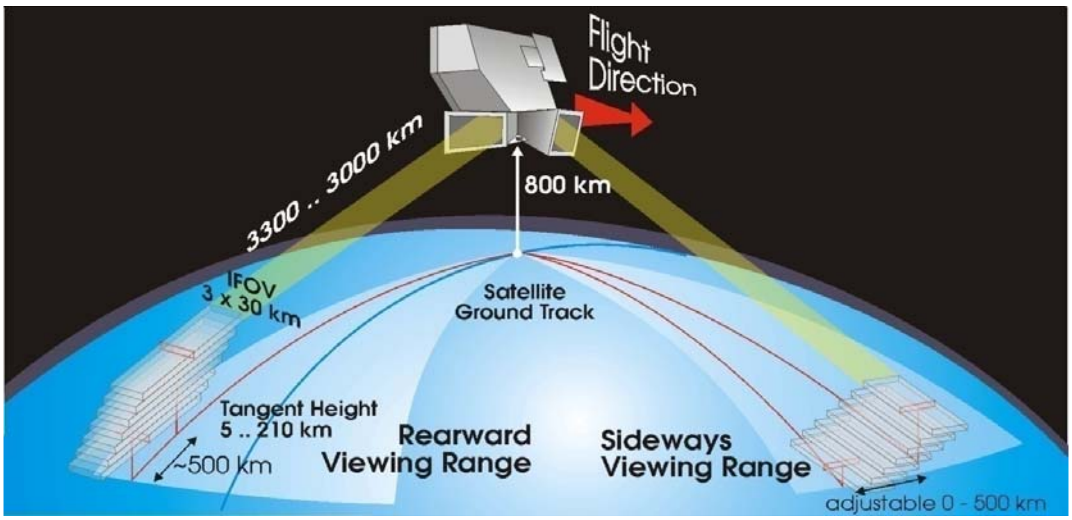
DOCUMENT

ENVISAT MIPAS MONTHLY REPORT: MARCH 2011



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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 Highlights

- **MIPAS instrument performances and operational products quality are nominal for the reporting month. The increase of IDU errors observed during November 2010 did not continue during the reporting month, and the IDU performances seem to be back to nominal status. During March 2011 three anomalies were detected due to IDU error.**
- **The MIPAS IPF 5.05 is operational in NRT and OFL centers for the generation of Level 1 and Level 2 products since June 2010. Some issues were detected in this processor version that will be fixed in the next delivery (5.06). The activation of IPF 5.06 is foreseen during the first quarter of 2011.**
- **MIPAS re-processing to Level 2 of the whole mission was completed with IPF 5.05, the products are available in the new D-PAC ftp server.**
- **The MIPAS off-line and re-processed dataset was re-organized at D-PAC in single accounts for each product type. All products for current processor version (V5) will be stored in the new server at eoa-dp.eo.esa.int. The data from the old processor version (V4) will be kept in the same server in a separate directory for about three months.**
- **The ENVISAT orbit was successfully lowered down during 22 Oct – 2 Nov 2010. The new orbit scenario will allow saving fuel and operating all payloads until end of 2013. MIPAS successfully resumed operations on 28 Oct 2010, at 9:46:48 UTC in Nominal measurement mode. The instrument performances and the products quality in the new mission phase are fully nominal.**
- **An extraordinary Ozone hole event was recorded during March 2011 above the Arctic region. A significant depletion of the ozone layer was clearly observed also with the MIPAS Level 2 operational dataset. The following plots show the Temperature, O3 and HNO3 monthly mean at 21 km for Mar 2011 compared to the same values of March 2010. These plots clearly show the extreme conditions observed during the reporting month, meaning an extremely cold area in the Polar vortex corresponding to exceptional low value of O3 and HNO3.**

Mar 2011 **Mar 2010**

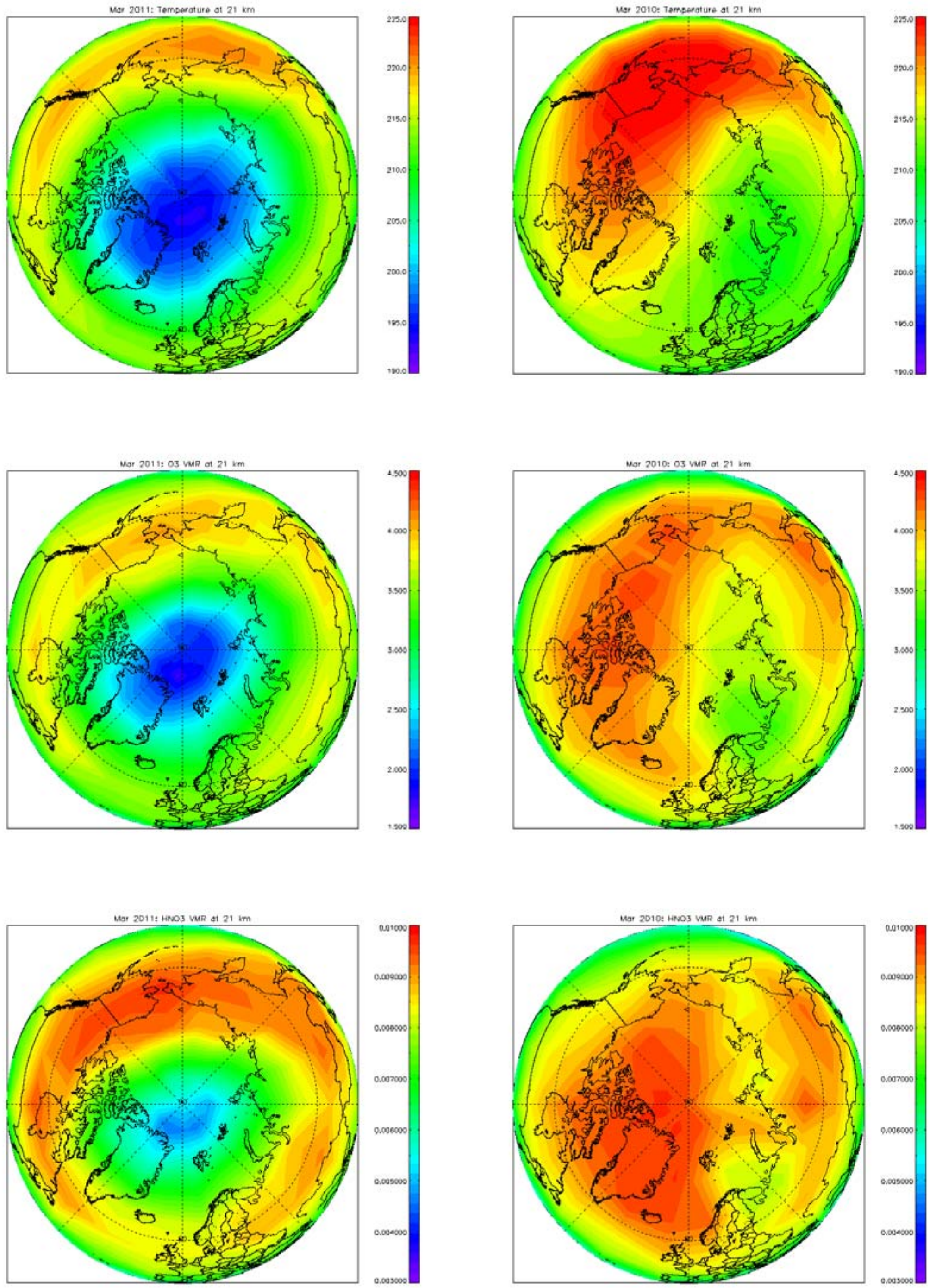

Figure 1 MIPAS Temperature, O3 and HNO3 Monthly Mean at 21 km for Mar 2011 and Mar 2010.

1.3 Report Summary

- The baseline planning was followed during this month (4 days NOM + 1 day UA + 4 days NOM + 1 day MA). Special planning operations were planned in support to the Kiruna Balloon Campaign (1st phase of ENRICHED project, 9 February - 10 March 2011). A more detailed description of the instrument planning can be found in §2.1.
- The instrument temperatures long term analysis doesn't show any significant degradation, the seasonal trend is clearly visible (see § 2.3.1).
- The interferometer performances are improving with respect to the problem observed during November 2010. The increase of IDU errors after the orbit lowering was linked to an imbalance of the motor currents for the two slides (see §2.3.2).
- The cooler performs well during the reporting month; the vibrations were well below the warning level of 8 mg (see § 2.3.3).
- The gain calibration was nominally performed during the reporting month and the associated auxiliary files were disseminated in the Ground Segment. During the reporting month the maximum of gain increase in all the MIPAS bands remains well below the acceptance criterion of 1%/week (see §3.1).
- The line-of-sight calibrations were performed nominally in the reporting month. No auxiliary files were disseminated since the mispointing remains within the chosen range of variability around the last disseminated value of -30 mdeg (see §3.2).
- MIPAS weekly NRT statistics show the improvement of the instrument performances since 2005 and the increase of duty cycle in the last years. The availability of L1 NRT products is also presented in this paragraph (see §4.2).
- The availability of L1 OFL products with respect to the expected time is stable around 95% during the last months (see §4.3).
- The analysis of the accumulated gain allows monitoring the level of detector ice contamination. During the last year 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. On a long term basis we observe that the gain in band A after each decontaminations is slightly increasing due to the loss of sensitivity in channel A (see §6.2.1).
- 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. Less and less stars are available in the last months for the LOS calibration, as a result the mispointing estimation is less precise now with respect to the beginning of mission (see §6.2.2).
- 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. The long term trend of ADC Max counts in the MIPAS channels

highlights sensitivity degradation in channel A and B (in the order of 0.2%/month). The C and D channels don't show any degradation with time (see §6.2.4).

- The monitoring of the linear spectral correction factor shows that 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 §6.2.3).
- 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 too small to impact the L1b products quality (see §6.2.5).
- NRT and OFL MIPAS daily reports for all level of production can be accessed at the following web page:
  http://earth.esa.int/pcs/envisat/mipas/reports/daily/

2 INSTRUMENT STATUS

2.1 Instrument Planning

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

- The duty cycle is set to 100% since 1st December 2007
- IDU re-initialization was dismissed since 3rd March 2008, a manual recovery is now implemented at ESOC in case of instrument anomaly
- All measurement modes 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 rearward are planned every 10 days

An overview of the measurements planned during the reporting month is presented in Table 1. The baseline planning was followed during this month (4 days NOM + 1 day UA + 4 days NOM + 1 day MA). Special planning operations requested as support to the Kiruna Balloon Campaign (1st phase of ENRICHED project, 9 February - 10 March 2011):

- Morning overpasses closest to Kiruna planned always in NOM mode (full orbits, also during the MA/UA days foreseen in the baseline)
- One SEM planned just before the 3 morning overpasses to enable predictable nominal scans latitude
- Daily RGC calibrations planned far away from the North Pole (time since ANX = 3000-3851 sec)
- RGC and LOS calibrations planned outside the 3 identified orbits above Kiruna

Special planning operations requested as support to the Kiruna Balloon Campaign (1st phase of ENRICHED project) suspended since March 11 until April 3. The 2nd phase of ENRICHED project is currently scheduled in the timeslot April 4-22.

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	Mode
1 – 4 Mar	**47057 - 47114**	NOM – Nominal
5 Mar	**47115 – 47117**	UA – Upper Atmosphere
	47118 – 47120	NOM – Nominal
	47121 – 47128	UA – Upper Atmosphere

Date	Orbit	Mode
6 – 9 Mar	**47129 – 47185**	NOM – Nominal
10 Mar	**47186 – 47189**	MA – Middle Atmosphere
	47190 – 47192	NOM – Nominal
	47193 – 47200	MA – Middle Atmosphere
11 – 14 Mar	**47201 – 47257**	NOM – Nominal
15 Mar	**47258 – 47272**	UA – Upper Atmosphere
16 – 19 Mar	**47273 – 47329**	NOM – Nominal
20 Mar	**47230 – 47344**	MA – Middle Atmosphere
21 – 24 Mar	**47345 – 47401**	NOM – Nominal
25 Mar	**47402 – 47415**	UA – Upper Atmosphere
26 – 29 Mar	**47416 – 47473**	NOM – Nominal
30 Mar	**47474 – 47487**	MA – Middle Atmosphere
31 Mar	**47488 – 47502**	NOM – Nominal

2.2 Instrument availability

The instrument unavailabilities during the reporting month are provided in the table below.

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

Start time	Stop time	Orbit		Planned	Ref	Comments
		start	stop			
9 Mar 2011 10:39:59	9 Mar 2011 13:04:16	47177	47179	No	EN-UNA-2011/0033	IDU error
11 Mar 2011 01:15:40	11 Mar 2011 01:43:00	47201	47201	No	EN-UNA-2011/0035	IDU error
14 Mar 2011 20:50:16	14 Mar 2011 20:54:16	47255	47255	Yes	EN-UNA-2011/0031	OBT full Wrap-Around
24 Mar 2011 08:36:00	24 Mar 2011 15:30:00	47392	47396	Yes	EN-UNA-2011/0043	Software cold initialization
27 Mar 2011 02:10:44	27 Mar 2011 05:23:00	47431	47433	No	EN-UNA-2011/0046	IDU error

2.3 Instrument performances

2.3.1 THERMAL PERFORMANCE

The following two plots (Figure 2 and Figure 3) 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).

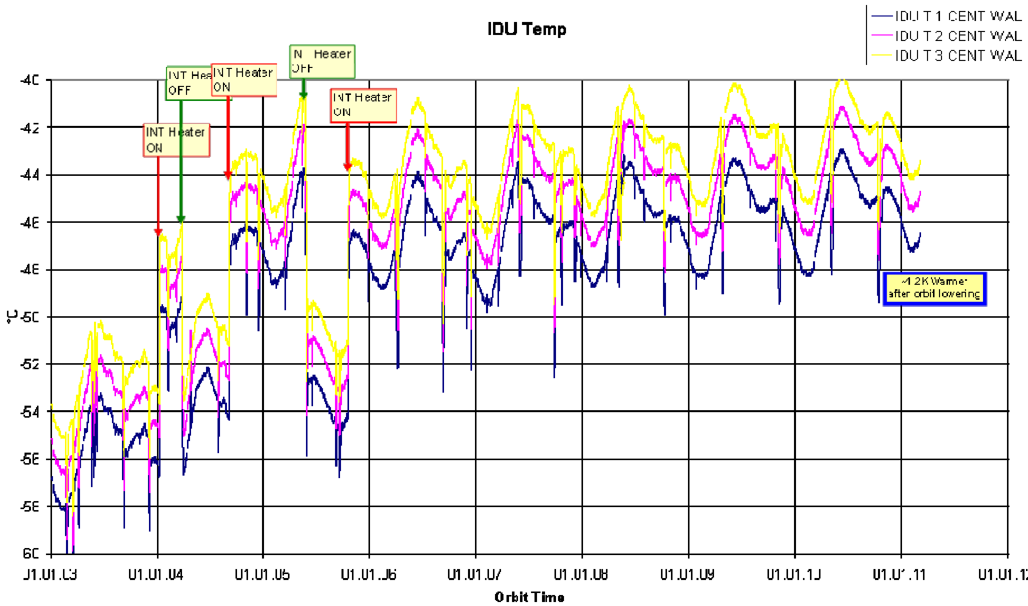

Figure 2 - IDU temperatures since November 2002 (courtesy of Astrium).

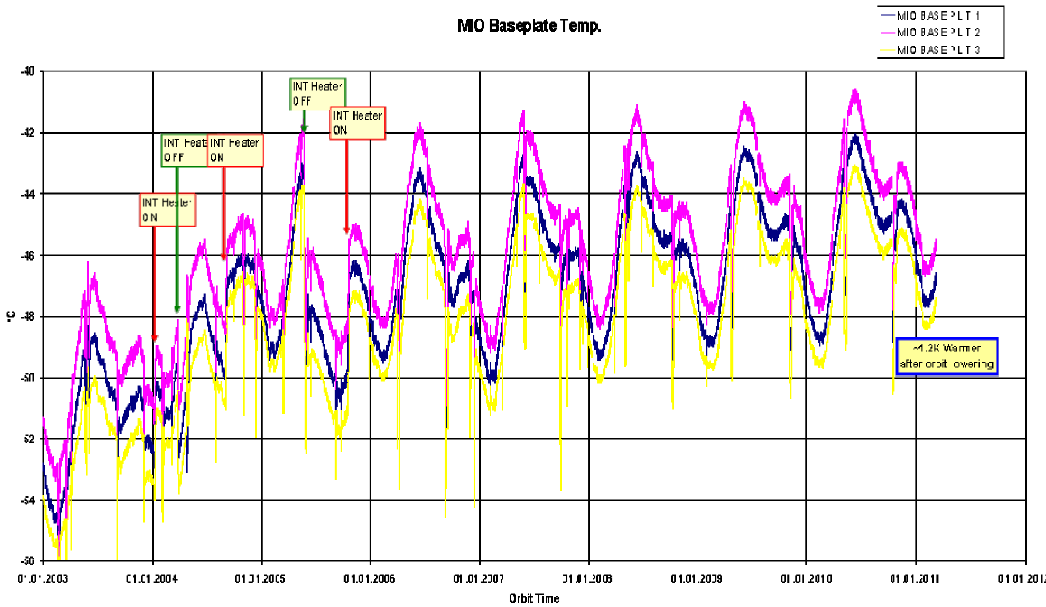

Figure 3 - MIO base plate temperatures since November 2002 (courtesy of Astrium).

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

Table 3 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

2.3.2 INTERFEROMETER PERFORMANCE

The historical record of differential speed errors can be seen in Figure 4 (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%. A further reduction of this parameter to 15 – 20 % is observed since Sep 2007. Finally this value reaches level close to beginning of mission since March 2008. This observation confirms that the instrument performances are continuously improving despite the fact that the duty cycle was progressively increased since May 2006.

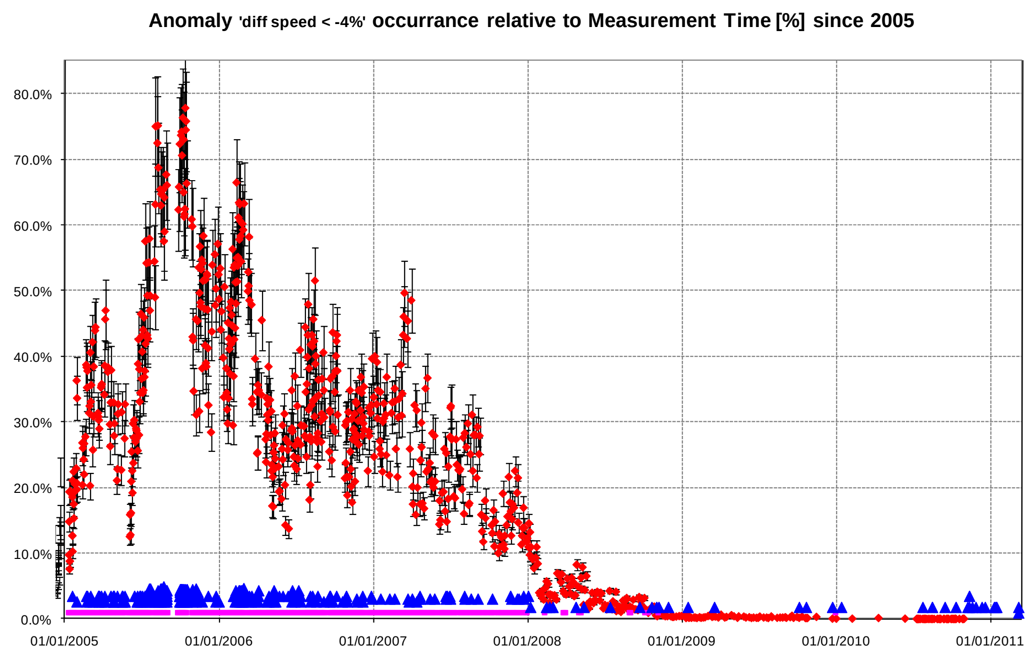

Figure 4 Occurrence of -4% differential speed error relative to measurement time since 2005 (courtesy of Astrium).

The number of INT errors per quarter and the different type of errors since 2006 can be seen in the Figure 5 (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 demonstrating that the switch-on of the INT-heater (Oct 2005), the better performances of the cooler and the more frequent decontaminations improved significantly the instrument performances.

- It is important to stress that since Oct 2006 only 3 turn-around error has been detected. This type of error was the most frequent during the first year of the RR mission (2005) and it increased significantly when the INT heater was switched off (Aug – Oct 2005).
- 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.
- It has to be noted that the start-up failure in 2006 and 2007 were often caused by the automatic re-initialization procedure. In fact in an ARB held in Dec 2007 it was decided to stop the automatic recovery and resume the manual intervention at ESOC. This new procedure is operational since March 2008. Since that date we had very few IDU anomalies.
- Nowadays the turn-around errors have almost disappeared and we have about one start-up failure per quarter of continuous operations.
- 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 (up to 100%) did not affect the instrument performances.

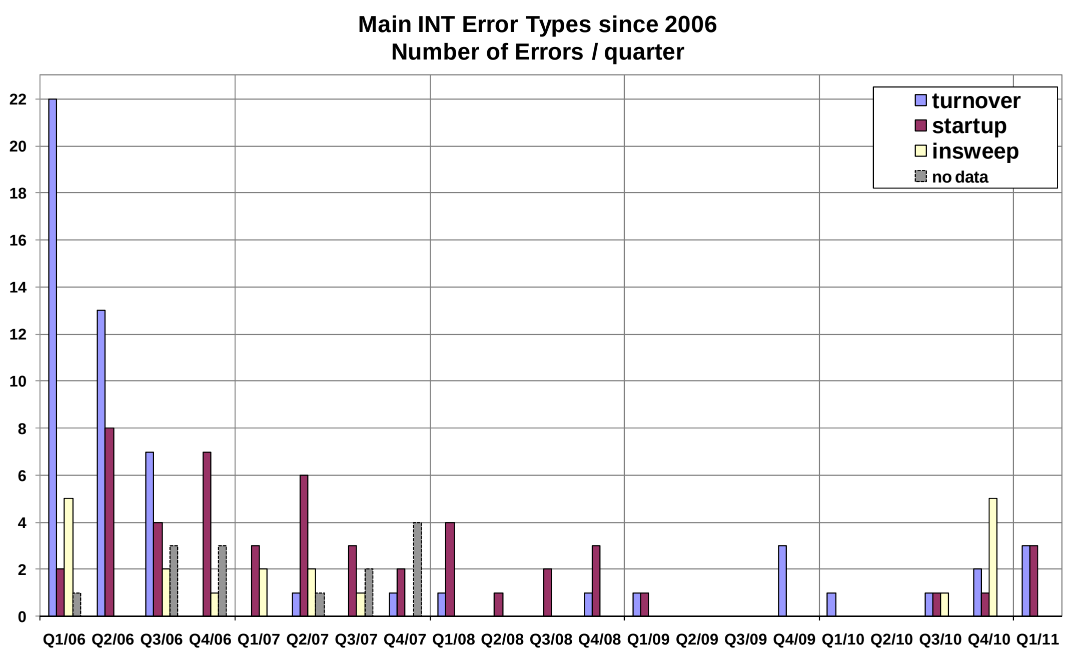

Figure 5 Main INT error types since 2006 (courtesy of Astrium).

2.3.3 COOLER PERFORMANCE

The Figure 6 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 6 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.

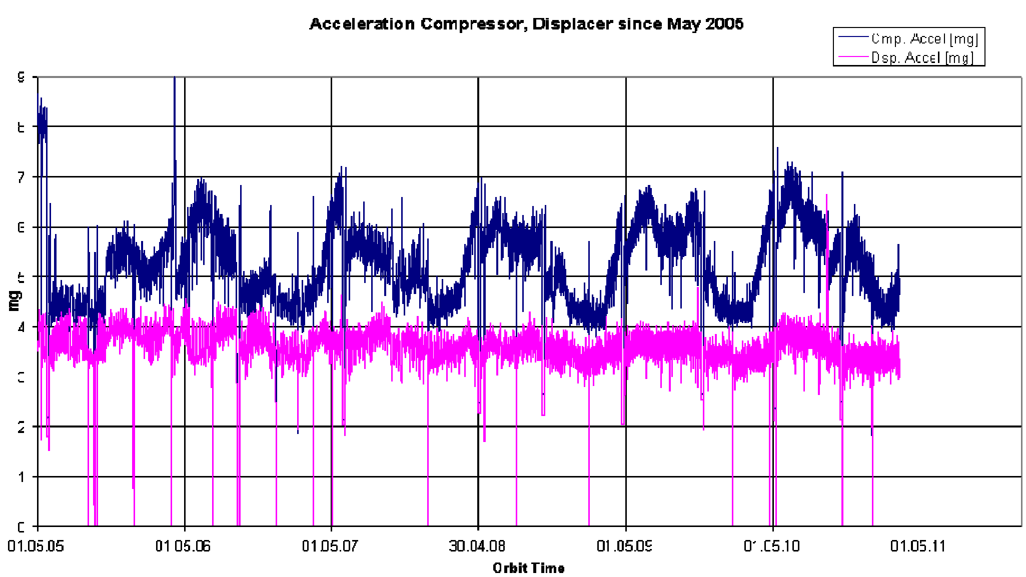

Figure 6 Cooler Displacer and Compressor vibration level, historical trend since 2005 (courtesy of Astrium).

3 INSTRUMENT CALIBRATION

3.1 Radiometric Calibration

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.
The following plots show the relative changes of gain for the reporting month from one week to the other and for all the bands. Some non-corrected spikes are observed on *band AB* and *B* always at the same spectral position, this behaviour is well known and is due to the aliasing spike caused by the on-board IGM rounding and decimation.

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 4. 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.

We can observe that during the reporting month the weekly increase remains well below the acceptance criterion of 1% per week. On a long term basis we observe that we have to slightly increase the gain in band A after each decontamination, this is due to the sensitivity degradation of channel A, which is of the order of 0.2%/month.

Table 4 Weekly and long term gain increase for gains disseminated during the reporting month in *band A*. The red indicates the decrease of gain factor after the planned decontamination of the reporting month.

Orbit #	Date	Weekly max increase (%)	Long term max increase[1] (%)
47159	08/03/2011	0.82	13.37
47275	16/03/2011	0.64	13.92
47377	23/03/2011	0.93	14.52
47478	30/03/2011	0.82	14.99

[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.

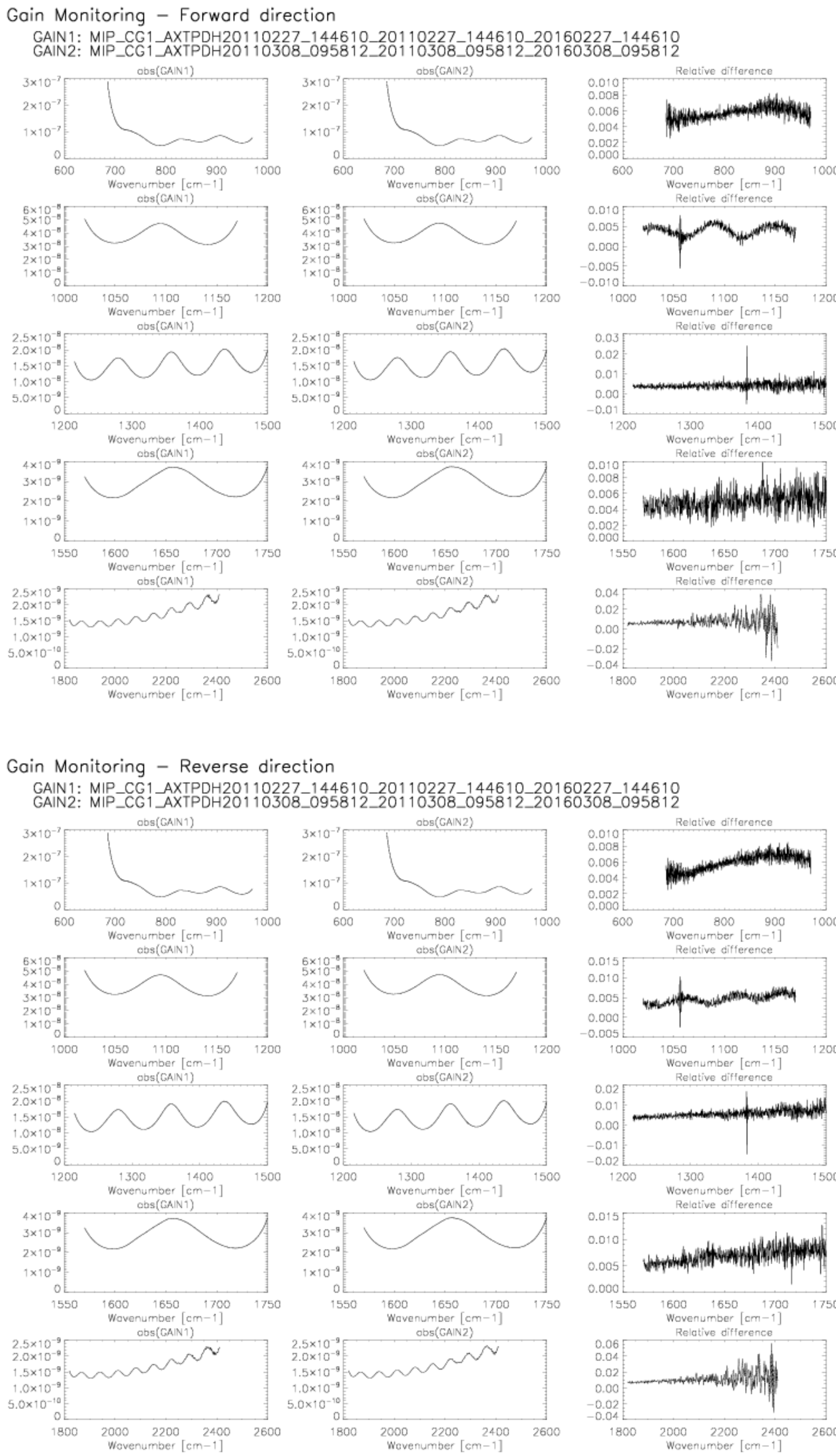

Figure 7 Relative variations of radiometric gain for consecutive disseminated gains in band A for the forward and reverse direction.

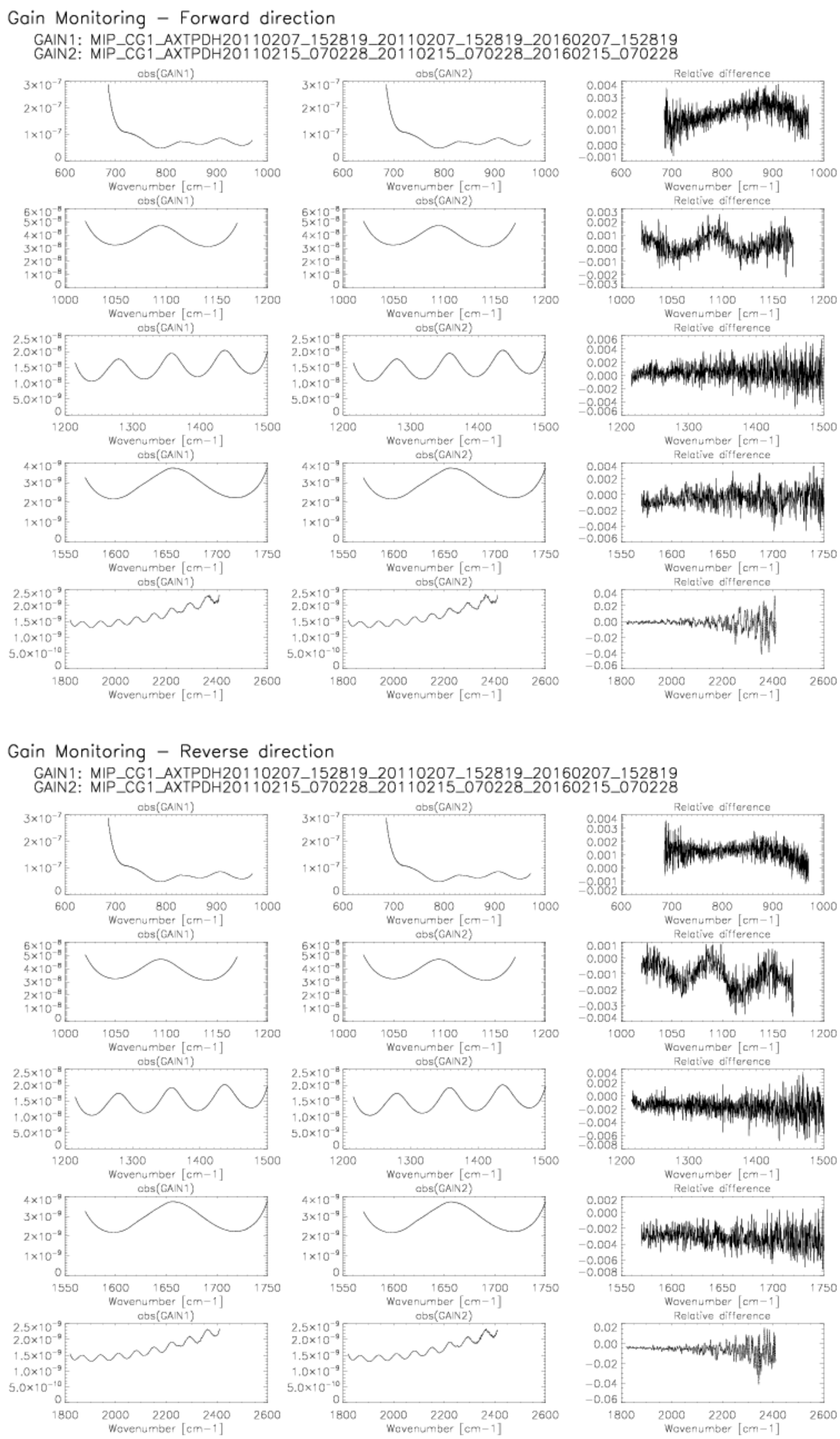

Figure 8 The same as Figure 7 but for a subsequent gain measurement.

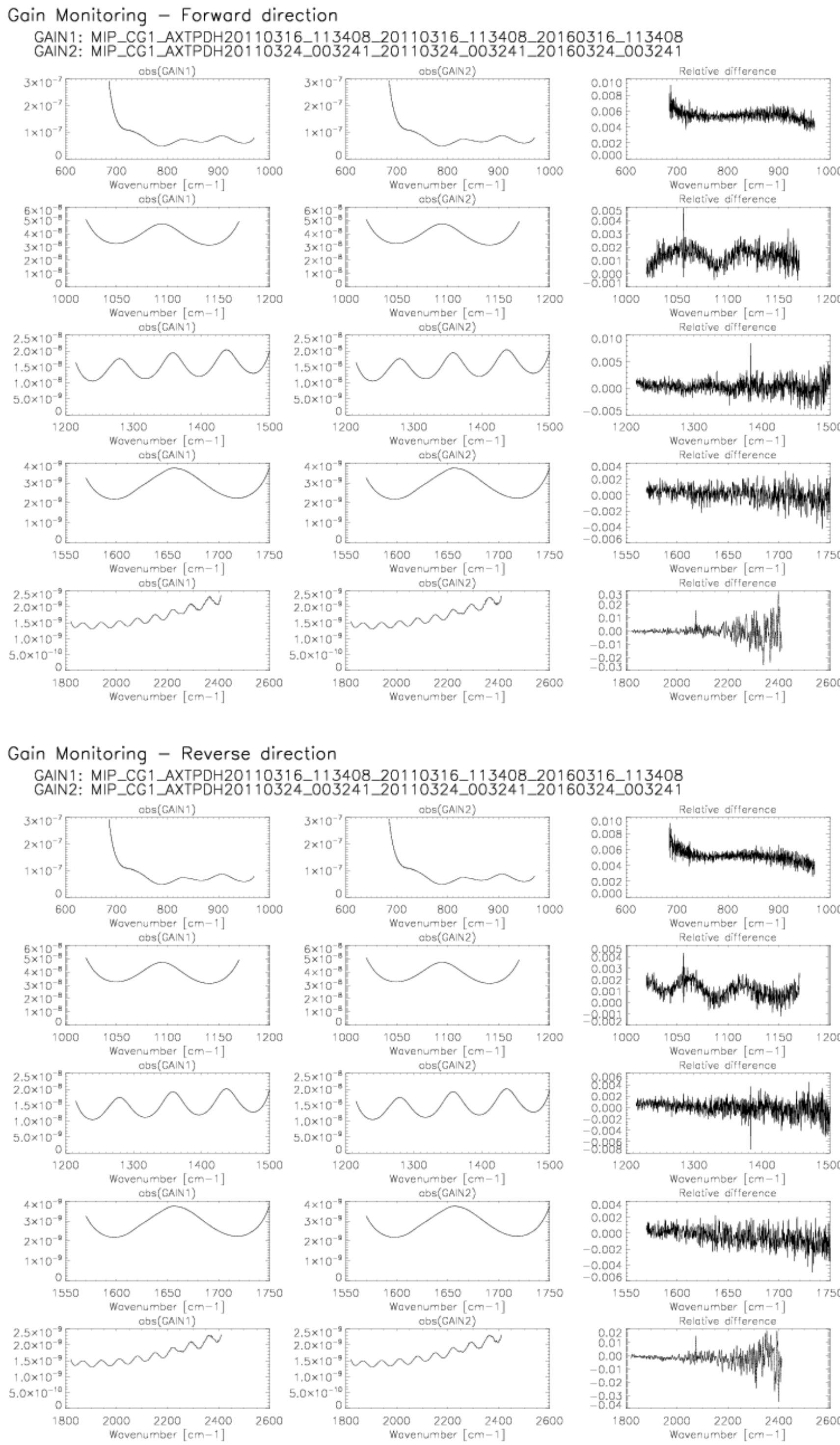

Figure 9 The same as Figure 7 but for a subsequent gain measurement.

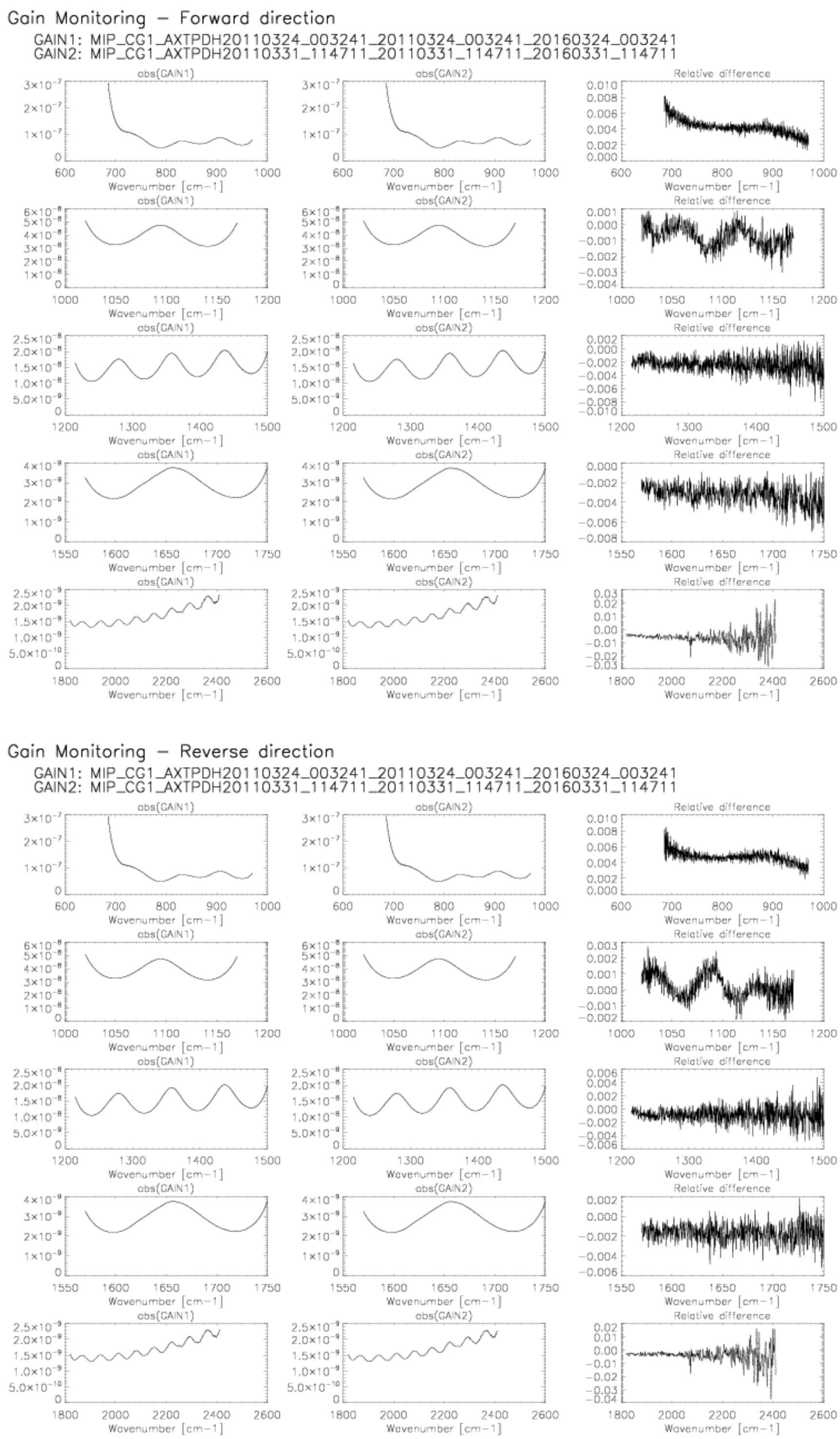

Figure 10 The same as Figure 7 but for a subsequent gain measurement.

3.2 Line of sight calibration

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**.

So far no results are available concerning sideways LOS calibrations that have been routinely planned since March 2007. The problem in processing the sideways data is the poor signal recorded. The LOS calibration in sideways were removed from the planning baseline starting from June 2008, since no results can be retrieved from them.

During the reporting months the calculated absolute bias remains in the range [-20:-30] mdeg. The acquisition and processing status of the LOS calibration for the reporting month is presented in the next table.

Table 5 LOS rearward calibrations performed during the reporting period.

Date	Orbit	Pointing error [deg]
17-Mar-11	**47290**	-0.033261
27-Mar-11	**47434**	-0.028836

3.3 Calibration Auxiliary files

3.3.1 GAIN CALIBRATION

The following auxiliary files were disseminated in the Ground segment to correct for the long term increase of the gain factor along the mission.

Table 6: Gain calibration AUX files disseminated during the reporting period.

Filename	Start validity	Stop validity
MIP_CG1_AXVIEC20110310_090503_20110308_000000_20160308_000000	08/03/2011	08/03/2016
MIP_CS1_AXVIEC20110310_091140_20110308_000000_20160308_000000		
MIP_CO1_AXVIEC20110310_090859_20110308_000000_20160308_000000		
MIP_CG1_AXVIEC20110317_091118_20110317_000000_20160317_000000	13/03/2011	13/03/2016
MIP_CS1_AXVIEC20110317_091242_20110317_000000_20160317_000000		
MIP_CO1_AXVIEC20110317_091202_20110317_000000_20160317_000000		
MIP_CG1_AXVIEC20110325_121032_20110324_000000_20160324_000000	25/03/2011	25/03/2016
MIP_CS1_AXVIEC20110325_121245_20110324_000000_20160324_000000		
MIP_CO1_AXVIEC20110325_121139_20110324_000000_20160324_000000		
MIP_CG1_AXVIEC20110331_131123_20110331_000000_20160331_000000	31/03/2011	31/03/2016
MIP_CS1_AXVIEC20110331_131332_20110331_000000_20160331_000000		
MIP_CO1_AXVIEC20110331_131208_20110331_000000_20160331_000000		

3.3.2 LINE OF SIGHT CALIBRATION

No auxiliary files were disseminated to update the MIPAS pointing information, since the mispointing calculated for the reporting month is still within the boundary of variability of 8mdeg with respect to the last disseminated auxiliary file.

4 PROCESSING STATUS

4.1 ESA Products availability

The MIPAS nominal processing of Level 1 and Level 2 NRT and off-line products was restarted during June 2010. The status of the MIPAS-ESA operational products is depicted in the table below.

Table 7: MIPAS-ESA available products.

Product description			Dissemination system and retention time	
Product name	IPF version	Max. size per orbit (MB)	NRT at ESRIN and Kiruna	Consolidated/ Re-processed at D-PAC
MIP_NL__1P	5.05	312	DDS and FTP (retention:7 days)	Available via FTP for the whole mission (retention: permanent)
MIP_NL__2P	5.05	20	FTP (retention:7 days)	Available via FTP for the whole mission (retention: permanent)
MIP_NLE_2P	5.05	2	FTP (retention:7 days)	-

The MIPAS accounts currently available for the users are the following. For additional details concerning account password please contact the eohelp@esa.int

NRT products
Data available at ftp servers at ESRIN and Kiruna: *oa-es.eo.esa.int/oa-ks.eo.esa.int*
Single account for Level 1 product: *mip1usr*
Single account for Level 2 product: *mip2usr*

Off-line and re-processed products
Data available in the single ftp server at D-PAC: *eoa-dp.eo.esa.int*
Single account for Level 1 product: *mip1usr*
Single account for Level 2 product: *mip2usr*

4.2 Near real time production statistics

In Table 8 we report the weekly statistics on the instrument and products availability. The table shows the planned duty cycle, the instrument availability w.r.t. the planning and the products availability. The L0 NRT availability is calculated with respect to the planning, while the L1 NRT availability is calculated with respect to the L0 data.

Table 8 MIPAS level 0 NRT products statistics for the reporting month.

Start time	Stop time	Planned duty cycle (%)	Instrument availability (%)	L0 availability at PDHS (%)	L1 availability w.r.t. L0 (%)
02/03/2011 21:40	08/03/2011 21:20	97.50	100.00	100.00	98.53
08/03/2011 21:20	14/03/2011 22:41	99.69	100.00	99.81	98.04
14/03/2011 22:41	20/03/2011 22:21	97.52	100.00	100.00	98.69
20/03/2011 22:21	26/03/2011 22:01	99.85	91.06	100.00	98.87
26/03/2011 22:01	01/04/2011 21:41	97.59	92.76	100.00	98.36

The weekly statistics were calculated for the entire MIPAS RR mission (since Jan 2005) and are presented in the Figure 11, in this plot the blue line is the instrument availability with respect to the total time, the magenta and red lines represent the total availability of L0 and L1 NRT products.
The total availability of the instrument increases from about 30% in 2005/2006 to 90%-100% during the last months owing to the increased duty cycle and the improved instrument performances. The L0 availability shows the performance of the PDS, in the best case the magenta line should match the instrument availability, any anomaly in the Ground Segment results in a loss of data. The L1 NRT availability is reported since February 2008, when the NRT processing was restarted at ESRIN and Kiruna sites.
The Figure 12 shows the instrument availability w.r.t the planning and the planned duty cycle. This figure shows in more details the increased planned duty cycle and the improved instrument performances in the last months.

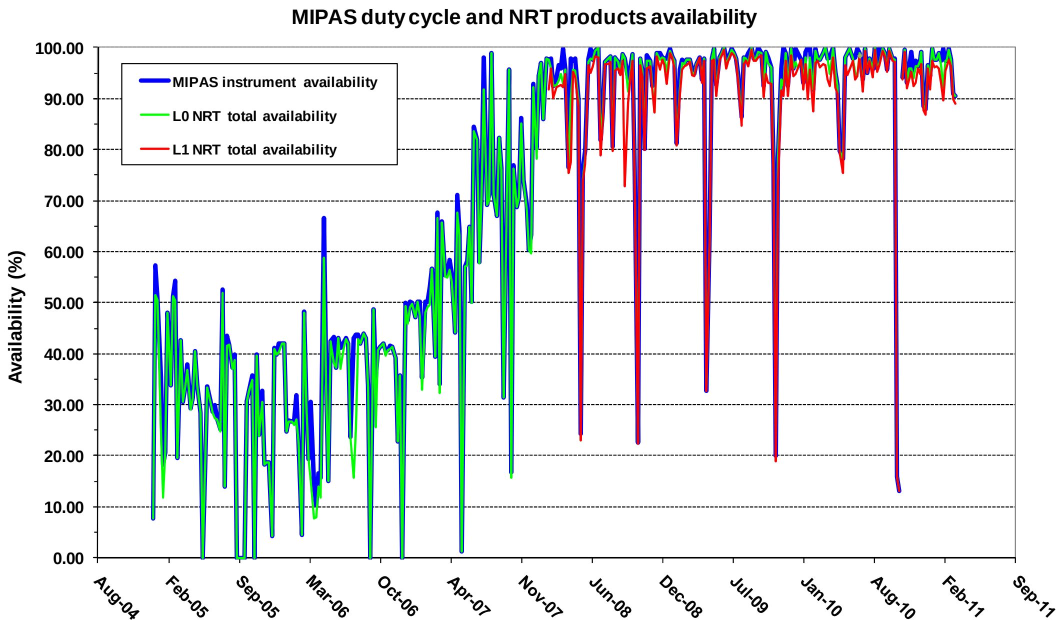

Figure 11 – MIPAS L0 NRT long term statistics since Jan 2005.

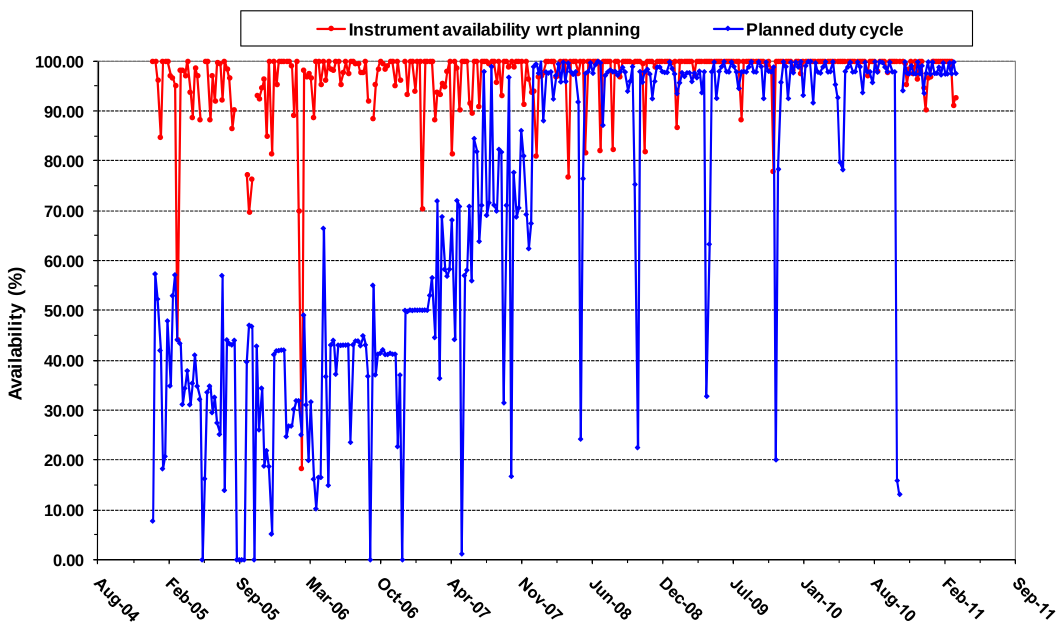

Figure 12 – MIPAS instrument availability w.r.t. planning and planned duty cycle.

4.3 Off-line production statistics

In this chapter we report the long term statistics of the L1 products availability in the D-PAC server. This is presented in Figure 13, 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 around 95% of the expected time. The availability with respect to the total time highlights the increased duty cycle since April 2006.

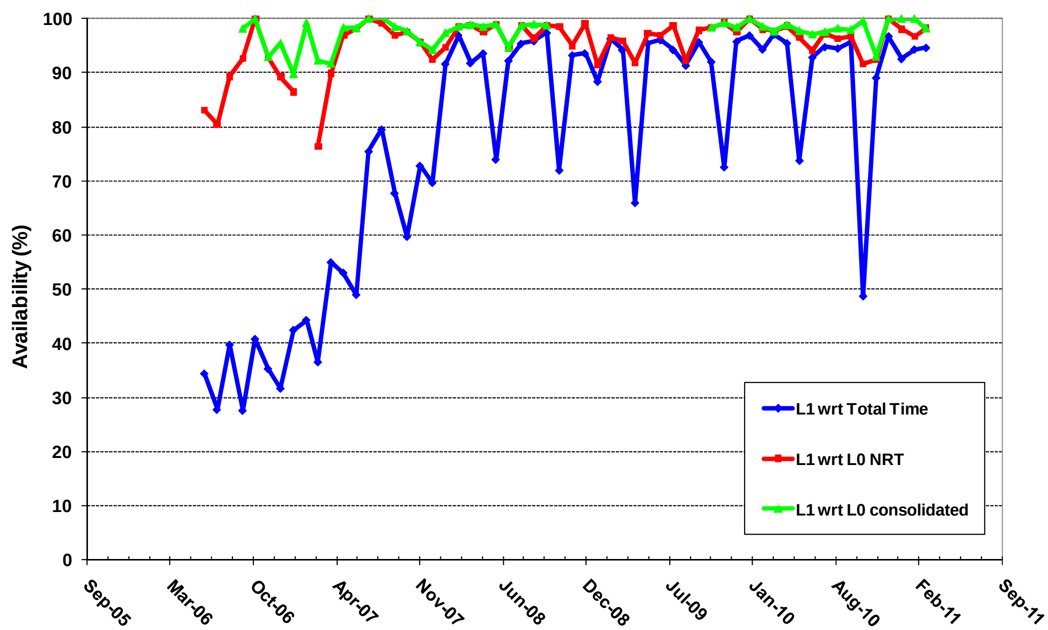

Figure 13 – MIPAS L1 off-line data at D-PAC: long term statistics since Jun 2006.

4.4 Re-processing status

4.4.1 SECOND RE-PROCESSING WITH VERSION 4

The first re-processing of the FR MIPAS mission (Jul 2002 – Mar 2004) 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.

Processing flag for this re-processing is set to “P”.

4.4.2 THIRD RE-PROCESSING WITH VERSION 5

The Level 1 re-processing of the full mission (Jul 2002 – Jan 2010) with IPF 5.02 was completed at D-PAC and data is available to the users on the eoa ftp server.
The Level 2 re-processing with version 5.05 was completed for the complete mission during January 2011.

Processing flag for this re-processing is set to “R”.

5 PROCESSOR CONFIGURATION

5.1 Processor baseline

The table below shows the list of IPF updates and the aligned prototype, DPM, IODD and the related NCR/SPRs.

Table 9 Historical updates of MIPAS processor, related prototype, DPM, IODD and NCR/SPR.

IPF	Prototype		DPM		IODD		TDS		ADF		Processor updates	
	L1	L2	L1	L2	L1	L2	L1	L2	L2	L2	Level 1	Level 2
Linux version												
5.05	2.7	5.0	4L	5.2	5B	5E	7.1	4.4	8.6	6.4	Aligned to L1 DPM 4L and L2 DPM 5.2, CFI 5.8.1 integrated	
5.02	2.7	-	4L	-	5B	-	7.1	-	8.6*	-	Aligned to L1 DPM 4L. No L2 processing is foreseen with this IPF version. New Mical 1.6 switched.	
4.67L02	2.6	4.0	4la	4.1	4E	4.0	6.0	3.4	6.1	5.2	IPF 4.67 AIX version ported to Linux IPF 4.67L02	
AIX version												
4.67	2.6	4.0	4la	4.1	4E	4.0	6.0	3.4	6.1	5.2	Fixed NCR_1594 NCR_1676	Fixed NCR_1458 NCR_1521 NCR_1522
4.65	2.5	4.0	4l	4.1	4E	4.0	6.0	3.4	6.1	5.2	-	Fixed NCR_1310
4.64	2.5	4.0	4l	4.1	4E	4.0	6.0	3.4	4.0	3.8	Fixed SPR-12100-2011	-
4.63	2.5	4.0	4l	4.1	4E	4.0	6.0	3.4	4.0	3.8	Fixed SPR-12000-2000 SPR-12000-2001	Fixed NCR_1278 NCR_1308 Rejected NCR_1310 NCR_1317
4.62	2.5	4.0	4H	4.0	4E	4.0	6.0	3.3	4.0	3.8	Fixed NCR_1157 NCR_1259	Fixed NCR_1128 NCR_1275 NCR_1276

***Version 8.6 is activated in synchronization with the new calibration chain (Mical 1.6)**

5.2 History of processor switches

The historical updates in the MIPAS L1 processor are detailed in §7.2 with all the information on the related NCRs and SPRs. The historical update of the IPF at each processing site is shown in the following table.

Table 10 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 **PDHS-E/K**	**V5.05**	**21-06-2010** **10-06-2010**
D-PAC **PDHS-E/K**	**V5.02**	**24-01-2010** **28-01-2010**
PDHS-E/K **D-PAC**	**V4.67L02** **(Switch to ESA Linux PDS)**	**28-09-2009**
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
SED-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

5.3 Open issues on current IPF

The table below shows a list of the open issues on the current MIPAS – ESA operational processor.

Table 11 Open issues for the current operational processor.

PR	Open date	Affected IPF	Description	Resolution
IDEAS-PR-11-05502	03-FEB-2011	5.05	MIP_NL__2P: Invalid information in DATASET STRUCTURE ADS for 'empty' products	To be fixed with IPF 5.06
IDEAS-PR-11-05499	28-JAN-2011	5.05	MIPAS L1: Wrong 'Number of sweeps in current scan' for special mode	To be fixed with IPF 5.06
PRD-PR-10-05464	13-OCT-2010	5.05	PBI000000000311: MIP_NLE_2P conversion fail on BUFR (ESRIN and Kiruna)	To be fixed with IPF 5.06
IDEAS-PR-10-05458	24-SEP-2010	5.05	MIPAS IPF 5.05 crashes for one orbit in NRT operations	To be fixed with IPF 5.06
IDEAS-PR-10-05457	24-SEP-2010	5.05	High chi square for CH4 and N2O retrieval	To be fixed with IPF 5.06
IDEAS-PR-10-05442	07-SEP-2010	5.05	[Amalfi-2 Pilot] Wrong REF_DOC in MPH of MIPAS products	To be fixed with IPF 5.06
IDEAS-PR-10-05434	04-AUG-2010	5.05	MIPAS wrong flag in ADS in case of empty MDS	To be fixed with IPF 5.06
IDEAS-PR-10-05313	15-JUN-2010	5.05	Microwindow Occupation ADS corrupted records	To be fixed with IPF 5.06
IDEAS-PR-10-05312	15-JUN-2010	5.05	MIPAS: problem with GRIBEX	To be fixed with IPF 5.06

5.4 Open issues on current operational products

The quality issues on the operational ESA products currently provided to the users are reported in the corresponding Level 1 and Level 2 products disclaimers, available at the following web addresses.

Level 1 product disclaimer
http://envisat.esa.int/handbooks/availability/disclaimers/MIP_NL_1P_Disclaimers.pdf

Level 2 product disclaimer
http://envisat.esa.int/handbooks/availability/disclaimers/MIP_NL_2P_Disclaimers.pdf

5.5 Auxiliary Data Files

5.5.1 LEVEL 1 ADF

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 static ADF valid for the reporting period are listed in the following table.

Table 12 Level 1 static ADFs valid for the reporting period.

Auxiliary Data File	Start Validity	Stop Validity
Static AUX for NRT MIP_CA1_AXNIEC20100125_145055_20100128_000000_20150128_000000 MIP_CL1_AXNIEC20100125_145256_20100128_000000_20150128_000000 MIP_MW1_AXNIEC20100125_145445_20100128_000000_20150128_000000 MIP_PS1_AXNIEC20100125_145601_20100128_000000_20150128_000000	2010-01-28	2015-01-28
Static AUX for OFL MIP_CA1_AXNIEC20100125_145055_20100122_000000_20150122_000000 MIP_CL1_AXNIEC20100125_145256_20100122_000000_20150122_000000 MIP_MW1_AXNIEC20100125_145445_20100122_000000_20150122_000000 MIP_PS1_AXNIEC20100125_145601_20100122_000000_20150122_000000	2010-01-22	2015-01-22

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 §7.3.

Table 13 Historical deliveries of level 1 ADF by Bomem. In green is the operational version.

ADFs Version	Updated ADF	Start Validity Date	IPF version	Dissemination date
8.6	**MIP_PS1_AX** **MIP_CL1_AX**	**RR mission** **(NRT and OFL)**	**5.02 +** **Mical 1.6**	**28 Jan 2010**
6.1	MIP_PS1_AX	09-Aug-2004	4.63 – 4.67	27-Jun-2005
6.0	MIP_PS1_AX	-	4.63	Not disseminated
4.1 TDS6	MIP_PS1_AX	09- Aug-2004	4.63	15-Mar-2005
3.2	MIP_PS1_AX	26-Mar-2004	4.61	21Apr-2004
3.1	MIP_PS1_AX	09-Jan-2004	4.61	17-Mar-2004

ADFs Version	Updated ADF	Start Validity Date	IPF version	Dissemination date
3.0	MIP_CA1_AX MIP_MW1_AX MIP_PS1_AX	April-2002	4.61	4-Nov-2003

5.5.2 LEVEL 2 ADF

The L2 ADFs are generated by IFAC and sent to ESRIN where they are verified for format issues and disseminated to the processing centers. A New set of L2 ADFs is generated as soon as it brings an improvement of the data quality. The level 2 ADF files valid in the current configuration are reported in the next table.

Table 14 L2 ADFs valid for the current GS configuration.

Auxiliary Data File	Start Validity
OR-27 data (since Jan 2005)	
ADFs V6.5 (NOM) MIP_CS2_AXVIEC20100601_142603_20050101_000000_20150101_000000 MIP_MW2_AXVIEC20100601_151110_20050101_000000_20150101_000000 MIP_PI2_AXVIEC20100601_152202_20050101_000000_20150101_000000 MIP_PS2_AXVIEC20100601_152623_20050603_000000_20150101_000000 MIP_SP2_AXVIEC20100601_153126_20050101_000000_20150101_000000 **OM2 patched to correct CH4 anomaly** MIP_OM2_AXVIEC20101014_082455_20050101_000000_20150101_000000 **IG2 seasonally updated** MIP_IG2_AXVIEC20100601_143357_20100601_000000_20110601_000000 MIP_IG2_AXVIEC20100921_161720_20100920_000000_20110121_000000 MIP_IG2_AXVIEC20101213_142459_20101221_000000_20110421_000000	1-JAN-05
RR-17 data (Aug – Sep 2004)	
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
FR data (Jan 2002 – Mar 2004)	
ADFs V4.1 NRT MIP_PS2_AXVIEC20040421_095623_20040326_143428_20090326_000000 Off-line MIP_PS2_AXVIEC20040421_095923_20040326_143428_20090326_000000	26-MAR-04

Auxiliary Data File	Start Validity
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

The Level 2 ADF historical deliveries by IFAC are reported in the following table. Further details on the Level 2 ADF deliveries provided by IFAC are reported in the Appendix (see **§7.5**).

Table 15 Historical update of Level 2 ADFs provided by IFAC.

ADFs Version	Updated ADF	Start Validity Date	IPF version	Dissemination date
For RR-o mission (from Jan 2005 onward)				
6.5	MIP_OM2_AX MIP_IG2_AX	01-Jan-2005 RR-o mission	5.05	14 Oct 2010
6.4	MIP_SP2_AX MIP_IG2_AX MIP_PI2_AX	01-Jan-2005 RR-o mission	5.05	Disseminated on 10 June 2010 with the switch of IPF 5.05
6.3	MIP_PS2_AX MIP_MW2_AX MIP_CS2_AX MIP_OM2_AX	01-Jan-2005 RR-o mission	5.05	*Not disseminated* *To be used with IPF 5.00*
6.2	*MIP_OM2_AX* *MIP_IG2_AX*	*01-Jan-2005* *RR-o mission*	*5.00*	*Not disseminated* *To be used with IPF 5.00*
6.1	*MIP_PS2_AX* *MIP_MW2_AX* *MIP_CS2_AX* *MIP_SP2_AX* *MIP_OM2_AX* *MIP_IG2_AX*	*01-Jan-2005* *RR-o mission*	*5.00*	*Not disseminated* *To be used with IPF 5.00*
6.0	*MIP_PS2_AX* *MIP_MW2_AX* *MIP_CS2_AX* *MIP_SP2_AX* *MIP_OM2_AX* *MIP_IG2_AX*	*01-Jan-2005* *RR-o mission*	*5.00*	*Not disseminated used only for GRIMI-2*
For RR-17 mission (Aug – Sep 2004)				
5.2	MIP_SP2_AX MIP_PS2_AX	09-Aug-2004 RR-17 mission	4.65/ 4.67	5-Jan-2006

ADFs Version	Updated ADF	Start Validity Date	IPF version	Dissemination date
5.1	*MIP_SP2_AX* *MIP_OM2_AX* *MIP_MW2_AX*	*09-Aug-2004* *RR-17 mission*	*4.65/* *4.67*	*Not used for processing due to a format error*
5.0	*MIP_PS2_AX* *MIP_MW2_AX* *MIP_PI2_AX*	*09-Aug-2004* *RR-17 mission*	*4.65/* *4.67*	*/*
For FR mission (Jun 2002 – Mar 2004)				
4.1	NRT: MIP_PS2_AX_NRT_V4.1 OFL: MIP_PS2_AX_OFL_V4.1	FR mission	4.61/ 4.62	13.02.2004
4.0	NRT: MIP_PS2_AX_NRT_V4.0 OFL: MIP_PS2_AX_OFL_V4.0	FR mission	4.61/ 4.62	03.09.2004

6 MONITORING RESULTS

6.1 Daily monitoring

6.1.1 LEVEL 0 NRT PRODUCTS

The quality control of L0 data processed NRT in ESRIN and Kiruna is going-on in parallel with the processing, the L0 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_0_NRT/

6.1.2 LEVEL 1 NRT PRODUCTS

The quality control of L1 data processed NRT in ESRIN and Kirunja is going-on in parallel with the 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_NRT/

6.1.3 LEVEL 1 OFL PRODUCTS

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/

6.1.4 LEVEL 2 NRT PRODUCTS

The quality control of L2 data processed NRT in ESRIN and Kiruna is going-on in parallel with the processing, the L2 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_2_NRT/

6.1.5 LEVEL 2 OFL PRODUCTS

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_2_OFL/

6.2 *Long-term monitoring*

6.2.1 GAIN MONITORING

The long term plot of gain changes in band A between two consecutive disseminated gains is shown in the following figure, where 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. From this plot we can notice that the effect of the ice contamination is a seasonal variation of the gain weekly increase with maxima around May, corresponding to the hottest period of the year.
Note that the high variations observed after decontamination events 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.

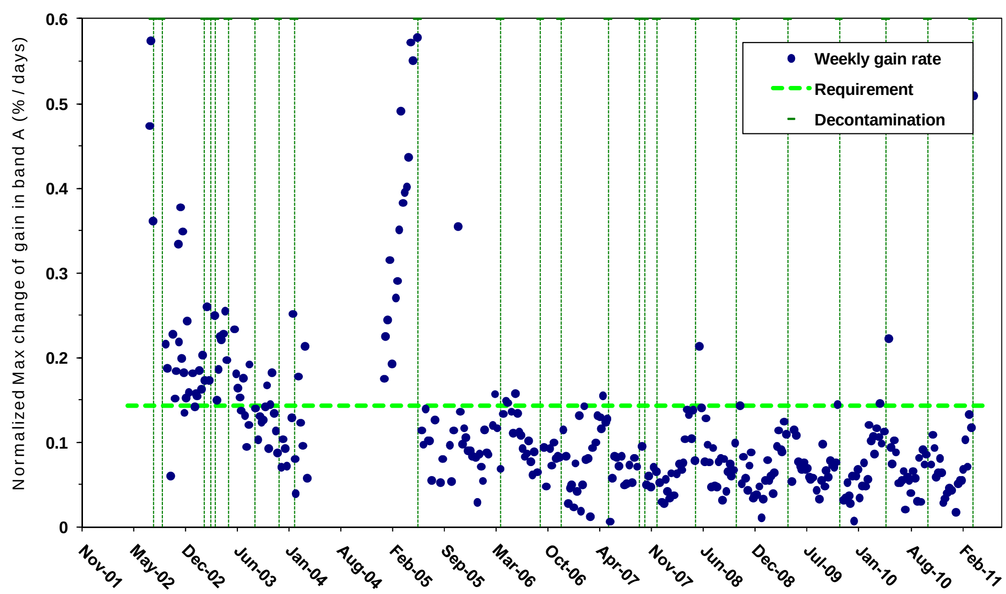

Figure 14 Gain maximum increase normalized to the time difference between consecutive disseminated gains since January 2005. The blue line represents the expected gain increase (1%/week).

The long term monitoring of the gain accumulation increase in band A is presented in Figure 15. 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 gain of the first point after each decontaminations is slightly increasing with time, demonstrating the effect of the sensitivity degradation in channel A.

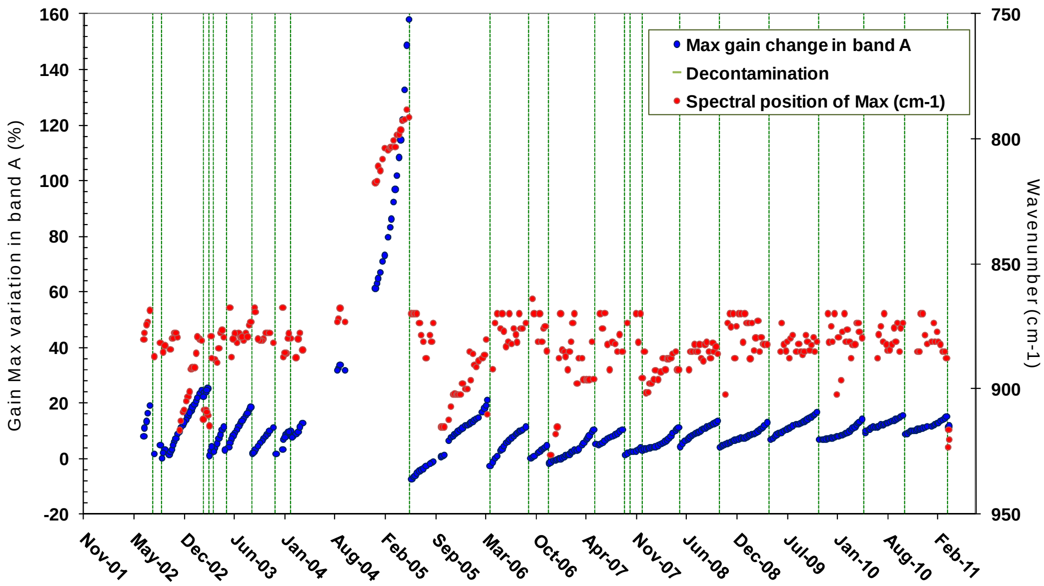

Figure 15 Gain accumulation increase since January 2005.

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%.

6.2.2 POINTING MONITORING

The long term trend of mispointing since start of mission is reported in the plot below. 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).

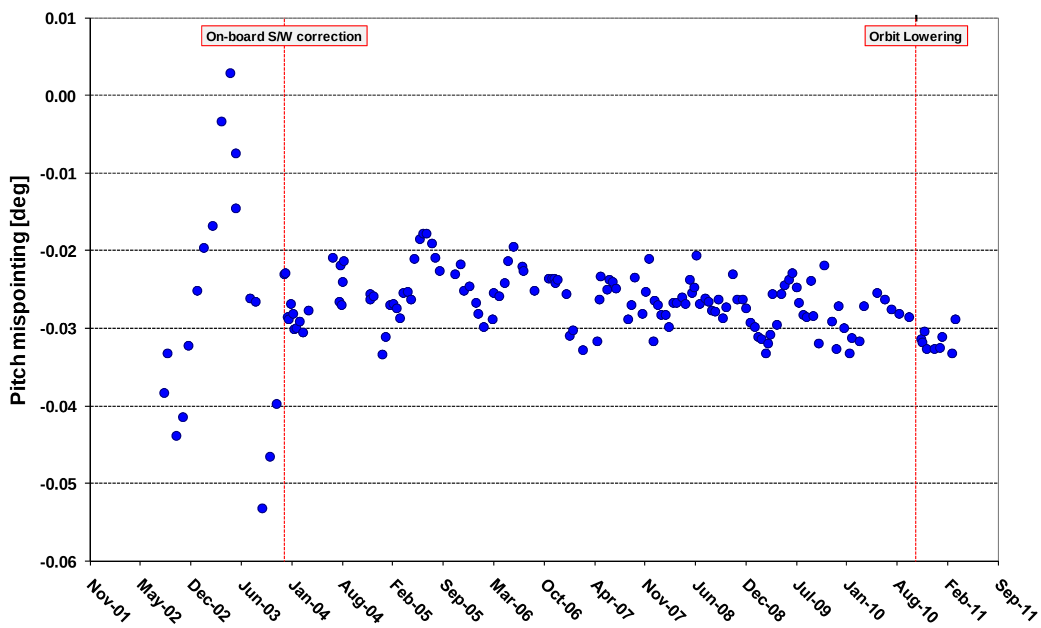

Figure 16 MIPAS long-term pointing error as a function of time since September 2002.

The following table 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 16 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

6.2.3 SPECTRAL CALIBRATION MONITORING

The linear spectral correction factor is applied to the spectra for the spectra calibration, it is a multiplicative factor applied to the frequency axis in order to match the position of well known atmospheric line. Variations of this factor are an indication of metrology problems or ageing of the laser. During the QWG#23 it was suggested to monitor the Linear Spectral Correction Factor as it is written in the Level 1 products. (e.g.: aging of the laser). This is presented in Figure 17 since Jan 2010, in fact this parameter was not ingested in the database before this date. From this plot we observe a very stable situation with slight seasonal trend and a large spreading of the points indicating the noise in the retrieval of this parameter. This monitoring will be part of the standard monitoring baseline for the continuation of the mission.

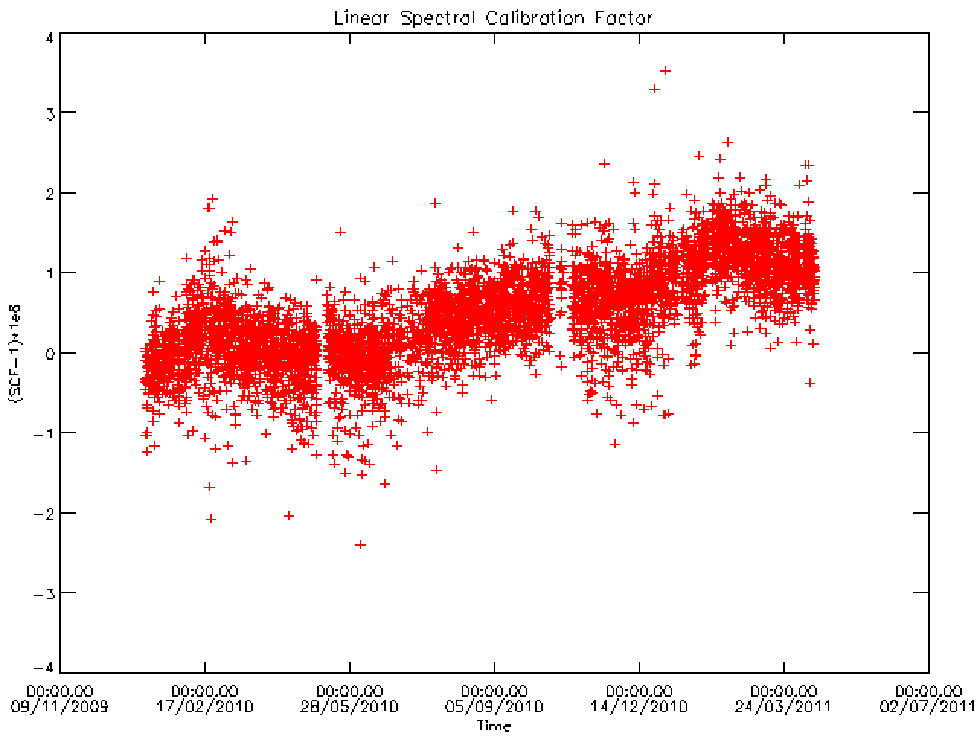

Figure 17 MIPAS Spectral Calibration Factor (SCF) since Jan 2010.

6.2.4 ADC COUNTS 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 all eight MIPAS channels since June 2005 is shown in the following figures. In these figures 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 that result in an increase of the signal due to the ice removal (see for ex. September and December 2006). From this plot we learn that a detector sensitivity degradation is visible for channel A and B, but not for channels C and D, where an increase of signal is found due to the increased instrument temperature.

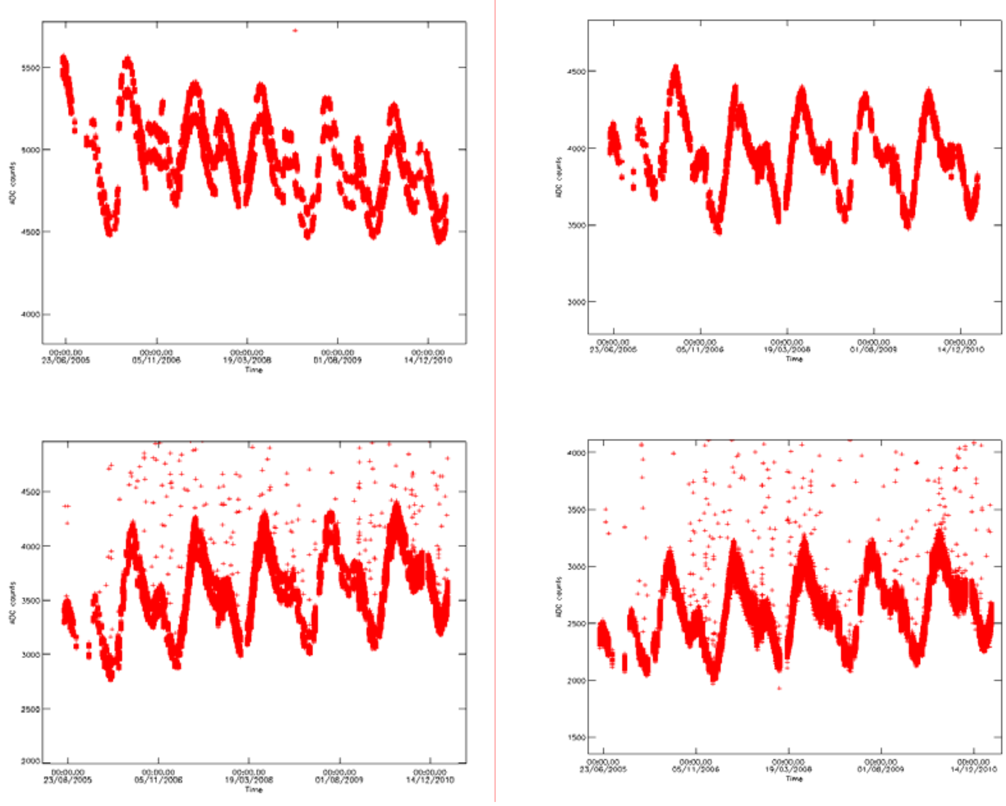

Figure 18 ADC max counts in channel A1, B1, C1 and D1 during DS measurements since June 2005.

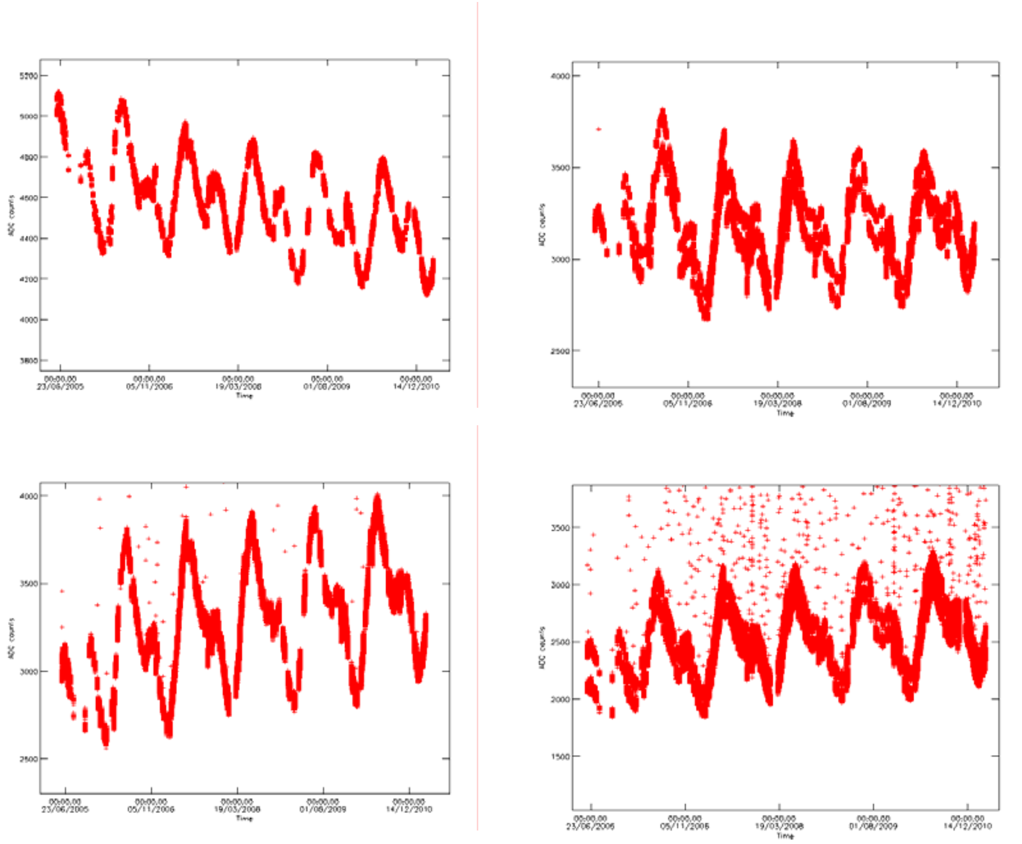

Figure 19ADC max counts in channel A2, B2, C2 and D2 during DS measurements since June 2005.

6.2.5 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 artifact (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 20 and Figure 21 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.

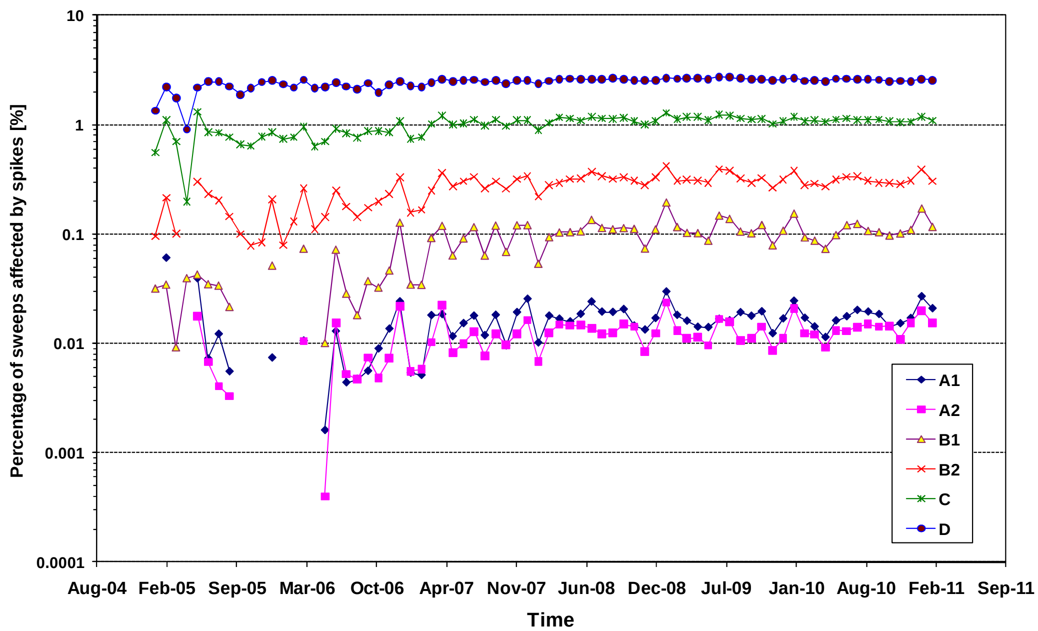

Figure 20 MIPAS long-term monitoring of spikes: percentage of spike-affected sweeps.

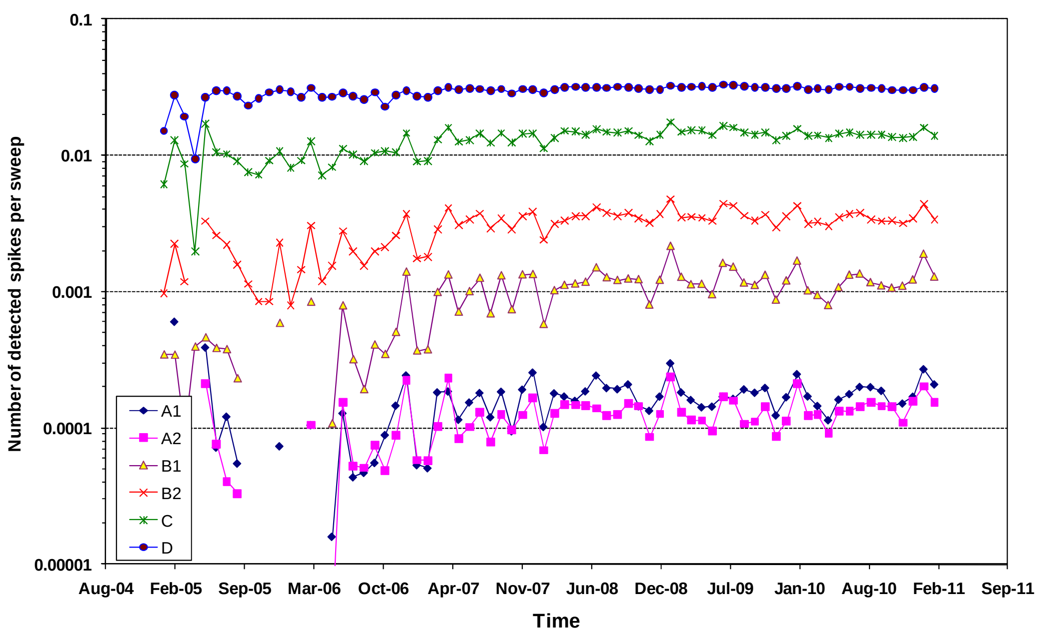

Figure 21 MIPAS long-term monitoring of spikes: number of detected spikes per sweep.

6.2.6 RETRIEVAL PERFORMANCES

A quality control of L2 NRT data started with the switch of IPF 5.05, the monitoring baseline will be refined with the upcoming Monthly Report. The first monitoring plot is presented here. It is the evolution of the final chi square value for NRT retrieval parameters. We can observe in the first products generated NRT a general high value of chi square for CH4 and N2O retrieval, this issue is currently under investigation.

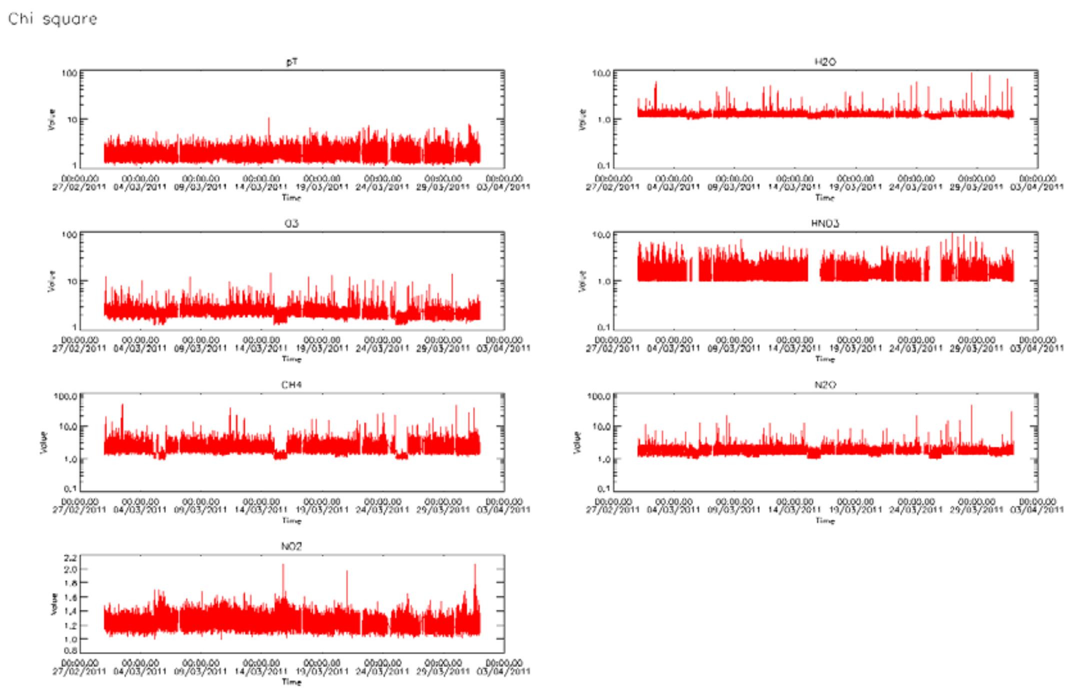

Figure 22 MIPAS last chi square values for NRT retrieval parameters.

6.2.7 ZONAL MEAN PLOTS

The following plots show the zonal mean of temperature and VMR of O3 and H2O at different pressure levels in the past three months.

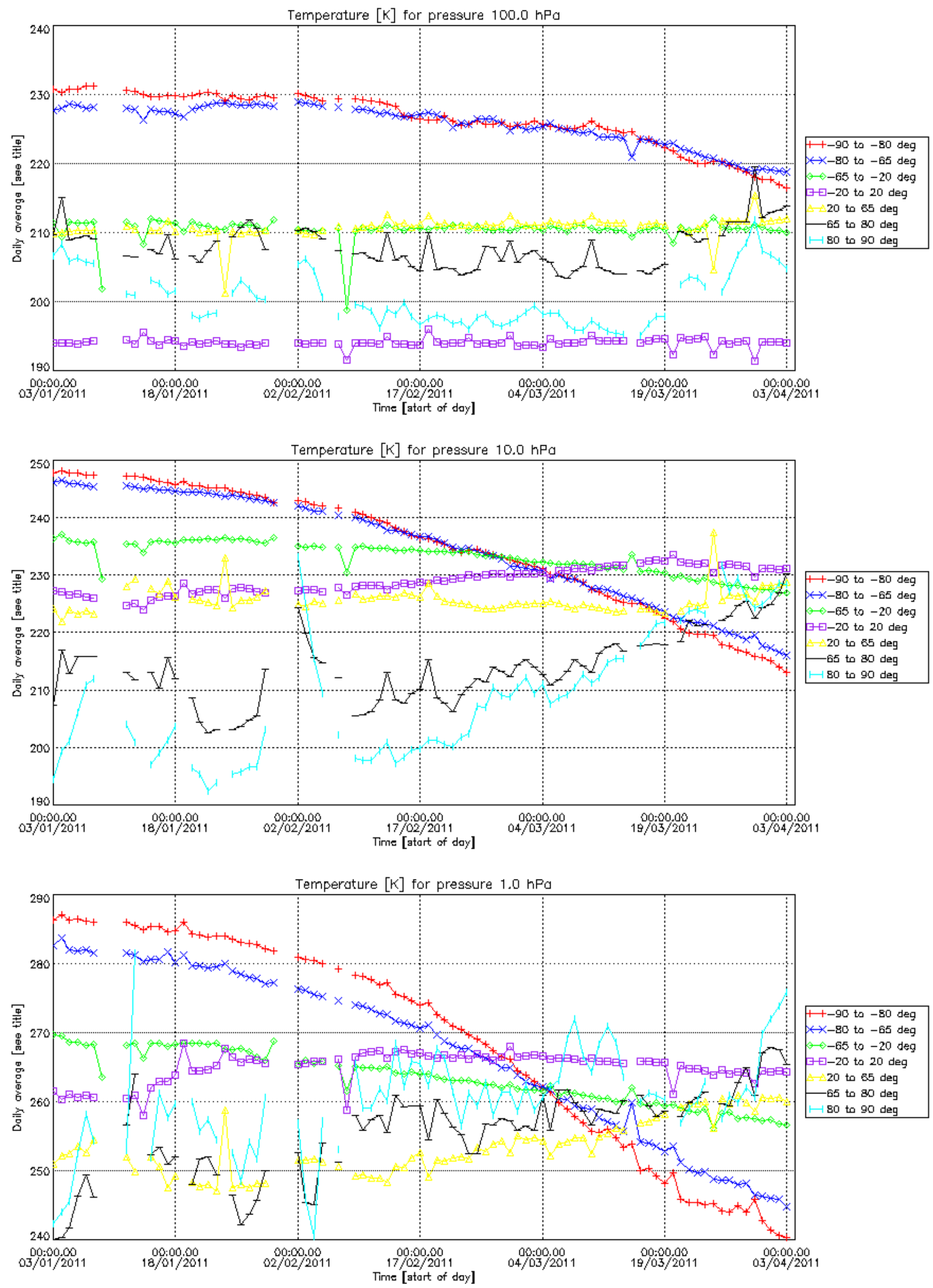

Figure 23 MIPAS temperature zonal mean at three pressure levels.

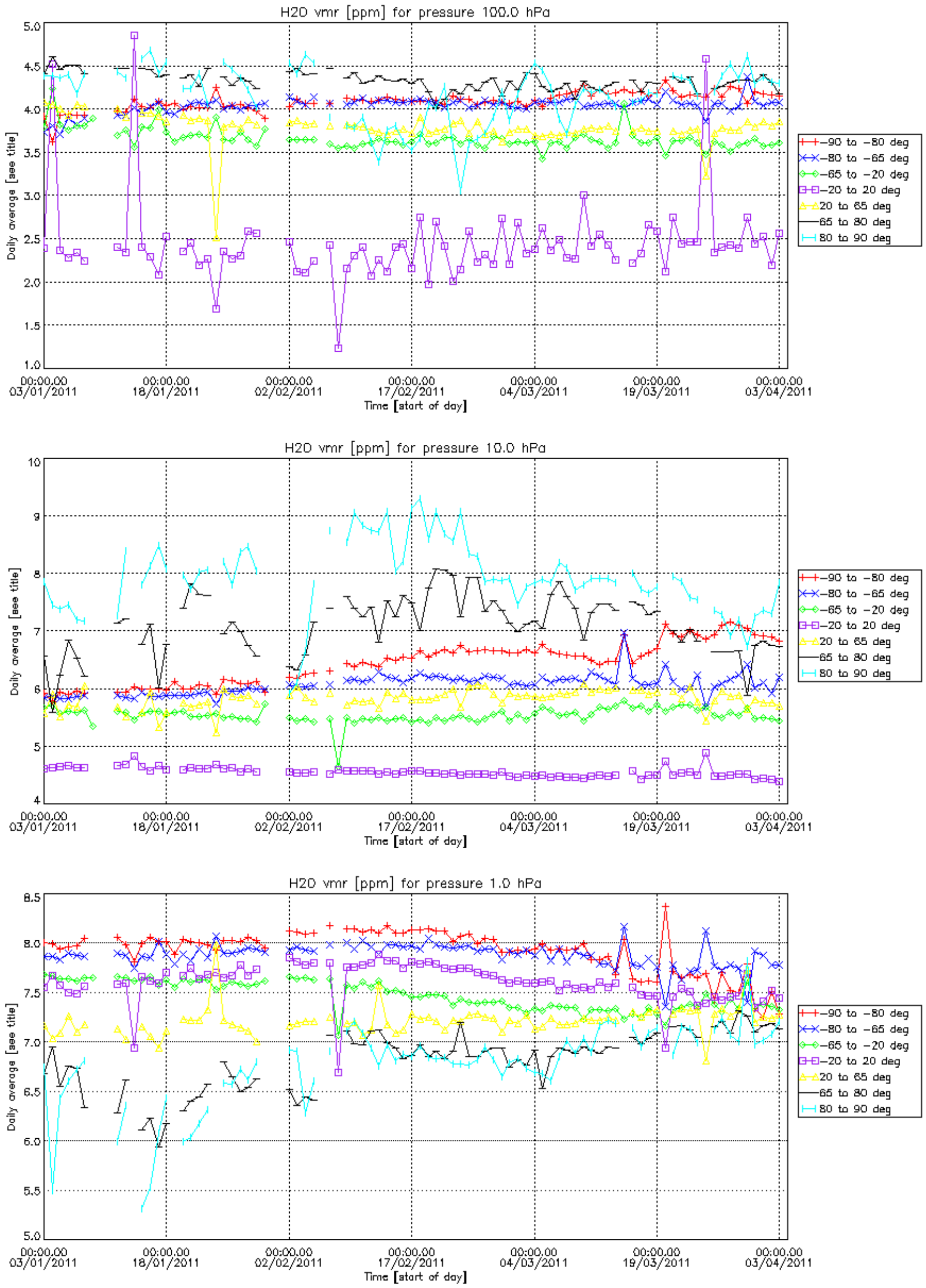

Figure 24 MIPAS H2O VMR zonal mean at three pressure levels.

Figure 25 MIPAS ozone VMR zonal mean at three pressure levels.

6.3 Instrument and products monitoring after the ENVISAT orbit lowering

The first two critical steps of the ENVISAT orbit lowering manoeuvre were successfully completed during 22 – 26 Oct 2010 and all payloads were slowly switched back on starting on 27 October. Further details can be found at the following web page:
http://www.esa.int/esaCP/SEMEZX1PLFG_index_0.html

Between 22 October and 02 November ENVISAT was in Yaw Steering Mode (YSM). Since 2 November, 10:25 UTC, ENVISAT is in Stellar Yaw Steering Mode (SYSM), which is the nominal mode of operations. Since 4 Nov 2010 ENVISAT was moved into the final orbit corresponding to the new scenario of the mission phase 3.

MIPAS successfully resumed operations on 28 Oct 2010, at 9:46:48 UTC in Nominal measurement mode. The instrument performances and the products quality in the new mission phase are briefly described in this paragraph.

6.3.1 INSTRUMENT PERFORMANCES IN NEW SCENARIO

The status of instrument performances after the start of the new mission phase is fully nominal, since all instrument parameters are within the expected range of variability. The detectors ice contamination is within the expected trend. The only issue on the instrument in the new phase was an anomaly in the Cooler Displacer observed after the switch-on of the instrument.

Cooler Anomaly

The Cooler Displacer monitoring showed some Out Of Limit (OOL) values after the switch-on, during 28 Oct 2010, see picture below. The analysis seems to show that these OOL were most likely due to a Single Event Upset (SEU), however an investigation is still on-going at PLSO.

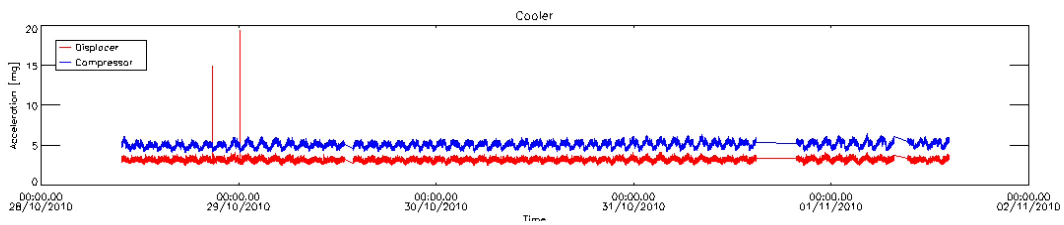

Figure 26 – MIPAS cooler acceleration level after the ENVISAT orbit lowering.

6.3.2 OPERATIONAL PRODUCTS PERFORMANCES IN NEW SCENARIO

The quality of the MIPAS operational ESA products in the new orbit scenario is fully nominal for both level 1 and level 2 products in NRT and off-line processing chain. The monitoring of the most critical quality indicators in the level 1 and level 2 data shows no major issues. The only significant problem observed so far is the pointing degradation during the period 28 Oct – 2 Nov 2010.

Pointing degradation in YSM

A degraded MIPAS pointing accuracy was observed for the period: 28 Oct – 2 Nov 2010. The results of the investigation performed in ESRIN, in agreement with independent results obtained by U. of Oxford, have shown that the issue is due to the ENVISAT Yaw Steering Mode (YSM) that was used during this part of the mission. The MIPAS pointing accuracy is back to nominal values since the switch to the ENVISAT nominal attitude control, the Stellar Yaw Steering Mode (SYSM) performed on 2 Nov 2010 at 10:25 UTC.

The figure below shows the variation of the average corrected altitude in MIPAS level 2 processing during October 2010. The increase in the altitude correction during the period where ENVISAT was operated in YSM is clear in this plot. The zoom on the right shows that the altitude correction was back to nominal values exactly at the time when the nominal SYSM was resumed.

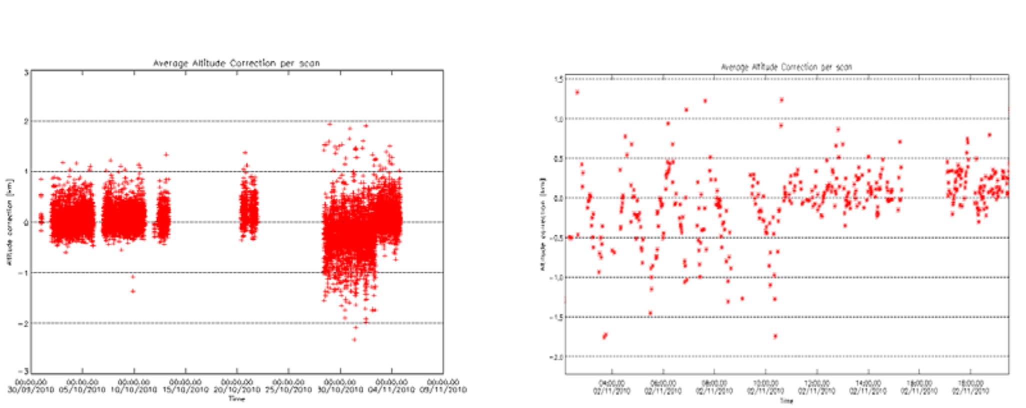

Figure 27 – MIPAS altitude correction in the Level 2 processing averaged over a scan during October 2010 and zoom at the time when the ENVISA SYSM was resumed after the orbit lowering.

6.3.3 INSTRUMENT PLANNING IN THE NEW SCENARIO

The planning was resumed after the orbit lowering with 6 days of nominal operations. The nominal baseline planning (4 days NOM + 1 day UA + 4 days NOM + 1 day MA) was restarted since 4 Nov 2010. An issue was detected in the planning of nominal mode after the MIPAS switch-on, owing to this, the actual altitude scan pattern along the

orbit moderately deviates from the baseline. The issue is illustrated in the figure below, where the tangent altitudes are reported as a function of time. We can see that the tangent altitudes did not follow the cosines law for the floating altitudes as a function of latitude, but a linear interpolation is used. This issue was recognized to be related to a bug of the planning tool. This issue doesn't impact the quality of the data.
The patch of the planning tool was applied starting from 30 Nov 2010. Since that date, the elevation scan pattern in nominal measurement mode is fully in-line with the baseline.

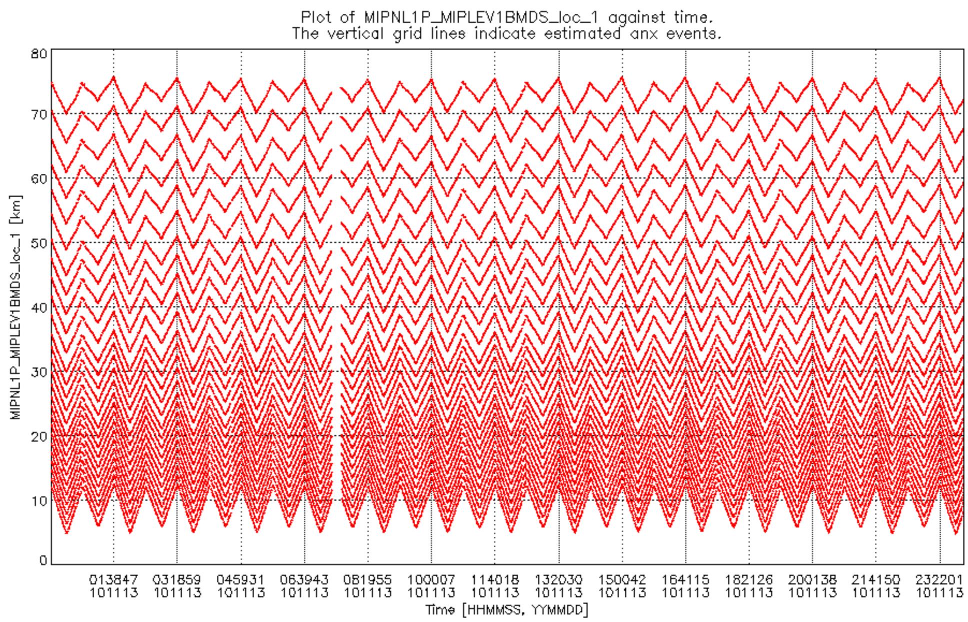

Figure 28 – MIPAS tangent altitude during 13 November 2010, showing the planning anomaly.

6.3.4 INSTRUMENT CALIBRATION IN NEW SCENARIO

No issues were detected in the routine radiometric calibration of MIPAS instrument. The detector ice contamination is in line with the expected trend.
Three Line-of-Sight calibrations were performed after the orbit lowering, the pitch mispointing observed by MIPAS with respect to the platform in the new orbit scenario is within the expected range (-30 mdeg).

7 APPENDICES

7.1 Appendix A – 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
MCMD	Macro-Command
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

7.2 Appendix B – Level 1 IPF historical updates

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

- **Version V5.05** it is equivalent to IPF 5.02, but the new CFI 5.8.1 for the ENVISAT mission extension are integrated
- **Version V5.02** (aligned with L1 DPM 4L and L1 ADFs V8.6) upgrade of the Level 1 processor. The L2 processing with this IPF is disabled, due to the investigation on-going on the discrepancies between IPF and reference prototype processor. For Level 1 the following upgrades were included:
    - Truncation of the Interferogram to 8.0 cm in order to avoid under-sampling the spectrum for the Optimized Resolution mission
    - Improved Level 1b engineering heights calculation
    - Calculation of the quadratic terms for spectral calibration that are provided in the output products
    - Additional fields in the Level 1b products, such as the auxiliary L0 data packets that provide information about house keeping data
- **Version V04.67L02** Linux porting version of 4.67 AIX processor
- **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

7.3 Appendix C – 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 17 Level 1 ADF start validity date

ADFs Version	Updated ADF	Start Validity Date	IPF version	Dissemination Date
8.6	MIP_PS1_AX MIP_CL1_AX	09-Aug-2004 RR mission	5.02 + Mical 1.6	28 Jan 2010
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	21Apr-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 8.6

MIP_PS1_AX

- Rejection Threshold NESR assessment = 1.0
- Changing the pitch, roll and yaw bias taking into account the alignment matrix correction introduced in the planning for reduced resolution data.
- The OPD is set also to 8.0 instead of 8.2 cm.
- Attitude flag set to 0 since for the IPF 5.02 the usage of AUX_FRA is disabled

MIP_CL1_AX

- A specific MIP_CL1_AX files has to used with ADF 8.6m, this ADF LOS calibration files has no pitch bias correction and allows to correct for the problem in the alignment matrix when used with the MIP_PS1_AX file of version 8.6

Mical 1.6

- The version 8.6 is activated in correspondence with the new Mical chain 1.6

<u>Version 6.1</u>

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

<u>Version 6.0</u>

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

<u>Version 5.0 draft</u>

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

<u>Version 4.1 (TDS 6)</u>

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

<u>Version 4.0 draft</u>

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

<u>Version 3.2</u>

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.

7.4 Appendix D – Level 2 IPF historical updates

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

- **Version V5.05** first IPF that allows L2 processing of Optimized Resolution mission, it is aligned with DPM 5.2 and ADF 6.4
- **Version V5.02** No L2 processing will be made with this version since some inconsistencies are still present with respect of the reference algorithm.
- **Version V04.67L02** Linux porting version of 4.67 AIX processor
- **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

7.5 Appendix E – Level 2 ADF historical updates

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). The versions 6.0 – 6.2 were still not used for operational processing. Version 6.4 was used for the switch of IPF 5.05.

Table 18. Historical update of Level 2 configuration ADFs. In green are the operational ones.

Version	Date of delivery	List of files upgraded by IFAC	Main modifications
ADF V6.0: to be used to process MIPAS measurements from January 2005 on, characterized by reduced spectral resolution and new measurements scenario (1.5 km step at low altitudes). To be used with ML2PP V5.0			
ADF V6.4	10.06.2010	MIP_IG2_AX_V6.4_2010_january MIP_SP2_AX_V6.4 MIP_PI2_AX_V6.4	Bug correction in MIP_IG2 and MIP_SP2 file. MIP_PI2 file updated to handle UA mode where 35 sweeps per scan are measured, VCM matrix of LOS increased in size up to 35.
ADF V6.3	29.03.2010	MIP_OM2_AX_V6.3 MIP_CS2_AX_V6.3 MIP_PS2_AX_V6.3_nom_before_5june2005_l MIP_PS2_AX_V6.3_nom_after_5june2005_l MIP_PS2_AX_V6.3_utls1_ECMWF_l MIP_PS2_AX_V6.3_ma_ua MIP_MW2_AX_V6.3	MIP_MW2_AX: correction of an error in the MW_PT ascii file for cloud detection microwindow pairs that brought an inconsistency in the MIP_MW2_AX binary file. • MIP_OM2_AX: inclusions of OMs used to process MA and UA measurement modes. • MIP_PS2_AX: 1. Modification in the threshold defining minimum value of eigenvalue (for inversion of matrix) for all species: old value: 1.e-30; new value: 1.e-17 2. Regularization for H2O set to 'off' Added a dedicated file to be used for processing MA and UA modes (these 2 modes, despite NOM and UTLs-1 modes, do not have floating altitudes). • MIP_CS2_AX: added LUTs per MWs contained in OMs for MA e UA modes (respectively OM_*_70* and OM_*_80*)
ADF V6.2	27.06.2008	MIP_IG2_AX_V6.2_2005_january MIP_OM2_AX_V6.2	New IG2 files (IG2 V4.1) Extended altitude bands for both UTLS1 and NOM OMs (± 4 km). Inserted pT error propagation matrices in nominal OMs for both NOM and UTLS-1 modes.

Version	Date of delivery	List of files upgraded by IFAC	Main modifications
ADF2 V6.1	21.12.2007	MIP_CS2_AX_V6.1 MIP_OM2_AX_V6.1 MIP_SP2_AX_V6.1 MIP_PS2_AX_V6.1_nom_before_5june2005 MIP_PS2_AX_V6.1_nom_after_5june2005 MIP_PS2_AX_V6.1_utls1 MIP_MW2_AX_V6.1 MIP_IG2_AX_V6.1_2005_april MIP_IG2_AX_V6.1_2005_january MIP_IG2_AX_V6.1_2005_july MIP_IG2_AX_V6.1_2005_october MIP_IG2_AX_V6.1_2006_april MIP_IG2_AX_V6.1_2006_january MIP_IG2_AX_V6.1_2006_july MIP_IG2_AX_V6.1_2006_october	New MW of O3. Extended altitude range for UTLS-1 OMs. New cloud MW to allow cloud filtering algorithm to discard from the analysis measurements with tangent altitudes below 4.5 km. Reduced vertical resolution for CH4 and N2O profiles. New settings for retrieved tangent altitude correction with ECMWF.
ADF2 V6.0	21.11.2006	MIP_CS2_AX_V6.0_nom MIP_OM2_AX_V6.0_nom MIP_PS2_AX_V6.0_nom MIP_SP2_AX_V6.0_nom MIP_PS2_AX_V6.0_nom_before_05june2005 MIP_PS2_AX_V6.0_nom_after_05june2005 MIP_PS2_AX_V6.0_utls1 MIP_MW2_AX_V6.0_nom_patch MIP_IG2_AX_2005_april MIP_IG2_AX_2005_january MIP_IG2_AX_2005_july MIP_IG2_AX_2005_october MIP_IG2_AX_2006_april MIP_IG2_AX_2006_january MIP_IG2_AX_2006_july MIP_IG2_AX_2006_october	New MW database and LUTs (MW_330 for pT, MW_360 for the other species.) New occupation matrices. New line list database New cloud indeces and cloud microwindows New climatological profiles IG2 V4.0 New PS settings with several new items added required by new or modified functionalities in ML2PP V5.0.
ADF2 V5.*: to be used for processing MIPAS measurements of August/September 2004, characterized by reduced spectral resolution, old measurements scenario (3 km step at low altitudes)			
ADF V5.2	16.12.2005	MIP_SP2_AX_V5.2 MIP_IG2_october_V5.2	Corrected error in binary files
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; extension of a microwindow for cloud detection corrected.

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ADF V5.0	18.03.2005	MIP_PS2_AX_V5 MIP_CS2_AX_V5 MIP_MW2_AX_V5 MIP_PI2_AX_V5 MIP_I2_AX_V5 MIP_OM2_AX_V5	New microwindows selected for reduced spectral resolution, and corresponding cross section LUT, occupation matrices and Initial Guess for continuum. 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.
ADF2 V4.*: to be used for processing MIPAS FR mission			
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.
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.
ADF2 V3.*: to be used for processing MIPAS FR mission			
ADF V3.7	13.02.2004	NRT: MIP_OM2_AX_NRT_V3.7 MIP_PS2_AX_NRT_V3.7 OFL: MIP_OM2_AX_OFL_V3.7 MIP_PS2_AX_OFL_V3.7	Increased NESR threshold in PS2 files to face the increase of NESR after the switch-on of the heater (since the middle of January 2004). Eliminated the OMs with fewer than 3 sweeps from the OM database.
ADF V3.6	20.10.2003	NRT: MIP_PS2_AX_V3.6_NRT OFL: MIP_PS2_AX_V3.6_OFL	Increased dimension of some vectors in MIP_PS2_AX files
ADF V3.5	26.09.2003	OFL: MIP_OM2_AX_V3.5	Introduced PT error propagation matrices different of 0 in MIP_OM2_AX_Offline
ADF V3.4	29.08.2003	NRT: MIP_MW2_AX_V3.4 OFL: MIP_MW2_AX_V3.4 MIP_OM2_AX_V3.4_OFL	Two set of aux ADF: one for NRT and one for Off-line. NRT: old conv. criteria, nom. altitude range, ILS bug correction ; Off-line : new conv. criteria, altitude range 6-68 km, ILS bug correction
ADF V3.3	08.08.2003	MIP_PS2_AX_V3.3	Short-term bug fix for ILS in PS2 file
ADF V3.2	31.07.2003	MIP_OM2_AX_V3.2 MIP_PS2_AX_V3.2 MIP_CS2_AX_V3.2	OMs for retrieval range 9-68 km, PS2 for improved convergence criteria, modification in the name of some cross-section files

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ADF V3.1	19.06.2003	MIP_MW2_AX_V3.1_CD MIP_MW2_AX_V3.1_noCD MIP_OM2_AX_V3.1	In reply to SPR MIPAS_OM2_AX_3.0: no gaps between altitude validity range and improved validity mask range in MW db.
ADF V3.0	14.05.2003	MIP_CS2_AX_V3.0 MIP_MW2_AX_V3.0_CD MIP_MW2_AX_V3.0_noCD MIP_OM2_AX_V3.0 MIP_PS2_AX_V3.0 MIP_SP2_AX_V3.0	MIPAS dedicated spectroscopic db. hitran_mipas_pf3.1, cloud detection enabled mws, improved OM for the nominal altitude range