

Background image: ESA and the PACS, SPIRE & HSC consortia, F. Motte (AIM Saclay, CEA/IRFU - CNRS/INSU - U.ParisDiderot) for the HOBY/Key programme

# 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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<http://www.congrex.nl/10A10/>

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## 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

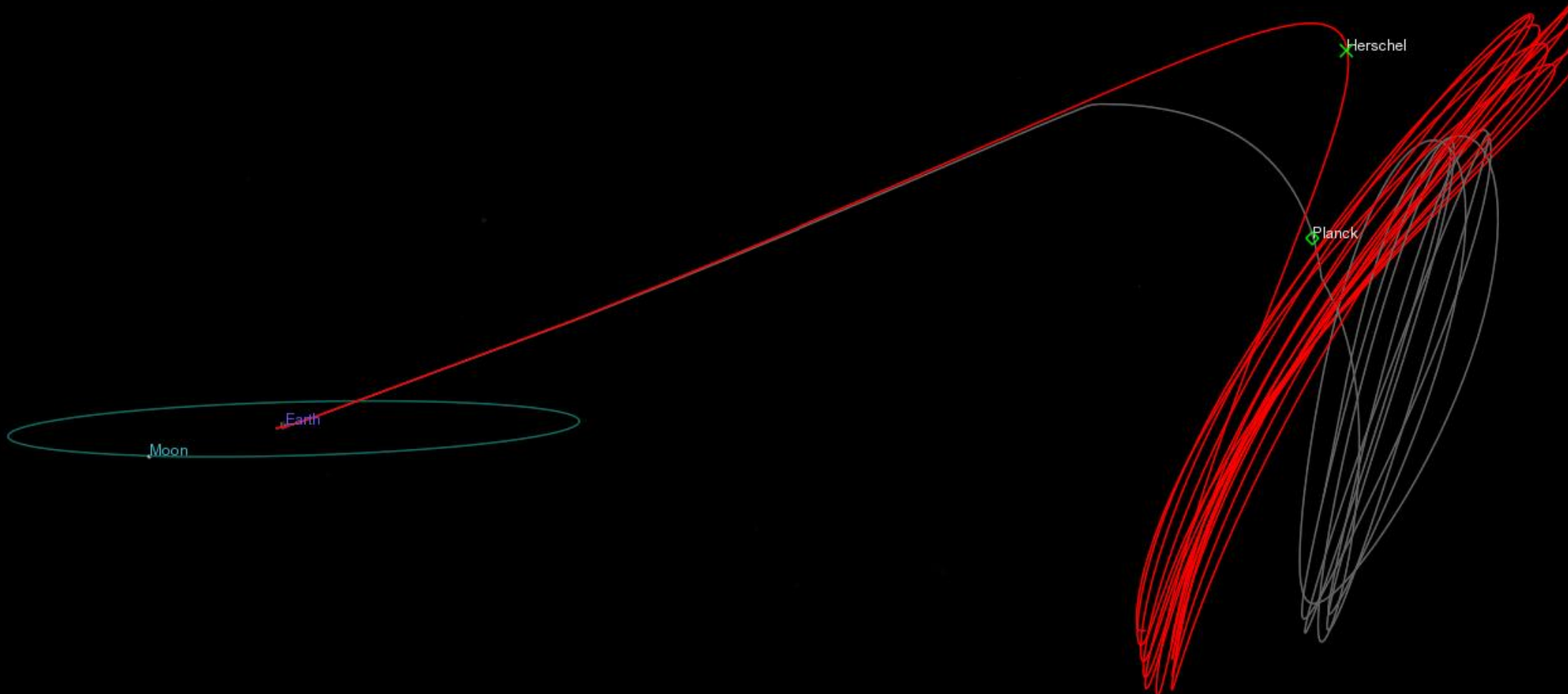
- Transfer OCMs 1 & 2 total 0.90 m/s
- Station keeping OCMs 1-7 total 1.27 m/s
- Typical OCMs 4-6 weeks apart with typical  $\Delta v$  ~0.1-0.2 m/s

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

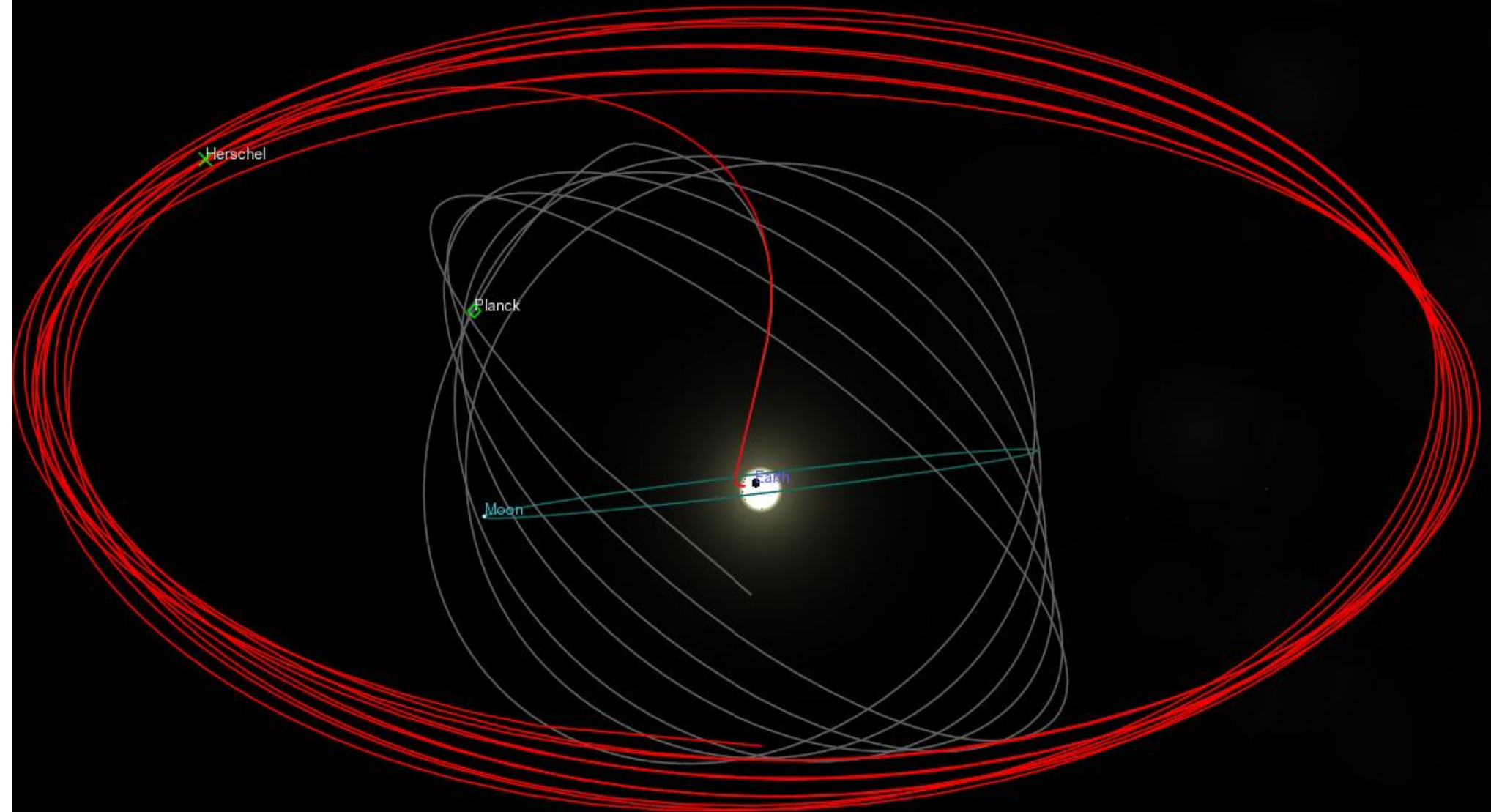
- Orbit maintenance, but no orbit insertion (as opposed to Planck)
- LEOP OCM put Herschel on 'stable manifold' for large amplitude 'semi halo' orbit



# 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

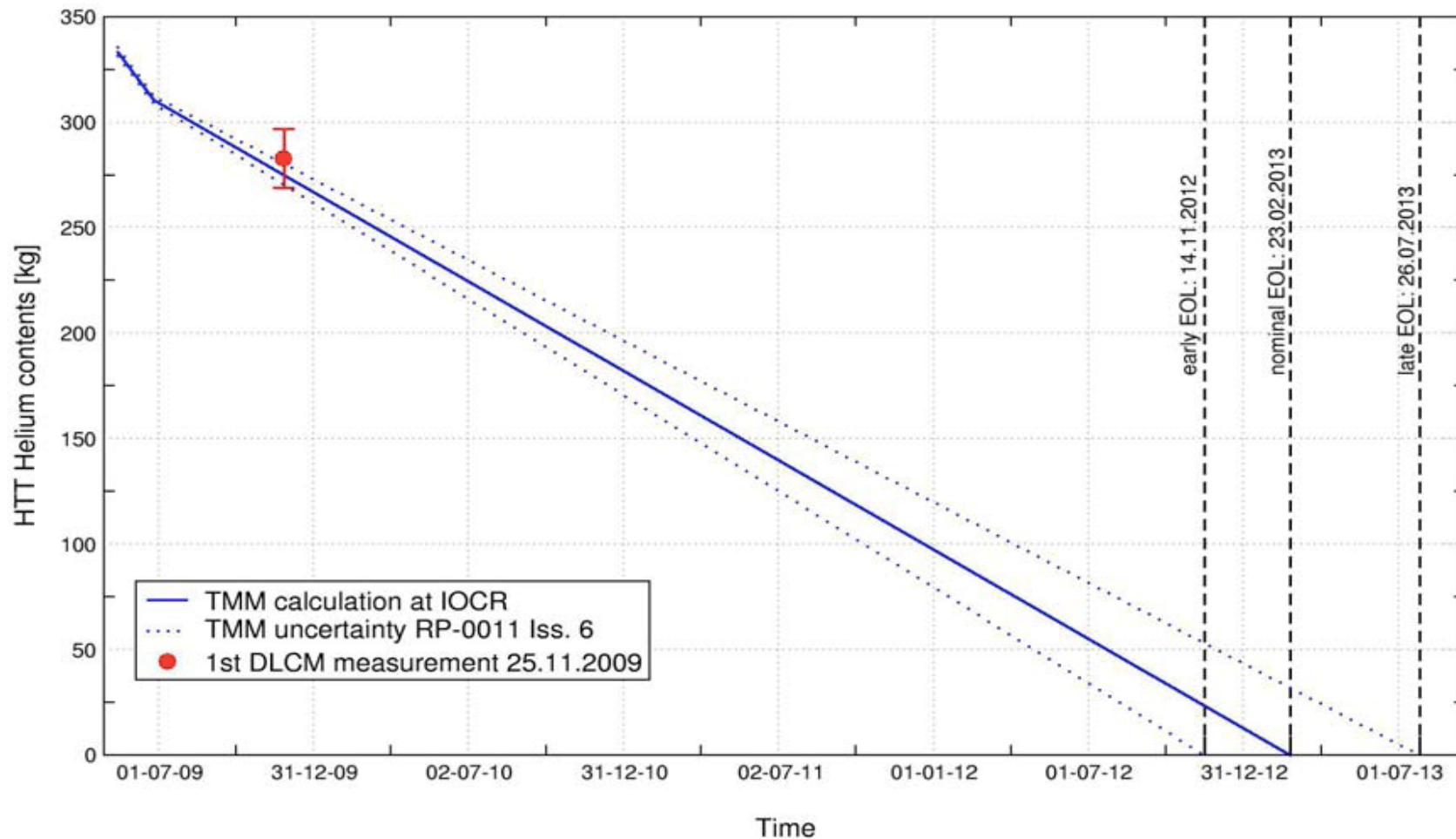
## First DLCM on OD#195 (25 November 2009)

- Remaining amount He measured at  $283 \pm 14$  kg (269-297 kg)
  - Use 2.668 mg/s =>  $1228 \pm 50$  days (1168-1288 days)
  - Compute total mission lifetime => 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  $\geq 3.5$  years



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



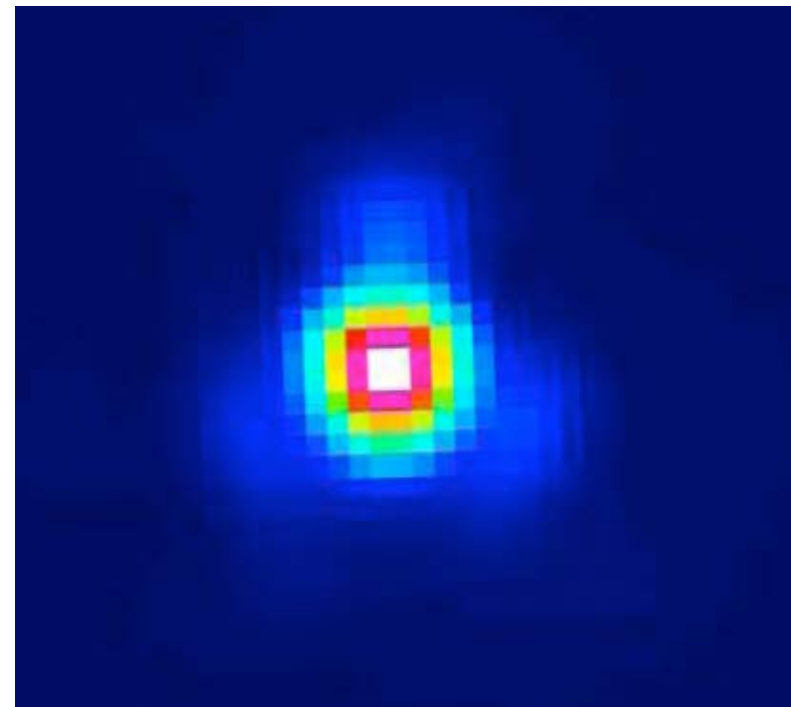
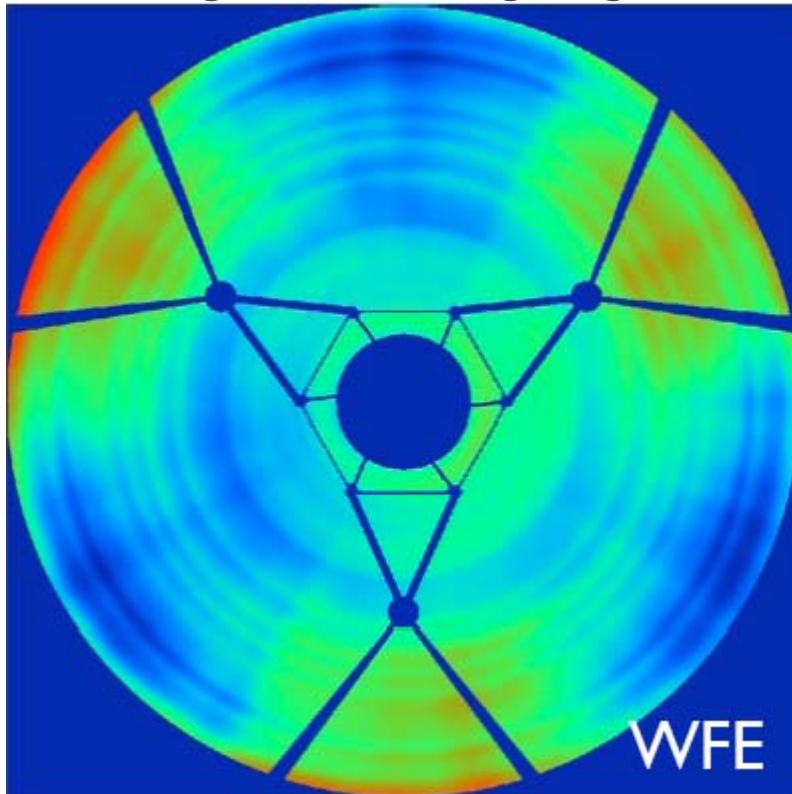
160  $\mu\text{m}$

100  $\mu\text{m}$

70  $\mu\text{m}$

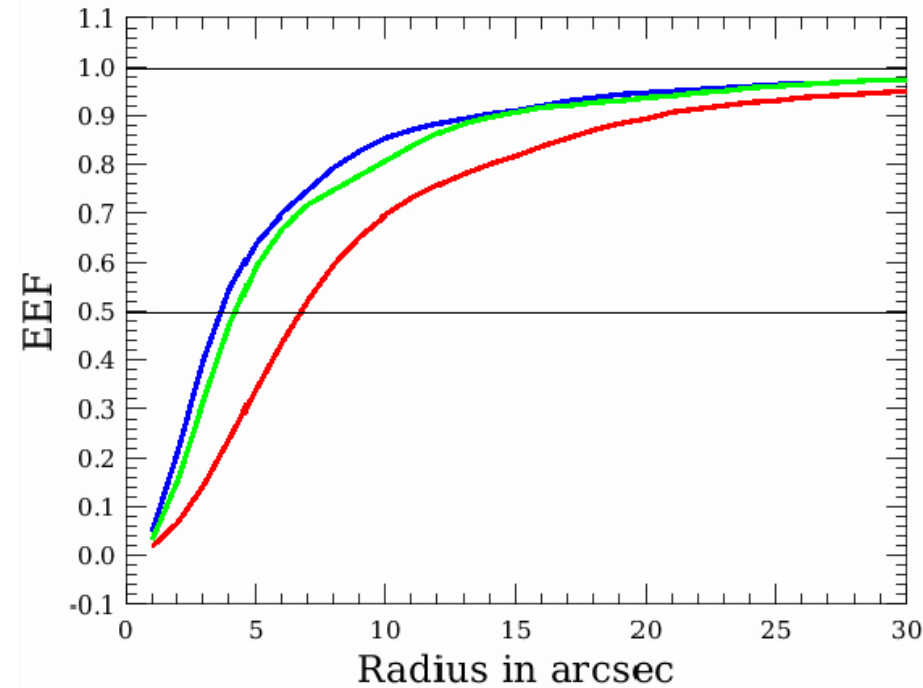
## PSF as predicted

- 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.

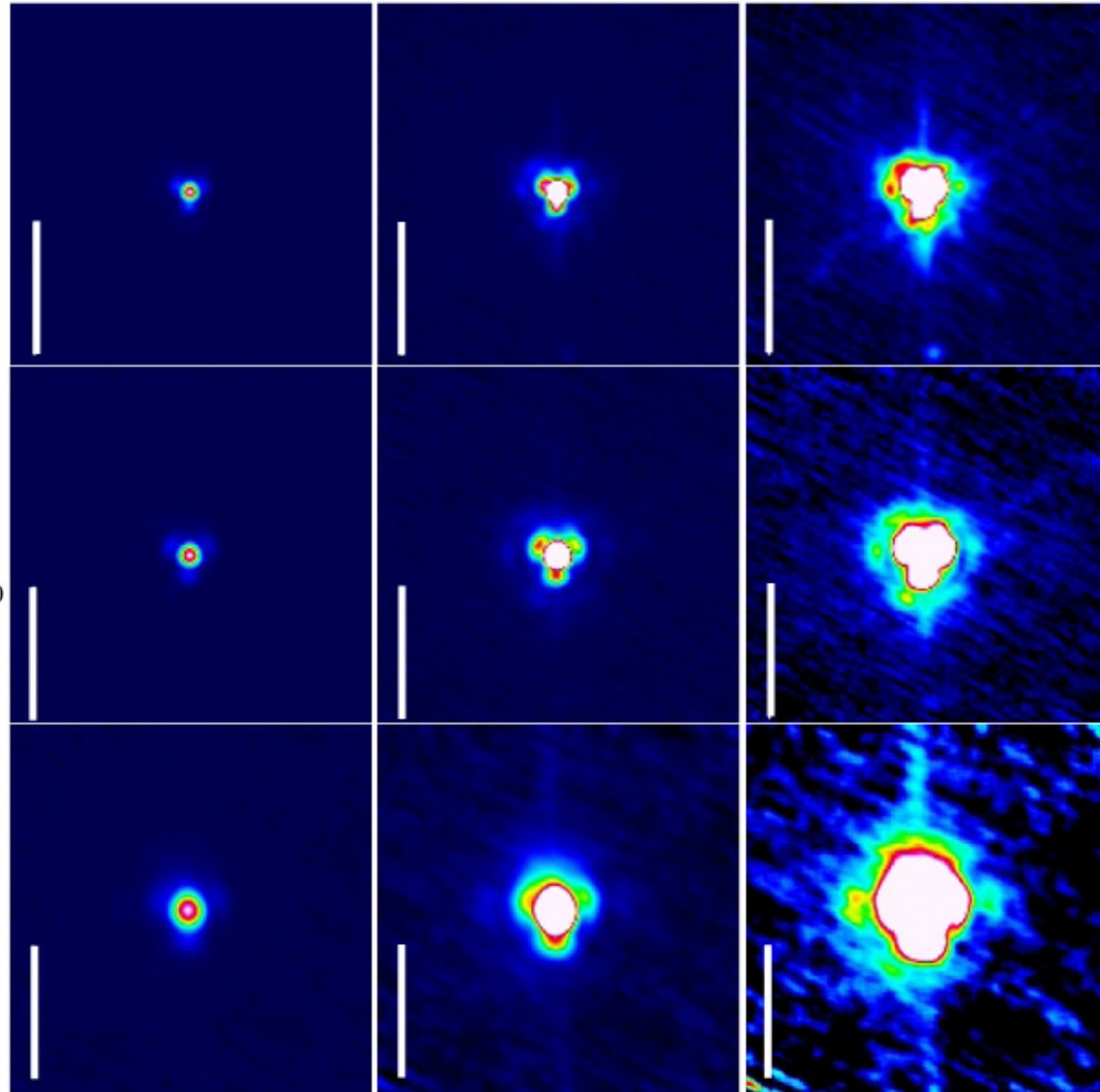
# Encircled energy and PSF by PACS



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

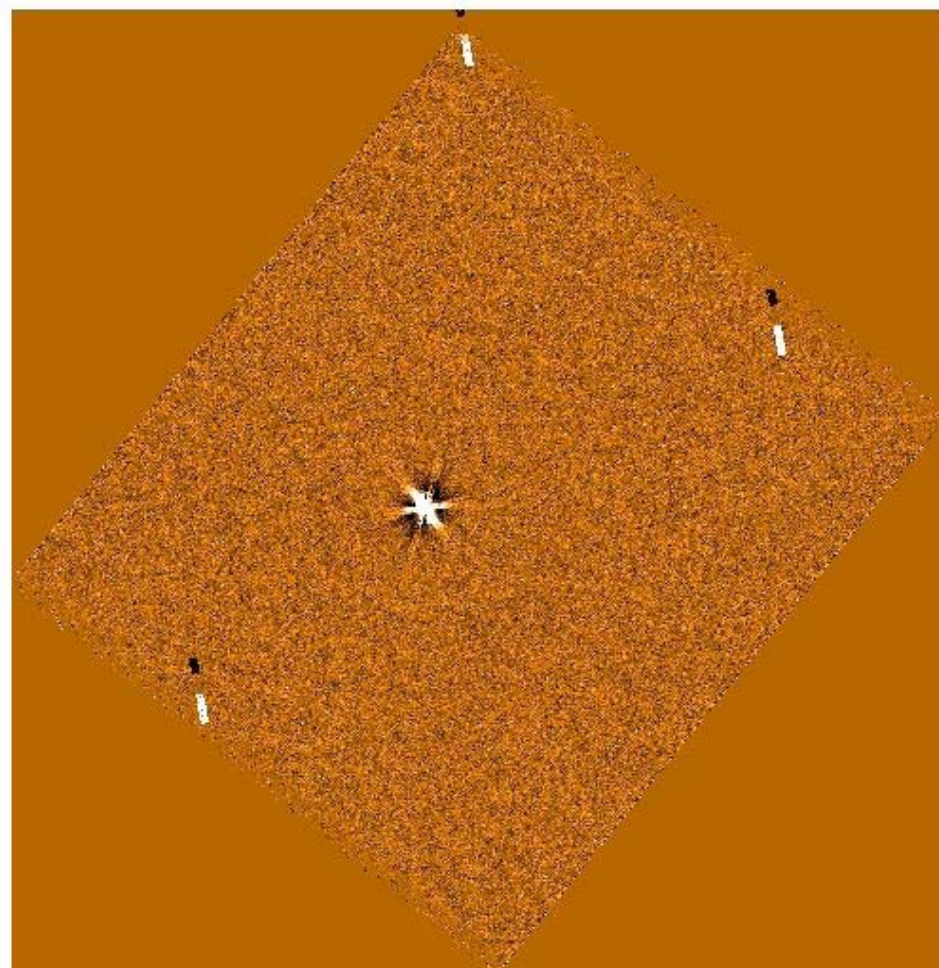
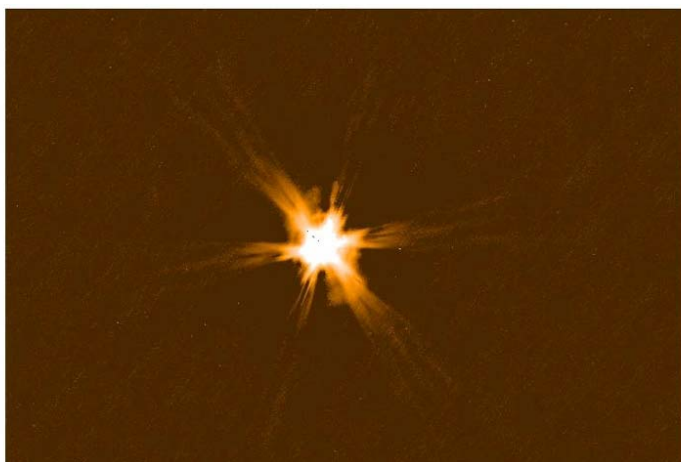
PSFs based on Vesta observations; top->bottom: blue, green, & red bands; left->right: scaled to peak, 10% and 1%.

Data now available from HSC.



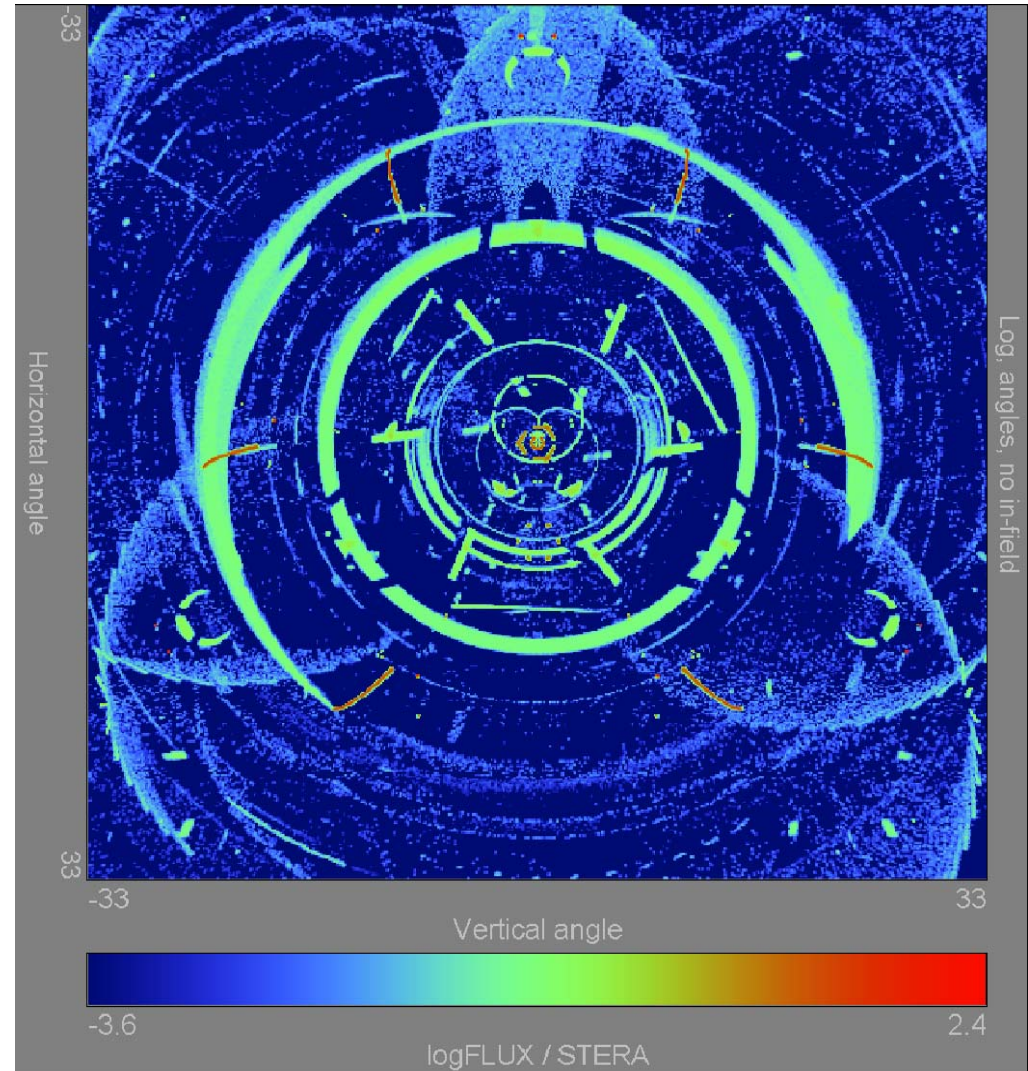
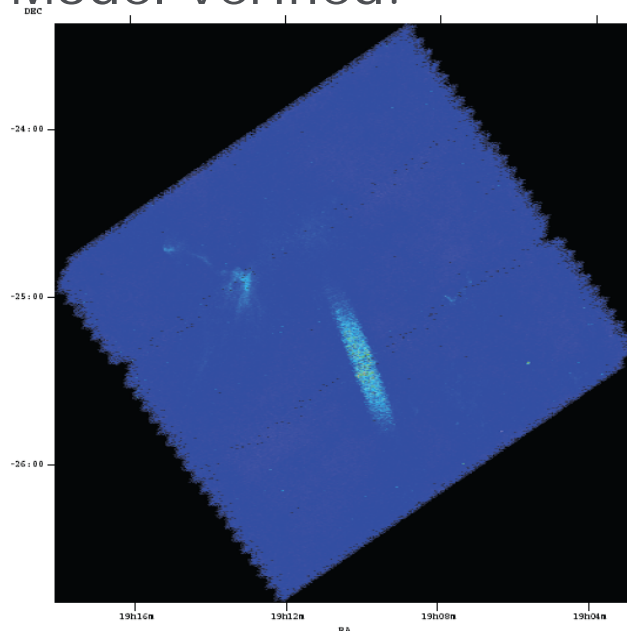
## Observation of Mars with PACS/SPIRE.

No hint of straylight around boresight.

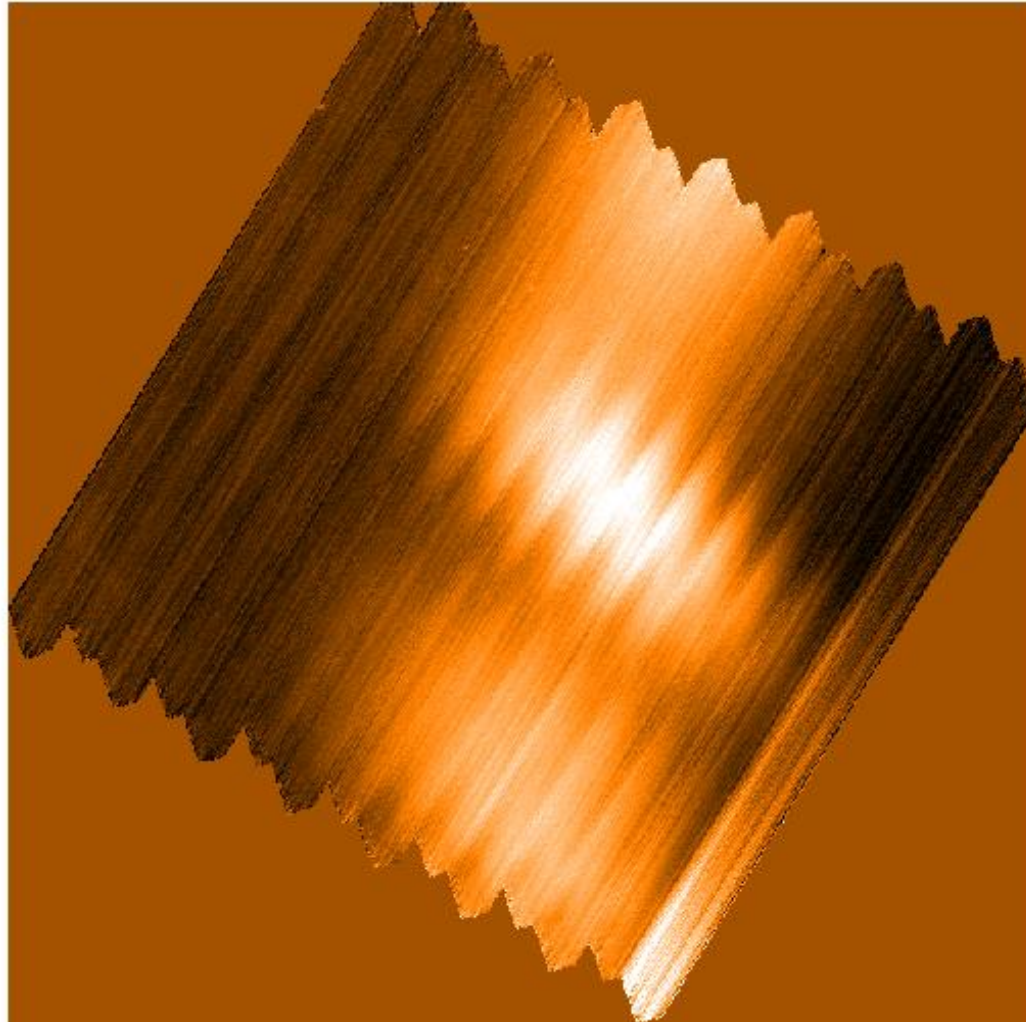


# Straylight - far-field

- 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.

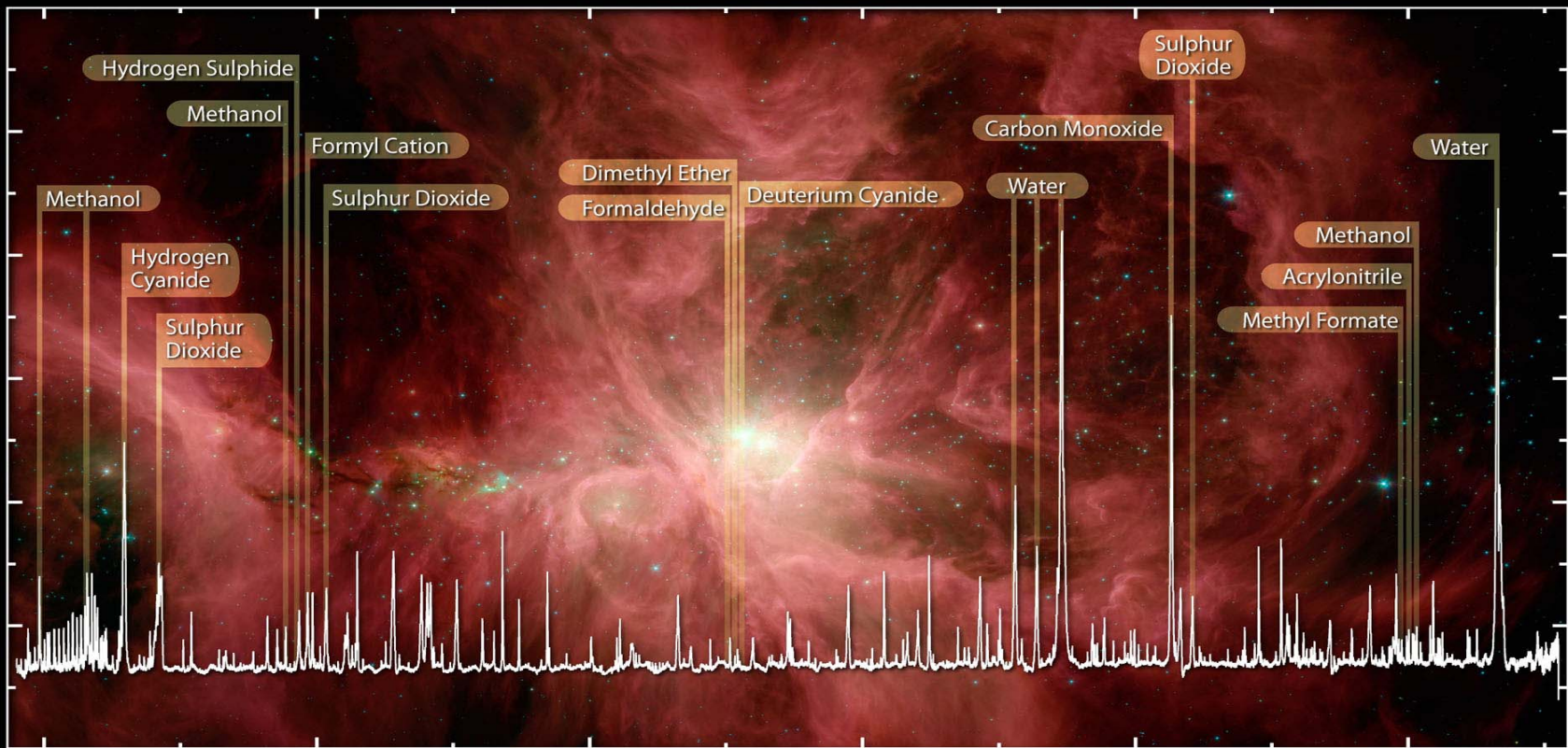
## 'Speedbumps'

- 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  $-10^{\circ}\text{C}$  (was  $+13^{\circ}\text{C}$ ) before OD#320 (29 March 2010)**
- Speedbumps reduced/removed completely.



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- 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

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# 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



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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)!

