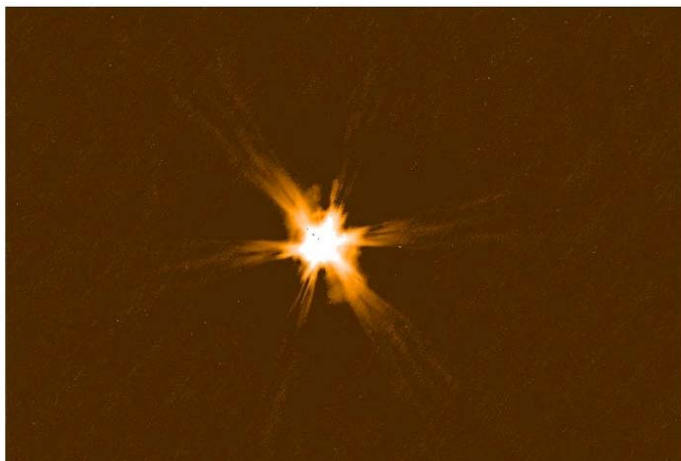
PSFs based on Vesta observations; top->bottom: blue, green, & red bands; left->right: scaled to peak, 10% and 1%.

Data now available from HSC.



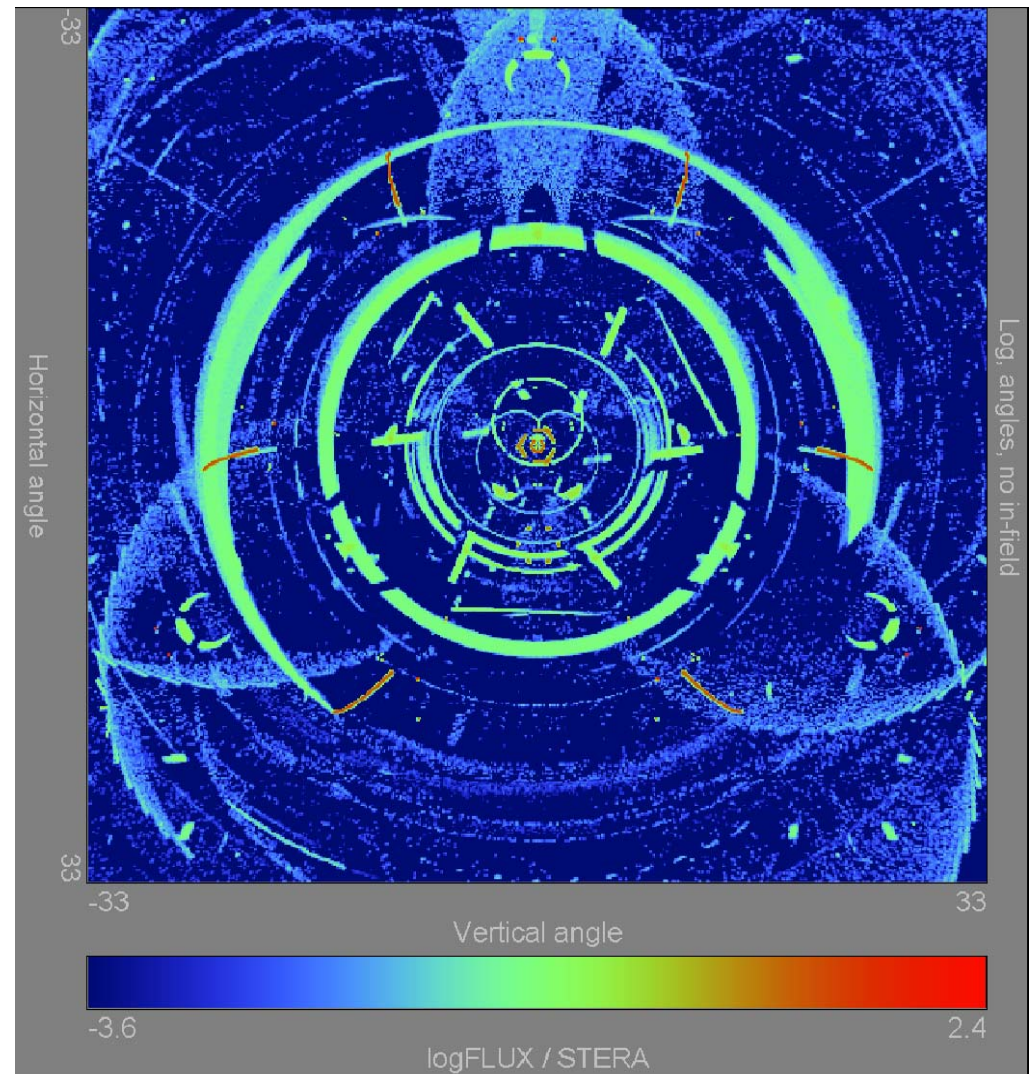
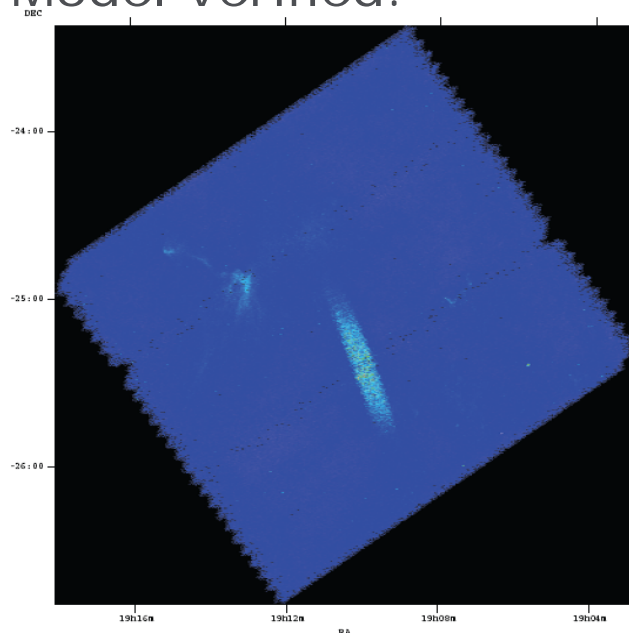
Observation of Mars with PACS/SPIRE.

No hint of straylight around
boresight.

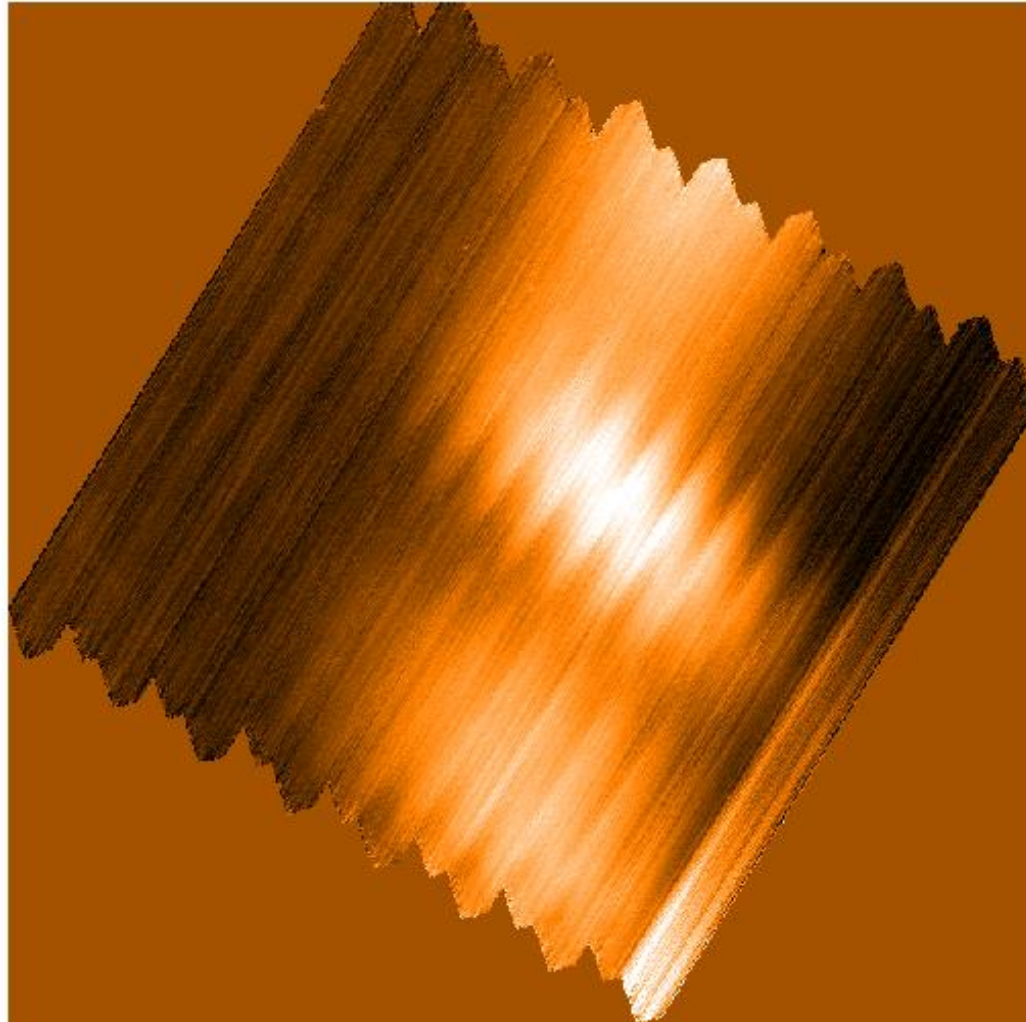


Straylight - far-field

- Straylight image in parallel model for Jupiter at one of the red spots of the Marc Ferlet optical model.
- Model verified.



Straylight – Moon (but very rare)



Pointing performance



Aquila: 3-color composite (70, 160, 500 um)

'Pointing Accuracy'

Absolute Pointing Error (APE) is approx. 2 arc seconds.

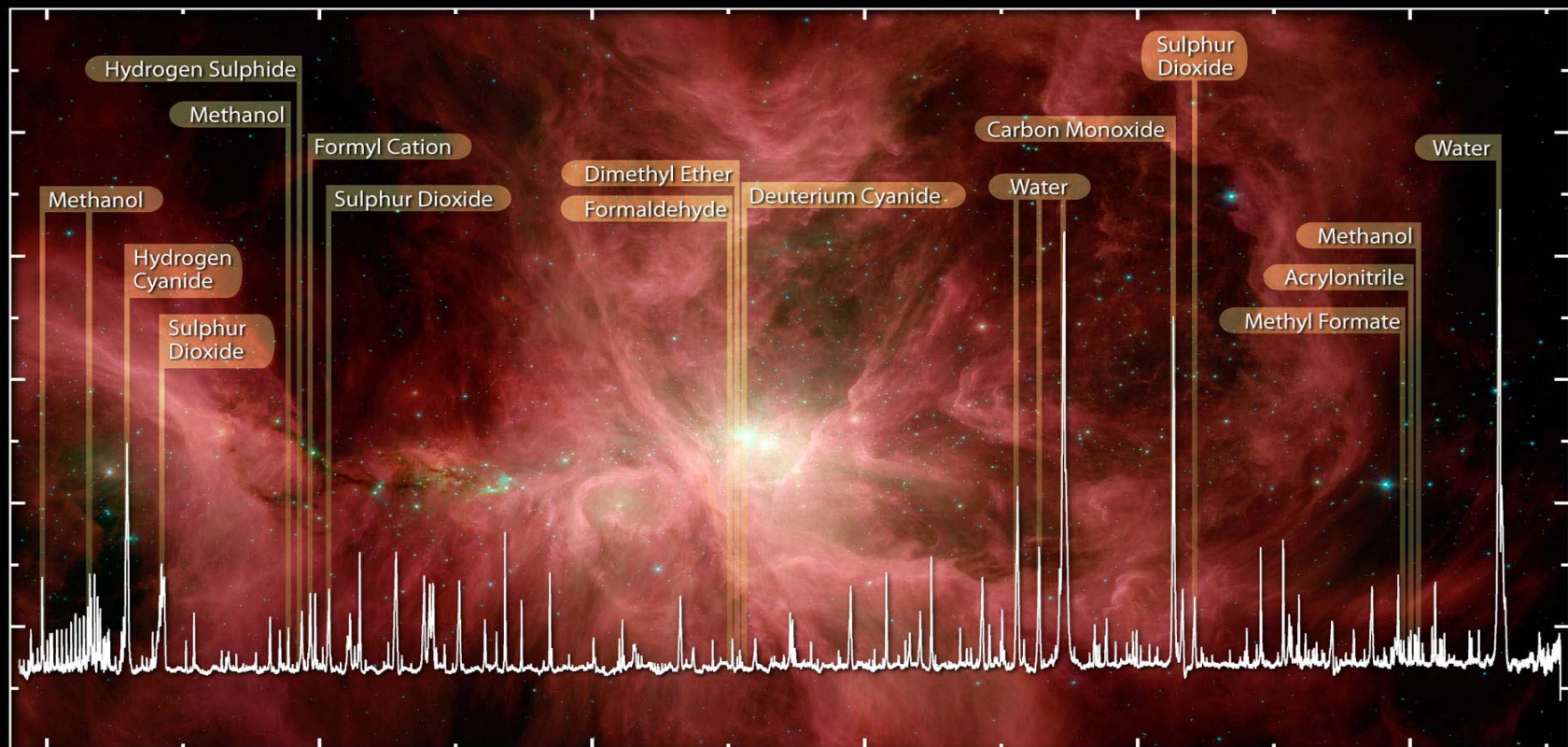
'Speedbumps'

- Observed in scanning, attributed to 'warm pixels' in the star tracker CCDs.
- Could ruin pointed observ. and we would not know. Little evidence it ever has.
- **STR CCD temperature was lowered to -10°C (was +13°C) before OD#320 (29 March 2010)**
- Speedbumps reduced/removed completely.



HERSCHEL SPACE OBSERVATORY

- In late August 2009, an anomaly caused a problem with the loss of the prime side electronics chain for the HIFI local oscillator unit. After investigations and updates (software/procedures) restarted in January using redundant electronics. In full working order.
- Throughout Feb and April, bias towards taking HIFI data and completing Performance Verification.
- PSP1 and PSP2 observations took place.
- HIFI AOT modes now all in place, although OTF mapping still to be officially released.
- All modes available for the upcoming AO call
- Some caveats with availability of frequency range – 2% unavailable or has issues (purity, spurs) but working on it!



HIFI Spectrum of Water and
Organics in the Orion Nebula

© ESA, HEXOS and the HIFI consortium
E. Bergin

Taking stock – status observing



SDP Initial Results workshop 17-18 December 2009

- 10-14 January 2010 – HIFI turned on
- February-April 2010 – HIFI catching up
- 9 March 2010 – HSA and HIPE publicly available
- 31 March 2010 – submission deadline A&A Special Issue papers



HIFI DP Workshop, 8-9 April 2010 @ ESTEC

HIFI Initial Results workshop 12-13 April 2010

- Consolidating Key Programmes in progress

Herschel First Results symposium 4-7 May 2010

- 14 May 2010 – deadline for Key Programme AORs
- 15 May 2010 – acceptance deadline for A&A Special Issue papers

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Taking stock – status observing



Status on 30 April 2010



- SDP observations
 - 86.7% out of 699.5 hr executed
 - remaining 'SDP observations' revert back to KP observations
- KP observations
 - 19.6% out of 11,010.3 hr executed, another 1.8% scheduled
 - another 24.7% released
 - remaining 53.9% not yet released

Consolidation of Key Programmes

- Note that 14 May 2010 is deadline for AOR delivery for inclusion in the Reserved Observations List (ROL) for the upcoming OT1 release
- ROL will be frozen during the OT1 process, until final delivery of AORs of consolidated accepted OT1 programmes => November 2010

HERSCHEL
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- **Mission lifetime 3.5-4 years**
 - Routine science phase duration 3-3.5 years
 - About 6600 hours science time per year
 - **Key Programmes**
 - Allocated ~11000 hours or ~1.7 years
 - **Time available to be allocated**
 - Total RSP – KP allocated = ~1.3-1.8 years
 - Reasonable to have 2 AOs (3 has been suggested, but overkill)
 - **Timing for future AOs**
 - Existing KPs cover – ‘in one block’ (unrealistic) – to mid-2011
 - Want many available AORs to ensure efficient scheduling
 - HIFI experience shows you need to be robust against instrument temporarily out of action
- ⇒ **want AO-1 AORs by late 2010, issue AO early 2010**



- **GT1 process**

- 31 March 2010 – 14 May 2010
- About 550 hours.
- Information sent to successful PIs on 6 May 2010.

- **OT1 process**

- Offer 1 year of observations (~6600 hours)
- Release: 20 May 2010 (large and 'normal' proposals)
- AKARI FIS and IRC compact source catalogues incorporated in HSpot v5.0
- Submission deadline: 22 July 2010
- Technical checking: until end September 2010
- HOTAC meetings: October 2010
- Final AOR updating by successful proposers October 2010
- OT1 AORs available for scheduling from November 2010

- **GT2 & OT2**

- About a year later – exact dates (TBD)



AO documentation:

- Herschel OT-1 Announcement of Opportunity
- Executive Summary
- Policies and Procedures
- Herschel Observers' Manual
- HIFI Observers' Manual
- PACS Observers' Manual
- SPIRE Observers' Manual
- SPIRE/PACS Parallel Mode Observers' Manual

AO tools:

- HerschelFORM PDFLaTeX package – *also allows joint application for XMM time.*
- Reserved Observations Search Tool & duplications policy
- HSpot Observing Planning Tool

Plus:

- ESLAB presentations & A&A papers on astro/ph (more than 100)!