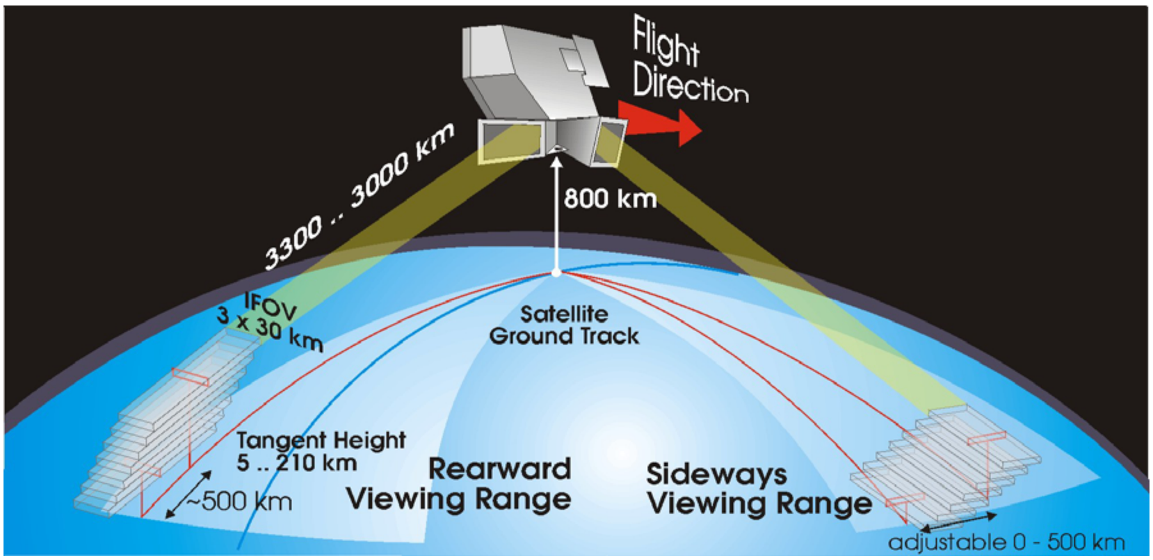
DOCUMENT

ENVISAT MIPAS MONTHLY REPORT: OCTOBER 2007



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1 INTRODUCTION

The MIPAS Monthly Report (MR) documents the current status and recent changes to the MIPAS instrument, its data processing chain, and its data products.

The MR is composed of analysis results obtained by the DPQC (Data Processing and Quality Control), combined with inputs received from the different groups working on MIPAS operation, calibration, product validation and data quality. The following groups participate in the MIPAS Quality Working Group (QWG):

- ESRIN-DPQC
- ESOC
- ESTEC
- ABB BOMEM
- Oxford University (OU)
- IFAC-CNR
- EADS-Astrium GmbH
- Leicester University
- LISA
- IMK
- University of Bologna
- ISAC-CNR
- IAA
- DLR
- ECMWF

In addition, the group interfaces with the Atmospheric Chemistry Validation Team (ACVT).

1.1 Scope

The main objective of the MR is to give, on a regular basis, the status of MIPAS instrument performance, data acquisition, results of anomaly investigations, calibration activities and validation campaigns.

1.2 Acronyms and Abbreviations

ACVT	Atmospheric Chemistry Validation Team
ADF	Auxiliary Data File
ADS	Annotated Data Set
AMT	Anomaly Management Tool
ANX	Ascending Node Crossing
AE	Aircraft Emission
AR	Anomaly Report
BB	Black Body

CBB	Calibration Black-Body
CTI	Configuration Table Interface
D-PAC	German Processing and Archiving Centre for ENVISAT
DPM	Detailed Processing Model
DPQC	Data Processing and Quality Control
DS	Deep Space
DSD	Data Set Description
ECMWF	European Centre for Medium-Range Weather Forecasts
ESF	Engineering Support Facility
FCA	FPS (Focal Plane Subsystem) Cooler Assembly
FCE	Fringe Count Error
FOCC	Flight Operation Control Centre
FOS	Flight Operations Segment
FR	Full Resolution
HD	Help-Desk
HSM	High-Speed Multiplexer
ICU	Instrument Control Unit
IDU	Interferometer Drive Unit
IECF	Instrument Engineering and Calibration Facilities
IF	In-Flight
IG	Initial Guess
IGM	Interferogram
ILS	Instrument Line Shape
INT	Interferometer
I/O DD	Input/Output Data Definition
IOP	In-orbit Performance
IPF	Instrument Processing Facility
LOS	Line of Sight
MA	Middle Atmosphere
MDS	Measurements Data Set
MIO	MIPAS Optics Module
MIPAS	Michelson Interferometer for Passive Atmospheric Sounding
MPH	Main Product Header
MPS	Mission Planning System
MR	Monthly Report
MW	Micro-Window
NCR	Non-Conformance Report
NESR	Noise Equivalent Spectral Radiance
NOM	Nominal
NRT	Near-Real-Time
OAR	Operational Anomaly report
OBT	On-board time
OCM	Orbit Control Manoeuvre
OFL	Off-Line
OM	Occupation Matrix
PCD	Product Confidence Data
PCF	Product Control Facility

PDS	Payload Data Segment
PFHS	Processing Facility Host Structure
PLSOL	Payload Switch off-line
PPM	Part per million
QC	Quality Control
QWG	Quality Working Group
RGC	Radiometric Gain Calibration
RR	Reduced Resolution
SEM	Special Event Measurement
SPH	Specific Product header
SPR	Software Problem Report
ST	Science Team
UA	Upper Atmosphere
UTLS	Upper Troposphere Lower Stratosphere
VCM	Variance Covariance Matrix
VMR	Volume Mixing Ratio
WCC	Wear Control Cycle

2 THE REPORT

2.1 Summary

- During the reporting month MIPAS performs really well; in fact only 1 instrument anomaly occurred due to IDU errors. However the instrument was switched during the period 18 – 24 October due to a planned passive decontamination (see §2.2.2).
- The instrument planning for the reporting month is hereafter summarized:
    - The *Baseline scenario* was planned during the first two weeks, it consists of the following measurements: 4 days NOM + 1 day MA + 3 days NOM + 2 days off
    - A passive decontamination and the Non-Linearity Characterization (IF16+IF4+IF16) was planned during the period 18 – 28 October
    - A test was planned on 29th October consisting on a series of orbit alternating sideways and rearward observations.
- A more detailed description of the instrument planning for the reporting month can be found in §2.2.1, see in particular Table 1.
- The availability of the instrument was high (99.3 % of the planned time) due to the good performances of the interferometer. The measurement segments not processed to L0 due to failures in the PDS were about 0.6% of the planned measurement time (see § 2.2.4).
- The long term analysis of MIPAS L0 data availability shows the increased duty cycle since April 2006 and highlights the improved instrument performances in the last year (see §2.2.4.2).
- In this report we present the long term L1 data availability in the D-PAC server. We can see that the availability of L1 consolidated products with respect to the expected time is approaching 100% in the last months (see §2.2.5).
- The instrument temperatures are stable over the reporting month, however the CBB temperature is varying significantly as a result of the planned Non-Linearity Characterization (see § 2.3.1).
- A special paragraph of this report is focused on the Non-Linearity Characterization (IF16+IF4+IF16) that was planned during the reporting month. In particular we monitored the evolution of the CBB temperature during this characterization phase in order to check the temperature range and the thermal stability of the CBB during the IF4 measurements. We observed that a good thermal stability was obtained during the first and third IF4, while at the highest temperature the CBB temperature was less stable. Further results about this characterization will be available after the DLR analysis (see §2.3.1.1).
- The cooler performs well during the reporting month; the vibrations were always well below the warning level of 8 mg (see § 2.3.3).
- The long term trend of ADC max counts in channel A1 shows a strong correlation with the instrument self-emission and with the detector ice contamination. During the reporting month the ADC counts increase after the planned decontamination (see §2.3.4).
- The monitoring of the spectral correction factor shows a slight decreasing trend; however the variations over more than two years of operations are really small (~ 2 ppm). The observed spreading of the points is due to the noise in the determination of this parameter (see § 2.4.2).

- The gain weekly increase during the reporting month is nominal, the maximum of gain increase in all the MIPAS bands remains below the acceptance criterion of 1%/week. The passive decontamination produces a decrease of the gain at its maximum (see § 2.4.3.1).
- The analysis of the accumulated gain allows monitoring the level of detector ice contamination. During the last months we observed a decreasing slope of the gain curve, showing that the detector is more and more ice-free. This is due to the better performances of the cooler obtained with more frequent decontamination (see §2.4.3.2).
- The absolute mispointing is stable around a value of -25mdeg. The seasonal variations of the pointing error are small and below the fixed threshold of 8mdeg (see §2.4.4).
- The long term monitoring of fringe count errors (FCE) shows that the width of the statistical distribution of the FCE can be used as a measure of the INT performances. In fact the long term variation of the FCE statistical dispersion is strongly correlated with the number of IDU errors (see § 2.4.5.1).
- The long term monitoring of the detected spikes shows that the number of detected spikes in channels A1, A2, B1 and B2 is varying with time with some peaks probably related to variation of the solar activity. The channels C and D (the detector most affected by spikes) didn't show any trend so far. From this analysis we can conclude that the number of detected spikes is still really small to impact the L1b products quality (see § 2.4.5.2).
- The level 0 NRT daily reports can be accessed at the following address: http://earth.esa.int/pcs/envisat/mipas/reports/daily/Level_0_NRT/
- The level 1b OFL daily reports can be accessed at the following address: http://earth.esa.int/pcs/envisat/mipas/reports/daily/Level_1_OFL/

2.2 *Instrument and products availability*

2.2.1 INSTRUMENT PLANNING

The planning for the MIPAS operations during the reporting month is briefly described in this section.

- All measurement mode are double slide operation with medium resolution (41% - 1.64 sec sweeps) with asymmetric transitory sweeps
- Radiometric Gain calibrations (RGC) is planned once per day
- Deep Space (DS) offset is planned every 800 sec
- LOS calibrations are planned every 5 days (one sideways every two rearward sequences)
- The duty cycle was set to 80%
- The *Baseline scenario* was planned during the period 1 – 17 Oct, it consists in the following series of measurements: 4 days NOM + 1 day MA + 3 days NOM + 2 days off
- A passive decontamination and the Non-Linearity Characterization (IF16+IF4+IF16) was planned during the period 18 – 28 October
- A measurement test was planned on 29th October consisting on a series of orbit alternating sideways and rearward observations.
- IDU re-initialization was set every 3 orbits

An overview of the measurements planned during the reporting month is presented in Table 1. In this table the calibration measurements are discarded, for more detailed information about mission planning you should refer to the mission planning excel sheet available on Uranus server at the following location:

ftp://uranus.esrin.esa.it/Mission_Planning/MIPAS/

Table 1 – Overview of the measurements planned during the reporting month. RGC and LOS calibration sequences are discarded here, refer to the planning excel sheet for further details.

Date	Orbit	Measurement mode
29 Sep – 02 Oct 07	29712 – 29228	**NOM**
03 Oct 07	29229 – 29243	**MA –** Middle Atmosphere
04 – 06 Oct 07	29244 – 29286	**NOM**
07 – 08 Oct 07	29287 – 29314	**Instrument OFF**
09 – 12 Oct 07	29315 – 29371	**NOM**
13 Oct 07	29372 – 29387	**MA –** Middle Atmosphere
14 – 17 Oct 07	29388 – 29430	**NOM**
18 – 24 Oct 07	29431 – 29535	**Passive Decontamination**
24 Oct 07	29538 – 29539	**IF16 -** Limb Scanning Sequences in raw data mode
26 Oct 07	29558 – 29562	**IF4 -** Non-Linearity Characterization
27 Oct 07	29572 – 29576	**IF4 -** Non-Linearity Characterization
28 Oct 07	29591 – 29595	**IF4 -** Non-Linearity Characterization
	29596 – 29597	**IF16 -** Limb Scanning Sequences in raw data mode
29 Oct 07	29603 – 29612	**Test**: Alternating Sideways/Rearward
30 – 31 Oct 07	29614 – 29644	**Instrument OFF**

2.2.2 INSTRUMENT AVAILABILITY

During the reporting month MIPAS performances were really satisfactory; indeed only 1 instrument anomaly was observed due to IDU errors, however the instrument was not available during the period 18 – 24 October due to the planned decontamination. All the unavailability intervals for the reporting month are reported in next table.

Table 2 List of MIPAS unavailabilities during the reporting month. In green is the planned decontamination.

Start time		Stop time		Duration	Ref	Orbit		Comments
Date	UTC	Date	UTC	sec		Start	Stop	
10-OCT-2007	4.08.50	10-OCT-2007	6.00.40	6710	EN-UNA-2007/0235	29331	29332	IDU error
18-OCT-2007	9.49.00	24-OCT-2007	10.59.33	522633	EN-UNA-2007/0237	29449	29535	Planned Passive Decontamination

2.2.3 LEVEL 0 PRODUCT AVAILABILITY

The planned measurements that were not processed to level 0 (MIP_NL__0P) due to failure in the Payload Data Segment (PDS) are reported in the next table.

Table 3 List of missing gaps for MIP_NL__0P during the reporting month.

Start time		Stop time		Duration	Start Orbit	Stop Orbit
Date	**UTC**	**date**	**UTC**	**sec**		
01-OCT-2007	8.13.22	01-OCT-2007	8.13.36	14	29204	29204
06-OCT-2007	10.38.18	06-OCT-2007	10.38.32	14	29277	29278
24-OCT-2007	16.31.35	24-OCT-2007	16.42.25	650	29539	29539
25-OCT-2007	2.01.07	25-OCT-2007	2.05.11	244	29544	29544
28-OCT-2007	16.05.48	28-OCT-2007	16.17.10	682	29596	29596
28-OCT-2007	17.44.09	28-OCT-2007	17.54.57	648	29597	29597
29-OCT-2007	1.35.15	29-OCT-2007	1.39.19	244	29601	29601
10-OCT-2007	6.00.40	10-OCT-2007	6.00.55	15	29332	29332
11-OCT-2007	9.39.59	11-OCT-2007	9.40.13	14	29348	29348
16-OCT-2007	8.14.26	16-OCT-2007	8.14.40	14	29419	29419
16-OCT-2007	23.36.53	17-OCT-2007	1.16.16	5963	29428	29429
24-OCT-2007	10.59.33	24-OCT-2007	10.59.48	15	29535	29535
24-OCT-2007	14.52.50	24-OCT-2007	15.04.11	681	29538	29538

During the reporting month the following LOS calibrations were not processed to level 0 (MIP_LS__0P) due to failure in the Payload Data Segment.

Table 4 List of missing gaps for MIP_LS__0P during the reporting month.

Start time		Stop time		Duration	Start Orbit	Stop Orbit
Date	**UTC**	**date**	**UTC**	**sec**		
01-OCT-2007	6.51.40	01-OCT-2007	6.51.47	7	29204	29204
16-OCT-2007	7.27.40	16-OCT-2007	7.27.47	7	29419	29419

2.2.4 LEVEL 0 PRODUCTS STATISTICS

2.2.4.1 Monthly statistics

During the reporting month the instrument duty cycle was set to 80%. The instrument availability with respect to the planned measurement time was very high (99.3%) due to the good performances of the interferometer. The planned measurement time that was lost due to failures in the L0 products generation at the PDS was about 0.6% of the expected measurement time. MIPAS L0 NRT products statistics are reported in the next table.

Table 5 MIPAS level 0 NRT products statistics for the reporting month.

		Time [s]
Total time over one month	t_{tot}	2678400
Time of planned measurements	t_{plan}	1652028
Time of expected measurements	t_{exp}	1640298
Time of L0 gaps	t_{L0gaps}	9198
Time of instrument unavailability	$t_{unav} = t_{plan} - t_{exp}$	11730
Planned duty cycle	$(t_{plan} / t_{tot})*100$	**61,68**
Instrument availability Vs planning (instrument failures)	$[1- t_{unav} / t_{plan}]*100$	**99,29**
L0 availability Vs planning (PDS failures)	$[(t_{exp} – t_{L0gaps})/t_{exp}]*100$	**99,44**
L0 availability Vs planning (PDS + instrument failures)	$[(t_{exp} – t_{L0gaps})/t_{plan}]*100$	**98,73**
L0 availability Vs Total time	$[(t_{exp} – t_{L0gaps})/t_{plan}]*(t_{plan} / t_{tot})*100$	**60,90**

2.2.4.2 Long term statistics

In this paragraph we present a long term statistics of the L0 products availability. The results are reported in Figure 1. In this figure the blue and magenta lines represent respectively the instrument and the L0 products availability with respect to the planned time, the green and the red lines are the instrument and L0 availability with respect to the total time. The improved instrument performances can be observed in this plot. In fact the availability of the instrument is always around 95% since April 2006. The products availability, which takes also into account the PDS performances in the L0 generation, is also very high a part from July 2006 when an anomaly in the ARTEMIS antenna downlink prevents the acquisition of many L0 products. Furthermore the increase of duty cycle since April 2006 can be appreciated in this figure, this value has been raised from 30% to about 80% and this increased duty cycle did not affect the instrument performances. As a result the availability of L0 products with respect to the total time was increased during last year except for the periods when a platform switch-off has occurred or a decontamination was planned.

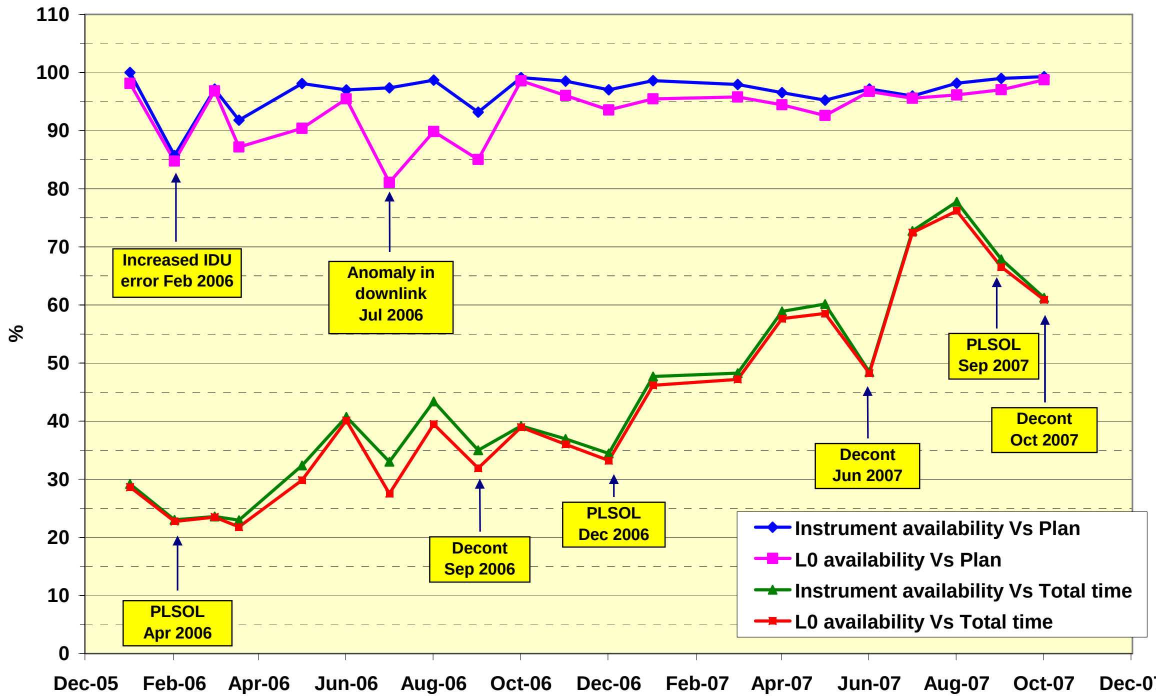


Figure 1 – MIPAS L0 NRT long term statistics since Jan 2006.

2.2.5 LEVEL 1 OFF-LINE PRODUCTS STATISTICS

Since February 2006 MIPAS L1 data are routinely processed off-line at D-PAC, these data are commonly used by the MIPAS science community, therefore it is important to have further information about the availability of these data. Since August 2007 we have direct (ssh) access to the D-PAC server, this allows us to provide a rapid and reliable information to the user community about L1 data availability on the D-PAC site. In particular a script was developed to provide the list of available L1 products on the ftp server with some associated product information (e.g.: sensing start/stop, number of scan, measurement mode). This information can be found now on a monthly basis in the Uranus server for the whole MIPAS mission, see the following link:

ftp://uranus.esrin.esa.it/MIPAS/DPAC_archive/

In this chapter we report the long term statistics of the L1 products availability in the D-PAC server. This is presented in Figure 2, where the statistics since June 2006 are reported with respect to the expected time and to the total time. Note that this statistic is updated with a delay of one month with respect to the reporting period; this is due to the delay in the generation of consolidated products (about 2 weeks). From this figure a problem can be observed in the data generation during March 2007, while in the last months the data availability is approaching the 100% of the expected time.

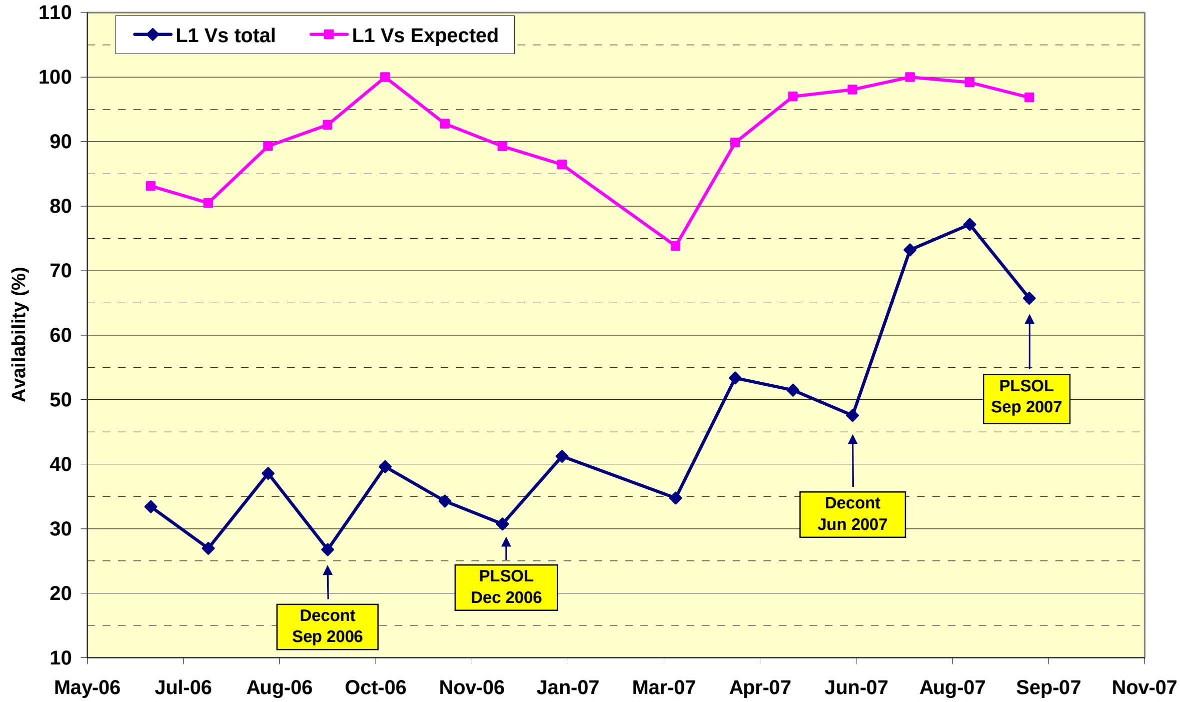


Figure 2 – MIPAS L1 off-line data at D-PAC: long term statistics since Jun 2006.

2.3 Instrument monitoring

2.3.1 THERMAL PERFORMANCE

The following two plots (Figure 3 and Figure 4) show the long-term trends of the IDU and MIO base plate temperature (analysis performed by Astrium). The yearly seasonal variations and the interferometer heater switching (see Tab. 5 for the schedule of heater switch-on/off) are clearly visible within these plots. Furthermore the effects of instrument decontamination are also evident with a reduction of the instrument temperatures (e.g.: the decrease of about 0.6K after the decontamination of June 2007).

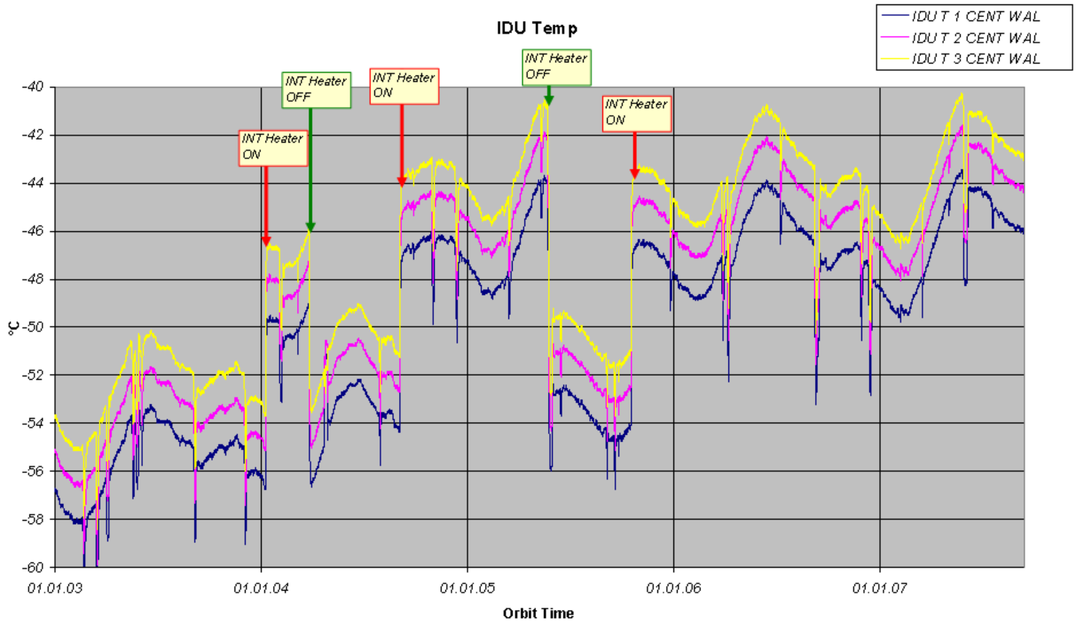


Figure 3 IDU temperatures as a function of time since November 2002 (courtesy of Astrium).

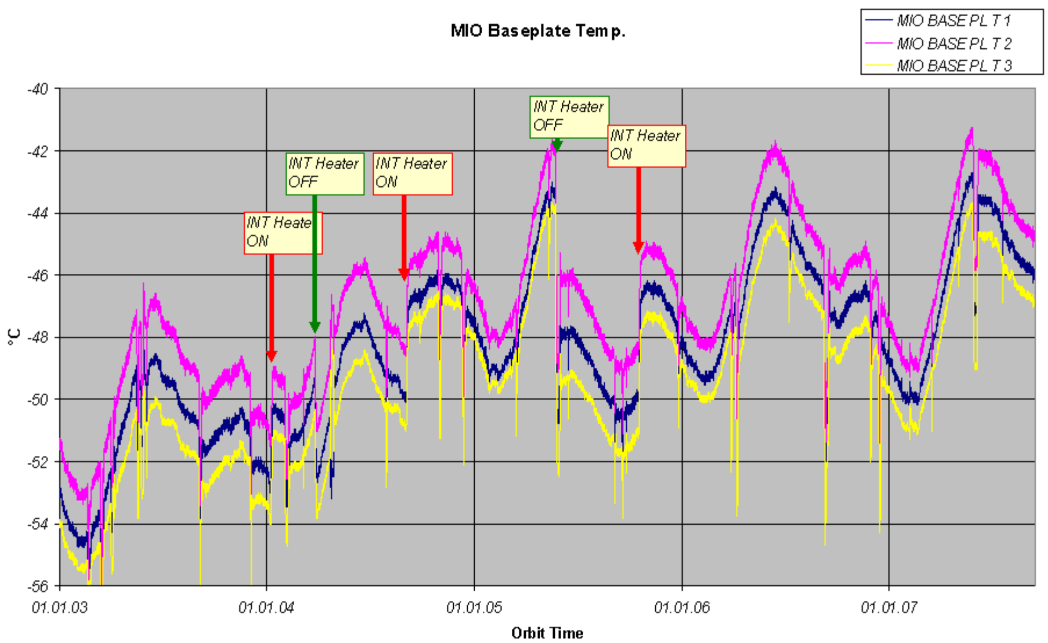


Figure 4 MIO base plate temperatures as a function of time since November 2002 (courtesy of Astrium).

The time of switch-on of the INT heater are reported in the following table.

Table 6 Schedule of interferometer heater switch-on/off.

Heater on	**09-Jan-2004**
Heater off	**26-Mar-2004**
Heater on	**03-Sep-2004**
Heater off	**25-May-2005**
Heater on	**17-Oct-2005**

The monthly monitoring of the instrument temperatures is reported in the following plots, which show the IDU, MIO, CBB and FCA temperatures. These plots show a stable situation for the IDU and MIO parameter. On the other hand the CBB temperatures vary as a result of the planned Non-Linearity Characterization; further details about these characterization measurements are reported in the next paragraph. FCA temperature was also impacted by the high variation of CBB.

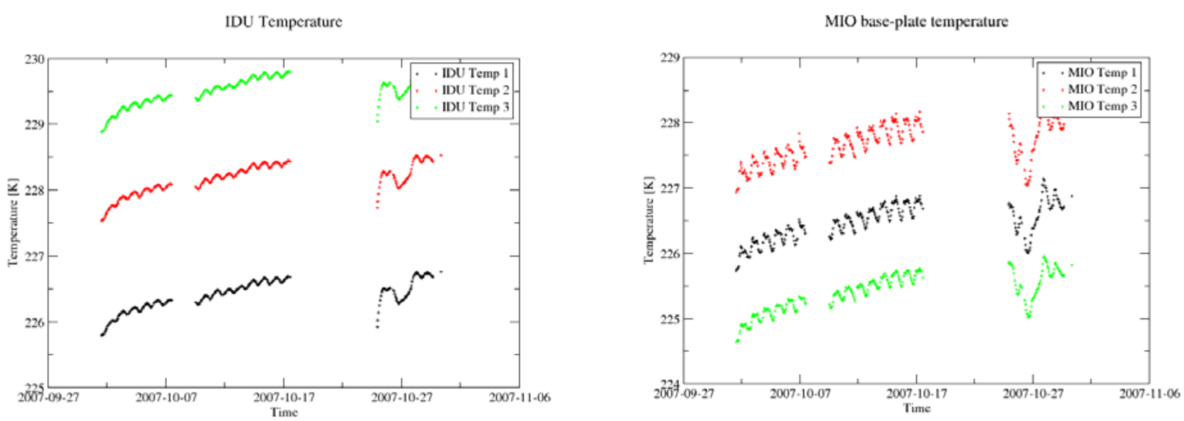


Figure 5 IDU and MIO Base-Plate temperature during reporting period.

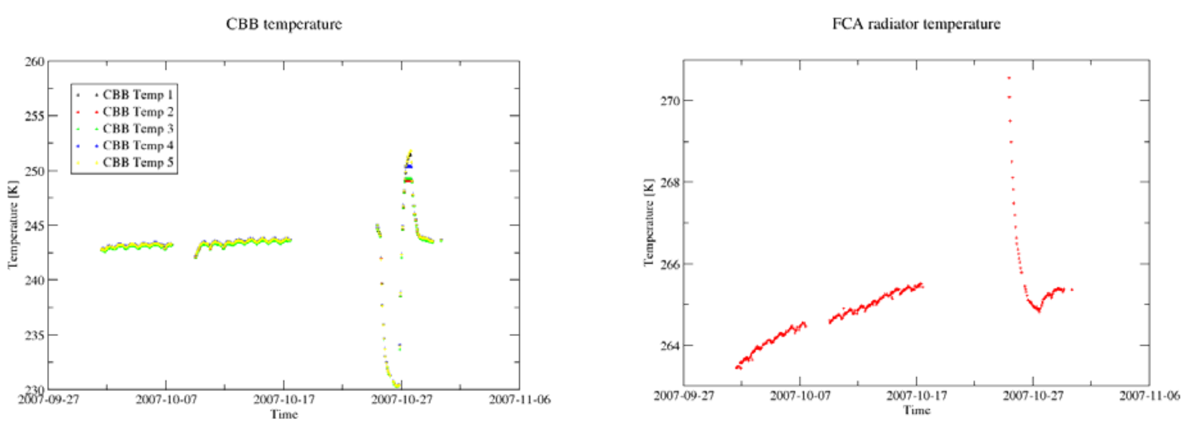


Figure 6 CBB and FCA radiator temperature during reporting period.

2.3.1.1 The Non-Linearity Characterization

MIPAS Non-Linearity Characterization (IF16+IF4+IF16) consists of commanding the calibration blackbody through its entire temperature range. During the temperature changes, blackbody observations are performed at different temperatures combined with sequences of deep-space measurements to correct for offset. This characterization involves minimization of out-of-band spectral contributions of raw mode measurements (IF16) to extend the non-linearity curve obtained from the IF4 measurements.
The basic requirements for this kind of measurements are:

- To perform a passive decontamination just before in order to have a clean instrument
- To cover a range of CBB temperature as large as possible
- To have a thermal stability of the CBB temperature during the series of IF4 measurements

This characterization was planned during the period 24 – 28 Oct (see §2.2.1 for details) just after a passive decontamination. The planning strategy consists of changing the Heater Level (HL) and waiting for thermal stability of the CBB before start of the IF4 measurement. We start by commanding HL=0 and wait for reaching the lowest temperature, then HL=7 in order to reach the highest temperature, finally HL=4 to come back to the nominal CBB temperature.
The evolution of the CBB temperature during these measurements is shown in the following figures. From these figures we noticed that a good temperature range was covered. Moreover a good thermal stability was reached at the time of the first and third series of IF4 measurements, while during the second IF4 (highest temperature) we observe some temperature instability. In conclusion these measurements were successfully planned and further analysis will be provided by DLR and Bomem after investigation on the IF4 and IF16 data.

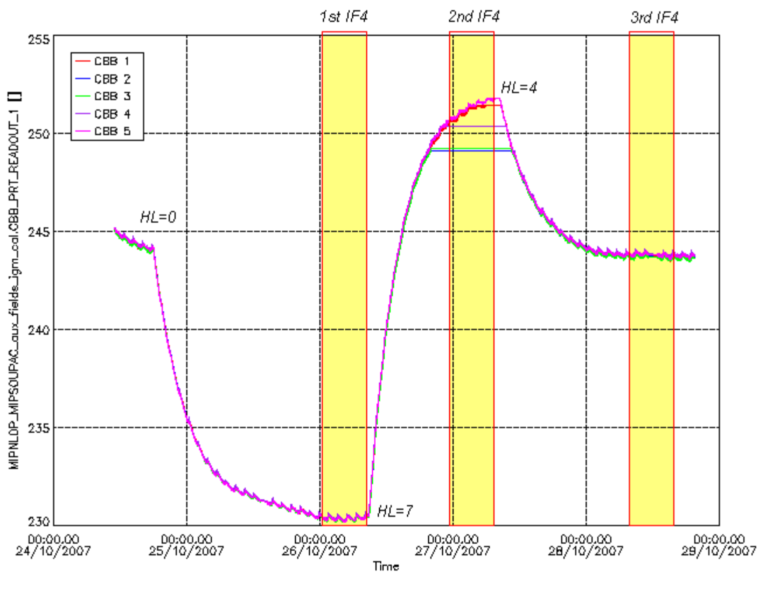


Figure 7 – Evolution of CBB temperature as recorded by the 5 readouts during the Non-Linearity Characterization measurements. In yellow are highlighted the periods of IF4 measurements. HL is the commanded Heater Level used to change the CBB temperature. Zoom on the three IF4 measurement periods are reported in the next figures. Note that at the highest temperature some of the CBB readouts hit a maximum calibrated value.

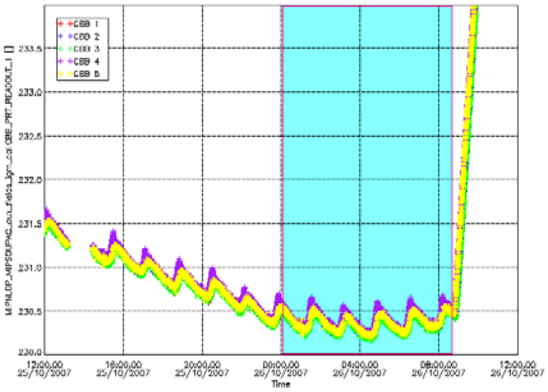


Figure 8 – CBB temperature during the first series of IF4 measurements, made to characterize the response at the lowest blackbody temperature. The filled area corresponds to the period of IF4 measurements.

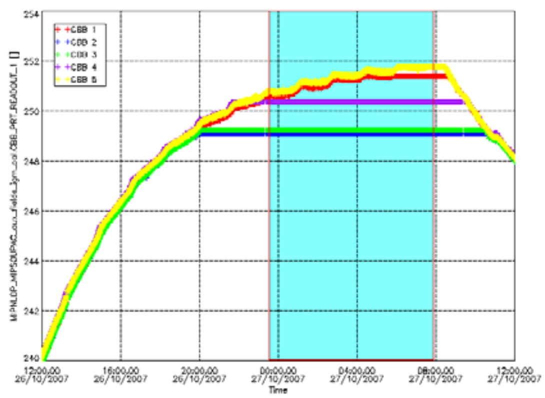


Figure 9 – CBB temperature during the second series of IF4 measurements, made to characterize the response at the highest blackbody temperature. The filled area corresponds to the period of IF4 measurements. We can note that some of the CBB readouts hit a maximum calibrated value at the highest temperature; this is not a problem for the instrument.

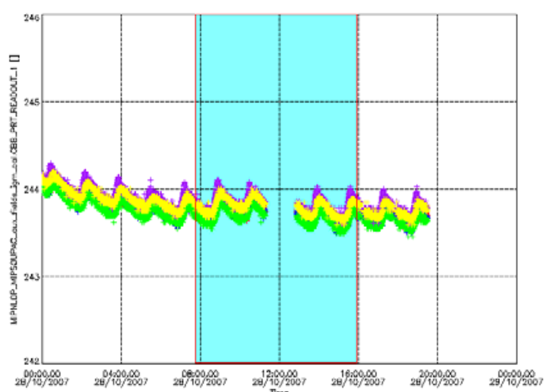


Figure 10 – CBB temperature during the first series of IF4 measurements, made to characterize the response at the medium blackbody temperature. The filled area corresponds to the period of IF4 measurements. The gap in the temperature is only due to data missing in the NRT production that will be recovered with the off-line processing.

2.3.2 INTERFEROMETER PERFORMANCE

The historical record of differential speed errors can be seen in Figure 11 (analysis carried out by Astrium). The -4% differential speed error is an indicator for non-perfections in the IDU system. This historical trend can be summarized in the following bullets:

- The very bad periods of August 2005, October 2005 and February 2006 can be distinguished. During these periods the INT velocity errors occurred with high frequency and the differential speed errors reached the maximum value of about 70%. It was noticed that when this parameter reaches this value the number of turn-around anomalies starts to increase significantly.
- The positive effect of the heater switch-on (end of October 2005) can be appreciated with a drastic reduction of the occurrence of differential speed errors.
- The impact of the ENVISAT anomaly of 6th April 2006 is manifest in this plot, this anomaly yields to improved cooler performances, due to the not intended decontamination and reflects into a significant improvement of the INT performances with a reduction of -4% differential speed errors.
- The effect of the planned decontamination of September 2006 is not visible within this plot; however it should be stressed that the instrument performances were already very good before the decontamination and the situation did not changed afterward.
- During the last months the -4% differential speed error remains constant around a value of 30%. This observation confirms that the instrument performances remain stable despite the fact that the duty cycle was progressively increased since May 2006.

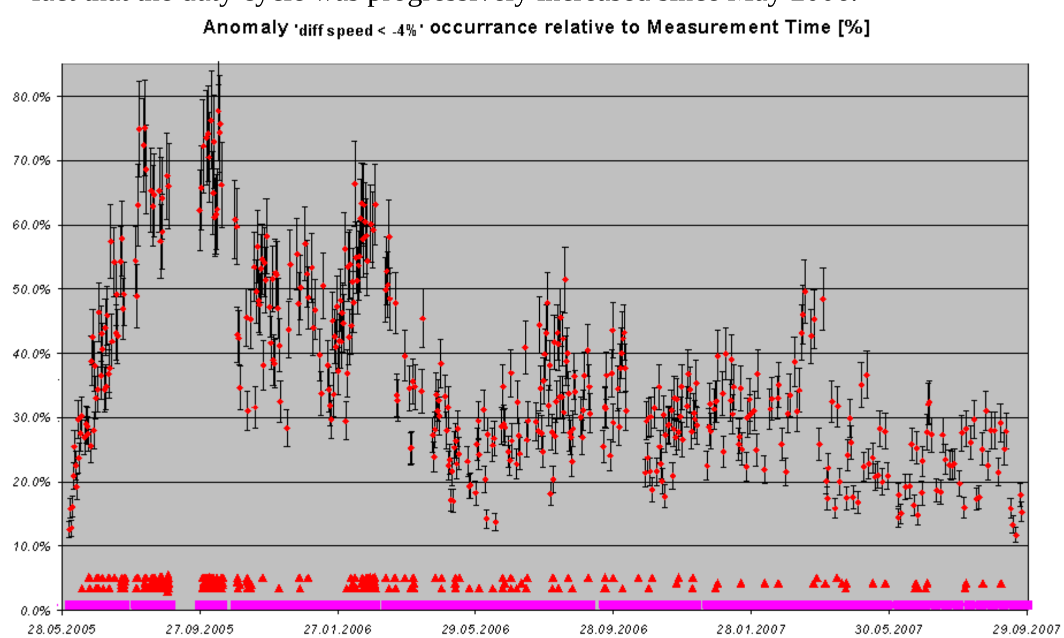


Figure 11 Occurrence of -4% differential speed error relative to measurement time since May 2005 (courtesy of Astrium).

The historical record of the INT velocity errors since October 2005 can be seen in the Figure 12 (analysis carried out by Astrium). The following points can be highlighted from this long term monitoring:

- We observed that the occurrence of turn-around errors is drastically reduced since Oct 2005 demonstrating that the switch-on of the INT-heater, the better performances of the cooler and the frequent decontaminations improved significantly the instrument performances.
- It has to be stressed that since Oct 2006 only 1 turn-around error has been detected, while this error was the most frequent one before that date
- On the other hand the frequency of the start-up failures that occur after an instrument interruption didn't change significantly in the last months, showing that this type of error is not correlated with INT temperatures or cooler performances. The frequency of this error is closely monitored, but it is still at an acceptable level.
- In conclusion the analysis of the INT anomaly historical record demonstrates that the instrument is performing very well in the last months and that the increase of duty cycle did not affect the instrument performances.

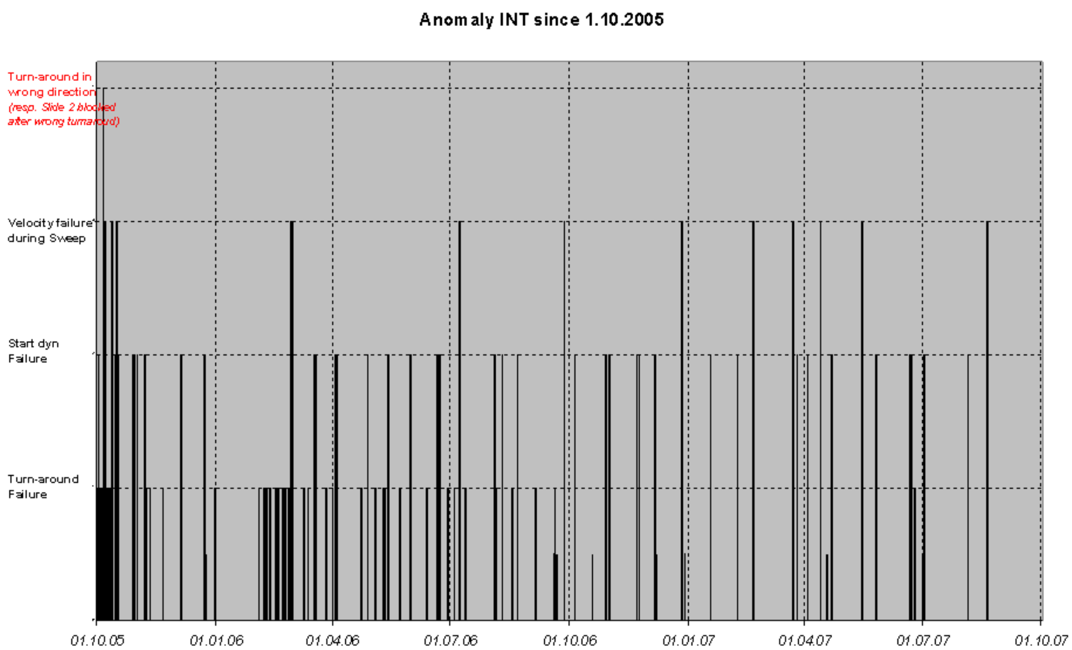


Figure 12 INT anomalies since Oct 2005 (courtesy of Astrium).

2.3.3 COOLER PERFORMANCE

The Figure 13 shows the cooler displacer and compressor vibration level historical trend. The variations of the cooler vibrations are linked to INT heater switch and decontamination events, the decontaminations can be planned or caused by platform switch-off. Furthermore the seasonal dependency of the cooler vibrations can be clearly appreciated, indeed the vibrations increase during the hottest period of the year (May-Jun), while are decreasing on winter time (Dec-Jan).
From the plot of Figure 13 the following historical events can be distinguished:

- A significant decrease of the cooler vibrations was detected on June 2005 after the decontamination and the switch-off of the INT-heater
- A slight increase of the compressor vibration by about 1 mg is observed after the switch-on of the INT heater at the end of October 2005

- An important improvement in the cooler performances with a reduction of the compressor vibration can be noticed after the ENVISAT anomaly of 6th April 2006. In fact this anomaly acts as a decontamination event and results in a significant improvement of the cooler performances.
- A significant reduction of the compressor acceleration can be observed after the decontamination of September 2006 and the PLSOL at the end of November 2006
- After the passive decontamination of June 2007 the compressor acceleration levels were reduced from about 6.8 mg to 5.6 mg and in general all the cooler parameters were significantly improved after this period.

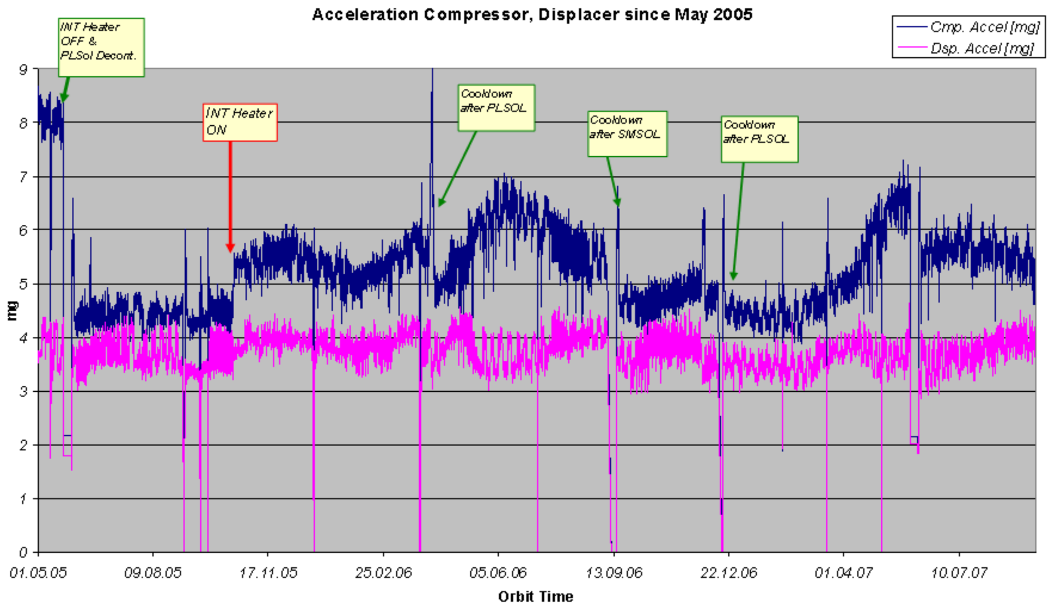


Figure 13 Cooler Displacer and Compressor vibration level, historical trend since 2005 (courtesy of Astrium).

The cooler acceleration levels during the reporting period were stable with values well below the warning level of 8 mg, as can be seen in the figure below.

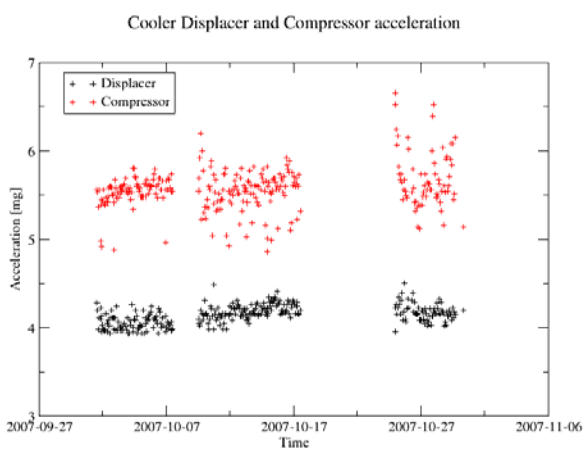


Figure 14 Cooler displacer and compressor vibration level for the reporting month.

2.3.4 ADC COUNTS LONG-TERM MONITORING

The long term monitoring of the ADC Min/Max counts along the mission is presented in this paragraph. The ADC counts is monitored only for deep-space measurements, when the instrument is looking at the cold space; in fact for the rest of the measurement modes this value depends upon the measurement scenario (e.g. when looking down in the atmosphere the signal increases). The monitoring of ADC counts could give interesting insight into different instrument-related topics such as instrument self-emission, forward/reverse effects, detector non-linearity and gain increase.
The long term trend of the ADC max counts in channel A1 since June 2005 is shown in Figure 15. In this figure the seasonal variation of the instrument thermal condition is clearly visible, demonstrating the effect of instrument self-emission. The split of the curve in two is due to the forward/reverse effect and it is coming from a different sampling of the IGM at its maximum in the two directions. Another effect that is superimposed to the seasonal variation is the impact of the decontamination events and the platform switch-off with a resulting increase of the signal at the detector due to the ice removal. An example of the effect of decontamination and PLSOL can be seen in correspondence to September and December 2006.
During the reporting month the ADC counts were increased as result of the PLSOL occurred at the end of September 2007 and of the passive decontamination planned during the reporting month.

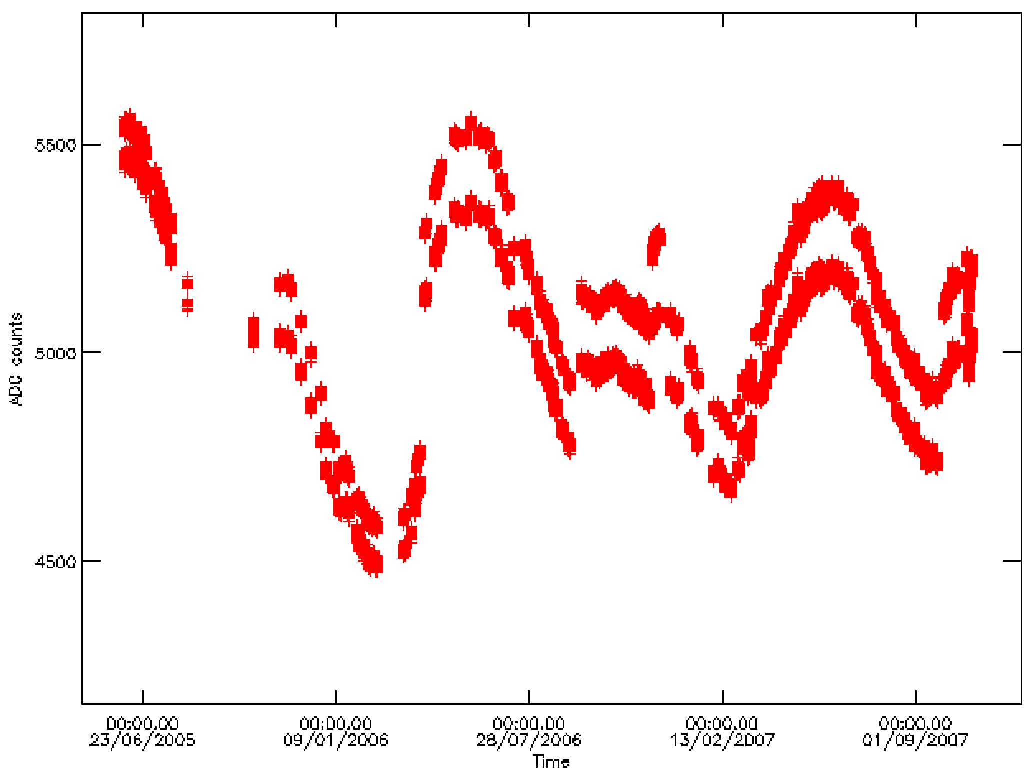


Figure 15 ADC max counts in channel A1 during DS measurements since June 2005.

2.4 Level 1b product quality monitoring

2.4.1 PROCESSOR CONFIGURATION

2.4.1.1 Version

The new IPF 4.67 was put into operations at D-PAC on 4th September 2006. This processor corrects for five NCRs with respect to the previous version (v4.65), further details about this release are reported in ***Appendix A and F***. It is important to stress that this new release does not impact the scientific L1 products, in fact the modification implemented for L1 processing are only operational issues related to processing performances on D-PAC machine. On the contrary for L2 processing important upgrades were introduced in order to fix two anomalies (the high NO2 chi-square value and the difference between 4.61 and 4.62 versions).
The table below shows the list of IPF updates and the aligned prototype, DPM, IODD and the related NCR/SPRs.

Table 7 Historical updates of MIPAS processor, related prototype, DPM, IODD and NCR/SPR.

IPF Version	Prototype		DPM		IODD		Processor update	
	L1 Migsp	L2 ml2pp	L1	L2	L1	L2	Level 1	Level 2
4.67	2.6	4.0	4Ia	4.1	4E	4.0	Fixed NCR_1594 Fixed NCR_1676	Fixed NCR_1458 Fixed NCR_1521 Fixed NCR_1522
4.65	2.5	4.0	4I	4.1	4E	4.0		Fixed NCR_1310
4.64	2.5	4.0	4I	4.1	4E	4.0	Fixed SPR-12100-2011	
4.63	2.5	4.0	4I	4.1	4E	4.0	Fixed SPR-12000-2000 Fixed SPR-12000-2001	Fixed NCR_1278 Fixed NCR_1308 Rejected NCR_1310 Rejected NCR_1317
4.62	2.5	4.0	4H	4.0	4E	4.0	Fixed NCR_1157 Fixed NCR_1259	Fixed NCR_1128 Fixed NCR_1275 Fixed NCR_1276

The historical updates in the MIPAS L1 processor are detailed in ***Appendix A*** with all the information on the related NCRs and SPRs.
The Figure 16 shows the alignment between the measurement mode (full resolution, RR with 17 sweeps and over-sampled RR) and the corresponding valid IPF and ADF for the L1 and L2 processing.

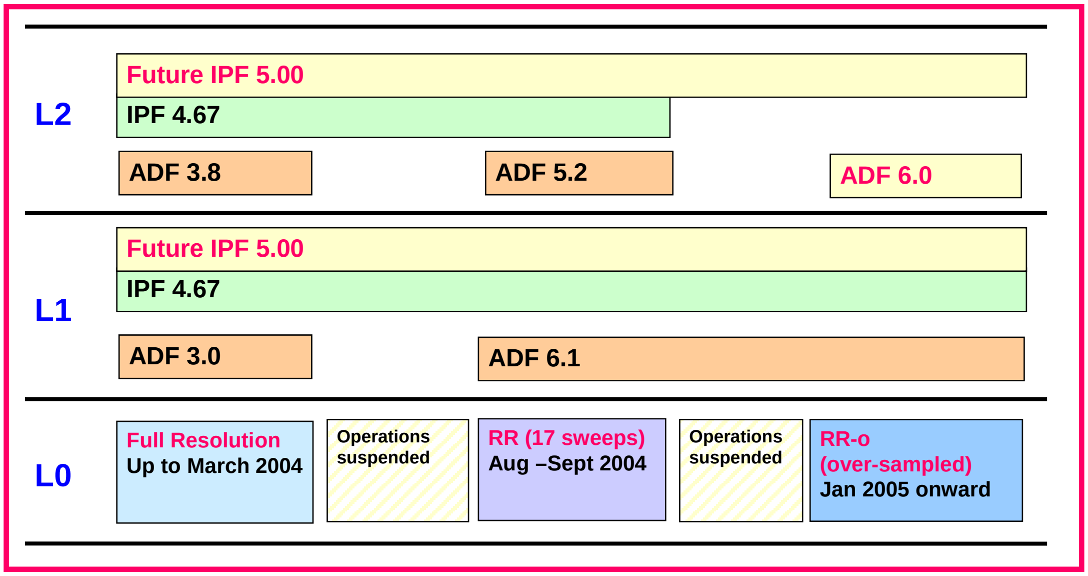


Figure 16 IPF and ADF validity for processing level 1 and level 2 products. IPF 4.62 – 4.61 were used for re-processing of FR mission, while the IPF 4.67 is now operational at D-PAC for OFL processing of RR mission. IPF 5.00 is the future IPF that will be used for OFL processing and for reprocessing of the whole mission. IPF 5.0 will be the only one able to process RR over-sampled measurements up to L2.

The historical update of the IPF at each processing site is shown in the following table.

Table 8 Historical updates of MIPAS processor at near real time (NRT) processing sites (PDHS-K and PDHS-E) and OFL processing sites (LRAC and D-PAC), in red is the current operational IPF.

Centre	Facility Software	Date
D-PAC	**V4.67**	**04-09-2006**
D-PAC	V4.65	09-02-2006
D-PAC	V4.62	06-09-2004
LRAC	V4.62	02-09-2004
D-PAC	V4.61	15-03-2004
LRAC	V4.61	18-03-2004
PDHS-K	V4.61	17-03-2004
PDHS-E	V4.61	17-03-2004
LRAC	V4.59	20-08-2003
D-PAC	V4.59	06-08-2003
PDHS-K	V4.59	23-07-2003
PDHS-E	V4.59	23-07-2003
PDHS-K	V4.57	22-07-2003
LRAC	V4.57	22-07-2003
PDHS-K	V4.59	21-07-2003
LRAC	V4.59	21-07-2003
LRAC	V4.57	19-03-2003
PDHS-K	V4.57	18-03-2003
D-PAC	V4.57	05-03-2003
PDHS-E	V4.57	04-03-2003

2.4.1.2 Auxiliary Data Files

The strategy for the level 1 ADFs update is as follows:

- The MIP_CO1_AX, MIP_CG1_AX and MIP_CS1_AX are updated every week and after a long detectors/cooler switch-off or after a long unavailability
- The MIP_CL1_AX is analyzed every two weeks and updated when the pointing error differs with respect to the last disseminated by more than 8 mdeg.
- The MIP_PS1_AX is updated every time there is a setting update.
- The MIP_MW1_AX is updated when the micro-window is changed.
- The MIP_CA1_AX is updated when new characterization parameters are defined.

The level 1 ADF files generated and disseminated during the reporting month are listed in the following table.

Table 9 Level 1 ADFs valid in December 2006.

Auxiliary Data File	Start Validity	Stop Validity	Updated during this month
V6.1 MIP_MW1_AXVIEC20050627_094928_20040809_000000_20090809_000000 MIP_PS1_AXVIEC20050627_100609_20040809_000000_20090809_000000 MIP_CA1_AXVIEC20050627_094412_20040809_000000_20090809_000000	08-JAN-05	08-JAN-09	No
MIP_CL1_AXVIEC20050420_152028_20050420_095747_20100420_095747	20-APR-05	20-APR-10	No
MIP_CS1_AXVIEC20071015_151535_20071009_000000_20121009_000000 MIP_CG1_AXVIEC20071015_150710_20071009_000000_20121009_000000 MIP_CO1_AXVIEC20071015_150132_20071009_000000_20121009_000000	09-OCT-07	09-OCT-12	Yes
MIP_CS1_AXVIEC20071026_095429_20071024_000000_20121024_000000 MIP_CG1_AXVIEC20071026_092034_20071024_000000_20121024_000000 MIP_CO1_AXVIEC20071026_095301_20071024_000000_20121024_000000	24-OCT-07	24-OCT-12	Yes

The characterization level 1 ADFs (MIP_PS1_AX, MIP_CA1_AX, MIP_MW1_AX) are generated by Bomem. The following table illustrates the history of level 1 ADF deliveries, more details can be found in ***Appendix B***.

Table 10 Historical deliveries of level 1 ADF by Bomem

ADFs Version	Updated ADF	Start Validity Date	IPF version	Dissemination date
6.1	MIP_PS1_AX	09-Aug-2004	4.63	27-Jun-2005
6.0	MIP_PS1_AX	Not disseminated	4.63	-
5.0 draft	MIP_PS1_AX	Not disseminated	4.63	-
4.1 TDS6	MIP_PS1_AX	09- Aug-2004	4.63	15-Mar-2005
4.0 draft	MIP_PS1_AX	Not disseminated	4.62	-
3.2	MIP_PS1_AX	26-Mar-2004	4.61	21-Apr-2004
3.1	MIP_PS1_AX	09-Jan-2004	4.61	17-Mar-2004
3.0	MIP_CA1_AX MIP_MW1_AX MIP_PS1_AX	April-2002	4.61	4-Nov-2003

2.4.2 SPECTRAL PERFORMANCE

The calibration file MIP_CS1_AX contains the linear spectral correction factor (SCF), which compensates for variations in the instrument metrology (e.g.: aging of the laser). Figure 17 gives the variation trend over the RR mission (from August 2004). We observe a very stable situation since the variations are of the order of 3 ppm over almost two years of operations. A decreasing trend can be observed, even though the spreading of the points is large due to noise in the determination of this parameter.

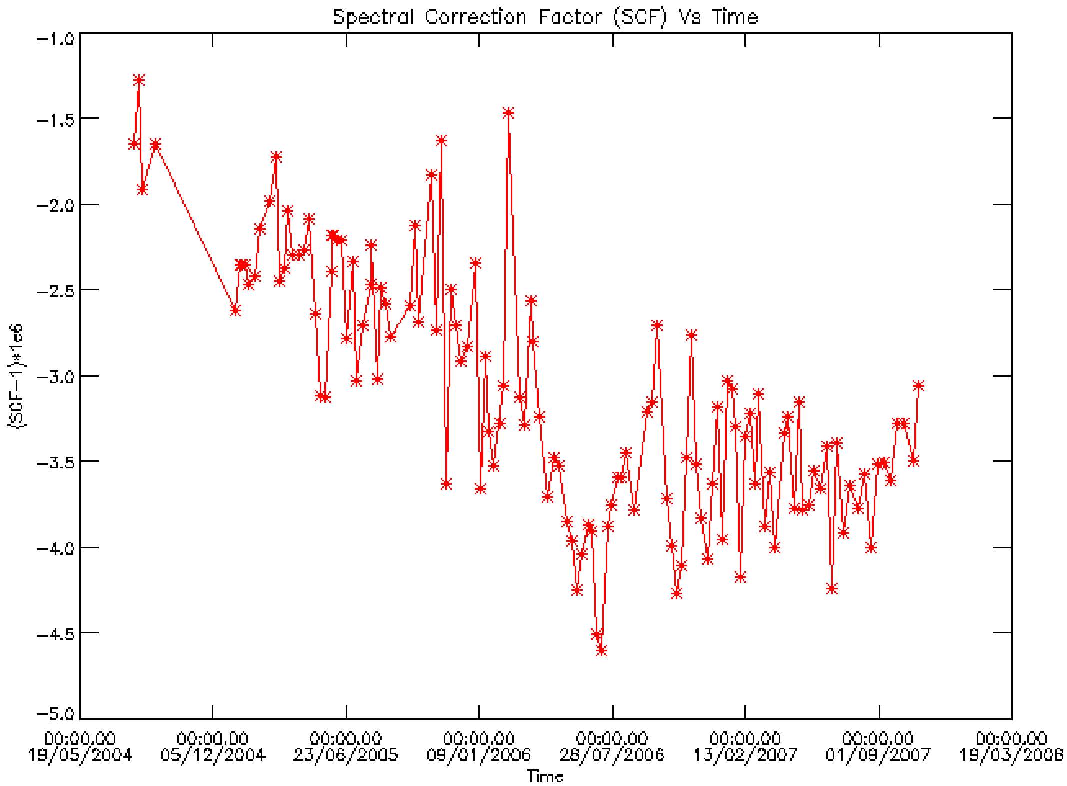


Figure 17 MIPAS Spectral Calibration Factor (SCF) since August 2004.

2.4.3 RADIOMETRIC PERFORMANCE

The radiometric calibration is performed on a weekly basis, furthermore the gain is always updated after long mission interruption, in case of instrument anomalies or when the instrument thermal conditions change (e.g.: heater or cooler switching). The maximum of the gain increase between two consecutive disseminated gains in the band A (where we expect the maximum of gain variation due to ice contamination) is closely monitored. The increase of gain in band A is expected to be less than 1%/week at its maximum.

2.4.3.1 Weekly monitoring

During the reporting month the weekly gain trend was nominally monitored. The following plots show the relative changes of gain for the reporting month, it can be observed that the maximum increase in the *band A* between two consecutive gains remains well below the expected level of 1%/week. The other bands show similar gain variations. The effect of the passive decontamination can be observed in Fig. 19 with a reduction of the gain factor. Some non-corrected spikes are observed on *band AB* and *B* always at the same spectral position, this behavior is well known and is due to the aliasing spike caused by the on-board IGM rounding and decimation.

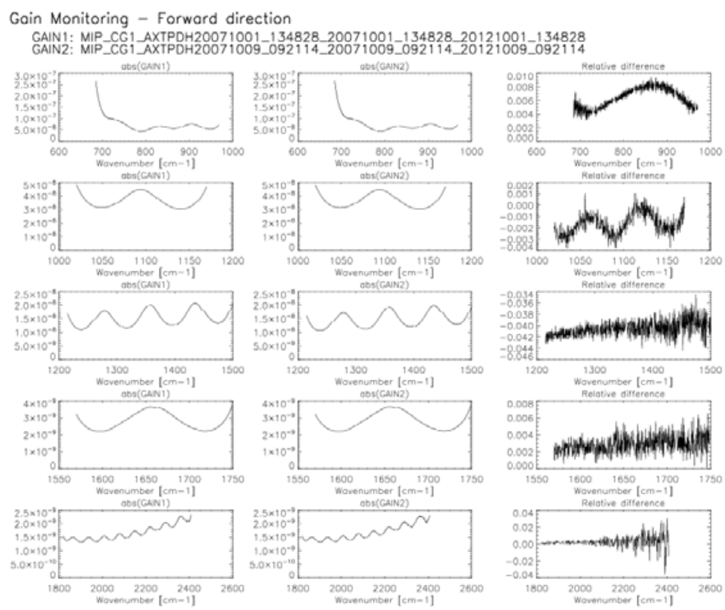


Figure 18 Relative variations of radiometric gain for consecutive disseminated gains in band A for the forward direction. The first two plots in each row are the complex modulus of the gain for each of the 5 MIPAS bands, the third plot is the ratio: *(abs(GAIN2)-abs(GAIN1))/abs(GAIN1)*. This plot refers to a gain measured on 9 Oct 2007.

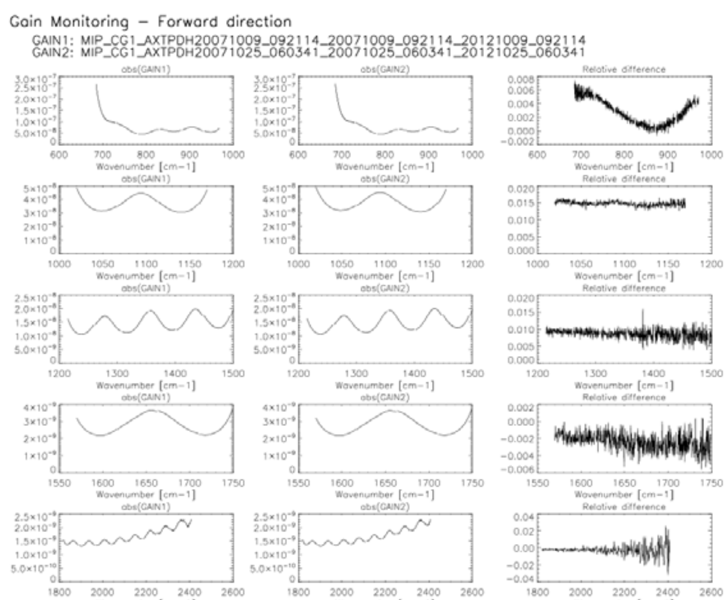


Figure 19 The same as Figure 18 but for a gain measured on 24 Oct 2007.

The maximum of gain increase is obtained as the maximum of the curves of gain relative difference presented in the previous plots. The maxima in *band A* are reported in Table 11. In this table it is also reported the long term increase, in this case we use as a reference a gain corresponding to low contaminated conditions. Note that the reference gain was changed on September 2006 after the planned decontamination. From this table we can see that the maximum of gain variation was always lower than the acceptance level; furthermore the effect of the passive decontamination can be observed with a decrease of the gain factor in *band A*.

Table 11 Weekly and long term gain increase for gains disseminated during the reporting month in *band A*.

Orbit #	Date	Weekly max increase (%)	Long term max increase[1] (%)
29315	09/10/2007	0,95	1,87
29537	24/10/2007	-0,07	1,65

2.4.3.2 *Long term monitoring*

The long term plot of gain changes in band A between two consecutive disseminated gains is shown in Figure 20; in this figure the maximum of gain increase is normalized with respect to the time between two consecutive gains. The acceptance criterion of 1% of weekly increase is reported in the plot with the dash-dotted blue line. The anomalous increase of gain during Jan – May 2005 can be observed in this figure. After the decontamination (end of May 2005) the gain rate suddenly decreases and it remains always lower than the acceptance level unless some peaks due to instrument temperatures changes, instrument outages or decontamination. Note that these variations are not presented in this plot since at this stage the goal is only to verify that the acceptance criterion of 1% of weekly increase is verified in nominal condition (e.g. excluding mission interruption or decontamination events). The effect of decontamination and changes in the instrument thermal conditions can be appreciated by analyzing the accumulation of gain over time as discussed in the next paragraph.

[1] Note that the long term increase is calculated using a different reference gain function, therefore this value doesn't correspond to a cumulative sum of the weekly increase.

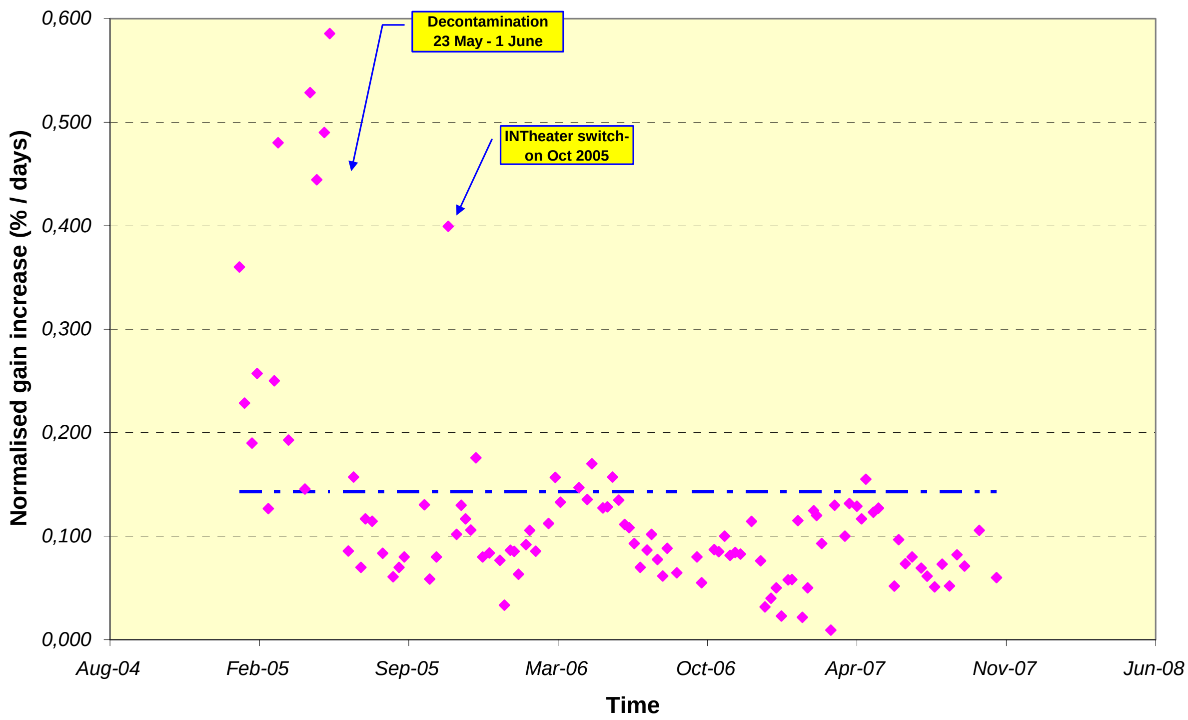


Figure 20 Gain maximum increase normalized to the time difference between consecutive disseminated gains since January 2005.

The long term monitoring of the gain accumulation increase in band A is presented in Figure 21. This plot shows the increase of gain taking as reference the first calibration orbit of Jan 2005 for the period Jan – May 2005 and the first orbit of June 2005 for the period June 2005 – September 2006. The reference gain was updated after the planned decontamination of September 2006. This long term investigation is useful in order to plan possible decontamination along the mission. As suggested by M. Birk (DLR) the decontamination should be planned when the gain has increased by more than 20% in order to prevent NESR value to become not acceptable for level 2 products retrieval precision. The following main points can be highlighted in this figure:

- The very high increase of gain during the period Jan – May 2005. At the end of this period the gain increase reached a value of about 60%. The situation was resolved with the decontamination of June 2005.
- The linear increase of gain in the period Jun-Oct 2005.
- A sudden increase of gain due to the INT heater switch-on of October 2005.
- The significant decrease of gain after the PLSOL of April 2006 was due to the platform (and cooler) switch-off and the consequent warming up of the detector. As a result the gain was dramatically reduced by more than 25%. After this non-intended decontamination the gain increased with a constant slope up to September 2006.
- The decrease of gain by about 10% after the decontamination of September 2006 and the PLSOL of 28th November 2006.
- The decrease of gain by about 5% after the decontamination planned at the beginning of June 2007 and the other decrease due to the PLSOL of end September 2007. A slight gain decrease was also obtained with the passive decontamination planned on October 2007.

As a result of this analysis the following conclusions can be drown:

- Planned decontamination and platform switch-off always cause an ice removal from the detector and a consequent increase of the signal; as a result the gain factor is reduced.
- The dramatic increase of gain that was observed at the beginning of 2005 was never observed again due to the improvement of the cooler performances obtained with more frequent decontaminations.
- The slope of the gain increase is progressively decreasing in the last months demonstrating that the detector is more and more "ice-free".
- The slope of the curve of the gain accumulation rate is closely related to the performances of the cooler.

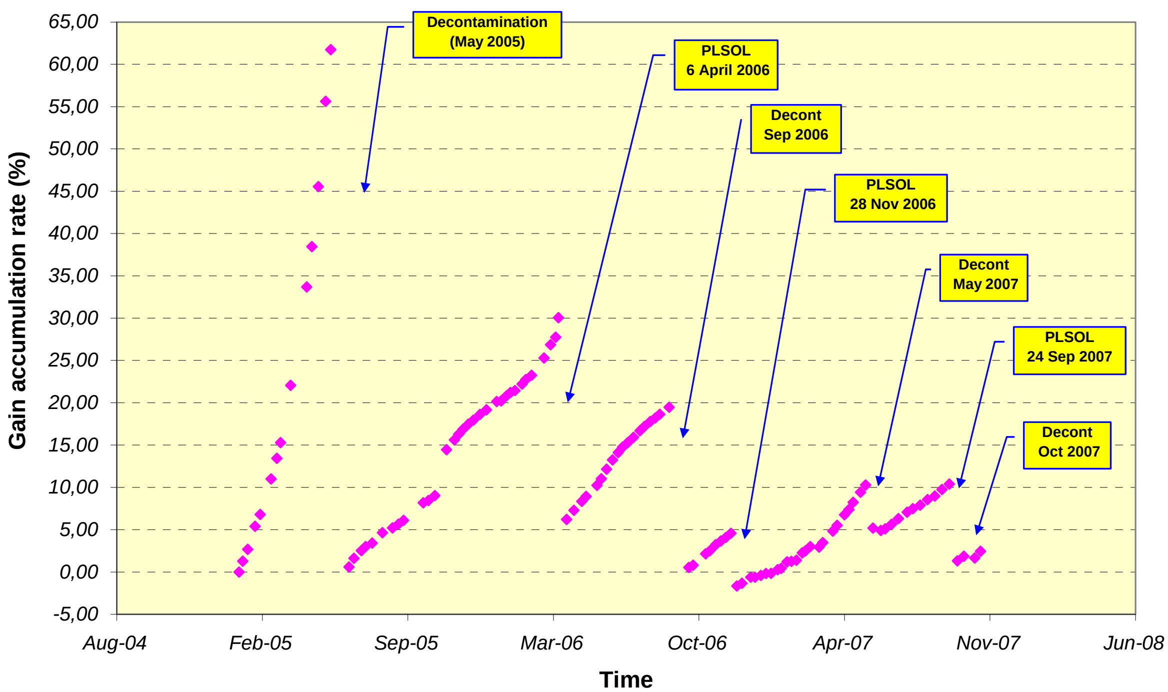


Figure 21 Gain accumulation increase since January 2005.

2.4.3.3 *Interpolated gains*

During the period January-May 2005, a strong gain increase was observed in the gain variation, as observed in the previous paragraph. This increase acts on the data quality in two ways:

- If the gain functions are only determined once per week, the drift leads to a scaling error in the calibrated spectra of up to 3.5 % in band A.
- The increase of the gain function corresponds to a decrease of the instrument response. This also decreases the signal-to-noise-ratio and leads to higher NESR-values.

In order to reduce the scaling error in the calibrated spectra the solution was to calculate and disseminate further gain values in between the already disseminated ones in order to comply with the condition for the gain weekly increase to be lower than 1%. This gain reprocessing has been done with the support of Bomem and the results are reported in ***Appendix C***.

2.4.4 POINTING PERFORMANCE

The LOS calibration measurements are performed every week and the mispointing is analyzed on a bi-weekly basis. This plan allows the pointing stability to be analyzed and guarantees the availability of the data in case of missing products. The baseline for LOS calibration is now that the absolute bias is compared to the last disseminated one, then a new LOS calibration ADF is disseminated only if the difference between the two is a higher than **8 mdeg**.
The long term trend of mispointing since start of mission is reported in Figure 22. The figure shows the absolute pointing error (evaluated taking into account the commanded elevation angle for the LOS calibration). The very pronounced annual trend at the beginning of the mission was not due to the MIPAS instrument itself, but to a mispointing of the entire ENVISAT platform resulting from the software response to orbit control information. In fact, after the update of the pointing software (December 2003) the deviation trend was drastically reduced. During the last months the absolute bias is stable around a value of -25 mdeg with a seasonal oscillation.
The problem observed during October 2006 on LOS calibration, namely the increase of noise in channel D2 with a resulting degradation of the star signal is still present. In fact the number of available stars for the mispointing determination is much lower than one year ago (in average 3-5 stars are now available).

During the reporting month the calculated absolute bias remain in the range [-25:-30] mdeg. So far no results are available concerning sideways LOS calibrations that have been routinely planned since March 2007. The problem in processing these data is the poor signal recorded. The acquisition and processing status of the LOS calibration for the reporting month is presented in the next table.

Table 12 LOS calibrations performed during the reporting period, in red are the sideways LOS.

Date	Orbit	Type	Acquisition and processing status	Absolute error [deg]
01/10/2007	**29204**	**side**	PDS failure	
06/10/2007	**29276-29277**	**rear**	processed but only 2 stars	-0,023478
16/10/2007	**29419**	**side**	Processing failure, no star, only noise	

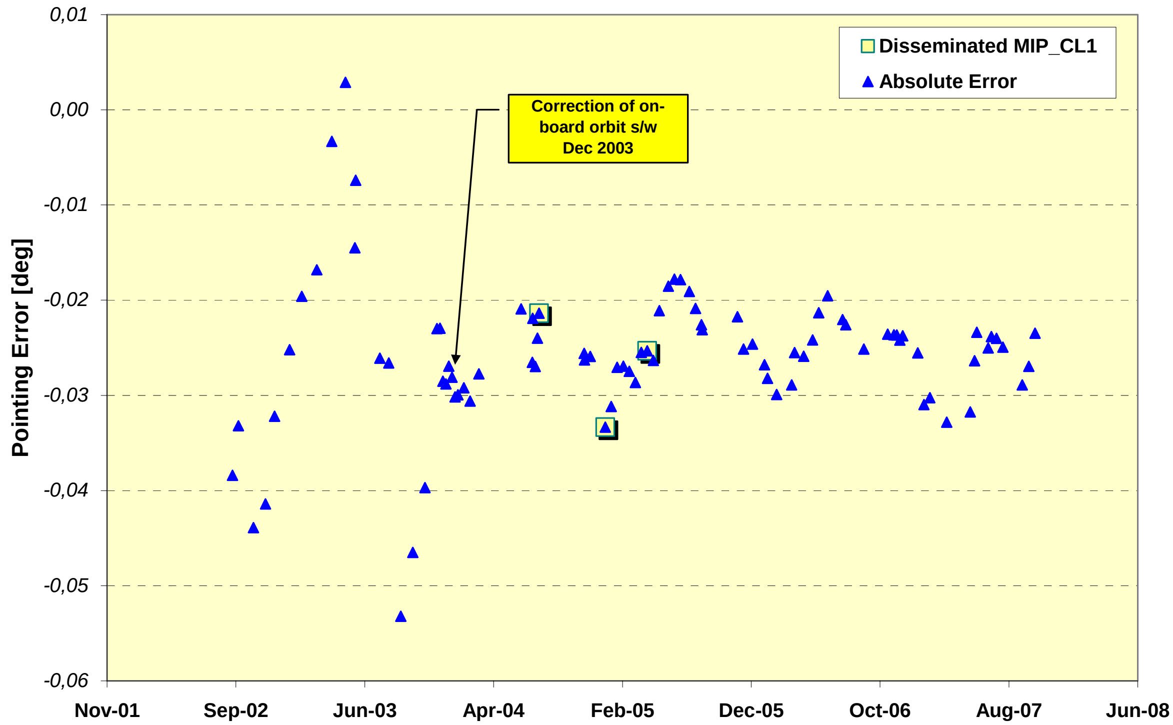


Figure 22 MIPAS long-term pointing error as a function of time since September 2002.

Table 13 shows the history of the commanded angle for LOS measurements. Starting from the second part of September 2003, only measurements from channel D2 are processed because of the increased noise affecting channel D1. In order to reduce that noise, from 21 November 2004 (orbit 14265), the planning strategy for LOS measurements has been changed and the number of observations per star has been doubled.

Table 13 LOS commanded angle updates.

Start Date	Start Orbit	Stop Date	Stop Orbit	Angle [mdeg]
beginning	/	28 Sep 2002	3024	0
05 Oct 2002	3123	26 Oct 2002	3424	- 22
02 Nov 2002	3524	30 Nov 2002	3926	- 25
07 Dec 2002	4025	01 Nov 2003	8738	- 40
08 Nov 2003	8835	08 Nov 2003	8836	- 25
10 Nov 2003	8864	10 Nov 2003	8865	0
15 Nov 2003	8934	6 Mar 2004	10538	- 25
13 Mar 2004	10639	20 Nov 2004	14250	0
21 Nov 2004	14265	/	/	- 30

2.4.5 QUALITY CONTROL OF L1 OFL DATA

The quality control of L1 data processed at D-PAC is going-on in parallel with the OFL processing, the L1b daily report are uploaded on the web as soon as they are generated, they can be accessed at the following address:
http://earth.esa.int/pcs/envisat/mipas/reports/daily/Level_1_OFL/

2.4.5.1 FCE monitoring

The number of fringe count error (FCE) represents the number of points for which the measured IGM should be translated in order to match the reference IGM. As reference IGM we use the gain that is updated on a weekly basis. FCE are detected by the L1b processor and corrected, therefore no impact on the data quality is expected. A long term monitoring of the detected/corrected FCE was proposed during QWG#10 aiming at the verification of the FCE stability over time. A statistical approach based on the distribution of FCE was proposed. The outline of this approach is reported in this paragraph together with the results.

As a first step all the FCE values since Jan 2005 were analyzed on a monthly basis and the frequency distribution of the FCE was investigated. An example of the total number and frequency distribution of the FCE of one month of data is reported in the following figure.

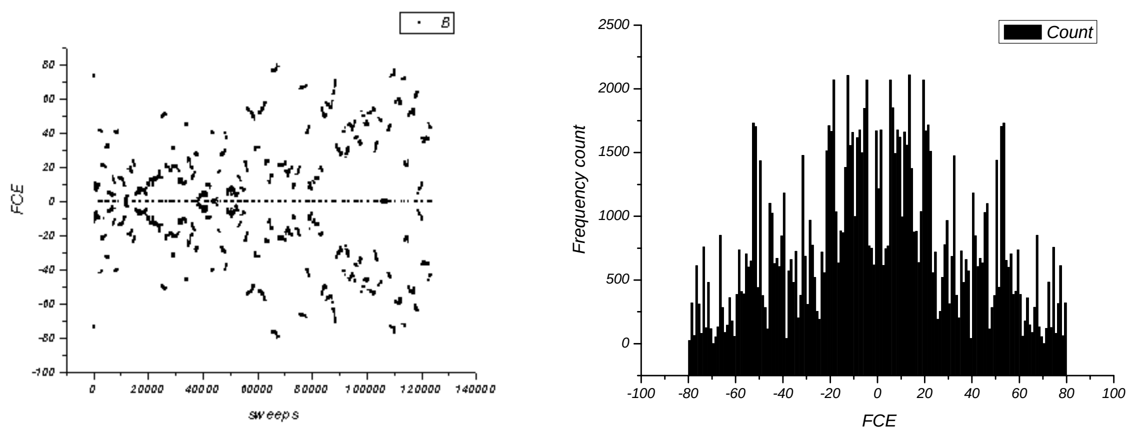


Figure 23 FCE values for one month of measurements and corresponding frequency distribution,

In order to quantify the dispersion of the frequency distribution around the mean we decide to consider the cumulative distribution function of the FCE and fit it with a sigmoid curve. The following expression was used to represent the sigmoid curve, $F(x) = A2\frac{(A1-A2)}{1+e^{\frac{(x-x_0)}{s}}}$, where x_0 is the mean of the distribution, and *s* gives an indication of the slope of the sigmoid curve. An example of a typical cumulative distribution function and of the fitted curve is reported in the next figure.

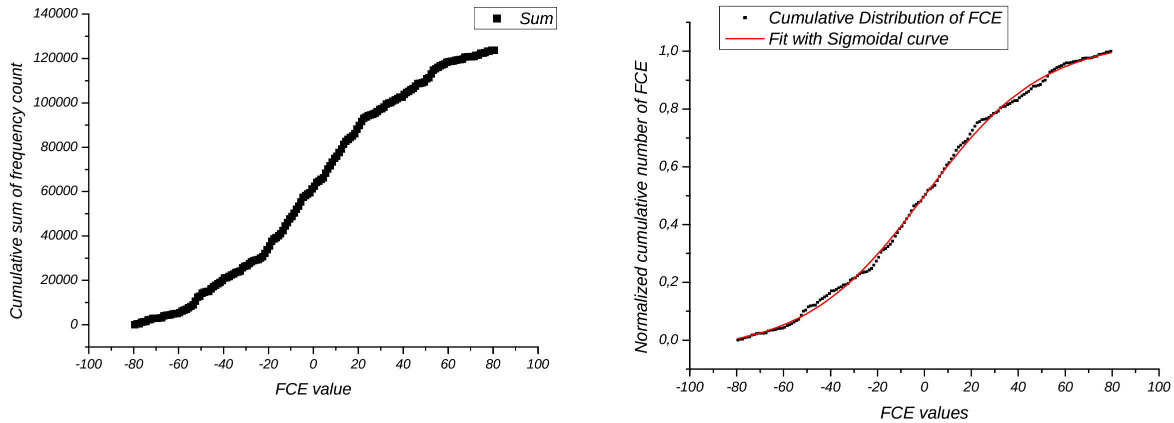


Figure 24 Cumulative distributions function of the FCE for one month of data. The fit with a sigmoid curve is reported on the right side.

The value of *s* in the expression of the fitted sigmoid curve gives an indication of the width of the probability distribution. As *s* is decreasing we approach a step-like curve, while the curve is close to be a straight line when *s* is very high. In other terms when *s* is really small we expect a distribution similar to a delta function, while when *s* is high we approach a bell-like curve. Therefore the parameter *s* can be seen as a measure of the dispersion of the points around the mean. The value of this parameter was calculated for every month since Jan 2005 and it is reported in Figure 25 together with the number of IDU errors. This figure shows that the width of the FCE distribution can be considered a good measure of the stability of the slide mechanism. The dependency of the FCE on the IDU temperature needs to be investigated in more details.

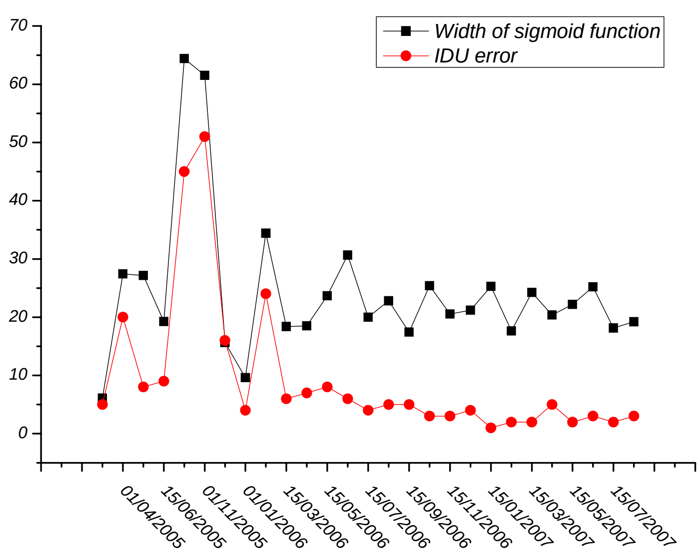


Figure 25 Width of the sigmoid curve (used to fit the FCE statistic distribution) plotted on a long term basis together with the number of IDU errors.

2.4.5.2 Spikes monitoring

During QWG#11 it was suggested to investigate the number of spikes detected in each MIPAS detectors. We recall here that the presence of spikes in an interferogram can be caused by cosmic radiation or transmission errors. Since the presence of a spike in the IGM will give an artefact (sinusoidal component) in the Fourier transformed spectrum, the scene IGM affected by a spike are corrected during the L1b processing by taking the mean between adjacent non affected points. Note that when a spike is detected during black body or deep space calibration measurement the corresponding IGM is discarded in order to avoid contamination in the co-addition of IGM. The L1 processor reports in the L1 products the number of detected and corrected spike for each measured scene IGM. This number was used to derive a long term statistic of detected spikes for each channel. The results are presented in Figure 26 and Figure 27 for the RR mission (starting from January 2005) in terms of percentage of sweeps affected by spikes and number of spikes/sweep. The channel C and D are the ones most affected by spikes, since they are more sensitive to high energy particle generated by cosmic rays.

A significant variability of the number of detected spikes can be observed in channels A1, A2, B1 and B2, this could be related to variation in the solar activity, but this correlation is still under investigation. The channels C and D (the detector most affected by spikes) didn't show any significant trend. In general the percentage of sweeps affected by spikes is small for the most important MIPAS bands (A, AB) while it is about 3% for band D; however the number of detected spikes is always very low for all the MIPAS bands. Finally taking into account that the spike's signal is smoothed out by the L1 processing we can conclude that the presence of spikes does not impact the quality of MIPAS L1 data.

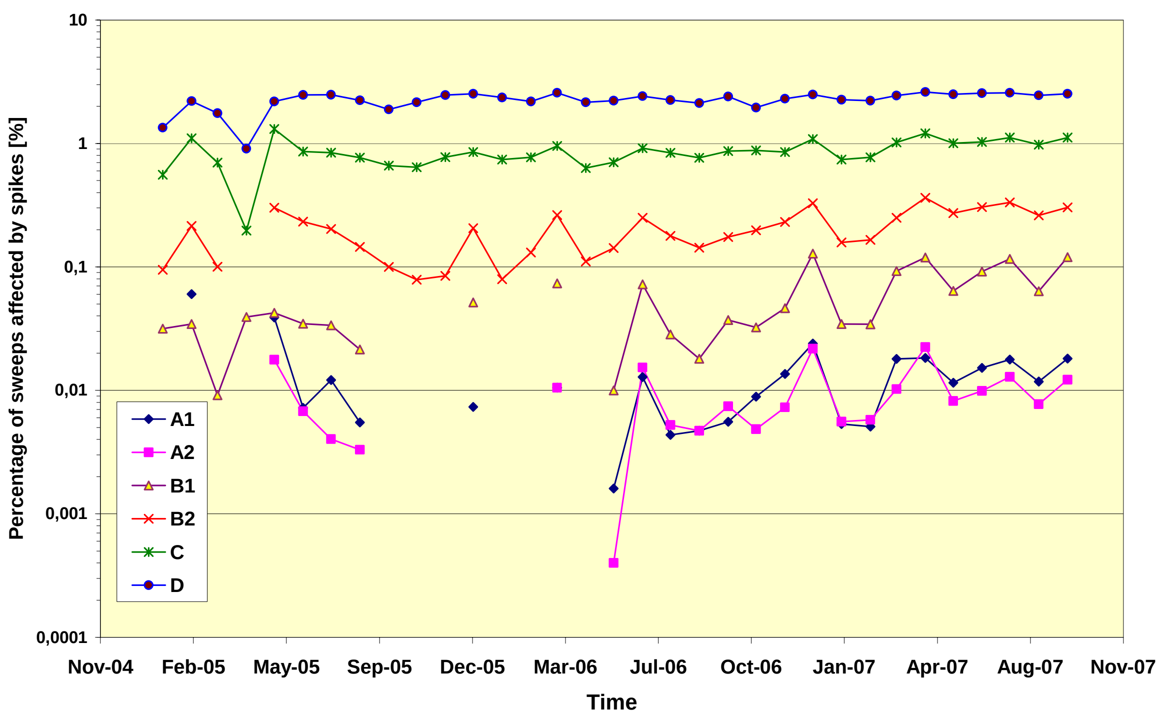


Figure 26 MIPAS long-term monitoring of spikes: percentage of spike-affected sweeps.

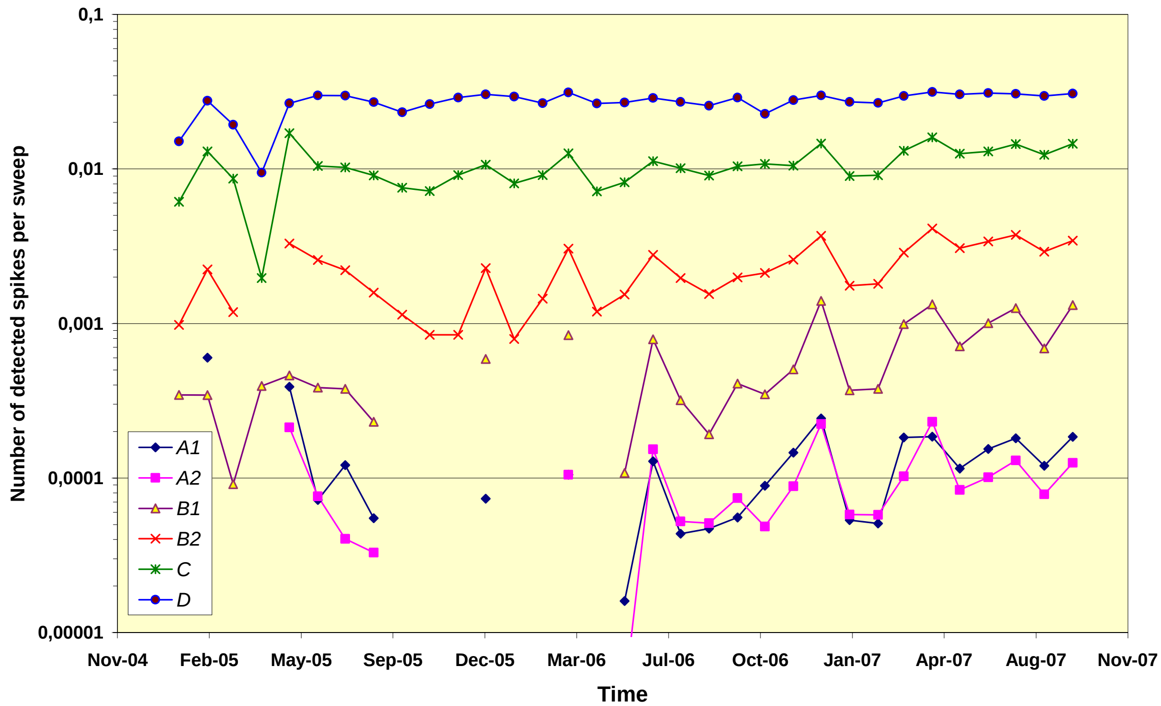


Figure 27 MIPAS long-term monitoring of spikes: number of detected spikes per sweep.

2.4.6 LEVEL 0 AND LEVEL 1 ANOMALY STATUS

The following table summarizes the anomalies affecting Level 0 and Level 1 products and shows the associated SPR, NCR, OAR and HD code, more details on anomalies investigation are reported in **§3.4**.

Table 14 Level 0 and Level 1 anomaly list. Refer to the appendices for further details on anomaly investigation.

Anomaly	Proto/DPM SPR	IPF NCR	OAR	HD	Status	Ref.
MIPAS wrong consolidated products	/	/	2097	/	Closed	§3.4.1
Excessive number of MISSING ISPS in the MPH for MIPAS L0 products	/	/	2165	/	Closed and corrected	§3.4.2
Non-valid band A at the same geo-location	/	1594	2263	/	Closed corrected in IPF 4.67	§3.4.3
Wrong MIPAS L1 product in D-PAC server	/	/	2303	/	Closed	§3.4.4
Badly calibrated L1 b spectra during 3 – 23 June and 29 July – 11 Aug 2005	/	/	/	/	Closed	§3.4.5
MIPAS Aircraft Emission measurements	/	/	/	/	Closed	§3.4.6

Wrongly calibrated MIPAS L1 products	/	/	/	/	Closed	§3.4.7
Anomalous scan pattern	/	/	/	/	Closed	$3.4.8

2.5 *Level 2 product quality monitoring*

2.5.1 PROCESSOR CONFIGURATION

2.5.1.1 Version

The list of IPF updates and the aligned DPM and the related NCR/SPRs is presented in the paragraph 2.4.1. The historical updates in the MIPAS Level 2 processor are listed in detail in ***Appendix F***.

2.5.1.2 Auxiliary Data Files

This paragraph reports the historical update of the level 2 ADF. The latest delivery for processing FR mission is the v3.8, whereas for the processing of RR data of Aug 2004 the latest delivery is the v5.2. The ADF version 5.2 was used for the L2 processing of RR not over-sampled data (Aug – Sept 2004). Further details on the Level 2 ADF deliveries provided by IFAC are reported in **§3.6**.

Table 15. Historical update of Level 2 configuration ADFs.

Version	Date of delivery	List of files upgraded by IFAC	Main modifications
ADF V5.2	05.12.2005	MIP_SP2_AX_V5.2 MIP_OM2_AX_V5.2_october	Correct for a bug in the binary conversion of these two ADF. The ascii version of these files was correct then it was just a problem in the binary conversion of the ADF.
ADF V5.1	05.07.2005	MIP_MW2_AX_V5.1 MIP_SP2_AX_V5.1 MIP_OM2_AX_V5.1	Spectroscopic line list relative to the new microwindow database for reduced spectral resolution; PT error propagation matrices for nominal OMs added in file MIP_OM2_AX; upper limit of a microwindow for cloud detection changed.
ADF V5.0	18.03.2005	MIP_PS2_AX_V5 MIP_CS2_AX_V5 MIP_MW2_AX_V5 MIP_PI2_AX_V5 MIP_IG2_AX_V5_july MIP_IG2_AX_V5_october MIP_OM2_AX_V5	New microwindows selected for reduced spectral resolution, and corresponding cross section LUT, occupation matrices and Initial Guess for continuum (July and October seasons). Boundaries of the microwindows for cloud detection modified to match the new spectral grid at reduced resolution. New Pointing Information (PI) with a smaller error in LOS, new settings (PS) for handling reduced resolution measurements and optimised convergence criteria thresholds for reduced resolution mws.
ADF V4.1	03.09.2004	NRT: MIP_PS2_AX_NRT_V4.1 OFL: MIP_PS2_AX_OFL_V4.1	Changed the flag in PS2 file spec_events_flag from "B" (dec 66) to "N" (dec 78). NESR threshold in PS2 files as in V3.6.

ADF V4.0	03.09.2004	NRT: MIP_PS2_AX_NRT_V4.0 OFL: MIP_PS2_AX_OFL_V4.0	Changed the flag in PS2 file spec_events_flag from "B" (dec 66) to "N" (dec 78). Increased NESR threshold in PS2 files as in V3.7.

2.5.2 QUALITY CONTROL OF L2 OFL DATA

A quality control of L2 RR17 products (Aug – Sept 2004) was carried out at ESRIN, daily reports were generated and can be accessed at the following address:
http://earth.esa.int/pcs/envisat/mipas/reports/daily/Level_2_OFL/
Looking at these daily reports we observe an overall good quality of L2 products. Only one major problem was found for the period: 21 – 22 Aug 2004. The investigation of this problem showed that a corruption in the band D was verified for these orbits. The corruption was due to a corrupted gain used for spectra calibration. As reported by Astrium the processor flags as corrupted one sweep even though only one band is corrupted. This processor specification seems excessively restrictive in particular in this case, since the band D is not used in the operational retrieval.

2.5.3 LEVEL 2 ANOMALY STATUS

The following table summarizes the anomalies affecting Level 2 products and shows the associated SPR, NCR, OAR and HD code. Further details on anomalies investigation are reported in **§3.7**.

Table 16 Level 2 anomaly list. Refer to the appendices for more information on the anomaly investigation.

Anomaly	Proto/DPM SPR	IPF NCR	OAR	HD	Status	Ref
Excessive Chi-square	/	1458	1929	/	Closed with IPF 4.67	§3.7.1
Difference on L2 products between v4.61 and v4.62	/	1521	2074	/	Closed with IPF 4.67	§3.7.2
NO2 retrieval during polar condition	/	/	/	/	Closed	§3.7.3
L2 OFL missing data around the South Pole	/	/	/	/	Closed	§3.7.4
L2 continuum anomaly	/	/	/	/	Closed	§3.7.5

2.6 Processing/Re-processing Status

2.6.1 FIRST RE-PROCESSING OF FR MISSION

The first re-processing of the FR MIPAS mission was terminated at D-PAC using IPF software version 4.61, 4.62. All the received consolidated L0 products were processed to L1 and L2. The complete list of L1 and L2 re-processed products at D-PAC (with the corresponding IPF software version) was provided to the QWG and can be found on Uranus ftp server (MIPAS/To_QWG/ DPAC_L1_L2_archive_FR_mission.xls).

2.6.2 OFL PROCESSING OF RR MISSION

2.6.2.1 Level 1b

The Level 1 processing of RR mission has started at D-PAC the 9th of February 2006 with IPF 4.65. Since Sept 2006 the IPF 4.67 was switched at D-PAC. The processing of the backlog RR data (from Aug 2004 to Dec 2005) was completed. The OFL processing is going on in parallel with the mission. All these data are available on D-PAC ftp server.

2.6.2.2 Level 2

The level 2 processing of RR mission at D-PAC has started the mid of February 2006 with the IPF 4.65. A total of 158 orbits were processed up to L2. All these data are available on D-PAC ftp server.

Table 17 Measurement segments processed OFL up to Level 2 for RR mission data.

	UTC		Orbit #	
	start	**stop**	**start**	**stop**
1st period	9 Aug 2004 16:42:00	22 Aug 2004 20:41:10	12783	12965
2nd period	16 Sept 2004 12:00:10	17 Sept 2004 22:06:43	13318	13338

3 APPENDICES

3.1 Appendix A – Level 1 IPF historical updates

The historical updates to the MIPAS Level 1 IPF processor are listed here:

- **Version V4.67** the following updates were introduced for L1 processing
    - Fixed NCR-1522 → The MIPAS IPF (from version 4.61 to version 4.65) generates L1b products with wrong "NUM_DSR" value in the SPH; in particular this value differs by one unit from the "TOT_SCAN" value, while the two should be the same. The L1 prototype doesn't show this anomaly.
    - Fixed NCR-1676 → This problem was detected at D-PAC during OFL L1 processing of MIPAS RR data; in particular it was observed that the MIPAS IPF 4.65 is violating the shared memory area of PFHS. PFHS performance is seriously affected, because too many manual re-starts become necessary.
- **Version V4.65** no update of Level 1 for this version
- **Version V4.64** (aligned with DPM 4I and ADFs V4.1) introduced modifications only for the Level 1 processor, with the following update:
  - Fixed internal SPR-121O0-2011: Problem with the block sequence
- **Version V4.63** (aligned with DPM 4I and ADFs V4.1) introduced modifications for both Level 1 and Level 2 processors. For the Level 1 processor, the following updates were introduced:
  - Processing of low resolution measurements, with reduced resolution also for offset and gain data.
  - Solution of internal SPR-120O0-2000: Band D oscillations in forward sweeps for MIPAS reduced-resolution products
  - Solution of internal SPR-120O0-2001: NESR data problem
- **Version V4.62** (aligned with DPM 4H and ADFs V4.0) introduced modifications for both Level 1 and Level 2 processors. For the Level 1 processor, the following updates were introduced:
  - Processing of low resolution measurements, without reduced resolution for offset and gain data that will be implemented in IPF 4.63.
  - Fixed NCR_1157: Bug in the MIPAS processor ILS retrieval.
  - Fixed NCR_1259: Scans with null NESR.
- **Version V4.61** consists of updates for both Level 1 and Level 2:
  - Fixed NCR_1143: Sparse corruption of bands between 1 and 4 January 2004.
- **Version V4.59** has introduced only upgrade on Level 2 processor.
- **Version V4.57** involved only Level 1 processor update, introducing the following modifications:
  - Modification of FCE algorithm
  - Elimination of strong anomalous oscillations in the spectra
  - Modification of NESR reporting
  - ADC saturation flagging
  - Addition of aliasing spike suppression algorithm

3.2 Appendix B – Level 1 ADF historical updates

The Level 1 characterization files (MIP_CA1_AX, MIP_MW1_AX, MIP_PS1_AX) are provided by Bomem and updated when needed, the activation date of these ADFs with respect to the operational processor are reported in the table below.

Table 18 Level 1 ADF start validity date

ADFs Version	Updated ADF	Start Validity Date	IPF version	Dissemination Date
6.1	MIP_PS1_AX	09-Aug-2004 RR mission	4.65 4.67	27-Jun-2005
5.0	MIP_PS1_AX	/	/	Not used for processing
4.1	MIP_PS1_AX	/	/	Not used for processing
3.2	MIP_PS1_AX	26-Mar-2004	4.61	21-Apr-2004
3.1	MIP_PS1_AX	09-Jan-2004	4.61	17-Mar-2004
3.0	MIP_CA1_AX MIP_MW1_AX MIP_PS1_AX	April-2002 FR mission	4.61	4-Nov-2003

A more detailed description of the historic updates of the L1 ADF is reported hereafter.

Version 6.1
MIP_PS1_AX
- OPD set to 8.2 cm
- Spike detection standard deviation threshold set to 10
- Spike detection number of points per block set to 256
- Set standard deviation threshold to 5 for Scene measurement quality

Version 6.0
MIP_PS1_AX
- OPD set to 20 cm
- Spike detection standard deviation threshold set to 10
- Spike detection number of points per block set to 256
- Set standard deviation threshold to 5 for Scene measurement quality

Version 5.0 draft
MIP_PS1_AX
- OPD set to 10 cm
- Channel A set to 5701 points
- Channel AB set to 3001 points
- Channel B set to 5701 points
- Channel C set to 3601 points

- Channel D set to 11801 points
- Set standard deviation threshold to 5 for Scene measurement quality

Version 4.1 (TDS 6)

MIP_PS1_AX

- OPD set to 8.2 cm
- Channel A set to 4561 points
- Channel AB set to 2401 points
- Channel B set to 4561 points
- Channel C set to 2881 points
- Channel D set to 9441 points
- Number of co-additions for ILS retrieval was set to 5
- Set standard deviation threshold to 5 for Scene measurement quality

Version 4.0 draft

MIP_PS1_AX

- OPD set to 8.2 cm
- Channel A set to 4561 points
- Channel AB set to 2401 points
- Channel B set to 4561 points
- Channel C set to 2881 points
- Channel D set to 9441 points
- Number of co-additions for ILS retrieval was set to 5

Version 3.2

MIP_PS1_AX

- Changed the threshold to take into account the modified noise level

Version 3.1

MIP_PS1_AX

- Changed the threshold to take into account the modified noise level

Version 3.0

MIP_CA1_AX

- Modify non-linearity coefficients for reverse sweep. Coefficients for forward are kept as is
- Neutral equalization filter for band A

MIP_MW1_AX

- Removal of band D microwindow D_H20b at 1870.8049 cm-1
- Set spectral calibration microwindow altitude to 32 km

MIP_PS1_AX

- Number of co-additions for spectral calibration was set to 4
- Number of co-additions for ILS retrieval was set to 10

When one ADF is modified the three AUX file are disseminated with the same START/STOP time and this correspond to a new level 1 ADF delivery, this prevents confusion.

3.3 Appendix C – Interpolated gains

Due to missing L0 products to calculate all the gain calibration ADF files, a program was developed to estimate the missing gain calibration files using the gain calibration ADF files available (already disseminated via the IECF). The program simply performs a linear interpolation between 2 known gains. The second gain is first aligned on the same fringe as the 1st gain before doing the interpolation. The interpolation factor is specified such that there is less than 1% gain difference between 2 consecutive gains.

$$Gain\_i = (G2 \times factor) + (G1 \times (1 - factor))$$

Gain_i:	Interpolated Gain vector
G1:	1st Gain Calibration vector
G2:	2nd Gain Calibration vector
Factor:	Interpolation factor (0 < range < 1)

For the interpolated gain calibration files, the "SENSING_START" and "SENSING_STOP" fields are set according to the interpolation factors. For example, an interpolation factor of 0.33 applied to two existing gains (acquired 8 days apart), will fix the interpolated gain "SENSING_START" to 8 * 0.33 = 2.6 days later than the 1st gain "SENSING_START". The sensing stop is set to the end of the mission: "SENSING_STOP" = "SENSING_START" + 5 years.
The complete list of the new interpolated gains MIP_CG1__AX files provided by Bomem and disseminated via IECF is reported in the table below. These 45 MIP_CG1__AX files were used for the reprocessing of the 2005 RR MIPAS mission.

Table 19 List of the gain files to be used during the period of enhanced gain increase of Jan – May 2005, the gain files already disseminated are highlighted in green, while the newly generated gains are in orange.

ADF file name	**Type** (* - interpolated gains)
MIP_CG1_AXVIEC20050309_081858_20050108_000000_20090108_000000	Gain calibration (CG_0)
MIP_CG1_AXVIEC20051115_085521_20050118_120000_20100118_120000	Gain (CG_0_a) *
MIP_CG1_AXVIEC20050310_091646_20050116_000000_20090116_000000	Gain calibration (CG_1)
MIP_CG1_AXVIEC20051115_085521_20050118_120000_20100118_120000	Gain (CG_1_a) *
MIP_CG1_AXVIEC20050311_085855_20050121_000000_20090121_000000	Gain calibration (CG_2)
MIP_CG1_AXVIEC20051115_090016_20050124_120000_20100124_120000	Gain (CG_2_a) *
MIP_CG1_AXVIEC20050314_154134_20050128_000000_20090128_000000	Gain calibration (CG_3)
MIP_CG1_AXVIEC20051115_090529_20050130_150000_20100130_150000	Gain (CG_3_a) *
MIP_CG1_AXVIEC20051115_091036_20050202_080000_20100202_080000	Gain (CG_3_b) *
MIP_CG1_AXVIEC20050315_131822_20050205_000000_20090205_000000	Gain calibration (CG_4)
MIP_CG1_AXVIEC20051115_101639_20050209_120000_20100209_120000	Gain (CG_4_a) *
MIP_CG1_AXVIEC20050316_081309_20050214_000000_20090214_000000	Gain calibration (CG_5)
MIP_CG1_AXVIEC20051115_102136_20050217_000000_20100217_000000	Gain (CG_5_a) *
MIP_CG1_AXVIEC20051115_102701_20050220_000000_20100220_000000	Gain (CG_5_b) *
MIP_CG1_AXVIEC20051115_103156_20050223_000000_20100223_000000	Gain (CG_5_c) *
MIP_CG1_AXVIEC20051115_103702_20050226_000000_20100226_000000	Gain (CG_5_d) *
MIP_CG1_AXVIEC20050405_145110_20050301_000000_20090301_000000	Gain calibration (CG_6)
MIP_CG1_AXVIEC20051115_104209_20050303_150000_20100303_150000	Gain (CG_6_a) *

MIP_CG1_AXVIEC20051115_104705_20050306_080000_20100306_080000	Gain (CG_6_b) *
MIP_CG1_AXVIEC20050406_070802_20050309_000000_20090309_000000	Gain calibration (CG_7)
MIP_CG1_AXVIEC20051115_105212_20050311_000000_20100311_000000	Gain (CG_7_a) *
MIP_CG1_AXVIEC20050407_072135_20050314_000000_20090313_000000	Gain calibration (CG_8)
MIP_CG1_AXVIEC20051115_105723_20050315_000000_20100315_000000	Gain (CG_8_a) *
MIP_CG1_AXVIEC20051115_110250_20050316_115754_20100316_000000	Gain (CG_8_b) *
MIP_CG1_AXVIEC20051115_122231_20050319_000000_20100319_000000	Gain (CG_8_c) *
MIP_CG1_AXVIEC20050407_143713_20050321_000000_20090321_000000	Gain calibration (CG_9)
MIP_CG1_AXVIEC20051115_122732_20050323_070000_20100323_070000	Gain (CG_9_a) *
MIP_CG1_AXVIEC20051115_123244_20050325_160000_20100325_160000	Gain (CG_9_b) *
MIP_CG1_AXVIEC20050411_123723_20050328_000000_20090328_000000	Gain calibration (CG_10)
MIP_CG1_AXVIEC20051115_123754_20050330_070000_20100330_070000	Gain (CG_10_a) *
MIP_CG1_AXVIEC20051115_124300_20050401_160000_20100401_160000	Gain (CG_10_b) *
MIP_CG1_AXVIEC20050412_072926_20050404_000000_20090404_000000	Gain calibration (CG_11)
MIP_CG1_AXVIEC20051115_124808_20050406_000000_20100406_000000	Gain (CG_11_a) *
MIP_CG1_AXVIEC20051115_125321_20050408_000000_20100408_000000	Gain (CG_11_b) *
MIP_CG1_AXVIEC20051115_125829_20050410_000000_20100410_000000	Gain (CG_11_c) *
MIP_CG1_AXVIEC20050415_073538_20050412_231018_20100412_231018	Gain calibration (CG_12)
MIP_CG1_AXVIEC20051115_130340_20050414_000000_20100414_000000	Gain (CG_12_a) *
MIP_CG1_AXVIEC20051115_130903_20050416_000000_20100416_000000	Gain (CG_12_b) *
MIP_CG1_AXVIEC20051115_131404_20050418_000000_20100418_000000	Gain (CG_12_c) *
MIP_CG1_AXVIEC20050421_065554_20050420_133450_20100420_133450	Gain calibration (CG_13)
MIP_CG1_AXVIEC20051115_131917_20050421_120000_20100421_120000	Gain (CG_13_a) *
MIP_CG1_AXVIEC20051115_132409_20050423_000000_20100423_000000	Gain (CG_13_b) *
MIP_CG1_AXVIEC20051115_132925_20050424_120000_20100424_120000	Gain (CG_13_c) *
MIP_CG1_AXVIEC20050427_150526_20050426_225532_20100426_225532	Gain calibration (CG_14)
MIP_CG1_AXVIEC20051115_133432_20050427_160000_20100427_160000	Gain (CG_14_a) *
MIP_CG1_AXVIEC20051115_133942_20050429_070000_20100429_070000	Gain (CG_14_b) *
MIP_CG1_AXVIEC20051115_134453_20050501_000000_20100501_000000	Gain (CG_14_c) *
MIP_CG1_AXVIEC20051115_134947_20050502_160000_20100502_160000	Gain (CG_14_d) *
MIP_CG1_AXVIEC20051115_135453_20050504_070000_20100504_070000	Gain (CG_14_e) *
MIP_CG1_AXVIEC20050509_150546_20050506_153444_20100506_153444	Gain calibration (CG_15)
MIP_CG1_AXVIEC20051115_154052_20050507_030000_20100507_030000	Gain (CG_15_a) *
MIP_CG1_AXVIEC20051115_151144_20050508_060000_20100508_060000	Gain (CG_15_b) *
MIP_CG1_AXVIEC20051115_151255_20050509_090000_20100509_090000	Gain (CG_15_c) *
MIP_CG1_AXVIEC20051115_151358_20050510_120000_20100510_120000	Gain (CG_15_d) *
MIP_CG1_AXVIEC20051115_151458_20050511_150000_20100511_150000	Gain (CG_15_e) *
MIP_CG1_AXVIEC20051115_151558_20050512_180000_20100512_180000	Gain (CG_15_f) *
MIP_CG1_AXVIEC20051115_151702_20050513_210000_20100513_210000	Gain (CG_15_g) *
MIP_CG1_AXVIEC20050523_090017_20050515_000000_20090515_000000	Gain calibration (CG_16)
MIP_CG1_AXVIEC20051115_150616_20050516_090000_20100516_090000	Gain (CG_16_a) *
MIP_CG1_AXVIEC20051115_150747_20050517_190000_20100517_190000	Gain (CG_16_b) *
MIP_CG1_AXVIEC20051115_150831_20050519_040000_20100519_040000	Gain (CG_16_c) *
MIP_CG1_AXVIEC20051115_150940_20050520_140000_20100520_140000	Gain (CG_16_d) *
MIP_CG1_AXVIEC20050524_081749_20050522_000000_20090522_000000	Gain calibration (CG_17)

3.4 Appendix D – Level 0 and Level 1 anomaly status

3.4.1 MIPAS WRONG CONSOLIDATED PRODUCTS

LRAC wrong consolidated L0 products (type "O" from cycle 7, 10, 11; end of 2002) were ingested into the D-PAC database and processed to L1 and L2 anomalous products. There was a bug in the LRAC consolidation at that time, this bug was fixed later and in general is not found in the consolidated "P" products. As a result in D-PAC L1/L2 archive (from the end of 2002) you can find wrong products: the consolidated data are shorter than unconsolidated near-real-time ones (type N).

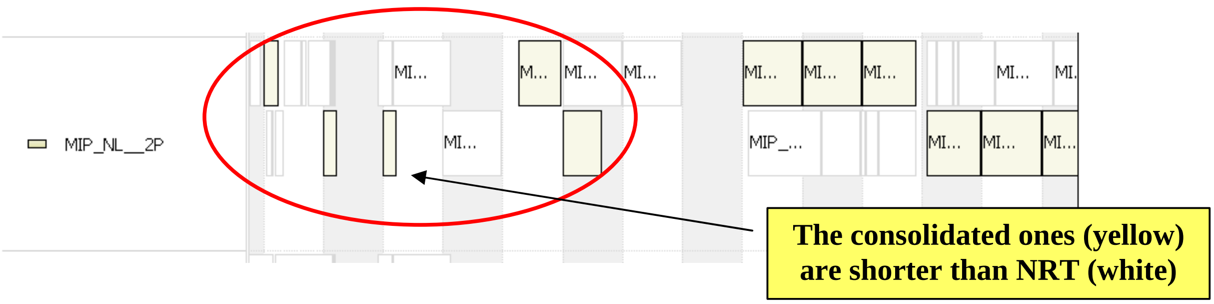


Figure 28 GANNT chart showing the anomaly in the consolidation of L2 "O" products.

The wrong consolidated orbits have been identified; a list was provided to QWG and can be found on Uranus ftp server (/MIPAS/To_QWG/Wrong_MIPAS_consolidated_Products.xls).
These products were deleted from D-PAC and re-consolidated at LRAC.

3.4.2 EXCESSIVE NUMBER OF MISSING ISPS IN THE MPH FOR MIPAS L0 PRODUCTS

Several MIPAS level 0 products have excessive NUM MISSING ISPS in the MPH, while the content of the products is correct. An example of this anomalous number can be found for the following product:

MIP_NL__0PNPDE20060209_020145_000033732045_00032_20627_0104.N1

In the MPH we find:
NUM_MISSING_ISPS=+0002102752
MISSING_ISPS_THRESH=+0.00000000E+00
NUM_DISCARDED_ISPS=+0000000000
DISCARDED_ISPS_THRESH=+0.00000000E+00
NUM_RS_ISPS=+0000000000
RS_THRESH=+0.00000000E+00

The investigation on the ground segment has demonstrated that the problem is due to the L0 processing of the MIPAS instrument source packets. The problem was resolved since Dec 2006 after the switch of the "new" FEOMI infrastructure with the EXTPS module.

3.4.3 NON-VALID BAND A AT THE SAME GEO-LOCATION

As can be observed in the following plot corrupted sweeps in band A are always found at the same geo-location (level 1b OFL consolidated products type "P"). The same is observed for all the other bands as can be observed in the following figure.

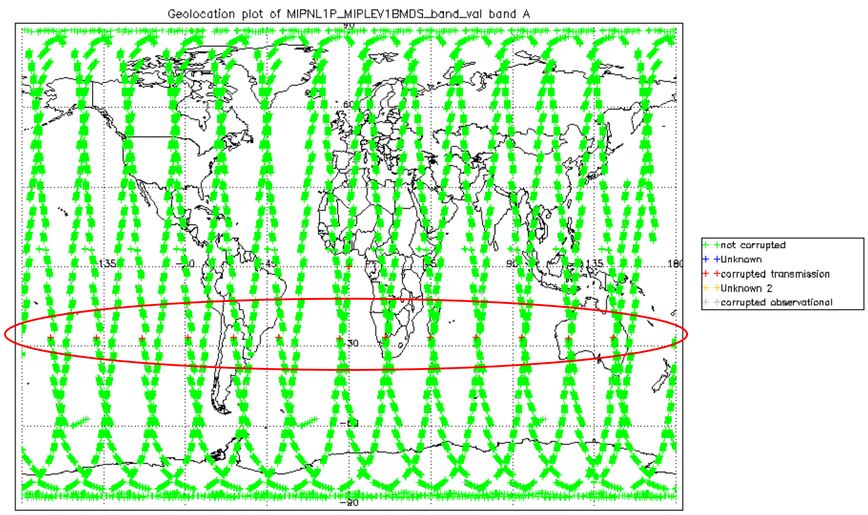


Figure 29 Corrupted sweeps are observed always at the same geo-location for these OFL L2 products of 10 March 2004 processed at D-PAC.

The investigation of the anomaly is now closed, since the reason of the problem has been recognized as an implementation error in the IPF, indeed the error is not obtained with the prototype.
The problem is the following: the IPF (version 4.61 up to 4.65) generates L1b products with wrong "NUM_DSR" value in the MPH; in particular this value is one unit higher than the "TOT_SCAN" value, while the two should be the same. As a result the Quadas tool recognize as corrupted the last scan of each orbit because the corresponding DSR is empty. For consolidated product this gives the same corruption at the same latitude for all the orbits (as observed in the figure above).
This problem was corrected within IPF 4.67 even though a discrepancy between the prototype and the IPF number of scans still remains.

3.4.4 WRONG MIPAS L1 PRODUCT IN D-PAC SERVER

One L1 product in D-PAC ftp server is corrupted (see red crosses in Figure 30), the product was generated using one outdated ADF. The product name is:
MIP_NL__1PPDPA20051002_233211_000060362041_00188_18779_0667.N1
The IPF used the following outdated ADF:
MIP_CO1_AXVIEC20050705_134752_20050703_044401_20100703_044401
instead of the correct ADF:
MIP_CO1_AXVIEC20051003_180613_20050926_000000_20100926_000000

The other L1 ADFs of this day were correctly selected by the IPF. To be understood why the IPF used this ADF and why the problem occurred only for this product and only with the MIP_CO1_AX aux file.
The investigation by Task 4 shows that the source of the problem is a wrong auxiliary file selection by PFHS; the problem seems to be the same than the one described in OARs 2009 and 1845. The wrong MIPAS product has been removed and reprocessed at D-PAC, the new filename is:
MIP_NL__1PPDPA20051002_233211_000060362041_00188_18779_1478.N1

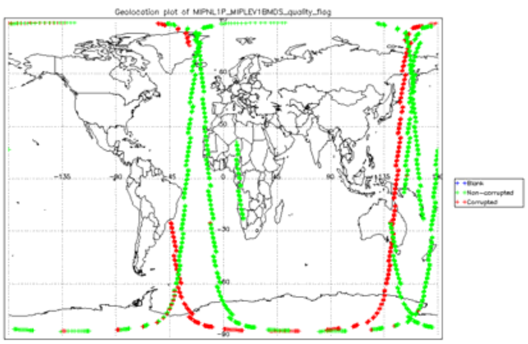


Figure 30 L1b PCD quality flag, corrupted sweep detected for 3 Oct 2005 L1b spectra

3.4.5 BADLY CALIBRATED L1B DATA DURING 3 – 23 JUNE 2005

The quality control of RR data generated OFL at D-PAC shows that a series of L1 spectra were highly corrupted due to a wrong calibration. This anomaly affects the L1 products corresponding to the following mission interval:

3 – 23 June 2005. Orbit # 17039 – 17332
29 Jul – 11 Aug 2005. Orbit # 17835 – 18021

M. Hopfner (IMK) detects this problem by carrying out a systematic calculation of the clouds top heights for all the L1b spectra processed at D-PAC. The cloudy sweeps were detected using the colour index, calculated as the ratio of the integrated radiance in two specific MWs of the band A. We can see the excessive cloud top height value found on 23 June 2005 (see Figure 31).

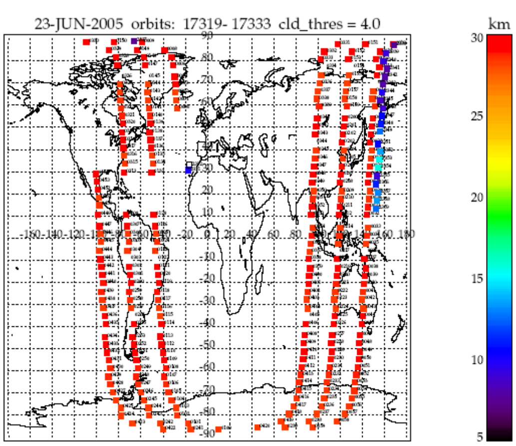


Figure 31 Cloud top height calculated by M. Hopfner (IMK) for 23 June 2005, the red points are due probably to a corruption in the band A spectrum.

The problem was also detected with the quality monitoring tool in ESRIN; in fact looking at the NESR level of 23 June 2005 we can see excessively high value (see red lines in the Figure 32). The two plots highlights the same anomaly in the spectra, indeed by the end of the day, when the cloud top height stops to be unrealistically high also the NESR comes back to nominal level, this is exactly the time when the correct ADF starts to be used by the processor. The problem is therefore due to a wrong calibration ADF. The first step of the investigation was to remove all the affected products from the D-PAC ftp server.

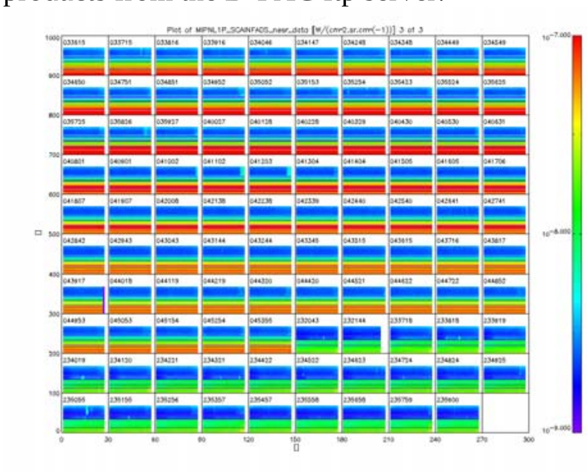


Figure 32 NESR level for different scan during 23 June 2005, each square is a scan made of 27 sweeps in nominal mode, the red lines show the anomaly of excessive high NESR, the anomaly stops when the correct ADF start to be used by the processor.

The ADFs suspected were identified and removed from all the processing centers. A first quality check (for format and scientific issue) of these ADFs didn't show any manifest anomaly; furthermore the gain calibration looks nominal, as resulted from comparison to other gain measurements of the same mission period. In order to better understand the problem we re-generate these ADFs from the same gain measurement orbit. The lists of outdated wrong ADFs and of the new ADFs are reported in the tables below. The only difference between these two sets of aux files is that the old ADFs were created from L0 NRT data, while the new ones are obtained from consolidated L0 products.

Table 20 List of wrong ADFs used by the OFL processor, which causes the anomaly of badly calibrated L1 data.

MIP_CS1_AXVIEC20051115_101936_20050601_082740_20090601_000000 MIP_CO1_AXVIEC20051115_101908_20050601_082740_20090601_000000 MIP_CG1_AXVIEC20051115_141026_20050601_082740_20090601_000000
MIP_CS1_AXVIEC20050627_084317_20050609_000000_20090609_000000 MIP_CO1_AXVIEC20050617_090408_20050609_000000_20090609_000000 MIP_CG1_AXVIEC20050617_090045_20050609_000000_20090609_000000
MIP_CS1_AXVIEC20050721_081614_20050616_000000_20090616_000000 MIP_CO1_AXVIEC20050617_132252_20050616_000000_20090616_000000 MIP_CG1_AXVIEC20050617_132141_20050616_000000_20090616_000000
MIP_CS1_AXVIEC20051115_102512_20050729_005430_20100729_000000 MIP_CO1_AXVIEC20051115_102420_20050729_005430_20100729_000000 MIP_CG1_AXVIEC20051115_141830_20050729_005430_20100729_000000

Table 21 List of new ADFs generated for repairing the anomaly.

MIP_CS1_AXVIEC20060524_152132_20050601_000000_20100601_000000 MIP_CO1_AXVIEC20060524_150040_20050601_000000_20100601_000000 MIP_CG1_AXVIEC20060524_152144_20050601_000000_20100601_000000
MIP_CS1_AXVIEC20060524_152232_20050609_000000_20100609_000000 MIP_CO1_AXVIEC20060525_080629_20050609_000000_20100609_000000 MIP_CG1_AXVIEC20060524_152244_20050609_000000_20100609_000000
MIP_CS1_AXVIEC20060524_152325_20050616_000000_20100616_000000 MIP_CO1_AXVIEC20060524_171909_20050616_000000_20100616_000000 MIP_CG1_AXVIEC20060524_152334_20050616_000000_20100616_000000
MIP_CS1_AXVIEC20060524_152430_20050729_000000_20100729_000000 MIP_CO1_AXVIEC20060524_172132_20050729_000000_20100729_000000 MIP_CG1_AXVIEC20060524_152419_20050729_000000_20100729_000000
MIP_CS1_AXVIEC20060524_152523_20050808_000000_20100808_000000 MIP_CO1_AXVIEC20060524_172132_20050808_000000_20100808_000000 MIP_CG1_AXVIEC20060524_152537_20050808_000000_20100808_000000

Comparing the two sets of ADFs we observed an anomaly in the off-set calibration data set (MIPAS OFFSET VECTOR field in the MIP_CO1_AX ADF). The interferogram (IGM) recorded during the deep-space scene is compared for the old and the new ADF in the following figures. The IGM of the old ADFs looks really different, the maximum being much less pronounced with respect to the new offset calibration ADF.

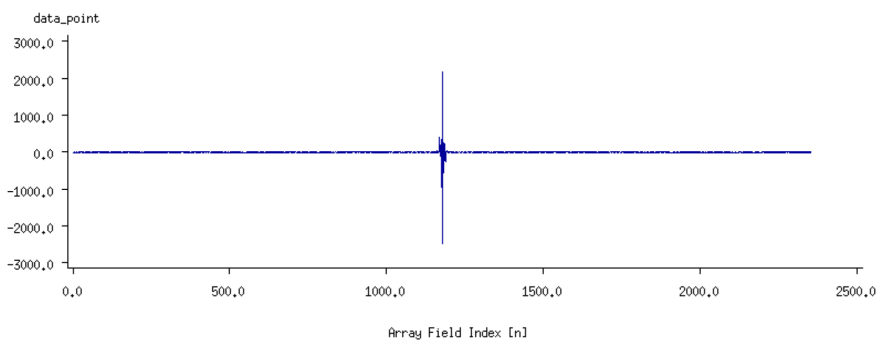


Figure 33 IGM recorded in the deep space measurement and stored in the wrong ADF.

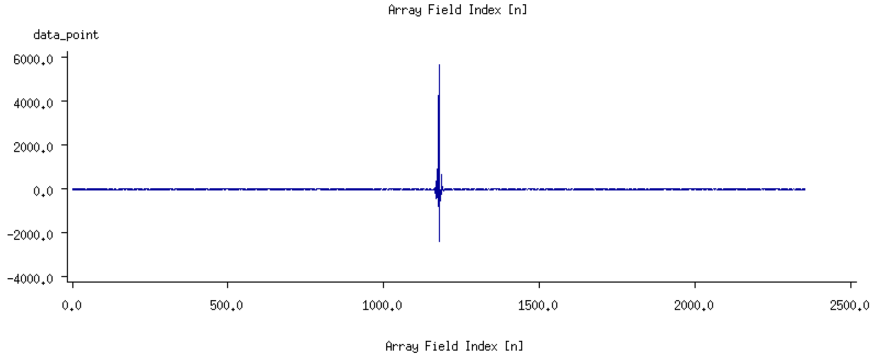


Figure 34 IGM recorded in the deep space measurement and stored in the new correct ADF.

The problem appears to be due to the offset calibration auxiliary file (MIP_CO1_AX). As a second step we generate two L1 prototype products from the same level 0, using respectively the old and the new set of ADFs. The comparison of the two resulting level 1 products is presented in the following figures. The comparison of the calibrated spectra shows that the use of the old MIP_CO1_AX file introduces a strange offset in the spectra, while the new set of ADFs allows a correct calibration of the measurements.

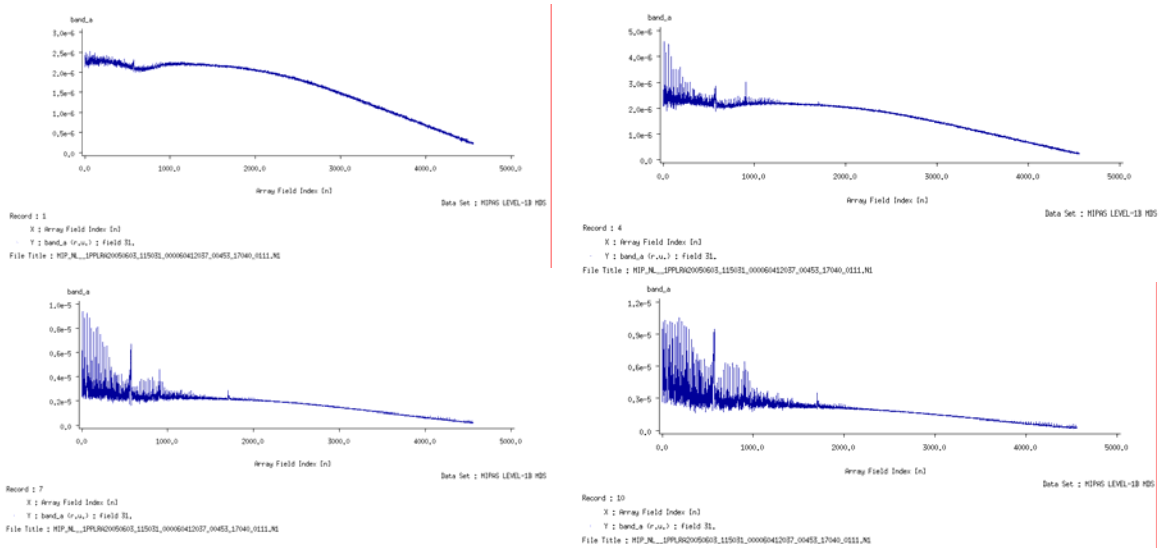


Figure 35 Example of badly calibrated spectra obtained with the old ADFs.

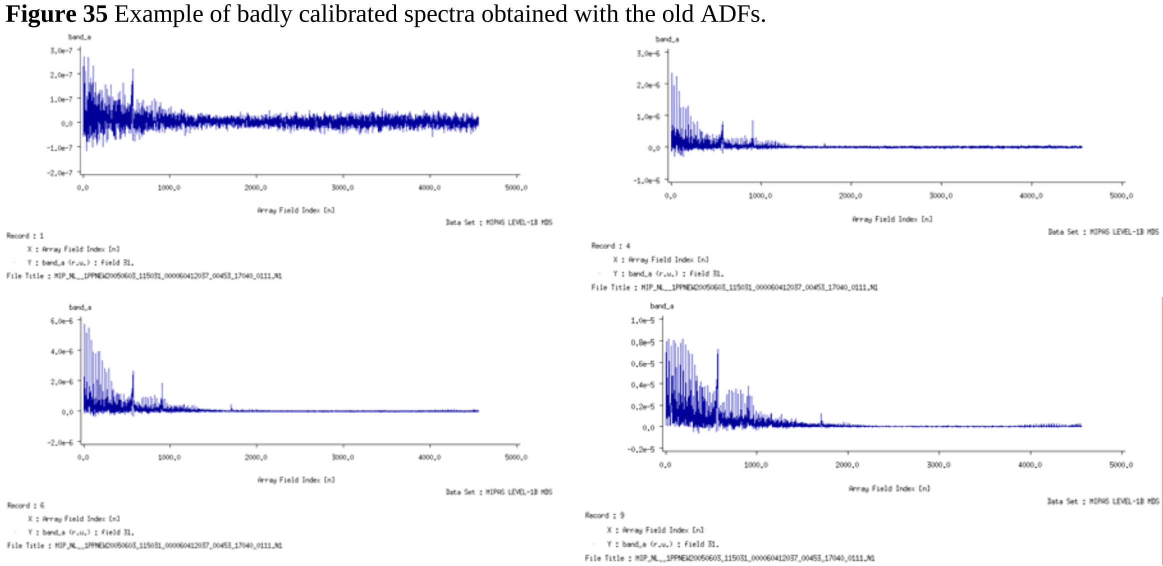


Figure 36 Example of correctly calibrated spectra obtained with the new ADFs.

The reason for these results was anyhow not fully clear; in fact the MIP_CO1_AX file is not used by the processor for the offset calibration of the spectra, for this calibration the IPF is using the closest offset scene contained in the L0 product. Note that one offset measurement is made every 4 MIPAS scans, which means that each L0 products contains several offset scenes. This choice is due to the fact that the instrument self-emission strongly depends on the platform position (e.g.: illumination) along the orbit; therefore in order to improve the quality of the offset calibration, the closest offset scene from the L0 product is used, instead of using the ADF. Support was requested to Bomem to understand why the processor used the offset contained in the ADF instead of using one offset scene from the L0 product. Bomem explained that since the offset scene contained in the L0 product is very different from the one stored in the wrong ADF, the processor automatically flags as corrupted the off-set of the L0 and it uses the off-set of the ADF, resulting in a weird calibration. The final step of the investigation consisted in trying to understand why the calibration

algorithm (mical) generates such strange MIP_CO1_AX file. The problem is still not fully understood, it is probably related to an anomaly in the NRT L0 products.
The anomaly is now closed, since the D-PAC centre reprocessed all the affected L1 products. The list of re-processed products was delivered to QWG and can be found on Uranus (MIPAS/To_QWG/ New_L1_June-Aug_2005.txt).

3.4.6 MIPAS AIRCRAFT EMISSION MEASUREMENTS

Looking at the AE L1B file taken on 5/6 May 2005 (processed with MIGSP), the tangent altitudes seem to be approximately 2km below the 7-38 km range specified in Mission_Plan_V4.1.pdf dated 3 May 2005.
Bomem check these L1B products and the problem does not seem to be due to processing (MIGSP 2.5). The problem was found to be due to the commanding, in particular to the software (SEM mode algorithm) used for the AE measurements. The software was designed only for localized SEM measurements, such as volcano eruptions. The use of this algorithm over a wide area around the globe (such is the case of AE measurements) can lead to very important deviations owing to the earth ellipsoid. This is the cause of the deviation between the planned and measured tangent altitude for these AE measurements. In this sense the planning anomaly is closed, nevertheless Anu Dudhia reported at the QWG#8 a further anomaly affecting these products. This consists of a difference of almost 3 km between the retrieved and engineering altitude. This anomaly is not related to the planning and the investigation is ongoing in collaboration with BOMEM and OU.

3.4.7 WRONGLY CALIBRATED L1 PRODUCTS

This anomaly was detected during the daily monitoring of the L1 products of 18th April 2007 generated at D-PAC. The problem consists in a wrong calibration for the following data:

MIP_NL__1PPDPA20070418_151435_000060452057_00226_26833_2624.N1
MIP_NL__1PPDPA20070418_165526_000060292057_00227_26834_2626.N1
MIP_NL__1PPDPA20070418_183601_000060162057_00228_26835_2629.N1
MIP_NL__1PPDPA20070418_201623_000060452057_00229_26836_2630.N1
MIP_NL__1PPDPA20070418_215714_000060292057_00230_26837_2632.N1
MIP_NL__1PPDPA20070418_233749_000060162057_00231_26838_2633.N1
MIP_NL__1PPDPA20070419_011811_000060452057_00232_26839_2636.N1
MIP_NL__1PPDPA20070419_025902_000060292057_00233_26840_2637.N1
MIP_NL__1PPDPA20070419_043937_000060162057_00234_26841_2638.N1
MIP_NL__1PPDPA20070419_061958_000060452057_00235_26842_2639.N1
MIP_NL__1PPDPA20070419_080049_000060292057_00236_26843_2645.N1

The anomaly was detected by looking at the NESR values (see Figure 37). The problem consisted in excessive NESR values in the band AB and B and was due to the usage of a wrong MIP_CO1_AX file. If the input MIP_CO1_AX is very different from the offsets in the L0 product, all the offsets are flagged as invalid and the IPF uses the input MIP_CO1_AX as the good offset and subtract it from the scene. In this case, the ZPD position of the offset and the ZPD position of the scene are mostly not aligned creating this oscillation in the calibrated spectrum. This oscillation effect was already observed in the past in case of usage of a wrong MIP_CO1_AX auxiliary file, it can be observed also in the products of 19th April 2007 as shown in Figure 38.
These products were deleted from D-PAC archive and reprocessed using correct auxiliary files.

Figure 37 NESR value during 18th Apr 2007. The red stripes show the anomaly consisting in excessive NESR values in the band AB and B.

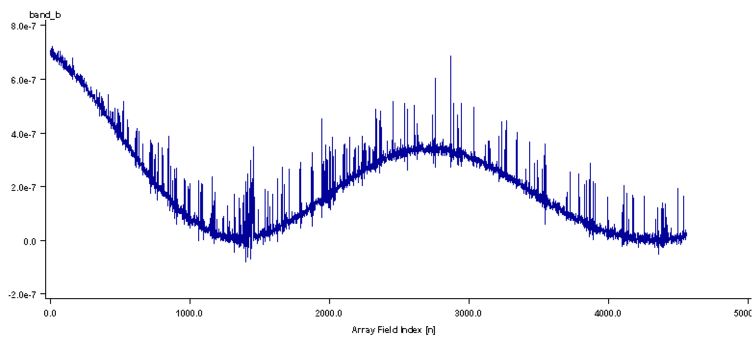


Figure 38 Band B spectrum for orbit 26839 measured on 19th April 2007.

The corrupted products have been reprocessed at D-PAC, below is the list of the re-processed data:

MIP_NL__1PPDPA20070418_151435_000060452057_00226_26833_0940.N1
MIP_NL__1PPDPA20070418_165526_000060292057_00227_26834_0012.N1
MIP_NL__1PPDPA20070418_183601_000060162057_00228_26835_0927.N1
MIP_NL__1PPDPA20070418_201623_000060452057_00229_26836_0932.N1
MIP_NL__1PPDPA20070418_215714_000060292057_00230_26837_0929.N1
MIP_NL__1PPDPA20070418_233749_000060162057_00231_26838_0930.N1
MIP_NL__1PPDPA20070419_011811_000060452057_00232_26839_0931.N1
MIP_NL__1PPDPA20070419_025902_000060292057_00233_26840_0933.N1
MIP_NL__1PPDPA20070419_043937_000060162057_00234_26841_0934.N1
MIP_NL__1PPDPA20070419_061958_000060452057_00235_26842_0935.N1
MIP_NL__1PPDPA20070419_080049_000060292057_00236_26843_0936.N1

3.4.8 ANOMALOUS SCAN PATTERN

On 21 May Anu Dudhia (OU) reported an anomalous scan pattern that was performed in the period 3-11 April 2007, in particular the following measurement pattern was adopted:

- 22-sweep scans
- tangent heights from 101 to 37 Km, at 6 Km steps
- each tangent altitude scanned twice

The altitudes of these measurements as a function of ANX are presented in Figure 39.

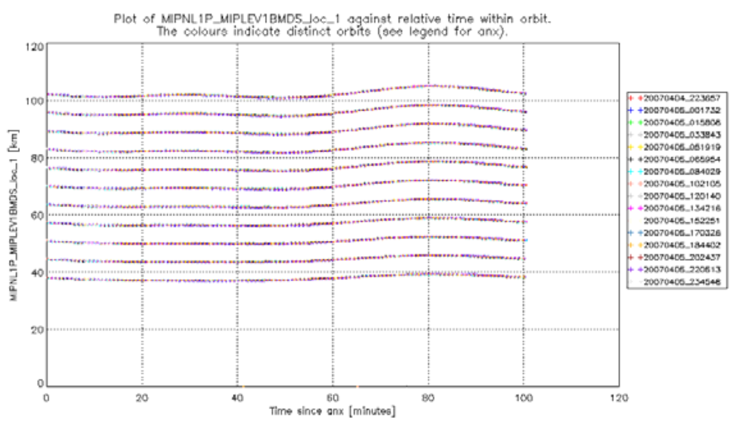


Figure 39 Altitude of the measured sweeps as a function of ANX for the anomalous scan pattern.

The investigation shows that the CTI tables were not correctly up linked to the platform. In fact when the CTI table were supposed to be sent there was a planned unavailability due to the OCM. As a result the instrument starts the measurement without all the correct CTI tables even though the planning was correctly prepared.

All the measurements taken during 3 – 11 April 2007 have this anomalous scan pattern and the L2 processing of these data will be strongly affected.

3.5 Appendix E – Level 2 IPF historical updates

The historical updates to the MIPAS Level 2 IPF processor are listed hereafter:

- **Version V4.67** the following updates were introduced for L2 processing:
  - Fixed NCR-1458 → NO2 MIPAS products relative to orbit #7000 (3 July 2003) came with high values of chi2, that were not reproduced in the retrievals performed with the prototype using the same set of auxiliary files.
  - Fixed NCR-1521 → Some Level 2 products processed at DPAC with IPF 4.62 differ from the corresponding products processed with IPF 4.61, revealing a problem in the new 4.62 data. In fact the IPF 4.61 results were carefully validated using a balloon flight with very good space and time collocation.
  - Fixed NCR-1522 → Some L2 products processed at DPAC with IPF 4.61 and IPF 4.62 give beat-check format error. The same L2 production made with the prototype doesn't show this anomaly.

- **Version V4.65** (aligned with DPM 4.1 and ADFs V5.1, under validation) introduces modifications only for the Level 2 processor, with the following update:
  - Solution of NCR_1310: Problem with MIP_NL__2P
- **Version V4.64** no update for the Level 2 processor in this version
- **Version V4.63** (aligned with DPM 4.1 and ADFs V5.1) has introduced the following modifications:
  - Processing of reduced resolution measurements in old configuration (17 sweeps per scan and fixed altitude – August/September 2004 measurements).
  - Solution of NCR_1278: Some MIPAS profiles have zero pressure
  - Solution of NCR_1308: MIPAS Level 2 failure.
  - Rejection of NCR_1310: Problem with MIPNL__2P
  - Rejection of NCR_1317: One second discrepancy in IPF 4.61
- **Version V4.62** (aligned with DPM 4.0) has solved the following problems:
  - Fixed NCR_1128: Cloud-detection anomaly.
  - Fixed NCR_1275: Inconsistent values in MIPAS files.
  - Fixed NCR_1276: Level2 profile counting bug.
- **Version V4.60, V4.61** has solved the following problems:
  - Fixed NCR_992: Inconsistency in number of profiles in MIPAS Level_2.
  - Fixed NCR_1068: Number of computed residual spectra not consistent with the number of observations.
- **Version V4.59**, operational since 23 July 2003, has introduced only Level 2 processing modifications. The main improvements introduced via both the processor V4.59 and the installation of a new set of ADFs have been:
  - Fixed NCR_892: Inconsistency in number of scans.
  - Fixed NCR_893: Different values for same scans.
  - The cloud filtering (that is, every time a cloud is detected at a given altitude, the retrieval is performed only above that altitude)
  - The removal of the gaps between the altitude validity ranges (allowing retrievals in the Antarctic region not feasible with the old MIP_MW2_AX)
  - Altitudes margins fixed to +/- 4 km

- MIPAS-SPR-MAINT-0011 Wrong DSD name in L2 product in case of not requested VMR
- MIPAS-SPR-MAINT-0012 Filling of SPH field 22 of MIPAS Level 2 ProductsMIPAS-SPR-MAINT-0013 Filling of the MIPAS MPH and MIPAS Level 2 SPH fields
- MIPAS-SPR-MAINT-0014 Wrong writing of PCD String to the PCD Information ADS
- MIPAS-SPR-MAINT-0015 Too strong test and skipping retrieval
- MIPAS-SPR-MAINT-0016 Not initialised nucl1 and nucl2 in R 8.5.6.3-7A
- ENVI-GSOP-EOAD-NC-03-0539 MIPAS L2 processing aborted

3.6 Appendix F – Level 2 ADF historical updates

The Level 2 ADF files historical deliveries by IFAC are reported in the following table and paragraph. Version 4 corresponds to a set of ADFs for processing of full resolution measurements, with the noise level adjusted for when the interferometer heaters are switched-on and a flag set for processing of only nominal measurements. Version 5 corresponds to ADFs for processing of reduced spectral resolution measurement (17 sweeps operations), so is able to process the measurements done in the Aug-Sept 2004 period.

Table 22. Historical update of Level 2 configuration ADFs.

Auxiliary Data File	Start Validity	Description
ADFs V5.2 MIP_CS2_AXVIEC20060105_121012_20040809_000000_20040917_220643 MIP_IG2_AXVIEC20060105_113531_20040901_000000_20040917_220643 MIP_IG2_AXVIEC20060105_114108_20040809_000000_20040901_000000 MIP_MW2_AXVIEC20060105_130642_20040809_000000_20040917_220643 MIP_OM2_AXVIEC20060105_130954_20040809_000000_20040917_220643 MIP_PI2_AXVIEC20060105_131141_20040809_000000_20040917_220643 MIP_PS2_AXVIEC20060105_131340_20040809_000000_20040917_220643 MIP_SP2_AXVIEC20060105_131744_20040809_000000_20040917_220643	9-AUG-04	Correction of a bug in the previous L2 ADF v5.1 MIP_IG2_AX, MIP_SP2_AX
ADFs V5.1 MIP_CS2_AXVIEC20050722_082136_20040809_000000_20040917_220643 MIP_IG2_AXVIEC20050721_130007_20040809_000000_20040901_000000 MIP_IG2_AXVIEC20050721_134702_20040901_000000_20040917_220643 MIP_MW2_AXVIEC20050721_144629_20040809_000000_20040917_220643 MIP_OM2_AXVIEC20050721_143058_20040809_000000_20040917_220643 MIP_PI2_AXVIEC20050721_142545_20040809_000000_20040917_220643 MIP_PS2_AXVIEC20050721_141630_20040809_000000_20040917_220643 MIP_SP2_AXVIEC20050721_140636_20040809_000000_20040917_220643	9-AUG-04	For processing RR measurement with fixed altitude and old vertical sampling
ADFs V3.8 NRT MIP_PS2_AXVIEC20040421_095623_20040326_143428_20090326_000000 Off-line MIP_PS2_AXVIEC20040421_095923_20040326_143428_20090326_000000	26-MAR-04	With respect to V3.7, adjusted the threshold to the new noise level.
ADFs V3.7: NRT MIP_MW2_AXVIEC20031021_145505_20020706_060000_20080706_060000 MIP_OM2_AXVIEC20040302_110723_20020706_000000_20080706_000000 MIP_PS2_AXVIEC20040302_110923_20040109_000000_20090209_000000 MIP_PI2_AXVIEC20031021_145745_20020706_060000_20080706_060000 MIP_CS2_AXVIEC20031021_145337_20020706_060000_20080706_060000 MIP_SP2_AXVIEC20031021_150016_20020706_060000_20080706_060000 Off-line MIP_MW2_AXVIEC20031027_100858_20020706_060000_20080706_060000 MIP_OM2_AXVIEC20040302_110823_20020706_000000_20080706_000000 MIP_PS2_AXVIEC20040302_111023_20040109_000000_20090209_000000 MIP_PI2_AXVIEC20031027_101146_20020706_060000_20080706_060000 MIP_CS2_AXVIEC20031027_100559_20020706_060000_20080706_060000 MIP_SP2_AXVIEC20031027_101441_20020706_060000_20080706_060000	06-JUL-02 and 09-JAN-04	With respect to V3.6: Eliminated scans with one or two altitude levels; adjusted the threshold to the new noise level.
MIP_IG2_AXVIEC20040227_081527_20040301_000000_20090301_000000	01-MAR-04	Seasonal update of climatological initial guess.
MIP_IG2_AXVIEC20031118_151533_20031201_000000_20081201_000000	01-DEC-03	Seasonal update of climatological initial guess.
ADFs V3.6: NRT MIP_MW2_AXVIEC20031021_145505_20020706_060000_20080706_060000 MIP_OM2_AXVIEC20031021_145630_20020706_060000_20080706_060000	06-JUL-02	Activation of cloud detection; removal of the gaps between the altitude validity ranges; altitudes margins fixed to +/-

MIP_PS2_AXVIEC20031021_145858_20020706_060000_20080706_060000 MIP_PI2_AXVIEC20031021_145745_20020706_060000_20080706_060000 MIP_CS2_AXVIEC20031021_145337_20020706_060000_20080706_060000 MIP_SP2_AXVIEC20031021_150016_20020706_060000_20080706_060000 Off-line MIP_MW2_AXVIEC20031027_100858_20020706_060000_20080706_060000 MIP_OM2_AXVIEC20031027_101029_20020706_060000_20080706_060000 MIP_PS2_AXVIEC20031027_101319_20020706_060000_20080706_060000 MIP_PI2_AXVIEC20031027_101146_20020706_060000_20080706_060000 MIP_CS2_AXVIEC20031027_100559_20020706_060000_20080706_060000 MIP_SP2_AXVIEC20031027_101441_20020706_060000_20080706_060000		4 km; short-term ILS bug fix. **NRT** Old convergence criteria; nominal altitude range. **Off-line** Improved convergence criteria; altitude range extended to 6-68 km.
MIP_IG2_AXVIEC20030731_134035_20030901_000000_20080901_000000	01-SEP-03	Seasonal update of climatological initial guess.
MIP_IG2_AXVIEC20030522_104714_20030601_000000_20080601_000000	01-JUN-03	Seasonal update of climatological initial guess.
MIP_IG2_AXVIEC20030307_142141_20030310_000000_20080301_000000	10-MAR-03	Seasonal update of climatological initial guess: This dissemination substitute the corrupt file disseminated previously.
MIP_IG2_AXVIEC20030214_130918_20030301_000000_20080301_000000	01-MAR-03	Seasonal update of climatological initial guess: This auxiliary file turned out to be corrupt, and a corrected version has been disseminated on 10 March 2003.
ADFs V3.1: MIP_MW2_AXVIEC20030722_134301_20030723_000000_20080722_000000 MIP_OM2_AXVIEC20030722_134602_20030723_000000_20080722_000000 MIP_PS2_AXVIEC20030722_102142_20030723_000000_20080722_000000 MIP_PI2_AXVIEC20030722_134848_20030723_000000_20080722_000000 MIP_CS2_AXVIEC20030722_133331_20030723_000000_20080722_000000 MIP_SP2_AXVIEC20030722_093046_20030723_000000_20080722_000000	23-JUL-03	Cloud detection enabled and improved validity mask range in Microwindows files; improved Occupation Matrices (no gaps between altitude validity ranges).

3.7 Appendix G – Level 2 anomaly status

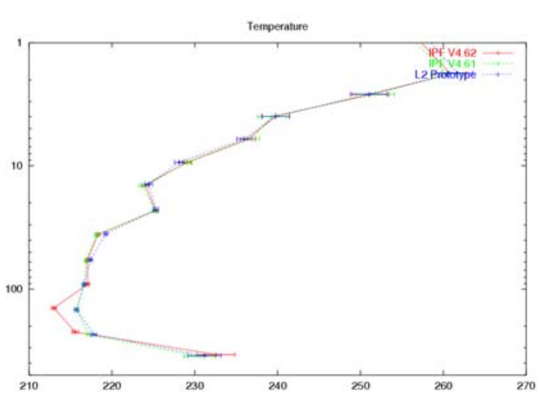
3.7.1 EXCESSIVE CHI-SQUARE

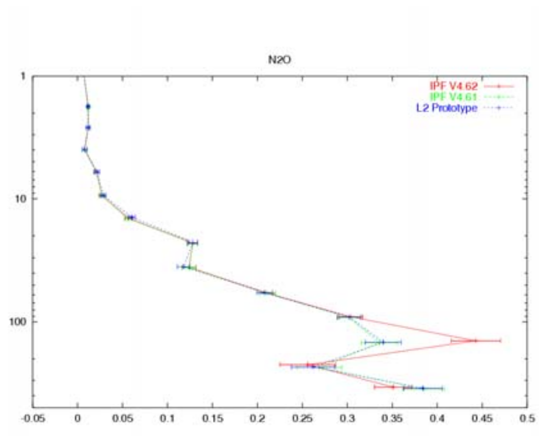
NO2 MIPAS products for orbit #7000 (3 July 2003) came with high values of chi2, that were not reproduced in retrievals performed with the prototype using the same aux files set. This NCR 1458 was classified as critical and is going to be analyzed by the IPF developers.

The first analysis by DJO shows that we were actually looking at an implementation error, then a bug in the IPF. DJO found a bug in the code in the 'Compute Optimum Estimate for Temperature/VMR' R 8.2.8.7-6. There was a wrong assignment of PS2 setting for Eo, po, grad E and Cr1 to the corresponding profile. After correction of this bug the IPF and prototype NO2 chi2 values for these orbit show to be the same. A patched version of the IPF will be delivered by DJO (4.66).

3.7.2 DIFFERENCE ON L2 PRODUCTS BETWEEN V4.61 AND V4.62

Some Level 2 products processed at D-PAC with IPF 4.62 differ from the corresponding products processed with IPF 4.61. Since the IPF 4.61 products were validated using one IMK balloon flight (with a very good space/time coincidence), this discrepancy reveals a problem in the new 4.62 data. In particular the most significant differences were detected for seq. # 16 of orbit 2975 (measured on 24 Sept 2002) for T, N2O and CH4 profile at low altitude (around 140 hPa). This anomaly on 4.62 L2 products was not observed with the prototype, which is in accordance with 4.61 data and with the reference balloon profiles. The following three figures show the tests made by IFAC on seq. no. 16 of orbit 2975 with Level 2 prototype using the same input data as the operational processor. This test confirms that the anomalous results in the ESA processor V4.62 cannot be reproduced with the prototype. In the following plots all the results by IPF 4.62, IPF 4. 61 and L2 prototype are reported for T, N2O and CH4 profiles (the profiles for which the most significant discrepancies have been detected). This problem was corrected with IPF 4.67 delivery.





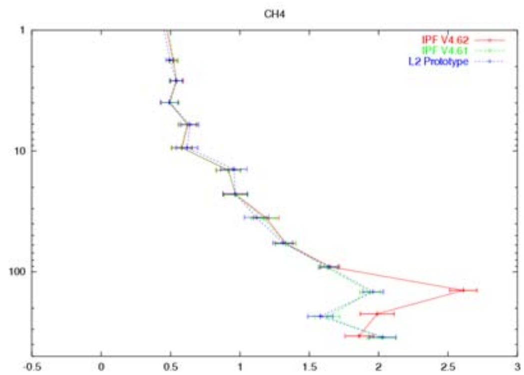


Figure 40 Temperature N2O and CH4 profiles as a function of pressure retrieved with IPF 4.62 and 4.61 compared to the prototype for seq. 16 of orbit 2975. The 4.61 profile is the reference, validated by a IMK balloon flight.

3.7.3 NO2 RETRIEVAL DURING POLAR CONDITION

NO2 profiles of OFL products during Antarctic winter (June 2003) show unrealistically high value in the low stratosphere and in general they present a degradation of the NO2 profiles (zigzagging zero value). This happens in correspondence of very high NO2 in the stratosphere. The same behavior was observed with the prototype (see plots below).

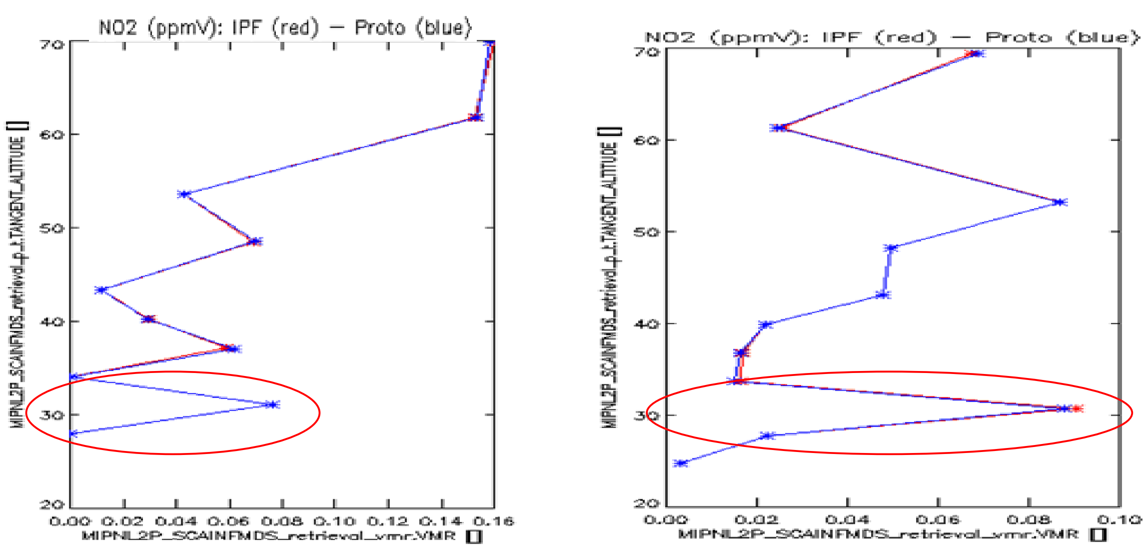


Figure 41 NO2 profiles obtained with the IPF and prototype for two particular scan of 6 June 2003 in Antarctic winter condition, highlighted in red are the region around 30 km with sudden increase of NO2 value, which has no physical meaning. Note the degraded profile shape, namely the zigzag and the zero value.

The investigation done by IFAC arrives at the following conclusions:

- It seems that the cause of the instabilities in the NO2 profile for the analyzed scans is the saturation of NO2 lines below 43 km
- No significant improvements were obtained when adding other micro-windows in the OM from the current NO2 MW database
- The micro window selection should consider the case of enhanced NO2 concentration.

3.7.4 MISSING L2 PROFILES AOURND THE SOUTH POLE

An anomaly on L2 OFL data of the FR mission was reported by Chiara Piccolo (OU). The problem is that several L2 products from July to Nov 2002 have missing data around the South Pole; the anomaly can be observed in Figure 42 where the number of successful retrieval is plotted as a function of geo-location. In this figure we observe that all the retrievals around the South Pole failed, in particular the processing chain fails already with the pT retrieval.

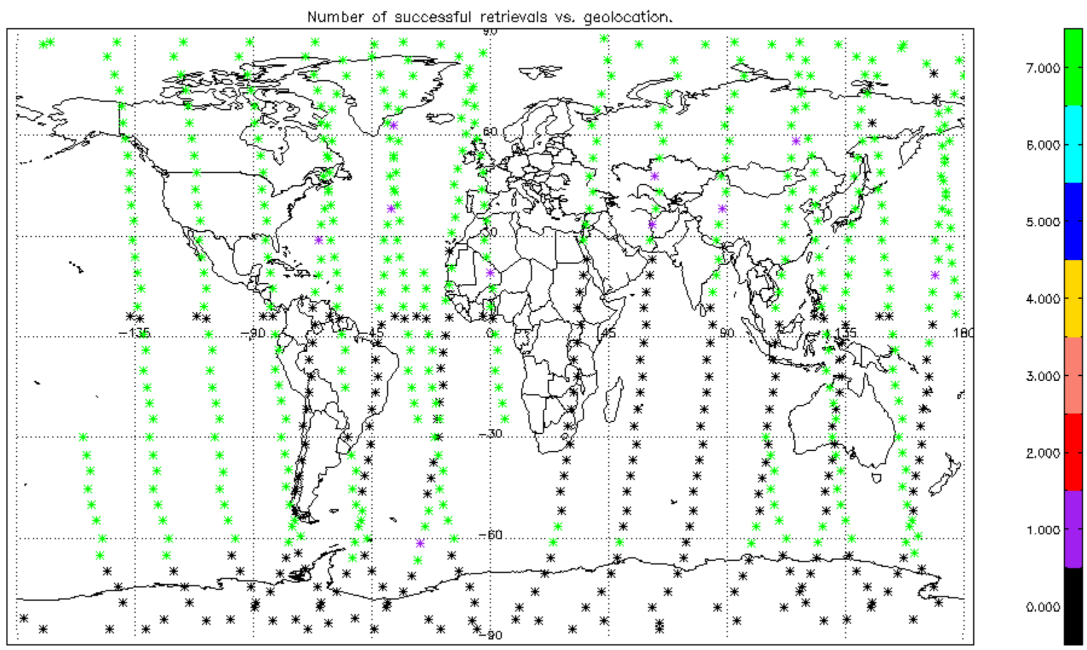


Figure 42 MIPAS number of successful retrieval for 25 July 2002. Note that 7 is the nominal value corresponding to the target species of the ESA MIPAS products. Zero value means that the retrieval fails already at the p-T stage.

The anomaly was investigated in collaboration with S. Bartha (Astrium). It was found that the problem is due to a too restrictive definition of the altitude range of the OM. In the used PS2 file the maximum altitude for a sweep was fixed to 72 km. During July – Nov 2002 around the South Pole it happens that the highest sweep exceeds sometimes this upper altitude limit, in such a case the algorithm couldn't select a valid OM for p-T and the retrieval of the corresponding scan was skipped. The problem happens in particular around the South Pole where the engineering tangent altitudes are higher with respect to other latitude regions (see left plot of Figure 43), this feature already known and is due to a problem on the MIPAS pointing knowledge. It should be noted also

that the 72km limit is exceeded several times from July to November 2002, while afterwards the maximum of tangent altitude remains lower than the critical value. This can be observed in the right panel of Figure 43, where a long term trend of the pointing is clearly noticed. This annual trend of the tangent altitude is due to a mispointing of the entire ENVISAT platform which was already discussed in the LOS long term analysis (see Figure 22). The problem was corrected on December 2003 with the upgrades of the platform s/w.
An easy solution to the problem of missing L2 profiles around the South Pole will be to relax the altitude range in the OM, however this problem will be overcame with the new algorithm baseline (ml2pp 5.00) where the floating altitude scenario will be handled.

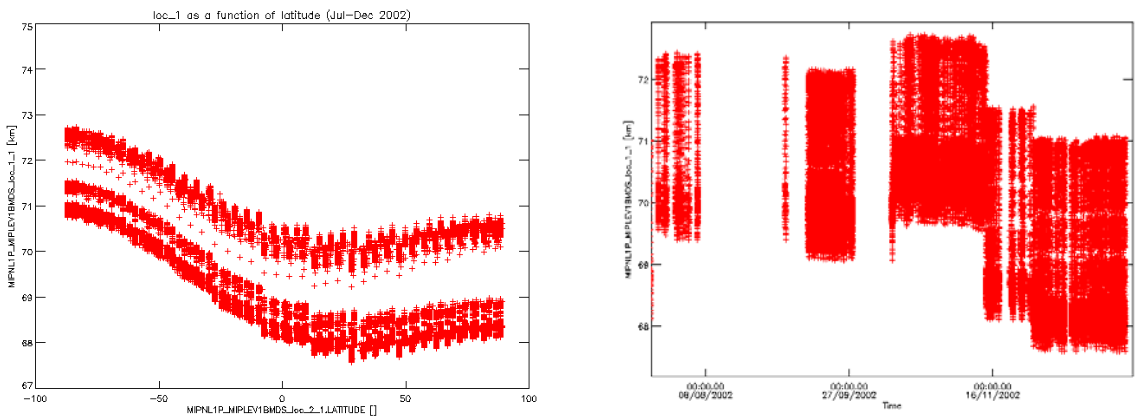


Figure 43 MIPAS engineering tangent altitude as written in the L1b files (loc_1 field) as a function of latitude and time.

3.7.5 CONTINUUM ANOMALY

This anomaly was reported by C. Bellotti (IFAC) at the QWG#10. The problem is that for some scans the operational processor retrieves continuum value even for very high altitude sweeps, while in the PS2 setting the highest altitude at which the continuum shall be fitted (rzUcl) is set to 20km. This anomaly doesn't affect the quality of the data, since when continuum is fitted for very high altitude the retrieved value is equal to zero. Nevertheless this feature is time consuming, since we spend time to retrieve a quantity which is known to be zero, moreover it was important to understand why this problem happens.
The investigation carried out with the support of S. Bartha (Astrium) highlights an anomaly in the algorithm baseline; in fact the same behaviour was observed when using the prototype. The problem appears whenever the lowest fitted sweep is above the limit defined by rzUcl parameter (20km); this can happen in case of cloud flagging or corruption of the lowermost sweeps. In these cases the algorithm has a weakness and it fits the continua for all the sweeps except for the highest one. This problem has been recognized and it was corrected within the new algorithm baseline delivery (ml2pp 5.0).