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ENVISAT MIPAS REPORT: MAR 2004 - FEB 2005

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1 INTRODUCTION

The MIPAS instrument has been switched off on 26 March 2004 because of a strong increase in the IDU velocity error trend. During the long unavailability period, a number of tests have been done to identify the cause of the anomalies and to decide how to operate the instrument in the future. Although it is evident that the anomalies are caused by a mechanical problem, the exact error source is currently not known.

Different operation modes have been investigated in order to assess the safer one with respect to the instrument health and the one producing data with best quality. The instrument has been operated in double-slide reduced resolution (2RR) and in both single-slide reduced resolution modes (1RR), i.e. with slide #1 one and slide #2 fixed respectively.

After a detailed anomaly review, the mission has restarted with MIPAS in 2RR mode and the in-flight re-characterization of the instrument has begun on 10 January 2005.

1.1 Scope

Scope of this document is to report the detailed analysis of all possible causes of the anomaly producing the IDU velocity error and the investigation of the different modes proposed for future operations.

The report contains also the description of the new instrument configuration, the way it will be operated, the related new planning strategy, the in-flight re-characterization and the definition of the new special modes as requested by the Science Team.

A description of the update done to the IPF with the alignment with prototype and ADFs will be also reported together with the analysis and solution of product anomalies and part of the usual MIPAS report.

1.2 Acronyms and Abbreviations

ADF	Auxiliary Data File
ADS	Annotated Data Set
ANX	Ascending Node Crossing
AE	Aircraft Emission
APS	Absolute Position Measurement Sensor
AR	Anomaly Report
CBB	Calibration Black-Body
CTI	Configuration Table Interface
DPM	Detailed Processing Model
DS	Deep Space
DSD	Data Set Description
FCC	Fringe Count Cosine

FCE	Fringe Count Error
FCS	Fringe Count Sine
FOCC	Flight Operation Control Centre
HD	Help-Desk
IDU	Interferometer Drive Unit
IF	In-Flight
IG	Initial Guess
ILS	Instrument Line Shape
INT	Interferometer
I/O DD	Input/Output Data Definition
IPF	Instrument Processing Facility
LOS	Line of Sight
MA	Middle Atmosphere
MDS	Measurements Data Set
MIPAS	Michelson Interferometer for Passive Atmospheric Sounding
MPH	Main Product Header
MR	Monthly Report
MW	Micro-Window
NCR	Non-Conformance Report
NESR	Noise Equivalent Spectral Radiance
NOM	Nominal
NRT	Near-Real-Time
OFL	Off-Line
PCD	Product Confidence Data
PCF	Product Control Facility
PDS	Payload Data Segment
QWG	Quality Working Group
RGC	Radiometric Gain Calibration
SEM	Special Event Measurement
SPH	Specific Product header
SPR	Software Problem Report
UA	Upper Atmosphere
UTLS	Upper Troposphere Lower Stratosphere
VCM	Variance Covariance Matrix
VMR	Volume Mixing Ratio
WCC	Wear Control Cycle
1RR	Single Slide Reduced Resolution
2RR	Double Slide Reduced Resolution

2 THE REPORT

2.1 Unavailability

2.1.1 INSTRUMENT UNAVAILABILITY

The mission restarted the 9 August 2004 and the instrument has been operated until 17 September 2004. Because of an increasing trend in the frequency of IDU velocity errors, the mission has been newly interrupted the 17 September 2004 22:06:43.000 (orbit 13338) and restarted the 10 January 2005 10:54:19.000 (orbit 14978).

During the operations, MIPAS switched to Heater/Refuse mode due to IDU velocity error during the following time intervals:

Start time: 9 Aug 2004 04:52:38.000, 12770
Stop time: 9 Aug 2004 16:42:00.000, 12777

Start time: 16 Aug 2004 17:39:08.000, 12878
Stop time: 16 Aug 2004 21:19:00.000, 12880

Start time: 19 Aug 2004 20:29:56.000, 12922
Stop time: 20 Aug 2004 07:42:00.000, 12929

Start time: 21 Aug 2004 04:49:59.000, 12941
Stop time: 21 Aug 2004 10:28:00.000, 12945

Start time: 22 Aug 2004 07:30:14.403, 12957
Stop time: 22 Aug 2004 11:34:30.000, 12960

Start time: 22 Aug 2004 12:03:15.000, 12960
Stop time: 22 Aug 2004 16:33:00.000, 12963

Start time: 22 Aug 2004 20:41:10.000, 12965
Stop time: 16 Sep 2004 12:00:10.000, 13318

Start time: 17 Sep 2004 05:39:31.000, 13328
Stop time: 17 Sep 2004 09:40:00.000, 13331

Start time: 18 Jan 2005 11:53:55.000, 15093
Stop time: 18 Jan 2005 15:12:00.000, 15095

Start time: 28 Jan 2005 20:27:20.000, 15241
Stop time: 29 Jan 2005 10:38:23.000, 15250

Start time: 20 Feb 2005 17:15:10.000, 15568
Stop time: 20 Feb 2005 17:36:46.000, 15569

Start time: 21 Feb 2005 16:45:28.000, 15582
Stop time: 21 Feb 2005 17:05:09.000, 15583

Start time: 22 Feb 2005 21:32:13.000, 15600
Stop time: 22 Feb 2005 21:35:20.000, 15600

Start time: 28 Feb 2005 13:24:04.000, 15681
Stop time: 28 Feb 2005 15:04:26.000, 15682

2.1.2 DATA GENERATION GAPS

Only MIP_NL__0P data coverage is reported below, as currently the Near-Real Time (NRT) mission is suspended, and currently no systematic operational Off-Line (OFL) processing is performed as processing algorithms are being adapted to the new observation modes.

Tab. 1 List of missing intervals for MIP_NL__0P: 9 August - 17 September 2004.

Start Time	Stop Time	Duration [s]	Start Orbit	Stop Orbit
09-AUG-2004 16:42:00	09-AUG-2004 16:42:14	14	12777	12777
10-AUG-2004 21:04:05	10-AUG-2004 21:54:41	3036	12794	12794
10-AUG-2004 21:54:41	10-AUG-2004 21:55:08	27	12794	12794
10-AUG-2004 21:55:08	10-AUG-2004 22:14:25	1157	12794	12794
13-AUG-2004 06:48:44	13-AUG-2004 06:48:50	6	12828	12828
14-AUG-2004 06:56:41	14-AUG-2004 07:02:25	344	12842	12843
16-AUG-2004 21:19:00	16-AUG-2004 21:19:14	14	12880	12880
20-AUG-2004 07:42:00	20-AUG-2004 07:42:14	14	12929	12929
21-AUG-2004 10:28:00	21-AUG-2004 10:28:14	14	12945	12945
22-AUG-2004 11:34:30	22-AUG-2004 11:34:44	14	12960	12960
22-AUG-2004 16:33:00	22-AUG-2004 16:33:14	14	12963	12963
17-SEP-2004 09:40:00	17-SEP-2004 09:40:14	14	13331	13331

Tab. 2 List of missing intervals for MIP_NL__0P: 10 January 2005 – 28 February 2005.

Start Time	Stop Time	Duration [s]	Start Orbit	Stop Orbit
11-JAN-2005 11:17:23	11-JAN-2005 12:09:57	3154	14992	14993
11-JAN-2005 23:16:45	12-JAN-2005 07:12:18	28533	14999	15004
15-JAN-2005 09:36:49	15-JAN-2005 09:37:03	14	15048	15048
17-JAN-2005 00:01:39	17-JAN-2005 00:02:58	79	15071	15071
17-JAN-2005 02:50:08	17-JAN-2005 02:53:58	230	15073	15073
17-JAN-2005 04:31:06	17-JAN-2005 04:33:43	157	15074	15074
18-JAN-2005 15:12:00	18-JAN-2005 15:12:14	14	15095	15095
22-JAN-2005 10:58:11	22-JAN-2005 10:58:25	14	15149	15149
27-JAN-2005 21:31:21	28-JAN-2005 07:08:31	34630	15227	15233
28-JAN-2005 20:05:27	28-JAN-2005 20:27:20	1313	15241	15241
29-JAN-2005 10:38:24	29-JAN-2005 10:38:38	14	15249	15250
29-JAN-2005 11:06:55	29-JAN-2005 12:35:43	5328	15250	15251
29-JAN-2005 12:35:43	29-JAN-2005 12:42:48	425	15251	15251
29-JAN-2005 12:42:48	29-JAN-2005 12:45:59	191	15251	15251
29-JAN-2005 21:08:07	29-JAN-2005 22:09:29	3682	15251	15251
29-JAN-2005 22:16:54	29-JAN-2005 23:49:46	5572	15256	15256
29-JAN-2005 23:53:29	30-JAN-2005 01:29:37	5768	15256	15257
30-JAN-2005 01:37:50	30-JAN-2005 02:42:56	3906	15257	15258
30-JAN-2005 02:45:00	30-JAN-2005 04:25:19	6019	15258	15259
30-JAN-2005 04:26:34	30-JAN-2005 06:05:52	5958	15259	15260
05-FEB-2005 10:17:32	05-FEB-2005 10:17:46	14	15260	15261
06-FEB-2005 20:07:48	06-FEB-2005 23:42:49	12901	15349	15349
06-FEB-2005 23:44:19	07-FEB-2005 06:54:10	25791	15370	15372
07-FEB-2005 09:39:54	07-FEB-2005 09:50:42	648	15372	15376
12-FEB-2005 09:58:11	12-FEB-2005 09:58:25	14	15378	15378
19-FEB-2005 09:38:03	19-FEB-2005 09:38:17	14	15549	15550
20-FEB-2005 21:08:42	21-FEB-2005 07:22:23	36821	15571	15577
21-FEB-2005 20:36:52	22-FEB-2005 02:21:41	20689	15585	15588
26-FEB-2005 10:57:31	26-FEB-2005 10:57:45	14	15650	15650
28-FEB-2005 13:20:01	28-FEB-2005 13:24:04	243	15681	15681
28-FEB-2005 15:04:26	28-FEB-2005 15:04:41	15	15682	15682

2.2 Instrument Configuration and Performance

2.2.1 ANOMALY INVESTIGATION

2.2.1.1 Possible Causes

Since the early in the mission the MIPAS Interferometer unit experiences various types of anomalies:

- velocity errors during interferometer slide turnaround (first occurrence September 2002 and with increased frequency early 2003 and again since December 2003)
- -4% differential speed errors since April 2003 with an increasing tendency
- +4% differential speed errors since October 2003
- velocity errors during the sweep (measurement period) itself since December 2003; increasing frequency since then
- initialisation failures after the recovery from the velocity errors above (2 occurrences in 2004)

All these errors point obviously to a degradation of the interferometer subsystem, in particular its mechanics and its control loop. However, the MIPAS scientific return was not affected, i.e. the generated products were still met the engineering and scientific requirements.
Thus far recovery from initialisation failures has succeeded, but a permanent failure would imply the end of MIPAS operations. The repeated initialisation failures therefore led to the decision to suspend the MIPAS operation on 26-Mar-2004, to allow deeper analysis of all anomalies.
Table 3 shows the overall event history of the MIPAS interferometer anomalies and related activities.

Tab. 3 Overall event history of the MIPAS interferometer anomalies and related activities.

Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03
2 Turn around		5 Turn around 2 of them accelerated towards end-stop	1st –4 % diff speed Steadily increasing since that time		
Jul-03	**Aug-03**	**Sep-03**	**Oct-03**	**Nov-03**	**Dec-03**
	1 Turn around Permanent –4% Mon. disabled.	2 Turn around	1st +4 % diff speed Steadily increasing since that time		1 In sweep (#1) 1 Turn around
Jan-04	**Feb-04**	**Mar-04**	**Apr-04**	**May-04**	**Jun-03**
5 In sweep 3 Turn around	1 In sweep 3 Turn around	5 In sweep 2 Turn around (2 Init. Failures) Mission interrupted	•Special Tests •B-chain Tests	•Special Tests •Data analysis •Init Failure risk assessment	Init failure Workaround
Jul-04	**Aug-04**	**Sep-04**	**Oct-04**	**Nov-04**	**Dec-04**
Testing of a Init failure Workaround	Double/reduced resolution 6 Turn around (4 within 24 h)	Single slide Tests	Single slide Tests 3 Turn around 1(S1) 2 (S2)	•Single slide Tests 3 Turn around 2(S1) 1 (S2)	•Event driven ops.Test

The observations of the various test campaigns have shown that a multitude of effects contribute to the actual operational difficulties of the MIPAS instrument. The following list highlights the main items:

- A general degradation of the movement stability can be derived from the APS plots presented in section 9.5 of ENV-TN-ASG-MP-035, Summary of INT Anomalies. The initial degradation in the slide movement is already present visible occurrence of the first differential speed warning.

- The turnaround errors observed in the mission at lower temperatures are mainly attributed to the known stress induced birefringence effect of the MIPAS ZnSe beamsplitter, leading to a phase shift between FCS and FCC signal.

- The occurrence of differential speed errors on MIPAS B-side and in the individual Backup Modes point clearly to a mechanical degradation of the rails or rail/bearing interface and exclude an effect of the electronics. The reduced number of differential speed errors in Backup Modes may be explained by the higher speed of the slides and the simplified control loop.

- The smooth APS in-sweep data of the Backup Mode point to a problem with the outer compensation control loop of the interferometer, which is based on APS readings. From supplier information, it is known that this control loop has a sensitivity above about 100 Hz. This frequency was observed in PSD evaluations of the life test force.

- The Interferometer initialisation difficulties point to mechanical problems, as e.g. an increased rail insert step and/or increased friction.

- An increased rail insert step (compared to on-ground) could explain the event in Jan-2003, where slide 2 did not reach the end stop after a turnaround failure.

- Thermal sensitivities exist in the system, since temperature gradients in the system induced e.g. by the INT heating have a negative effect.

2.2.1.2 New Operations

As a result from the investigations in 2004 and 2005, the following constraints apply to MIPAS operations:

- In order to minimise the risk of initialisation failure, the resolution of the instrument is to be kept at 40.99% of the nominal resolution for all future measurements (including calibration and special measurements)

- In order to benefit from the self-healing effect, the duty cycle should be kept below 35% to 40%

Figure 1 shows the planning (periods of measurement / non-measurement) versus the IDU outages (availability).

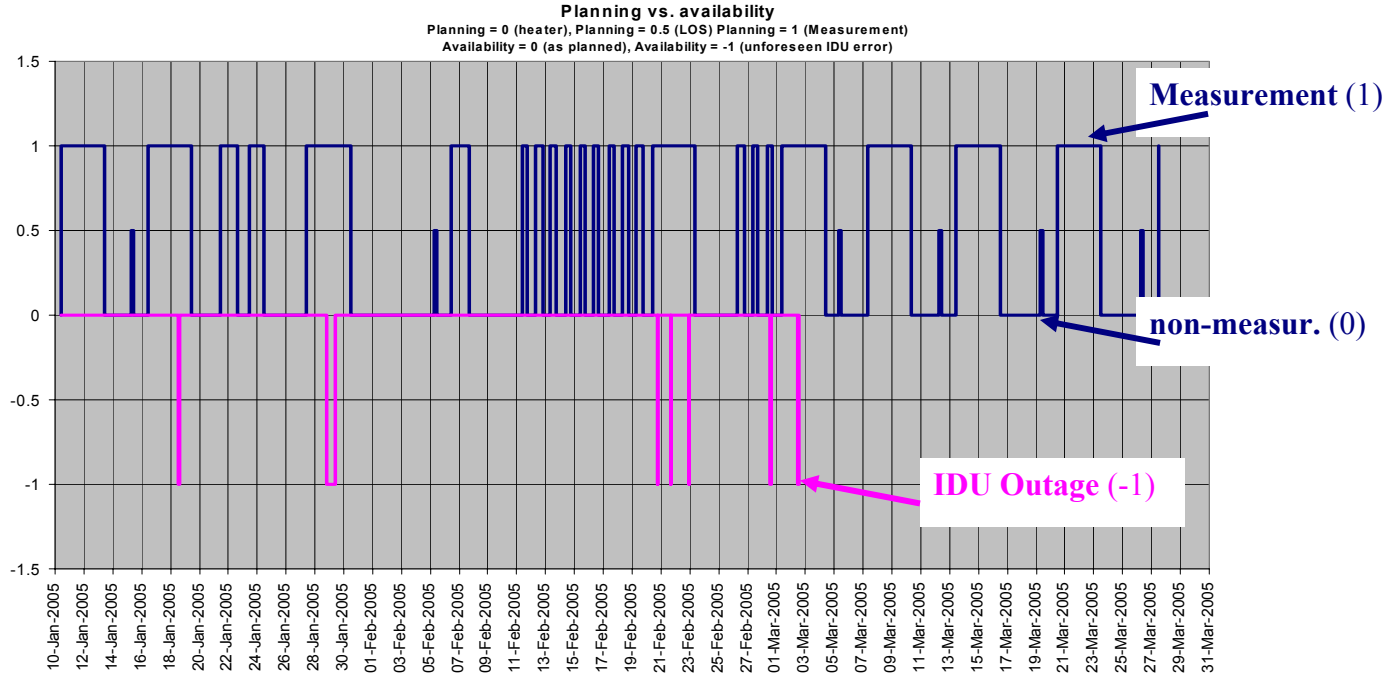

Fig. 1 Planning versus the IDU outages.

The tendency can be seen that the number of un-intended IDU errors increases with the measurement ratio. The following 2 plots (Fig. 2 and 3) shows the growing / reduction of the - 4% differential speed error during the periods of measurement and non-measurement.

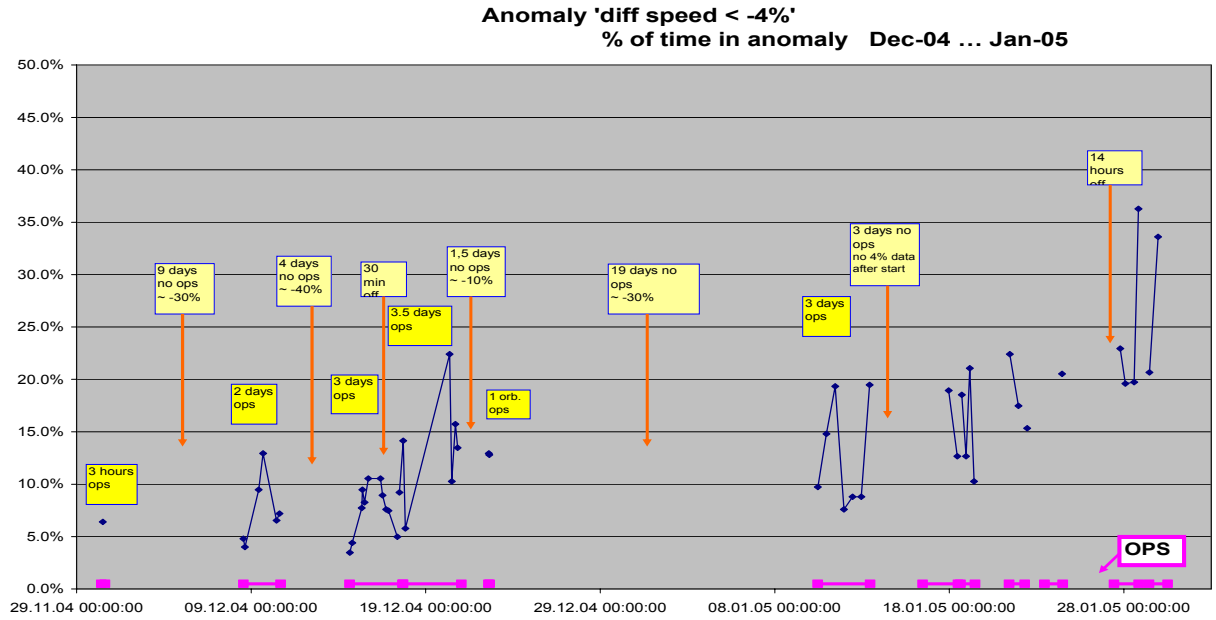

Fig. 2 Growing / reduction of the - 4% differential speed error during the periods of measurement and non-measurement: Dec 2004 – Jan 2005.

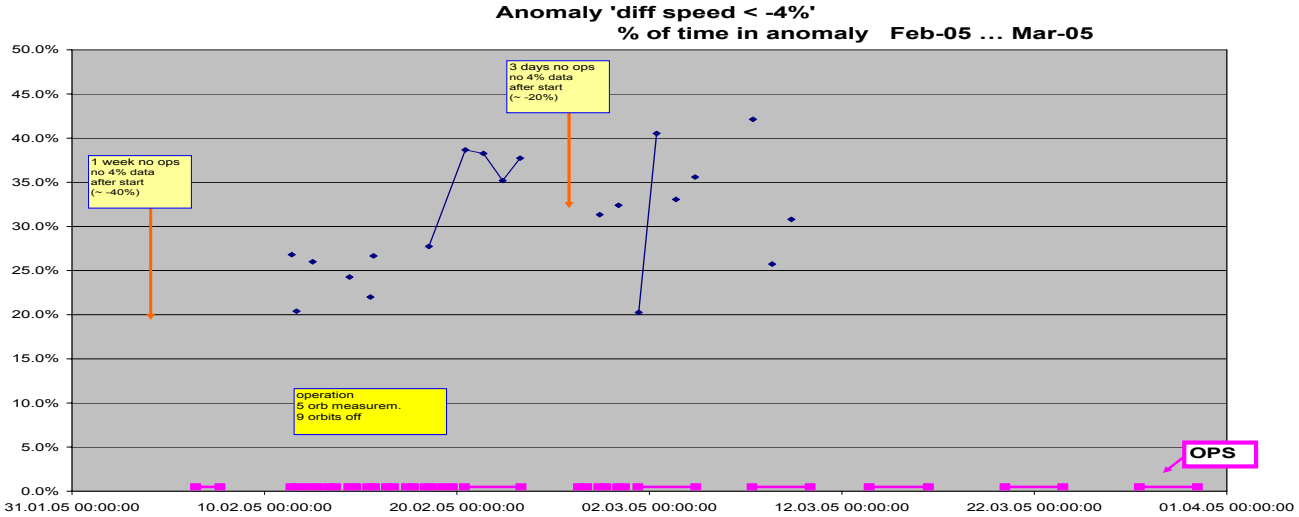

Fig. 3 Growing / reduction of the - 4% differential speed error during the periods of measurement and non-measurement: Feb 2004 – Mar 2005.

A further improvement was introduced within the mission planning system at ESOC to minimize the MIPAS outage period by an auto-recovery of the IDU once per orbit in February 2005. Due to this automated procedure the following has been achieved:

- An IDU error is always recovered within the next orbit.
- The data loss is limited to max. 100 min per IDU error.
- No operator support required for IDU error recoveries
- Approach works for any day in the week/ so no more restrictions for weekends etc.

The frequency of IDU error events is monitored carefully.

The current status shows that an IDU error can occur at any time; however the probability increases with continuous time in duty. Currently, a duty cycle of 35% to 45% is considered optimal. This allows three days of continuous operations followed by a similar interval without operations. For specific campaigns, longer operations intervals can be activated, preceded by a longer planned outage.

2.2.2 MIPAS OPERATIONS

2.2.2.1 New Operational Scenario

The MIPAS Science Team has proposed modifications of Nominal and Special Modes, which are currently under review. A large number of special tests have been planned and executed in support of these proposals.

Nominal Mode

The following configuration has been tested for the Nominal mode.

6 – 21 km at 1.5 km
21 – 31 km at 2 km
31 – 46 km at 3 km
46 – 70 km at 4 km

and a scan will be composed by 27 sweeps, with an along track sampling around 400 km. The measurements in nominal mode have been already commanded with both fixed and floating altitude offset. For the floating altitude offset a dependence on latitude is proposed as follows: minimum tangent altitude = 6 km + 3 km * cos(2 * tangent point latitude).

Special Modes

UTLS-1 – Upper Troposphere Lower Stratosphere to enable 2D retrieval
The following altitude scanning has been tested:

(5.5-11.5) km – (19-25) km at 1.5 km
(19-26) km – (25-32) km at 2 km
(25-32) km – (31-38) km at 3 km
(31-38) km – (46-53) km at 5 km

with 18 sweeps per scan and an along track sampling around 270 km, with MIPAS operated for 3 days.

UTLS-2 – Upper Troposphere Lower Stratosphere to test horizontal over-sampling
The following altitude scanning has been tested:

12 – 20 km at 2 km
20 – 29 km at 3 km
29 – 37 km at 4 km
37 – 42 km at 5 km

with 11 sweeps per scan and an along track sampling around 165 km, with MIPAS operated for 1 day.

MA – Middle Atmosphere
The following altitude scanning has been tested:

18 – 102 km at 3 km

with 29 sweeps per scan and MIPAS operated for 3 days close to the Solstice and the Equinox.

UA – Upper Atmosphere
The following altitude scanning has been tested

42 – 102 km at 3 km (the lowest height is still not fixed)
102 – 172 km at 5 km

with 35 sweeps per scan and MIPAS operated for 1 day.

AE – Aircraft Emissions
The following altitude scanning has been tested

8 – 15 km at 1.5 km
17, 20, 25, 30, and 38 km

with 11 sweeps per scan and MIPAS operated for 2 days.

2.2.2.2 Measurement Mode Test Campaigns

Two series of measurements have been planned from the restart of operations:
9 August - 20 September 2004
8 January – 28 February 2005

Starting from January 2005, the scenario described in Section 2.2.2.1 has been applied. MIPAS is operated in an experimental scenario, to capture important atmospheric events within the constraints of the 35% duty cycle. This scenario has been implemented at mission planning level by the Unavailability files (AVI_UAV_TL files), which define the period of unavailability of the instrument and therefore also command the segments of measurement.
To reduce the loss of measurement time after interferometer anomalies, and automatic recovery mechanism has been implemented in March 2005. The automatic recovery consists of a re-initialisation of the interferometer slides in each orbit at ANX+200 seconds, regardless of whether an anomaly occurred or not. This automatic recovery takes less than 4 minutes per orbit.

Operations summary for the period 9 August – 20 September 2004 (orbits #12770 - 13379)

Operations planning:

- All activities have been planned with a double slide reduced spectral resolution of 1.64 sec
- Compensation times and transitory times have been updated accordingly to both ESRIN and ESOC and following the industry prime contractor recommendations
- Nominal (NOM) background mission with spectral reduced resolution and DS offset every 20 scans
- Periodic RGC performed every 18 orbits, starting at ANX = 5500 sec
- Periodic WCC performed every 6 orbits, starting at ANX = 4010 sec
- The short orbital Special Event activity (SEM) has been dismissed
- LOS activity with a PRIME sequence in the first two Kiruna orbits on Saturday and a BACKUP sequence on the first two Kiruna orbits on Sunday

Files transferred to the FOCC:

CTI_TCP_MPVRGT20040722_092827_00000000_00001726_20040809_043315_20781231_235959.N1
Group_16500 RGTv_1758 restart in orbit #12770 at ANX=0 sec
CTI_DSN_MPVRGT20040722_095114_00000000_00000116_20040809_043415_20781231_235959.N1
Group_16502 RGTv_133 restart in orbit #12770 at ANX=60 sec
CTI_BBN_MPVRGT20040722_095427_00000000_00000072_20040809_043515_20781231_235959.N1
Group_16503 RGTv_89 restart in orbit #12770 at ANX=120 sec
MPL_CAL_MPVRGT20040722_095929_00000000_00000056_20040809_043615_20781231_235959.N1
Group_16504 RGTv_79 restart in orbit #12770 at ANX=180 sec
CTI_S20_MPVRGT20040722_102113_00000000_00000002_20040809_043635_20781231_235959.N1
Group_16505 RGTv_11 restart in orbit #12770 at ANX=200 sec
CTI_S21_MPVRGT20040722_102236_00000000_00000002_20040809_043655_20781231_235959.N1
RGTv_11 restart in orbit #12770 at ANX=220 sec
CTI_SEW_MPVRGT20040722_101959_00000000_00000002_20040809_043715_20781231_235959.N1
RGTv_12 restart in orbit #12770 at ANX=240 sec
CTI_E02_MPVRGT20040722_105148_00000000_00000053_20040809_044850_20781231_235959.N1
Group_16507 restart in orbit #12770 at ANX=1000 sec
CTI_E01_MPVRGT20040722_105148_00000000_00000053_20040809_044853_20781231_235959.N1
CTI_AST_MPVRGT20040722_105148_00000000_00000053_20040809_044856_20781231_235959.N1
CTI_N02_MPVRGT20040722_105148_00000000_00000026_20040809_044859_20781231_235959.N1
CTI_S08_MPVRGT20040722_105148_00000000_00000013_20040809_044902_20781231_235959.N1
CTI_NOC_MPVRGT20040722_105148_00000000_00000053_20040809_044905_20781231_235959.N1
MPL_LOS_MPVRGT20040722_180633_00000000_00000130_20040814_065629_20040815_094415.N1
Group_16564 RGTv_183
PRIME orbits #12843-12844, BACKUP orbits #12857-12858 Pitch: Bias=+0.0 deg, no harmonics, rearward observations only
MPL_LOS_MPVRGT20040723_144214_00000000_00000131_20040821_063706_20040822_110514.N1
Group_16568 RGTv_184
PRIME orbits #12943-12944, BACKUP orbits #12958-12959 Pitch: Bias=+0.0 deg, no harmonics, rearward observations only
MPL_LOS_MPVRGT20040727_134826_00000000_00000132_20040904_073718_20040905_102618.N1
Group_16627 RGTv_188

PRIME orbits #13144-13145, BACKUP orbits #13158-13159 Pitch: Bias=+0.0 deg, no harmonics, rearward observations only
MPL_LOS_MPVRGT20040727_142714_00000000_00000133_20040911_071724_20040912_100635.N1
Group_16631 RGTv_189
PRIME orbits #13244-13245, BACKUP orbits #13258-13259 Pitch: Bias=+0.0 deg, no harmonics, rearward observations only
MPL_LOS_MPVRGT20040727_150230_00000000_00000134_20040918_065735_20040919_094630.N1
Group_16636 RGTv_190
PRIME orbits #13344-13345, BACKUP orbits #13358-13359 Pitch: Bias=+0.0 deg, no harmonics, rearward observations only

Operations summary for the period 10 January – 28 February 2005 (orbits #14947 - 15687).
The first part of planned measurements has been dedicated to special modes and in-flight re-characterization measurements. Starting from 11 February 2005 nominal measurements have been planned with two different strategies: 5 orbits per day (11-20 and 23-28 February 2005) and 3 days of consecutive measurements (20-23 February 2005).

Operations planning:

- All activities have been planned in nominal mode (double slide operation) with medium resolution (41% - 1.64 sec sweeps) with asymmetric transitory sweeps
- Compensation times and transitory times have been planned according to the new operational baseline defined last August
- Tests conform the New Nominal scenario recommendations (formulated during the 1st Science Team meeting) have been planned
- DS offset measurements for nominal mode every 13 scans
- Special Mode Scenarios defined by the 1st Science Team meeting (UTLS1, UTLS2, UA and MA) and the In-Flight Calibration measurements (IF8, IF10, IF11, IF6, IF16 and IF2) have been commanded with the scheduling shown in Tab. 4
- Radiometric Gain calibrations (RGC) have been planned using the MPL_ORS_MP file (see Tab. 4)
- The WCC activity cannot be explicitly requested trough the MPL_ORS_MP file, anyway it will be performed after every transition to Heater
- The short orbital Special Event activity (SEM) has been dismissed
- 2 LOS orbits during the week-end (see Tab. 4) with the following inputs: 2 consecutive PRIME orbits + 2 consecutive BACKUP orbits; PITCH BIAS=-0.030<deg>, no harmonics (INT_AUX_MP.27); EL_OFFSET=+000.100000<deg> and NUM_STEPS=+15 (INT_AUM_MP.23); Rearward observations only

Tab. 4 MIPAS planning from 8 January to 28 February 2005.

Date		First Orbit	Last orbit	LOS orbits (Prime)		LOS orbits (Backup)		RGC orbit	Campaigns			
									Orbit	ANX	UTC	Scenario
07-Jan-05	Fri	14929	14943									OCM
08-Jan-05	Sat	14944	14957	14947	14948						08-Jan-2005 06:37:05	start LOS Prime
											08-Jan-2005 09:55:48	stop LOS Prime
09-Jan-05	Sun	14958	14971			14962	14963					
10-Jan-05	Mon	14972	14985					14980	14978	1500	10-Jan-2005 10:59:19	start MA - Middle Atmosphere
11-Jan-05	Tue	14986	15000					14994				
12-Jan-05	Wed	15001	15014					15009				
13-Jan-05	Thu	15015	15028						15021	1000	13-Jan-2005 10:57:50	stop MA - Middle Atmosphere
14-Jan-05	Fri	15029	15043									
15-Jan-05	Sat	15044	15057	15047	15048						15-Jan-2005 06:16:10	start LOS Prime
											15-Jan-2005 09:36:21	stop LOS Prime
16-Jan-05	Sun	15058	15071			15062	15063	15066	15064	1500	16-Jan-2005 11:10:49	start UTLS1 - Upper Tropo Lower Strato 1
17-Jan-05	Mon	15072	15086					15080				
18-Jan-05	Tue	15087	15100					15094				
19-Jan-05	Wed	15101	15114						15107	1000	19-Jan-2005 11:09:19	stop UTLS1 - Upper Tropo Lower Strato 1
20-Jan-05	Thu	15115	15129									
21-Jan-05	Fri	15130	15143					15137	15135	1500	21-Jan-2005 10:13:20	start UA - Upper Atmosphere
22-Jan-05	Sat	15144	15157	15148	15149				15152	1000	22-Jan-2005 14:36:16	stop UA - Upper Atmosphere
23-Jan-05	Sun	15158	15172			15162	15163	15166	15164	1500	23-Jan-2005 10:50:41	start UTLS2 - Upper Tropo Lower Strato 2
24-Jan-05	Mon	15173	15186						15179	1000	24-Jan-2005 11:52:26	stop UTLS2 - Upper Tropo Lower Strato 2
25-Jan-05	Tue	15187	15200									
26-Jan-05	Wed	15201	15215									
27-Jan-05	Thu	15216	15229					15223	15221	1500	27-Jan-2005 10:24:49	start NOM - fixed altitude
28-Jan-05	Fri	15230	15243					15237	15242	1500	28-Jan-2005 21:37:24	stop NOM fixed altitudes start NOM floating altitudes
29-Jan-05	Sat	15244	15257	15248	15249			15251				
30-Jan-05	Sun	15258	15272			15262	15263		15265	1000	30-Jan-2005 12:03:56	stop NOM floating altitudes
31-Jan-05	Mon	15273	15286									
01-Feb-05	Tue	15287	15300									

02-Feb-05	Wed	15301	15315									
03-Feb-05	Thu	15316	15329									
04-Feb-05	Fri	15330	15343									
05-Feb-05	Sat	15344	15358	15348	15349						05-Feb-2005 06:58:57	start LOS Prime
											05-Feb-2005 10:17:03	stop LOS Prime
06-Feb-05	Sun	15359	15372			15362	15363		15364	1000	06-Feb-2005 10:02:07	start IF2 - Spectral Characterisation
									15372	2000		stop IF2 - Spectral Characterisation start NOM floating altitudes
07-Feb-05	Mon	15373	15386						15377	1550-2272		IF16 - Limb Scanning Sequences in raw data mode
									15378	1486-2280		
									15379	1000		IF6 - CBB and DS SNR Characterisation
									15380	1000		IF11 - Absence of High Resolution Features Verification in Gain
									15381	...		IF10 - $NESR_0$ Verification
									15382	1000		IF8 - Radiometric Calibration Characterisation
									15382	1850	07-Feb-2005 16:28:10	stop NOM floating altitudes
08-Feb-05	Tue	15387	15401									
09-Feb-05	Wed	15402	15415									
10-Feb-05	Thu	15416	15429									
11-Feb-05	Fri	15430	15444					15436	15435	1000	11-feb-2005 09.05.44	start NOM - floating altitudes
									15440	1500	11-feb-2005 17.37.03	stop NOM - floating altitudes
12-Feb-05	Sat	15445	15458	15448	15449			15451			12-feb-2005 06.39.47	start NOM - floating altitudes
									15455	1500	12-feb-2005 18.46.02	stop NOM - floating altitudes
13-Feb-05	Sun	15459	15472			15463	15464	15464	15463	1000	13-feb-2005 08.02.30	start NOM - floating altitudes
									15468	1500	13-feb-2005 16.33.50	stop NOM - floating altitudes
14-Feb-05	Mon	15473	15486					15479	15478	1000	14-feb-2005 09.11.29	start NOM - floating altitudes
									15483	1500	14-feb-2005 17.42.49	stop NOM - floating altitudes
15-Feb-05	Tue	15487	15501					15493	15492	1000	15-feb-2005 08.39.52	start NOM - floating altitudes
									15497	1500	15-feb-2005 17.11.12	stop NOM - floating altitudes
16-Feb-05	Wed	15502	15515					15507	15506	1000	16-feb-2005	start NOM -

											08.08.15	floating altitudes
									15511	1500	16-feb-2005 16.39.34	stop NOM - floating altitudes
17-Feb-05	Thu	15516	15529					15522	15521	1000	17-feb-2005 09.17.14	start NOM - floating altitudes
									15526	1500	17-feb-2005 17.48.33	stop NOM - floating altitudes
18-Feb-05	Fri	15530	15544					15536	15535	1000	18-feb-2005 08.45.37	start NOM - floating altitudes
									15540	1500	18-feb-2005 17.16.56	stop NOM - floating altitudes
19-Feb-05	Sat	15545	15558	15548	15549			15551			19-feb-2005 06.20.40	start NOM - floating altitudes
									15555	1500	19-feb-2005 18.25.55	stop NOM - floating altitudes
20-Feb-05	Sun	15559	15572			15563	15564	15565	15564	1000	20-feb-2005 09.22.59	start NOM - floating altitudes
21-Feb-05	Mon	15573	15587					15579				
22-Feb-05	Tue	15588	15601					15593				
23-Feb-05	Wed	15602	15615						15606	1000	23-feb-2005 07.48.08	stop NOM - floating altitudes
24-Feb-05	Thu	15616	15630									
25-Feb-05	Fri	15631	15644									
26-Feb-05	Sat	15645	15658	15649	15650			15652			26-feb-2005 07.41.12	start NOM - floating altitudes
									15655	1500	26-feb-2005 18.05.48	stop NOM - floating altitudes
27-Feb-05	Sun	15659	15673			15663	15664	15665	15664	1000	27-feb-2005 09.02.52	start NOM - floating altitudes
									15669	1500	27-feb-2005 17.34.11	stop NOM - floating altitudes
28-Feb-05	Mon	15674	15687					15679	15678	1000	28-feb-2005 08.31.15	start NOM - floating altitudes
									15683	1500	28-feb-2005 17.02.34	stop NOM - floating altitudes

Files transferred to the FOCC:

Unavailability files

AVI_UAV_TLVFOS20041217_145918_00000000_00000104_20041214_101745_20050108_063205.N1
AVI_UAV_TLVFOS20041217_150400_00000000_00000105_20050108_100047_20050110_105419.N1
AVI_UAV_TLVFOS20041221_113510_00000000_00000106_20050113_110250_20050115_061110.N1
AVI_UAV_TLVFOS20041221_114223_00000000_00000107_20050115_094121_20050116_110549.N1
AVI_UAV_TLVFOS20041221_120520_00000000_00000108_20050119_111419_20050121_100820.N1
AVI_UAV_TLVFOS20041221_121400_00000000_00000109_20050122_144116_20050123_104541.N1
AVI_UAV_TLVFOS20041221_122147_00000000_00000110_20050124_115726_20050215_120000.N1
AVI_UAV_TLVFOS20050117_150342_00000000_00000111_20050124_115726_20050127_101949.N1
AVI_UAV_TLVFOS20050117_151325_00000000_00000112_20050130_120856_20050215_120000.N1
AVI_UAV_TLVFOS20050121_154923_00000000_00000113_20050130_120856_20050205_065357.N1
AVI_UAV_TLVFOS20050121_155123_00000000_00000114_20050205_102203_20050215_120000.N1
AVI_UAV_TLVFOS20050126_085045_00000000_00000115_20050205_102203_20050206_095707.N1
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AVI_UAV_TLVFOS20050131_124005_00000000_00000117_20050207_163310_20050211_090044.N1
AVI_UAV_TLVFOS20050131_124505_00000000_00000118_20050211_174203_20050212_063447.N1
AVI_UAV_TLVFOS20050131_130100_00000000_00000119_20050212_185102_20050213_075730.N1
AVI_UAV_TLVFOS20050131_143700_00000000_00000120_20050213_163850_20050214_090629.N1
AVI_UAV_TLVFOS20050131_143900_00000000_00000121_20050214_174749_20050215_083452.N1
AVI_UAV_TLVFOS20050131_144000_00000000_00000122_20050215_171612_20050216_080315.N1
AVI_UAV_TLVFOS20050131_144400_00000000_00000123_20050216_164434_20050217_091214.N1
AVI_UAV_TLVFOS20050131_144700_00000000_00000124_20050217_175333_20050218_084037.N1
AVI_UAV_TLVFOS20050131_145700_00000000_00000125_20050218_172156_20050219_061540.N1
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AVI_UAV_TLVFOS20050131_150600_00000000_00000127_20050220_175918_20050228_120000.N1
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AVI_UAV_TLVFOS20050203_103700_00000000_00000129_20050221_172745_20050222_081445.N1
AVI_UAV_TLVFOS20050203_105700_00000000_00000130_20050222_165605_20050223_074308.N1
AVI_UAV_TLVFOS20050203_110900_00000000_00000131_20050223_162428_20050224_085207.N1
AVI_UAV_TLVFOS20050203_111600_00000000_00000132_20050224_173326_20050225_082030.N1
AVI_UAV_TLVFOS20050203_112000_00000000_00000133_20050225_170149_20050226_073612.N1
AVI_UAV_TLVFOS20050203_114000_00000000_00000134_20050226_181048_20050227_085752.N1
AVI_UAV_TLVFOS20050203_115000_00000000_00000135_20050227_173911_20050228_082615.N1
AVI_UAV_TLVFOS20050203_120600_00000000_00000136_20050228_170734_20050331_120000.N1

MPL_LOS_MPVRGT20041216_154316_00000000_00000138_20050108_063705_20050109_110510.N1
Group_18442 RGTv_199
MPL_LOS_MPVRGT20041217_192447_00000000_00000139_20050115_061610_20050116_104547.N1
Group_18523 RGTv_200
MPL_LOS_MPVRGT20041220_094329_00000000_00000140_20050122_073725_20050123_102632.N1
Group_18525 RGTv_201
MPL_LOS_MPVRGT20041220_100830_00000000_00000141_20050129_071809_20050130_100625.N1
Group_18526 RGTv_202
MPL_LOS_MPVRGT20041220_103142_00000000_00000142_20050205_065857_20050206_094554.N1
Group_18527 RGTv_203
MPL_LOS_MPVRGT20050128_175820_00000000_00000143_20050212_063947_20050213_110659.N1
Group_19030 RGTv_204
MPL_LOS_MPVRGT20050128_182724_00000000_00000144_20050219_062040_20050220_104653.N1
Group_19031 RGTv_205
MPL_LOS_MPVRGT20050202_165531_00000000_00000145_20050226_074111_20050227_102546.N1
Group_19133 RGTv_206

CTI_E02_MPVRGT20041216_175834_00000000_00000056_20050110_105919_20781231_235959.N1
Group_18450
CTI_E01_MPVRGT20041216_175834_00000000_00000056_20050110_105922_20781231_235959.N1
CTI_AST_MPVRGT20041216_175834_00000000_00000056_20050110_105925_20781231_235959.N1
CTI_N01_MPVRGT20041216_175834_00000000_00000029_20050110_105928_20781231_235959.N1
CTI_S06_MPVRGT20041216_175834_00000000_00000014_20050110_105931_20781231_235959.N1
CTI_NOC_MPVRGT20041216_175834_00000000_00000056_20050110_105934_20781231_235959.N1
CTI_E02_MPVRGT20041220_181154_00000000_00000057_20050116_111049_20781231_235959.N1
Group_18536
CTI_E01_MPVRGT20041220_181154_00000000_00000057_20050116_111052_20781231_235959.N1
CTI_AST_MPVRGT20041220_181154_00000000_00000057_20050116_111055_20781231_235959.N1
CTI_N02_MPVRGT20041220_181154_00000000_00000028_20050116_111058_20781231_235959.N1
CTI_S08_MPVRGT20041220_181154_00000000_00000014_20050116_111101_20781231_235959.N1
CTI_NOC_MPVRGT20041220_181154_00000000_00000057_20050116_111104_20781231_235959.N1
CTI_E02_MPVRGT20041221_095650_00000000_00000058_20050121_101320_20781231_235959.N1
Group_18537

CTI_E01_MPVRGT20041221_095650_00000000_00000058_20050121_101323_20781231_235959.N1
CTI_AST_MPVRGT20041221_095650_00000000_00000058_20050121_101326_20781231_235959.N1
CTI_N01_MPVRGT20041221_095650_00000000_00000030_20050121_101329_20781231_235959.N1
CTI_S02_MPVRGT20041221_095650_00000000_00000016_20050121_101332_20781231_235959.N1
CTI_NOC_MPVRGT20041221_095650_00000000_00000058_20050121_101335_20781231_235959.N1
CTI_E02_MPVRGT20041221_110137_00000000_00000059_20050123_105041_20781231_235959.N1
Group_18538
CTI_E01_MPVRGT20041221_110136_00000000_00000059_20050123_105044_20781231_235959.N1
CTI_AST_MPVRGT20041221_110137_00000000_00000059_20050123_105047_20781231_235959.N1
CTI_N02_MPVRGT20041221_110136_00000000_00000029_20050123_105050_20781231_235959.N1
CTI_S04_MPVRGT20041221_110136_00000000_00000015_20050123_105053_20781231_235959.N1
CTI_NOC_MPVRGT20041221_110136_00000000_00000059_20050123_105056_20781231_235959.N1
CTI_E02_MPVRGT20050117_123146_00000000_00000060_20050127_102449_20781231_235959.N1
Group_18684
CTI_E01_MPVRGT20050117_123146_00000000_00000060_20050127_102452_20781231_235959.N1
CTI_AST_MPVRGT20050117_123146_00000000_00000060_20050127_102455_20781231_235959.N1
CTI_N01_MPVRGT20050117_123146_00000000_00000031_20050127_102458_20781231_235959.N1
CTI_S06_MPVRGT20050117_123146_00000000_00000015_20050127_102501_20781231_235959.N1
CTI_NOC_MPVRGT20050117_123146_00000000_00000060_20050127_102504_20781231_235959.N1
CTI_E02_MPVRGT20050117_130630_00000000_00000061_20050128_213724_20781231_235959.N1
Group_18685
CTI_E01_MPVRGT20050117_130630_00000000_00000061_20050128_213727_20781231_235959.N1
CTI_AST_MPVRGT20050117_130630_00000000_00000061_20050128_213730_20781231_235959.N1
CTI_N02_MPVRGT20050117_130630_00000000_00000030_20050128_213733_20781231_235959.N1
CTI_S08_MPVRGT20050117_130629_00000000_00000015_20050128_213736_20781231_235959.N1
CTI_NOC_MPVRGT20050117_130629_00000000_00000061_20050128_213739_20781231_235959.N1

IF2 - Spectral Characterisation (start orbit #15364 at ANX=1000 sec)
CTI_E02_MPVRGT20050124_180555_00000000_00000062_20050206_100207_20781231_235959.N1
Group_18756
CTI_E01_MPVRGT20050124_180555_00000000_00000062_20050206_100210_20781231_235959.N1
CTI_AST_MPVRGT20050124_180556_00000000_00000062_20050206_100213_20781231_235959.N1
CTI_N01_MPVRGT20050124_180555_00000000_00000032_20050206_100216_20781231_235959.N1
CTI_S02_MPVRGT20050124_180555_00000000_00000017_20050206_100219_20781231_235959.N1
CTI_NOC_MPVRGT20050124_180555_00000000_00000062_20050206_100222_20781231_235959.N1
Back to NOM scenario (start orbit #15372 at ANX=2000 sec)
CTI_E02_MPVRGT20050124_181934_00000000_00000063_20050206_234335_20781231_235959.N1
Group_18757
CTI_E01_MPVRGT20050124_181934_00000000_00000063_20050206_234338_20781231_235959.N1
CTI_AST_MPVRGT20050124_181935_00000000_00000063_20050206_234341_20781231_235959.N1
CTI_N02_MPVRGT20050124_181934_00000000_00000031_20050206_234344_20781231_235959.N1
CTI_S04_MPVRGT20050124_181934_00000000_00000016_20050206_234347_20781231_235959.N1
CTI_NOC_MPVRGT20050124_181934_00000000_00000063_20050206_234350_20781231_235959.N1

MPL_ORS_MPVRGT20041216_184606_00000000_00000044_20050110_141316_20050112_150449.N1
Group_18451 RGTv_62
MPL_ORS_MPVRGT20041220_171706_00000000_00000045_20050116_142446_20050123_141850.N1
Group_18535 RGTv_63
MPL_ORS_MPVRGT20050117_144508_00000000_00000046_20050127_133847_20050129_124944.N1
Group_18687 RGTv_64

IF16 - Limb Scanning Sequences in raw data mode (orbits #15377-15378)

CTI_DSN_MPVRGT20050125_152258_00000000_00000118_20050207_074420_20781231_235959.N1
Group_18770 RGTv_135 set table
CTI_BBN_MPVRGT20050125_153118_00000000_00000074_20050207_074520_20781231_235959.N1
Group_18772 RGTv_91 set table
CTI_DSN_MPVRGT20050125_154310_00000000_00000119_20050207_092456_20781231_235959.N1
Group_18774 RGTv_137 reset table
CTI_BBN_MPVRGT20050125_153853_00000000_00000075_20050207_092556_20781231_235959.N1
Group_18773 RGTv_92 reset table
MPL_ORS_MPVRGT20050125_155751_00000000_00000047_20050206_101953_20050207_095024.N1
Group_18775 RGTv_65 RGC for IF2 and IF16

IF6 - CBB and DS SNR Characterisation (orbit #15379)

CTI_DSN_MPVRGT20050125_162122_00000000_00000120_20050207_110532_20781231_235959.N1
Group_18790 RGTv_138 set table
CTI_BBN_MPVRGT20050125_162454_00000000_00000076_20050207_110632_20781231_235959.N1
Group_18791 RGTv_93 set table

IF11 - Absence of High Resolution Features Verification in Gain (orbit #15380)

CTI_DSN_MPVRGT20050125_164011_00000000_00000121_20050207_124608_20781231_235959.N1
Group_18792 RGTv_139 set table
CTI_BBN_MPVRGT20050125_164701_00000000_00000077_20050207_124708_20781231_235959.N1
Group_18793 RGTv_94 set table
MPL_ORS_MPVRGT20050125_182811_00000000_00000048_20050207_111212_20050207_130711.N1
Group_18807 RGTv_66 RGC for IF6 and IF11

IF10 - $NESR_0$ Verification (orbit #15381)

CTI_BBN_MPVRGT20050125_165134_00000000_00000078_20050207_142643_20781231_235959.N1
Group_18794 RGTv_95 reset table
CTI_DSN_MPVRGT20050125_173157_00000000_00000122_20050207_145823_20781231_235959.N1
Group_18796 RGTv_140 set table
CTI_DSN_MPVRGT20050125_173933_00000000_00000123_20050207_150003_20781231_235959.N1
Group_18797 RGTv_141 set table
CTI_DSN_MPVRGT20050125_174243_00000000_00000124_20050207_150143_20781231_235959.N1
Group_18798 RGTv_142 set table
CTI_DSN_MPVRGT20050125_174515_00000000_00000125_20050207_150323_20781231_235959.N1
Group_18799 RGTv_143 set table
CTI_DSN_MPVRGT20050125_174814_00000000_00000126_20050207_150503_20781231_235959.N1
Group_18800 RGTv_144 set table
CTI_DSN_MPVRGT20050125_175146_00000000_00000127_20050207_150643_20781231_235959.N1
Group_18801 RGTv_145 set table
CTI_DSN_MPVRGT20050125_175417_00000000_00000128_20050207_150823_20781231_235959.N1
Group_18802 RGTv_146 set table
CTI_DSN_MPVRGT20050125_175646_00000000_00000129_20050207_151003_20781231_235959.N1
Group_18803 RGTv_147 set table
CTI_DSN_MPVRGT20050125_175943_00000000_00000130_20050207_151143_20781231_235959.N1
Group_18804 RGTv_148 set table
CTI_DSN_MPVRGT20050125_180232_00000000_00000131_20050207_152323_20781231_235959.N1
Group_18805 RGTv_149 reset table
MPL_ORS_MPVRGT20050125_184142_00000000_00000049_20050207_145830_20050207_151223.N1
Group_18808 RGTv_67 RGC for IF10

IF8 - Radiometric Calibration Characterisation (orbit #15382)
MPL_ORS_MPVRGT20050125_185006_00000000_00000050_20050207_161359_20050207_162810.N1
Group_18809 RGTv_68 nominal gain

MPL_ORS_MPVRGT20050131_162137_00000000_00000051_20050211_104620_20050220_111745.N1
Group_19032 RGTv_69
MPL_ORS_MPVRGT20050202_183052_00000000_00000052_20050221_103157_20050228_102601.N1
Group_19134 RGTv_70

2.3 Level 1 Product Quality Monitoring

2.3.1 PROCESSING CONFIGURATION

Figure 4 schematises the IPF updates, the resolution with which MIPAS has been operated, the activation and deactivation of the interferometer heaters and the dissemination of related ADFs.

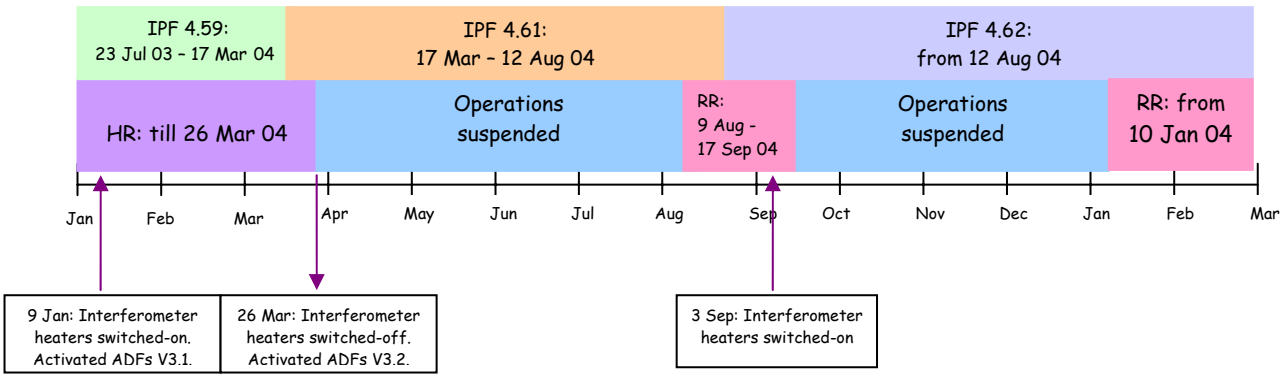

Fig. 4 Scheme for IPF update, interferometer heaters switch-on/off, resolution and ADFs version.

2.3.1.1 Processor Version

Table 5 lists the historical updates of the MIPAS processor:

- **Version V4.62** (aligned with DPM 4H) has introduced variations for both Level 1 and Level 2 processor. For Level 1 processor, the following updates have been introduced:
  - Processing of low resolution measurements (without reduced resolution for offset and gain data that will be implemented in IPF 4.63 aligned with DPM 4I)
  - Fixed: ILS retrieval anomaly
  - Fixed: Scans with null NESR anomaly
- **Version V4.61** consists of updates for both Level 1 and Level 2, and in particular resolves the anomaly that resulted in oscillating spectra.
- **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

Tab. 5 Historical updates of MIPAS processor at near real time (NRT) processing sites (PDHS-K and PDHS-E) and off-line processing sites (LRAC for Level 1 and D-PAC for Level 2).

Centre	Facility Software	Date
DPAC	V4.62	12-08-2004
LRAC	V4.62	12-08-2004
PDHS-K	V4.62	12-08-2004
PDHS-E	V4.62	12-08-2004
DPAC	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

2.3.1.2 Auxiliary Data Files

Table 6 lists the ADFs valid till the mission interruption occurred in March 2004. The ADFs have not been updated since the mission interruption. Two sets of ADFs have been received from Bomem, but they have not been disseminated: V4.0 and V4.1 for 2RR and V5.0 for 1RR.

Tab. 6 Level 1 ADFs valid in March 2004.

Auxiliary Data File	Start Validity	Stop Validity	Updated in March 2004
V3.0 MIP CA1 AXVIEC20031021 143953 20020706 060000 20080706 060000	06-JUL-02	06-JUL-08	No
MIP CL1 AXVIEC20040220 144507 20040117 000000 20050117 000000	17-JAN-04	17-JAN-05	No

V3.0 MIP_MW1_AXVIEC20031021_144135_20020706_060000_20080706_060000	06-JUL-02	06-JUL-08	No
V3.1 MIP_PS1_AXVIEC20040317_134725_20040109_000000_20090209_000000	09-JAN-04	09-FEB-09	Yes
V3.2 MIP_PS1_AXVIEC20040421_090242_20040326_143428_20090326_000000	26-MAR-04	26-MAR-09	No

The strategy for the ADFs update is the following one:

- The MIP_CO1_AX, MIP_CG1_AX and MIP_CS1_AX are updated every week and after a long cooler switch-off.
- The MIP_CL1_AX is analysed every two weeks and updated when the pointing error differs with respect to the last disseminated one more than 10 mdeg.
- The MIP_PS1_AX is updated every time there are setting updates: per example when the interferometer heaters are switched-on/off it is needed to adjust the noise threshold.
- The MIP_MW1_AX is updated when the micro-window are changed.

2.3.2 POINTING PERFORMANCE

The LOS calibration measurements are performed every week. This configuration allows the analysis of the pointing stability and guaranties the availability of the data in case of missing products. Initial analysis has evidenced a marked annual cycle (as shown in Fig. 5) covering the period September 2002 – February 2005. The figure shows the relative and the absolute (evaluated taking into account the commanded elevation angle for the LOS calibration) pointing error. That annual trend is not due to the MIPAS instrument itself, but to a mispointing of the entire ENVISAT satellite resulting from software response to orbit control information. In fact, the update in the platform pointing software implemented on 12 December 2003 (orbit 9321) has evidently reduced the pointing deviation trends (see last points in Fig. 5).

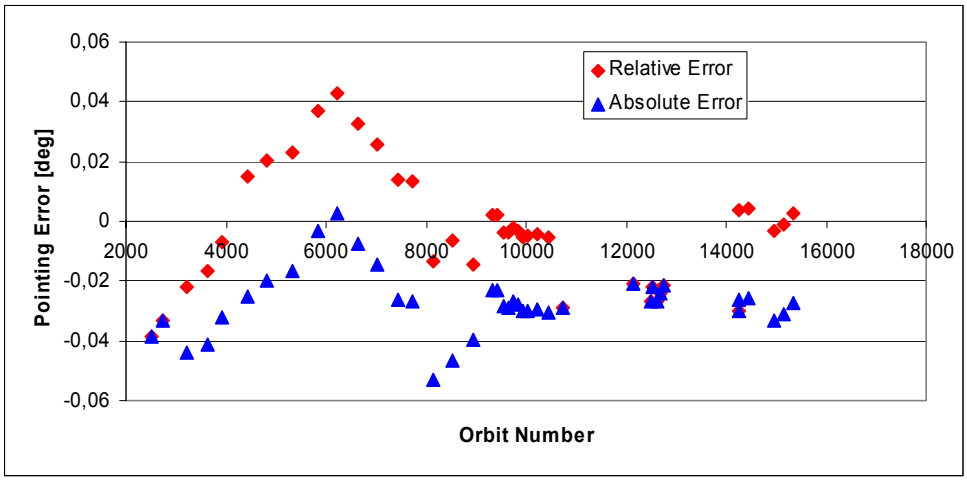

Fig. 5 MIPAS pointing error as a function of the orbit number: September 2002- February 2005.

As it can be seen in Fig. 5, there are points were relative and absolute errors are coincident because the angle for LOS measurements has been commanded to 0 mdeg. Table 7 shows the history of the commanded angle for LOS measurements.

Tab. 7 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

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.

During the anomaly investigation in winter 2005, the absence of interferometer operations has been used for a dedicated Line of Sight campaign. MIPAS LOS data have been inter-compared with restituted attitude information from the Envisat star trackers, in preparation of future operational use of restituted attitude in off-line processing.
Figure 6 presents results from July 29th, 2004. Note that a bias of 24 mdeg was subtracted from pointing error. Apart from this bias, results from MIPAS LOS campaign agree with star tracker information. Investigations are currently ongoing to find the cause of this bias.

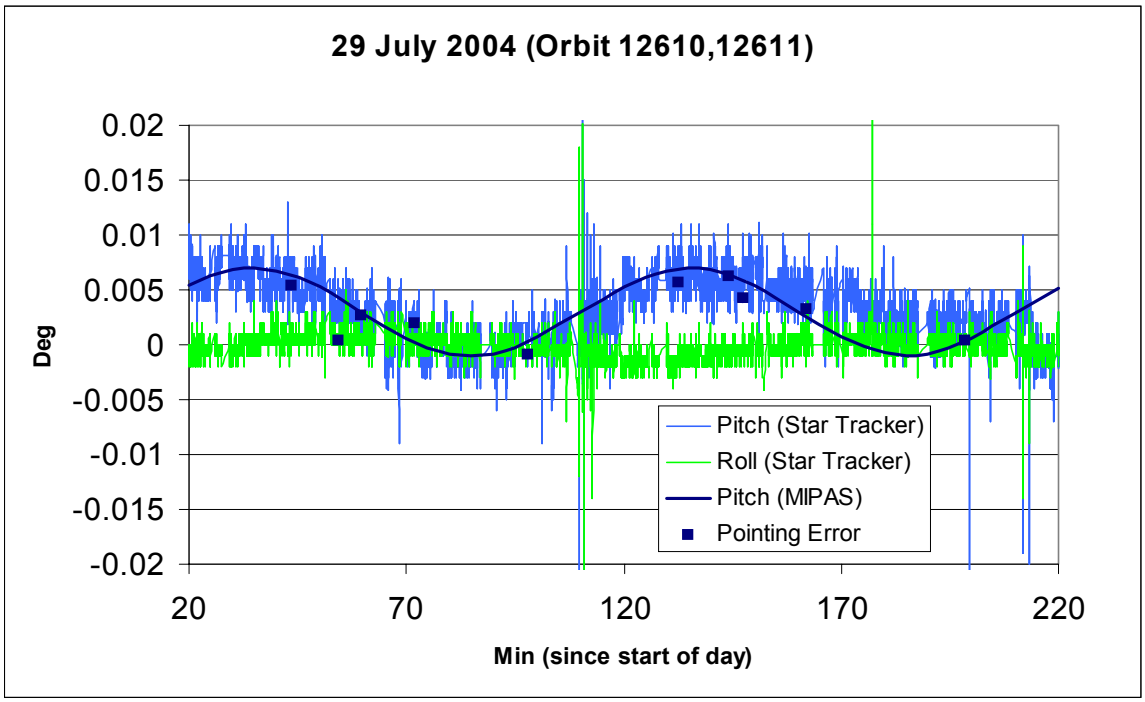

Fig. 6 Comparison between MIPAS pointing and star tracker information.

2.3.3 ANOMALY STATUS

Table 8 summarises the anomalies affecting Level 1 products and shows the associated SPR, NCR, AR and HD code.

Tab. 8 Level 1 anomaly list.

Anomaly	Prototype/DPM SPR	IPF NCR	AR	HD
S6 corrupted sweeps	/	/	/	HD/07-2004/705
S3 multiple scans in one MDS	/	/	/	HD/01-2005/1007
Oscillations in band D	/	Internal SPR – 120O0-2000	1690	HD/12-2004/749
Many corrupted sweeps in band AB	/	/	/	HD/01-2005/1008
Many corrupted sweeps in band D	/	/	/	HD/01-2005/1009
Number of sweeps per scan	/	/	/	HD/01-2005/1010
Corrupt points in NESR data	/	Internal SPR – 120O0-2001	/	HD/01-2005/1011
Kiruna-Esrin difference in F/R oscillations	/	/	/	HD/01-2005/1012

2.3.3.1 S6 Corrupted Sweeps

The S6 level 1b data from July 2003 have a large number of corrupted sweeps. In general, not all bands are corrupted. The problem has been traced to the NESR threshold that gives different level of rejection depending on the resolution. Currently analysis is ongoing to establish optimum threshold levels as a function of resolution.

2.3.3.2 S3 Multiple Scans in One MDS

Affected product:
MIP_NL__1PNPDK20031212_093739_000060272022_00251_09323_0357.N1
In the product there are two scans (#5 and #6) with 69 sweeps instead of 10 scans composed by 13 sweeps. The anomaly is related to the software for planning generation (RGT). The problem will be solved by planning special event scans individually.

2.3.3.3 Oscillations in Band D

Comparison with prototype data has shown that this anomaly is due to an implementation error in the IPF4.62. The next release will contain a correction for this error.

2.3.3.4 Many Corrupted Sweeps in Band AB

This anomaly is eliminated by adjustment of the NESR threshold, in the new ADF version 4.0.

2.3.3.5 Many Corrupted Sweeps in Band D

Anomaly investigation has shown that this anomaly is due to upload of incorrect configuration tables after an instrument restart. The PAW gain settings in band D had set to maximum during these nominal measurements and this generated ADC saturation. The Flight Operations Segment team has been warned, and the correct tables have been reloaded.

2.3.3.6 Number of Sweeps per Scan

The affected product is orbit 12963 generated with IPF 4.62. SPH gives: "NUM_SWEEPS_PER_SCAN=+00018", but 17 is the correct value (although the last scan has 18 sweeps). The problem is still under investigation.

2.3.3.7 Corrupt Points in NESR Data

Affected products are orbits 12877 (scan #119) and 12965 (scan #62) generated with IPF 4.62. NESR data appear to include some corrupt points. This anomaly has been traced down to an implementation error, and will be corrected in IPF463.

2.3.3.8 Kiruna-Esrin Difference in F/R Oscillations

The large observed differences in Forward-Reverse oscillation patterns between ESRIN and Kiruna data has been traced down to an anomalous MIP_CA1-AX activation, which has been corrected in November 2004.

2.4 Level 2 Product Quality Monitoring

2.4.1 PROCESSOR CONFIGURATION

Figure 7 schematises the IPF updates, the resolution with which MIPAS has been operated, the activation and deactivation of the interferometer heaters and the dissemination of related ADFs.

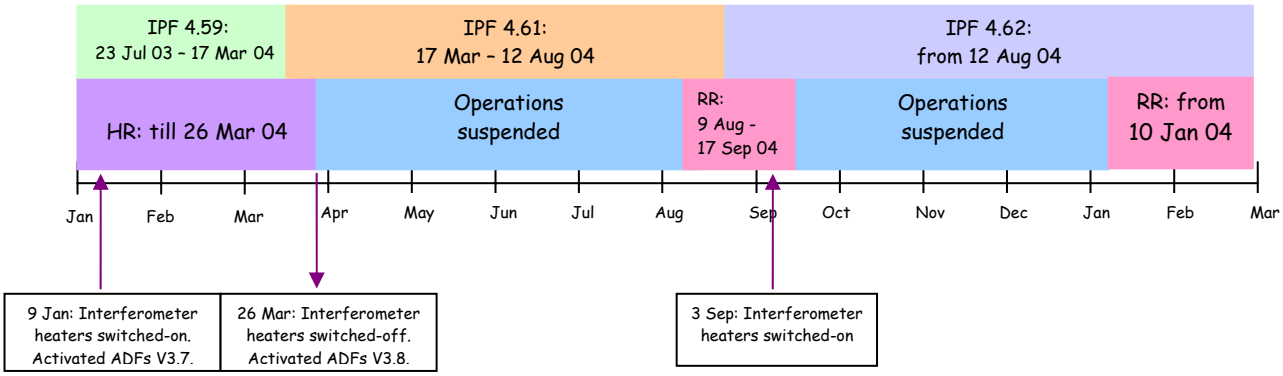

Fig. 7 Scheme for IPF update, interferometer heaters switch-on/off, resolution and ADFs version.

2.4.1.1 Version

As already explained in Section 2.4.2.1, Tab. 6 lists the historical updates of the MIPAS processor.

- **Version V4.62** (aligned with DPM 4.0) has solved the following problems:
  - Fixed cloud-detection anomaly
  - Fixed negative variance values anomaly
  - Fixed profile counting bug anomaly
- **Version V4.61** has solved the following problems:
  - Inconsistency in number of profiles in MIPAS Level_2 (NO2 <-> p, T)
  - 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 variations. The main improvements introduced via both the processor V4.59 and the installation of a new set of ADFs, have been:
  - 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 Products
  - MIPAS-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

2.4.1.2 Auxiliary Data Files

Table 9 shows the historical dissemination (from January 2003) of Level 2 ADFs till the mission interruption occurred in March 2004. The ADFs have not been updated since the mission interruption.

Tab. 9 Historical update of Level 2 ADFs.

Auxiliary Data File	Start Validity	Description
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).
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.
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_AXVIEC20030522_104714_20030601_000000_20080601_000000	01-JUN-03	Seasonal update of climatological initial guess.
MIP_IG2_AXVIEC20030731_134035_20030901_000000_20080901_000000	01-SEP-03	Seasonal update of climatological initial guess.
ADFs V3.6: NRT MIP_MW2_AXVIEC20031021_145505_20020706_060000_20080706_060000	06-JUL-02	Activation of cloud detection;

MIP_OM2_AXVIEC20031021_145630_20020706_060000_20080706_060000 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		removal of the gaps between the altitude validity ranges; altitudes margins fixed to +/- 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_AXVIEC20031118_151533_20031201_000000_20081201_000000	01-DEC-03	Seasonal update of climatological initial guess.
MIP_IG2_AXVIEC20040227_081527_20040301_000000_20090301_000000	01-MAR-04	Seasonal update of climatological initial guess.
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.
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.

2.4.2 ANOMALY STATUS

Table 10 summarises the anomalies affecting Level 2 products and shows the associated SPR, NCR, AR and HD code.

Tab. 10 Level 2 anomaly list.

Anomaly	Prototype/DPM SPR	IPF NCR	AR	HD
Anomalous processing time	33	1127	1361	/
Zero pressure values	36	1278	1527	HD/06-2004/973
One-second discrepancy	/	1317	1577	HD/06-2004/970
Problem with PCD data set	/	1310	1570	HD/06-2004/1150
Ozone p,T error propagation covariance matrix	/	/	/	HD/07-2004/236
Number of sweeps per scan	/	/	/	HD/10-2004/1669
Products covering same time-interval with different data	/	/	1647	HD/11-2004/499
Products covering same time-interval with same data	/	/	1648	HD/11-2004/596
Wrong MIP_IG2_AX	/	/	1689	HD/12-2004/746
Jump anomaly	/	/	/	HD/01-2005/1013

2.4.2.1 Anomalous Processing Time

An anomalous processing time characterises processing of some offline products generated with IPF 4.59. Two different anomalies have been observed:

- 9 hours of processing instead of nominal 6 hours. Example:
MIP_NL__1POLRA20031006_005226_000060272020_00289_08359_1882.N1
MIP_NL__2PODPA20031006_005226_000060262020_00289_08359_0261.N1
- Processing failure after 24 hours of processing. Example:
MIP_NL__1POLRA20031024_012653_000060272021_00046_08617_0043.N1

For the first case, the anomaly is still under investigation. The second problem has been temporary solved with a new MIP_OM2_AX that filter scans composed by only one vertical level (generating a loop that causes the processing failure). For a definitive solution, the DMP will be changed (SPR 33) and the modifications will be implemented in next IPF delivery.

2.4.2.2 Zero Pressure Values

It was found a number of cases for which the retrieval in MIP_NL__2P has ended with a pressure value of zero, while the pressure-error for these cases is non-zero. Examples:
MIP_NL__2PODPA20020926_090044_000060362009_00437_02996_0041.N1
Scans #61, #62 and #63
MIP_NL__2PODPA20020926_123036_000055162009_00439_02998_0115.N1

Scans #54 and #58
MIP_NL__2PODPA20020926_140242_000060262009_00440_02999_0042.N1
Scans #60 and #61
MIP_NL__2PODPA20020926_154318_000060162009_00441_03000_0043.N1
Scan #60
MIP_NL__2PODPA20020926_172344_000060362009_00442_03001_0306.N1
Scan #60
MIP_NL__2PODPA20020926_190430_000060262009_00443_03002_0212.N1
Scans #64 and #65

The I/O DD will be changed (SPR 36) and the problem will be fixed in next IPF delivery.

2.4.2.3 One-Second Discrepancy

There are products where a one-second discrepancy between off-line and NRT products has been observed. Example:
Off-line
MIP_NL__2PPDPA20040321_032435_000060372025_00176_10751_0959.N1
SCAN GEOLOG ADS: dsr_time 21-MAR-2004 04:13:18.120870
NRT
MIP_NL__2PNPDE20040321_041241_000005672025_00176_10751_0878.N1
SCAN GEOLOG ADS: dsr_time 21-MAR-2004 04:13:17.120870

The problem is still under investigation.

2.4.2.4 Problem with PCD Data Set

A byte mismatch affects the PCD dataset of some products

The problem is still under investigation.

2.4.2.5 Ozone p, T Error Propagation Covariance Matrix

The anomaly affects field error_p_t_vcm in the O3 retrieval MDS. Problem:

1) All values are set to zero
2) All values are set but the errors given are extremely large, corresponding to an error standard deviation that is four times larger than the ozone retrieval

Example:
MIP_NL__2PODPA20020916_005217_000060262009_00289_02848_0289.N1

Investigation results:

1) The quantity reported is given by E0*VCM_PT*E0^T and most of the matrix E0 used in the Occupation Matrix file are zero. So, the observed behaviour is not an anomaly.

2) The error of the p, T profiles reported in the pt-error propagation VCM, is the VMR error imposed by the error of the p,T profiles. It is an additional error on top and it is very well possible that it is bigger than the error resulting from the VMR.

2.4.2.6 Number of Sweeps per Scan

In the following product, processed off-line with IPF 4.61, it has been noticed that the NUM_SWEEPS_PER_SCAN parameter in the SPH is set to 22 instead of the usual 17:
MIP_NL__2PODPA20030227_182403_000060732014_00142_05206_1342.N1

The problem is related to the planning. In fact, there are two ways to plan special measurements: as nominal, with dedicated altitude tables or as special. When they are planned as nominal (as in present case) the field under investigation is set to the maximum number of sweeps per scan and in the present case it is set to 22 because of the presence of special measurements. The way to plan these special measurements will be changed.

2.4.2.7 Products Covering Same Time-Interval with Different Data

Data covering same time-interval and containing different data have been generated by IPF 4.62.

An Anomaly Report has been raised against IPF 4.62. The overlap problem has been solved, but the difference in data cannot yet be explained. Investigation has been interrupted and will be restarted only if the anomaly will be newly observed in IPF 4.63.

2.4.2.8 Products Covering Same Time-Interval with Same Data

Data covering same time-interval and containing same data have been generated by IPF 4.62.

An Anomaly Report has been raised against IPF 4.62. The overlap problem has been solved.

2.4.2.9 Wrong MIP_IG2_AX

In February 2004 (IPF 4.59), some MIPAS Level 2 has been processed with a not updated MIP_IG2_AX. The anomaly affected only ESRIN products. The disclaimer has been updated.

2.4.2.10 Jump Anomaly

Oxford University detected a jump in the zonal means of all Level 2 NRT data produced after switch-on on 8th February until 16th February 2004, compared with Level 2 data generated from 17th March 2004 but also with the data until switch-off on 9th February 2004. The anomaly is still under investigation, but aux data activation can already be excluded as potential cause.