f

DOCUMENT

document title/ titre du document

ENVISAT MIPAS MONTHLY REPORT: JANUARY 2004

prepared by/*préparé par*	MIPAS Quality Working Group
reference/*réference*	ENVI-SPPA-EOPG-TN-04-0006
issue/*édition*	1.0
revision/*révision*	0
date of issue/*date d'édition*	23 February 2004
status/*état*	Final
Document type/*type de document*	Technical Note

a

A P P R O V A L

Title *titre*	ENVISAT MIPAS Monthly Report: January 2004	issue *issue* 1.0	revision *revision* 0

author *auteur*	MIPAS Quality Working Group	date *date* 23 February 2004

approved by *approuvé by*		date *date*

C H A N G E L O G

reason for change / *raison du changement*	issue / *issue*	revision / *revision*	date / *date*

C H A N G E R E C O R D

Issue: 1.0 Revision: 0

reason for change / *raison du changement*	page(s) / *page(s)*	paragraph(s) / *paragraph(s)*

TABLE OF CONTENTS

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 Product Control Facility (PCF), 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-PCF
- ESOC
- ESTEC
- ABB BOMEM
- Oxford University
- IFAC-CNR
- EADS-Astrium GmbH
- Leicester University
- LPM
- IMK
- University of Bologna,
- ISAC,
- 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. The MR is composed of the following six sections:

- Summary;
- Unavailability;
- Instrument Configuration and Performance;
- Level 1 Product Quality Monitoring;
- Level 2 Product Quality Monitoring;
- Validation Activities and Results.

1.2 Acronyms and Abbreviations

ACVT	Atmospheric Chemistry Validation Team
ADF	Auxiliary Data File
ADS	Annotated Data Set
AIRS	Atmospheric Infrared Sounder
ANX	Ascending Node Crossing
APID	Application Process Identifier
AR	Anomaly Report
ASP	Analogue Signal Processor
ASU	Azimuth Scan Unit
CBB PRT	Calibration Blackbody Platinum Resistance Thermometer
CCU	Central Communication Unit
CFS	CCU Flight Software
CTI	Configuration Table Interface
DLR	Deutsches Zentrum für Luft und Raumfahrt
DSD	Data Set Description
ECMWF	European Centre for Medium-Range Weather Forecasts
ESL	Expert Support Laboratory
ESU	Elevation Scan Unit
FCA	FPS (Focal Plane Subsystem) Cooler Assembly
FPS	Focal Plane Subsystem
IAA	Astrophysics Institute of Andalusia
ICE	Instrument Control Electronics
IDE	IDU Electronics
IDSE	Interferometer Differential Speed Error
IDU	Interferometer Drive Unit
IF	In-Flight
IFAC-CNR	Istituto di Fisica Applicata Nello Carrara – Consiglio Nazionale delle Ricerche
IG	Initial Guess
ILS	Instrument Line Shape
IMK	Institute für Meteorologie und Klimaforschung
INT	Interferometer
IPF	Instrument Processing Facility
ISP	Instrument Source Packet
LOS	Line of Sight
MIO	MIPAS Optical Module
MIPAS	Michelson Interferometer for Passive Atmospheric Sounding
MPH	Main Product Header
MR	Monthly Report
MW	Micro-Window
NESR	Noise Equivalent Spectral Radiance
NL	Non Linear
NOM	Nominal
OCM	Orbit Control Manoeuvre

ODS	Optical Path Difference Measurement Sensor
PAW	Pre-Amplifier Warm
PCD	Product Confidence Data
PCF	Product Control Facility
QWG	Quality Working Group
REC	Residual and Error Correlation
RGC	Radiometric Gain Calibration
SEM	Special Event Measurement
SPH	Specific Product header
VCS	Vibration Cancellation System
VMR	Volume Mixing Ratio
WCC	Wear Control Cycle

2 THE MONTHLY REPORT

2.1 *Summary*

- Seven instrument unavailabilities occurred caused by interferometer velocity error.
- Changed the RGC measurements frequency from one every 14 orbits to one every 50 orbits.
- Heated the interferometer in order to reduce the unavailability caused by the interferometer velocity error.
- A problem in the ADF dissemination software causes a wrong use of ADFs for data processing.
- Changed the software for the MIP_CO1_AX generation in order to force statistics to one as a workaround for processor bug.
- Stabilized the MIPAS mispointing after the update of the software for the ENVISAT pointing.
- A new MIP_OM2_AX has been generated and will be disseminated next month in order to resolve the bug about the wrong handling of scans composed by one only altitude level.
- Because of the increased noise level, new MIP_PS1_AX and MIP_PS2_AX have been generated and will be disseminated next month in order to correctly process the data.
- REC Analysis: The main changes from the previous month are in the non-target microwindow residuals for polar latitudes. These may simply reflect the discrete change in the seasonal 'initial guess' climatology that is introduced in January. There has also been an improvement (i.e., reduction) in the derivative signatures associated with the NO2 microwindows.
- OM Statistics: No valid retrievals were received in January after the 11th, and prior to that the average number of profiles/day (532) was also below normal (~850 for Oct/Nov 2003). However, the OM statistics for the profiles, which were successfully retrieved, appear normal and the previous month's problem with corrupt AB and C band spectra appears to be resolved.

2.2 UNAVAILABILITY

2.2.1 Instrument Unavailability

MIPAS switched to Heater/Refuse mode due to an IDU anomaly:
Start Time: 6 Jan 2004 13:36:00 (orbit 9683)
Stop time: 6 Jan 2004 18:09:00 (orbit 9686)

MIPAS in Heater/Refuse mode due to an IDU system tolerance error:
Start Time: 9 Jan 2004 14:27:28 (orbit 9726)
Stop time: 9 Jan 2004 18:18:00 (orbit 9729)

MIPAS in Heater/Refuse mode:
Start Time: 11 Jan 2004 06:51:40 (orbit 9751)
Stop time: 11 Jan 2004 12:20:00 (orbit 9754)

MIPAS in Heater/Refuse mode:
Start Time: 12 Jan 2004 03:21:08 (orbit 9763)
Stop time: 15 Jan 2004 10:12:00 (orbit 9810)
MIPAS switched to Heater/Refuse mode due to an IDU anomaly:
Start Time: 17 Jan 2004 18:17:23 (orbit 9843)
Stop time: 18 Jan 2004 15:12:00 (orbit 9856)

MIPAS in Heater/Refuse mode due to an IDU system tolerance error:
Start Time: 18 Jan 2004 23:51:16 (orbit 9861)
Stop time: 19 Jan 2004 09:50:00 (orbit 9867)

MIPAS in Heater/Refuse mode due to an IDU system tolerance error:
Start Time: 19 Jan 2004 17:19:12 (orbit 9871)
Stop time: 20 Jan 2004 10:59:00 (orbit 9882)

2.2.2 Data Generation Gaps

2.2.2.1 MIP_NL__0P

Table 1 lists the MIP_NL__0P missing intervals.

Tab. 1 List of missing intervals: MIP_NL__0P.

Start Time	Stop Time	Duration [s]	Start Orbit	Stop Orbit
03-Jan-04 07:37:21	03-Jan-04 07:37:23	2	9636	9636
03-Jan-04 10:58:33	03-Jan-04 10:58:47	14	9638	9639
06-Jan-04 13:35:57	06-Jan-04 13:36:00	3	9683	9683
06-Jan-04 18:09:00	06-Jan-04 18:09:14	14	9686	9686
08-Jan-04 00:06:51	08-Jan-04 00:20:54	843	9704	9704
08-Jan-04 03:45:05	08-Jan-04 05:07:31	4946	9706	9707
08-Jan-04 05:08:06	08-Jan-04 05:08:35	29	9707	9707
08-Jan-04 05:08:36	08-Jan-04 05:24:56	980	9707	9707
09-Jan-04 14:27:23	09-Jan-04 14:27:28	5	9726	9726
09-Jan-04 18:18:00	09-Jan-04 18:18:14	14	9729	9729
10-Jan-04 10:36:35	10-Jan-04 10:36:49	14	9738	9738
11-Jan-04 06:50:58	11-Jan-04 06:51:40	42	9751	9751
11-Jan-04 12:20:00	11-Jan-04 12:20:14	14	9754	9754
12-Jan-04 03:20:24	12-Jan-04 03:21:08	44	9763	9763
15-Jan-04 10:12:00	15-Jan-04 10:12:14	14	9810	9810
17-Jan-04 06:56:37	17-Jan-04 06:56:40	3	9836	9836

17-Jan-04 10:17:15	17-Jan-04 10:17:29	14	9838	9838
17-Jan-04 15:43:00	17-Jan-04 15:43:04	4	9842	9842
17-Jan-04 17:21:35	17-Jan-04 17:21:57	22	9843	9843
17-Jan-04 18:17:19	17-Jan-04 18:17:23	4	9843	9843
18-Jan-04 15:12:00	18-Jan-04 15:13:19	79	9856	9856
18-Jan-04 16:50:16	18-Jan-04 16:51:33	77	9857	9857
18-Jan-04 18:27:46	18-Jan-04 18:29:51	125	9858	9858
18-Jan-04 20:07:24	18-Jan-04 20:10:33	189	9859	9859
18-Jan-04 23:51:14	18-Jan-04 23:51:16	2	9861	9861
19-Jan-04 09:50:00	19-Jan-04 09:50:14	14	9867	9867
20-Jan-04 10:59:00	20-Jan-04 10:59:14	14	9882	9882
20-Jan-04 12:31:41	20-Jan-04 13:53:27	4906	9883	9884
20-Jan-04 13:54:02	20-Jan-04 13:54:31	29	9884	9884
20-Jan-04 13:54:32	20-Jan-04 14:09:17	885	9884	9884
22-Jan-04 08:10:48	22-Jan-04 09:29:00	4692	9909	9910
22-Jan-04 09:29:35	22-Jan-04 09:30:05	30	9910	9910
22-Jan-04 09:30:06	22-Jan-04 09:49:48	1182	9910	9910
24-Jan-04 09:58:00	24-Jan-04 09:58:14	14	9938	9939
25-Jan-04 03:02:30	25-Jan-04 03:09:02	392	9949	9949
25-Jan-04 04:45:47	25-Jan-04 04:51:35	348	9950	9950
25-Jan-04 06:28:24	25-Jan-04 06:30:59	155	9951	9951
25-Jan-04 08:09:00	25-Jan-04 08:13:51	291	9952	9952
25-Jan-04 09:42:53	25-Jan-04 09:54:18	685	9953	9953
31-Jan-04 06:18:01	31-Jan-04 06:18:04	3	10037	10037
31-Jan-04 09:37:50	31-Jan-04 09:38:04	14	10038	10038

2.2.2.2 MIP_LS__0P

Table 2 lists the MIP_LS__0P missing intervals.

Tab. 2 List of missing intervals: MIP_LS__0P.

Start Time	Stop Time	Duration [s]	Start Orbit	Stop Orbit
17-Jan-04 07:26:14	17-Jan-04 07:26:21	7	9837	9837
24-Jan-04 07:04:40	24-Jan-04 07:04:47	7	9937	9937

2.2.2.3 MIP_RW__0P

Table 3 lists the MIP_RW__0P missing intervals.

Tab. 3 List of missing intervals: MIP_RW__0P.

Start Time	Stop Time	Duration [s]	Start Orbit	Stop Orbit
15-Jan-04 22:52:00	15-Jan-04 22:55:23	203	9817	9817
21-Jan-04 23:03:27	21-Jan-04 23:07:03	216	9903	9903

2.2.2.4 MIP_NL__1P

Percentage of not available data: 1.5 %.

2.3 INSTRUMENT CONFIGURATION AND PERFORMANCE

2.3.1 MIPAS Operations

Here a summary of the MIPAS operations planning for the January month is presented together with the analysis of the special measurements (special in-flight calibration and/or special observation modes) execution.

Operations planning:

- Special Event Measurement (SEM) activity every orbit at the same ANX time (=527.1 sec); background SEM compensation time set to low resolution (=10.2 sec).
- Nominal (NOM) background mission; NOM scan starts every orbit at ANX =574.3 sec.
- Line Of Sight (LOS) activity with a prime sequence in the first two orbits visible from Kiruna station on Saturday and a backup sequence on the first two orbits visible from Kiruna station on Sunday.
- Starting from orbit #9700 the periodic RGC is performed every 50 orbits, starting at ANX = 5500 sec.
- Periodic Wear Control Cycle (WCC) performed every 5 orbits, starting at ANX =4000 sec.
- Special S1 observation mode has been planned in orbits #9776-9790 (13 January 2004); during those orbits the NOM measurements are interrupted and resumed just after.
- Special IF14 calibration using Mercury rearward observations has been also planned in orbits #9817 and #9903.

CTI needed for planning:

The SEMs are needed to re-start the NOM measurements in each orbit always at the same latitude. Each SEM is composed by a single scan of two sweeps. In order to execute that special measurement it is needed to define a Configuration Table Interface (CTI) per orbit (CTI_SEM_MP) containing information about: orbit number, SEM start and stop ANX time, number of sweeps (presently 2), resolution (presently high) and DS flag before the SEM. Two further CTI are needed to define respectively the elevation increment and the azimuth increment for the SEM sweep: CTI_S22_MP and CTI_S23_MP.

Start S1 (Polar Chemistry and Dynamics) in orbit #9776 (ANX = 574.3 sec, without orbital SEM)
CTI_E02_MPVRGT20031215_182311_00000000_00000045_20040113_004913_20781231_235959.N1
Group_13705
CTI_E01_MPVRGT20031215_182311_00000000_00000045_20040113_004916_20781231_235959.N1
CTI_AST_MPVRGT20031215_182311_00000000_00000045_20040113_004919_20781231_235959.N1
CTI_N02_MPVRGT20031215_182311_00000000_00000022_20040113_004922_20781231_235959.N1
CTI_S08_MPVRGT20031215_182311_00000000_00000011_20040113_004925_20781231_235959.N1
CTI_NOC_MPVRGT20031215_182311_00000000_00000045_20040113_004928_20781231_235959.N1

Reset background NOM mode in orbit #9790 (start ANX = 2032.4 sec)
CTI_E02_MPVRGT20031216_114020_00000000_00000046_20040114_004154_20781231_235959.N1
Group_13711
CTI_E01_MPVRGT20031216_114020_00000000_00000046_20040114_004157_20781231_235959.N1
CTI_AST_MPVRGT20031216_114020_00000000_00000046_20040114_004200_20781231_235959.N1
CTI_N01_MPVRGT20031216_114020_00000000_00000024_20040114_004203_20781231_235959.N1
CTI_S02_MPVRGT20031216_114020_00000000_00000013_20040114_004206_20781231_235959.N1
CTI_NOC_MPVRGT20031216_114020_00000000_00000046_20040114_004209_20781231_235959.N1

IF14 (Specific scanning sequence) in orbit #9817
CTI_TCP_MPVRGT20031216_150000_00000000_00001714_20040115_225239_20040115_225241.N1
CTI_SEM_MPVRGT20031216_150100_00000000_00007175_20040115_225241_20040115_225300.N1
CTI_TCP_MPVRGT20031216_150200_00000000_00001715_20040115_225257_20040115_225259.N1
CTI_SEM_MPVRGT20031216_150300_00000000_00007176_20040115_225301_20040115_225312.N1
CTI_TCP_MPVRGT20031216_150400_00000000_00001716_20040115_225320_20040115_225322.N1
CTI_SEM_MPVRGT20031216_150500_00000000_00007177_20040115_225322_20040115_225341.N1
CTI_TCP_MPVRGT20031216_150600_00000000_00001717_20040115_225338_20040115_225340.N1
CTI_SEM_MPVRGT20031216_150700_00000000_00007178_20040115_225342_20040115_225353.N1

IF14 (Specific scanning sequence) in orbit #9903
CTI_TCP_MPVRGT20031216_151000_00000000_00001718_20040121_230421_20040121_230423.N1
CTI_SEM_MPVRGT20031216_151100_00000000_00007261_20040121_230424_20040121_230443.N1
CTI_TCP_MPVRGT20031216_151200_00000000_00001719_20040121_230439_20040121_230441.N1
CTI_SEM_MPVRGT20031216_151300_00000000_00007262_20040121_230444_20040121_230455.N1
CTI_TCP_MPVRGT20031216_151400_00000000_00001720_20040121_230501_20040121_230503.N1
CTI_SEM_MPVRGT20031216_151500_00000000_00007263_20040121_230504_20040121_230523.N1
CTI_TCP_MPVRGT20031216_151600_00000000_00001721_20040121_230519_20040121_230521.N1
CTI_SEM_MPVRGT20031216_151700_00000000_00007264_20040121_230524_20040121_230535.N1
MPL_ORS_MPVRGT20031217_151957_00000000_00000032_20040115_225132_20040121_230655.N1
Group_13733 RGTv_47 RAW mode segment

Execution analysis:

Table 4 summarizes the status of the special measurements done in January.

Tab. 4 Status of the MIPAS special measurements done in January.

Special Measurement	Date	Orbit	Execution
S1	13 January 2004	9776-9790	Missing
IF_14	15 January 2004	9817	Processed 8% (Asked reprocessing)
IF_14	21 January 2004	9903	Processed 2% (Asked reprocessing)

2.3.2 Thermal Performance

In order to reduce the instrument unavailability caused by the interferometer velocity error, the interferometer heaters have been activated on the 9 January 2004. The temperature increase can clearly be notified both in the monthly thermal trend (Fig. 1) and in the long-term thermal trend (Fig. 2).

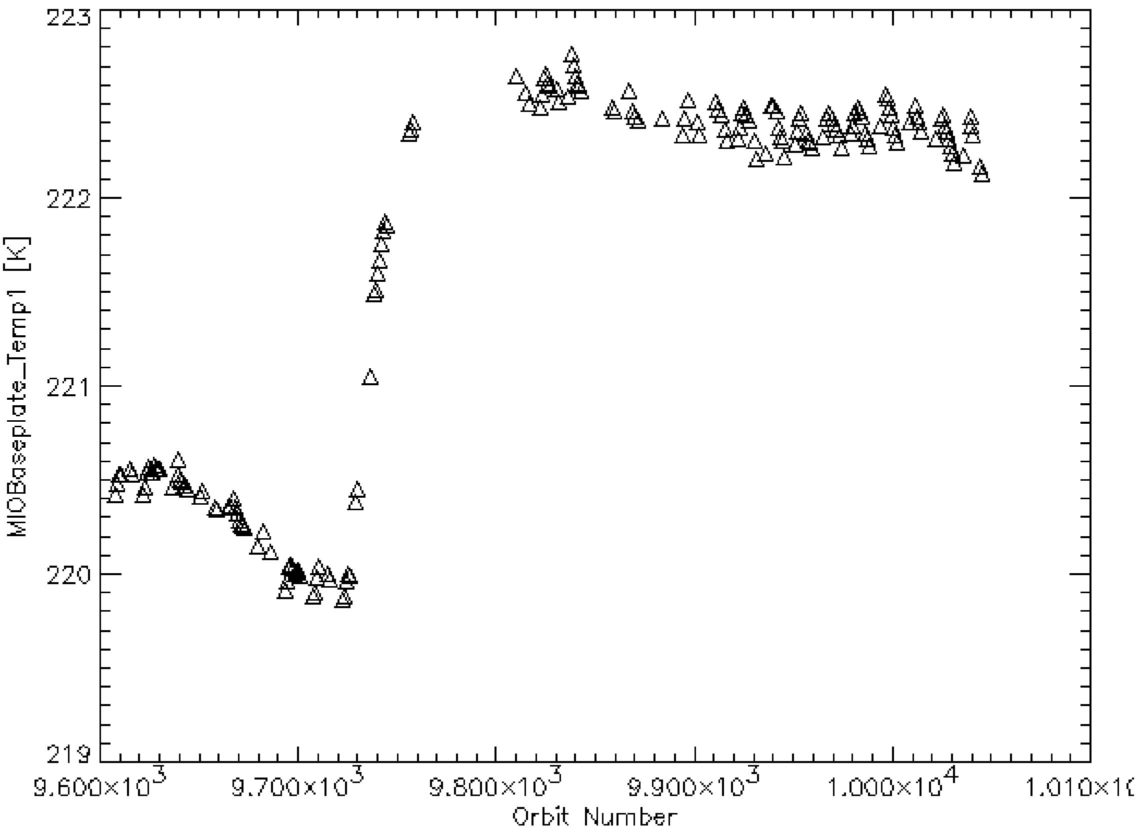

Fig. 1 Short-term trend of instrument temperature (each point represents the orbit mean value): January 2004.

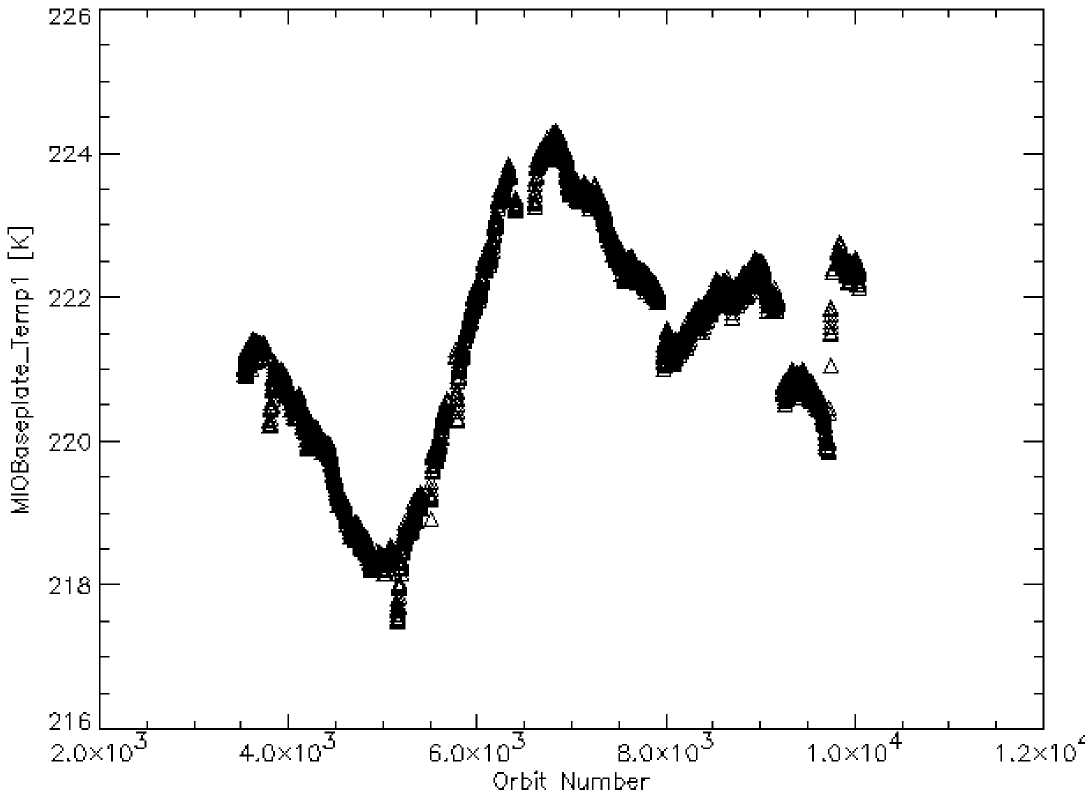

Fig. 2 Long-term trend of instrument temperature (each point represents the orbit mean value): November 2002-January 2004.

2.3.3 Mechanical Performance

2.3.3.1 Cooler Performance

The Compressor and Displacer vibration level, together with the Radiator temperatures, are monitored on a daily basis (an example is shown if Fig. 3). The monitoring foresees a warning message whenever the Compressor vibration level exceeds a threshold value (8 mg) well below the tolerance error that activates the MIPAS standby/refuse mode. During January, the threshold value has not been reached and the spike shape characterizing the threshold exceeding has not been observed.

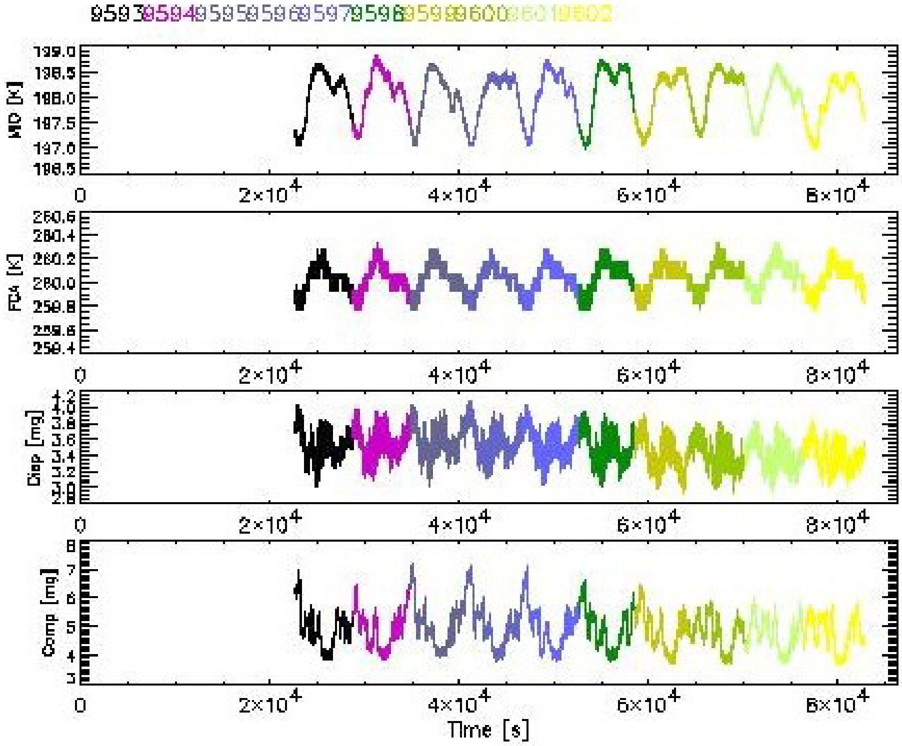

Fig. 3 Daily Compressor and Displacer vibration level, together with the Radiator temperatures as a function of time (each colour refers to a single orbit).

2.3.3.2 Interferometer Performance

Interferometer velocity error:

As already mentioned above, in January MIPAS suffered from an increased occurrence of the IDU velocity error. In total seven events occurred which are listed below:

- 6 Jan 2004 13:36:00
- 9 Jan 2004 14:27:28
- 11 Jan 2004 06:51:40
- 12 Jan 2004 03:21:08
- 17 Jan 2004 18:17:23
- 18 Jan 2004 23:51:16
- 19 Jan 2004 17:19:12

In order to cope with this anomaly, the INT heaters were switched on January, 9th. However, the observation was that directly after the heater switching there were additional velocity errors, which was attributed to thermal gradients within the Interferometers. Therefore it was decided to let the temperature stabilise and to leave MIPAS in Heater Mode (unavailability between 12.01.2004 and 15.01.2004). After the stabilisation period, MIPAS was put back into measurement, but even at the higher operational temperature the anomaly was still present, which was in contradiction to on-ground testing experiences and the related earlier anomaly investigations. As a result of this unexpected behaviour, a detailed investigation started to collect all the Interferometer related anomalies observed so far and to match them with error hypotheses. The investigation on this subject is ongoing.

<u>Interferometer differential speed error:</u>

Figure 4 shows the number of +4% anomalies (positive differential speed errors) per day as a function of time starting from October 2003, Figure 5 shows the increase of the -4% error (negative differential speed errors) since August 2003

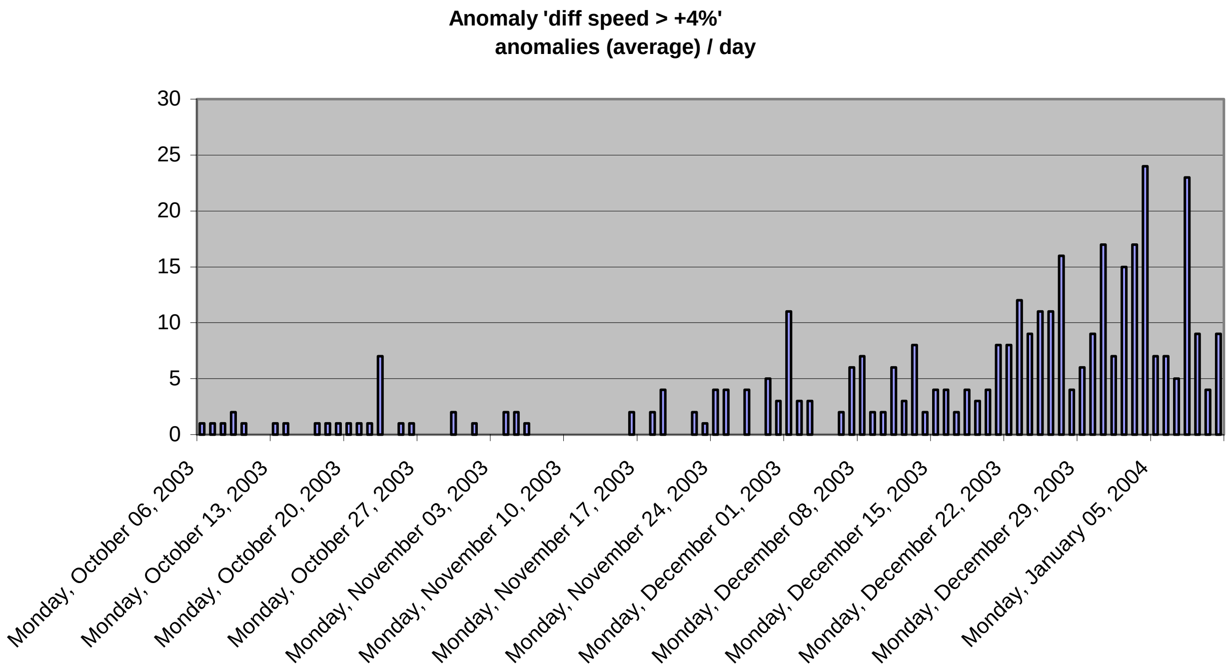

Fig. 4 Number of +4% IDSE per day as a function of time (starting from October 2003).

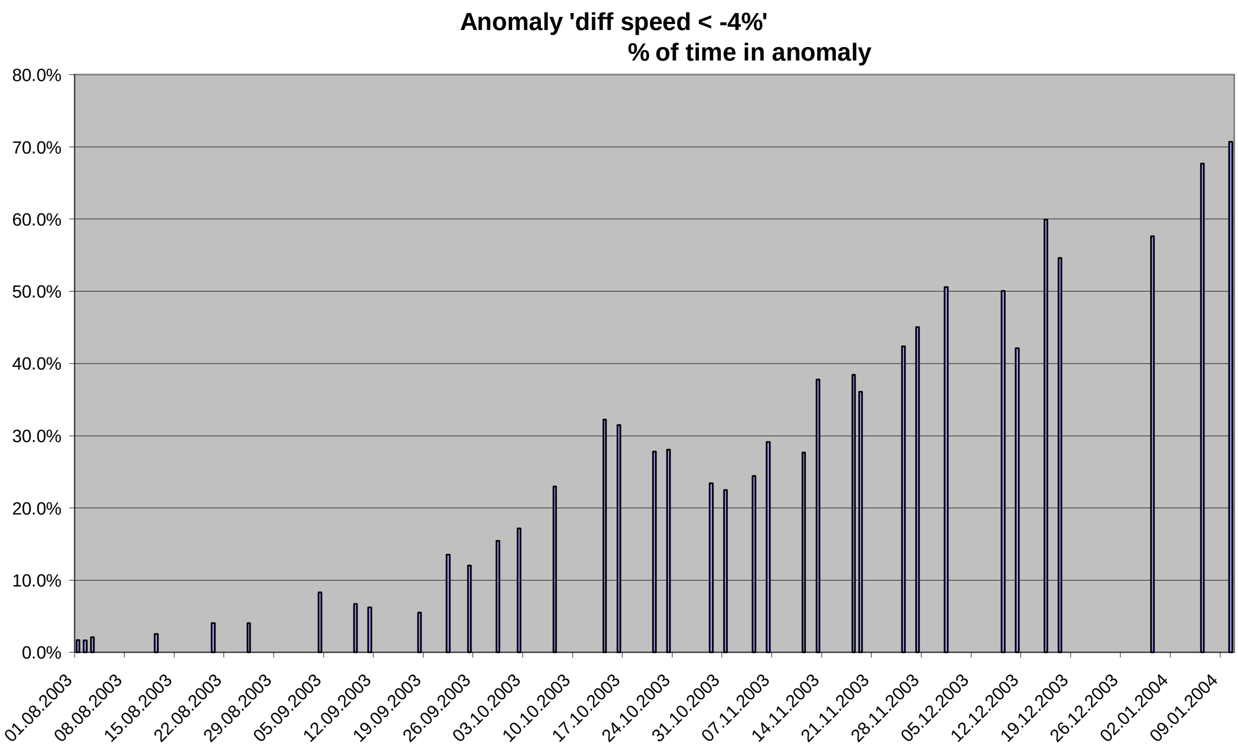

Fig. 5 Number of -4% IDSE per day as a function of time (since August 2003).

2.3.3.3 ASU/ESU Performance

ASU/ESU are performing nominal.

2.3.4 Other Instrument Parameters

N/A.

2.4 LEVEL 1 PRODUCT QUALITY MONITORING

2.4.1 Processor Configuration

2.4.1.1 Version

Table 5 lists the historical updates of the MIPAS processor. Version V4.57 has introduced upgrade only on Level 1 processor, 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

Version V4.59 has introduced only upgrade on Level 2 processor.

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
LRAC	V4.59	20-08-2003
D-PAC	V4.59	06-08-2003
PDHS-K	V4.59	23-07-2003
PDHS-E	V4.59	23-07-2003
PDHS-K	V4.57	22-07-2003
LRAC	V4.57	22-07-2003
PDHS-K	V4.59	21-07-2003
LRAC	V4.59	21-07-2003
LRAC	V4.57	19-03-2003
PDHS-K	V4.57	18-03-2003
D-PAC	V4.57	05-03-2003
PDHS-E	V4.57	04-03-2003

2.4.1.2 Auxiliary Data Files

Table 6 lists the ADFs valid in January. The new ADFs this month have been: Gain (MIP_CG1_AX), Offset (MIP_CO1_AX) and Spectral (MIP_CS1_AX) calibration files, which are updated weekly in order to prevent degradation of data quality due to gradual accumulation of contamination. A problem in the ADF dissemination software has caused error in the update of ADFs in the PDS, so some product may have been processed with wrong ADFs.

Tab. 6 Level 1 ADFs valid in January.

Auxiliary Data File	Start Validity	Stop Validity	Updated in January
MIP_CA1_AXVIEC20031021_143953_20020706_060000_20080706_060000	06-JUL-02	06-JUL-08	No
MIP_CL1_AXVIEC20021108_154256_20021113_120000_20071106_145139	13-NOV-02	06-NOV-07	No
MIP_CS1_AXVIEC20031230_141351_20031230_031155_20081230_031155	30 DEC-03	30-DEC-08	No
MIP_CS1_AXVIEC20040107_100234_20040105_230001_20090105_230001	05-JAN-04	05-JAN-09	Yes
MIP_CS1_AXVIEC20040129_140908_20040129_101721_20090129_101721	29-JAN-04	29-JAN-09	Yes
MIP_MW1_AXVIEC20031021_144135_20020706_060000_20080706_060000	06-JUL-02	06-JUL-08	No
MIP_PS1_AXVIEC20031021_144418_20020706_060000_20080706_060000	06-JUL-02	06-JUL-08	No
MIP_CO1_AXVIEC20031230_140457_20031230_051523_20081230_051523	30-DEC-03	30-DEC-08	No
MIP_CG1_AXVIEC20031230_140118_20031230_045656_20081230_045656	30-DEC-03	30-DEC-08	No
MIP_CO1_AXVIEC20040107_100042_20040106_010154_20090106_010154	06-JAN-04	06-JAN-09	Yes
MIP_CG1_AXVIEC20040107_095934_20040106_004424_20090106_004424	06-JAN-04	06-JAN-09	Yes
MIP_CO1_AXVIEC20040129_140727_20040129_121741_20090129_121741	29-JAN-04	29-JAN-09	Yes
MIP_CG1_AXVIEC20040129_140559_20040129_120348_20090129_120348	29-JAN-04	29-JAN-09	Yes

The strategy for the ADFs update is the following one:

- The MIP_CO1_AX, MIP_CG1_AX and MIP_CS1_AX will be updated every week and the MIP_CO1_AX and MIP_CG1_AX are evaluated with previous generation of MIP_CS1_AX.
- The MIP_CL1_AX will be analysed every two weeks and updated if needed.

For MIPAS data reprocessing, the generation of the historical ADFs series is ongoing:

- Weekly generation of MIP_CG1_AX and MIP_CO1_AX with previous evaluation of MIP_CS1_AX
- Monthly generation of MIP_CL1_AX
- Weekly generation of MIP_CS1_AX

The software for MIP_CO1_AX generation has been updated in order to force the number of statistics to one because a standard deviation different from one is not correctly handled by the MIPAS operative processor. The bug will be removed in the new processor version.

2.4.2 Spectral Performance

The evaluation of the spectral calibration has been changed using the MIP_MW1_AX generated in October and disseminated in November. A verification of the spectral calibration upgrade in Level 1 processor was performed with ORM, that is able to retrieve, together with the target parameters, a band dependent and altitude independent residual spectral shift along the whole orbit. Orbit #2081 was used for this test. Figure 6 shows the deviation from unity of the frequency shift scaling parameter retrieved by ORM as a function of the scan ID before the new spectral calibration. The different curves represent the results obtained by the different retrievals for the different bands. These curves are grouped in different colours according to the number of spectral points used for the retrieval. Since a greater number of spectral points allows to obtain a greater accuracy in the results, the scattering of the retrieved values is reduced when a greater number of points is used (see blue curves). From Figure 6 it emerges a variability of the frequency shift scaling parameter with the scan ID. In particular, for some scans a deviation from unity of the frequency shift scaling parameter equal to $1 \cdot 10^{-6}$ is obtained. Even if this result is still within the MIPAS requirements, the attained frequency calibration accuracy is worse than the one that can be theoretically obtained by MIPAS measurements, as indicated by the spread of the curves (about 3 parts in 10^7).

The same test described above was repeated with a new Level 1 file for orbit #2081 where the new spectral calibration introduced with the MIP_MW1_AX had been applied. The accuracy of the frequency calibration obtained after this upgrade is reported in Figure 7. We observe that the residual spectral shift is always within $\pm\ 5 \cdot 10^{-7}$, from which it emerges that the new spectral calibration succeeds in reducing significantly the variability of frequency accuracy along the orbit. A degradation of the performance is visible only in the first 3 scans of the orbit, characterised by large values of the frequency shift scaling parameter, but this is due to the use of a spectral calibration performed several months before. The new MIP_CS1_AX update strategy is expected to reduce this initial discontinuity.

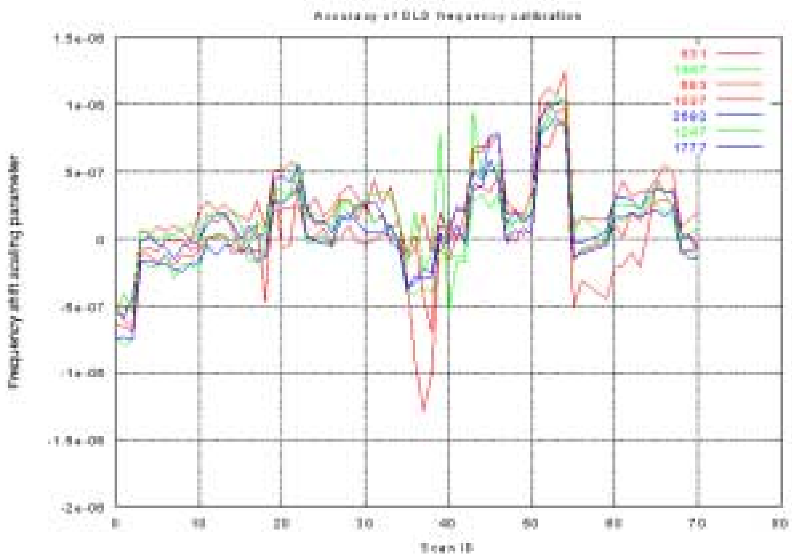

Fig. 6 Accuracy of the old frequency calibrations as a function of scan ID for different spectral bands obtained by the different specie retrievals. The curves are grouped in different colours according to the number of spectral points used for the fit (red: few points, green: medium number of points, blue: large number of points).

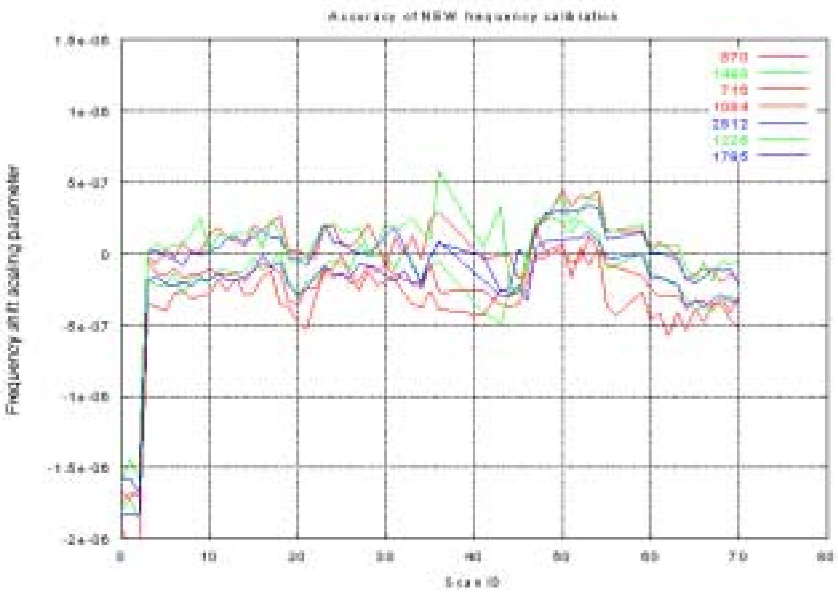

Fig. 7 Accuracy of the new frequency calibrations as a function of scan ID for different spectral bands obtained by the different specie retrievals. The curves are grouped in different colours according to the number of spectral points used for the fit (red: few points, green: medium number of points, blue: large number of points).

2.4.3 Radiometric Performance

The radiometric gain is characterized by an increase as a function of time. Figure 8 shows the comparison of the gain disseminated in January with the previously disseminated one. The first disseminated gain shows a normal increase (0.4% per week). The instrument heating probably causes the strong increase observed in the last disseminated gain.

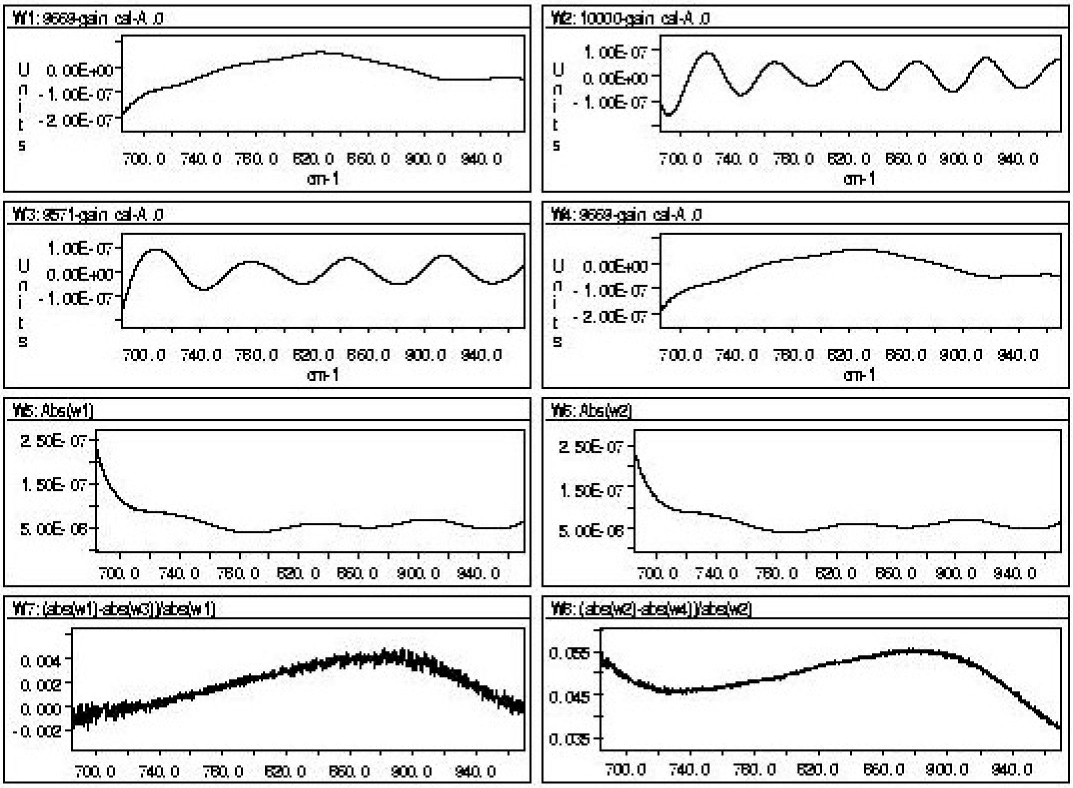

Fig. 8 Comparison between the new radiometric gain (disseminated in January 2004) and the last disseminated one: Band A.

The ice contamination affecting the detectors may cause strong impact on the radiometric gain. For that reason every time there is a long MIPAS unavailability with the cooler not operating, it is needed to generate a new gain and off-set ADF because the decontamination causes a strong increase in the instrument response.

It has been evaluated that RGC variations during 7-9 days doesn't affect the quality of the MIPAS data, so the RGC is performed every week. The frequency may be changed in case of MIPAS unavailability because of the necessity to calculate a "decontaminated" gain.

Two gain and offset ADFs have been disseminated on January:
07-JAN-2004 (using orbit 9669, dated 05-JAN-2004)
29-JAN-2004 (using orbit 10000, dated 28-JAN-2004)
The frequent instrument unavailability prevented a weekly generation of RGC files.

Starting from 7 January 2004 (orbit 9700) two RGC sequences per week (instead of one per day) have been planned.

2.4.4 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. LOS calibration analysis is ongoing. Initial results have evidenced a marked annual cycle (as shown in Fig. 9) covering the period September 2002 – December 2003. 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 related to the MIPAS mispointing, but to a problem in the software for the evaluation of the ENVISAT satellite mispointing. 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. 9).

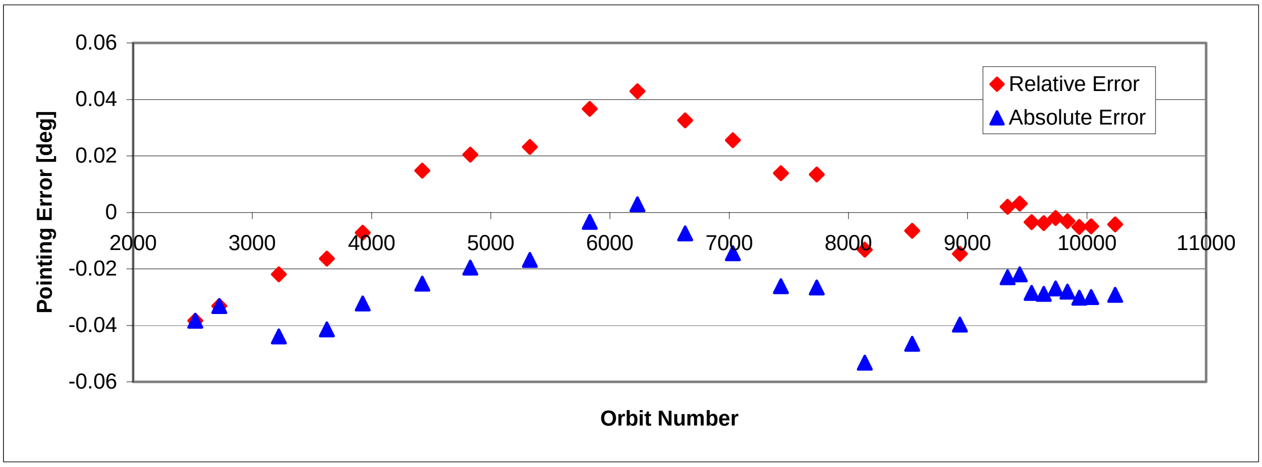

Fig. 9 MIPAS pointing error as a function of the orbit number: September 2002- January 2004.

Five LOS calibration measurements have been performed in January:
03-JAN-2004 (orbits 9637 and 9638)
10-JAN-2004 (orbits 9737 and 9738)
17-JAN-2004 (orbits 9837 and 9838)
24-JAN-2004 (orbits 9937 and 9938)
31-JAN-2004 (orbit 10037)

2.4.5 Other Results

INCREASED NOISE LEVEL

The interferometer heating done on 9 January 2004 has increased the instrument noise level. Many spectra have not been processed because the noise threshold in MIP_PS1_AX has not been adequate to the new noise level. In fact, that threshold is used as a criterion to judge the spectra quality. The MIP_PS1_AX has been modified in order to take into account the new noise level and will be disseminated next month.

D1-CHANNEL NOISE

Between September and November channel D1 noise went up by a factor 10 and channel D2 noise went down (remaining higher than the old D1 noise). This anomaly might potentially be linked to the LOS commanding error. The settings for the LOS measurements processing have been changed assigning 0 weight to channel D1 and weight equal to 1 to channel D2. The investigation is still ongoing.

OSCILLATING SPECTRA

Starting from middle November, spectra characterized by strong oscillations have been observed. That anomaly has corrupted a big amount of MIPAS Level 1 and Level 2. The anomaly is related to a bug in the MIPAS operating processor and partly has been resolved changing the MIP_CO1_AX, partly will be resolved with a new version of the MIPAS processor. The new MIP_CO1_AX will be disseminated next month.

2.5 LEVEL 2 PRODUCT QUALITY MONITORING

2.5.1 Processor Configuration

2.5.1.1 Version

As already explained in Section 2.4.1.1, Tab. 5 lists the historical updates of the MIPAS processor. The current version V4.59, operative 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. The other updates are listed below:

- 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

2.5.1.2 Auxiliary Data Files

Table 7 lists the ADFs valid in January and Tab. 8 summarizes the historical (from January 2003) update of Level 2 ADFs.

Tab. 7 Level 2 ADFs valid in January.

Auxiliary Data File	Start Validity	Stop Validity	Updated in January
MIP_IG2_AXVIEC20031118_151533_20031201_000000_20081201_000000	01-DEC-03	01-DEC-08	No
NRT MIP_MW2_AXVIEC20031021_145505_20020706_060000_20080706_060000 Off-line MIP_MW2_AXVIEC20031027_100858_20020706_060000_20080706_060000	06-JUL-03	06-JUL-03	No
NRT MIP_OM2_AXVIEC20031021_145630_20020706_060000_20080706_060000 Off-line MIP_OM2_AXVIEC20031027_101029_20020706_060000_20080706_060000	06-JUL-03	06-JUL-03	No
NRT MIP_PS2_AXVIEC20031021_145858_20020706_060000_20080706_060000 Off-line MIP_PS2_AXVIEC20031027_101319_20020706_060000_20080706_060000	06-JUL-03	06-JUL-03	No
NRT MIP_PI2_AXVIEC20031021_145745_20020706_060000_20080706_060000 Off-line MIP_PI2_AXVIEC20031027_101146_20020706_060000_20080706_060000	06-JUL-03	06-JUL-03	No
NRT MIP_CS2_AXVIEC20031021_145337_20020706_060000_20080706_060000 Off-line MIP_CS2_AXVIEC20031027_100559_20020706_060000_20080706_060000	06-JUL-03	06-JUL-03	No
NRT MIP_SP2_AXVIEC20031021_150016_20020706_060000_20080706_060000 Off-line MIP_SP2_AXVIEC20031027_101441_20020706_060000_20080706_060000	06-JUL-03	06-JUL-03	No

Tab. 8 Historical update of Level 2 ADFs.

Auxiliary Data File	Start Validity	Description
ADFs Kit 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 Kit V3.6: NRT MIP_MW2_AXVIEC20031021_145505_20020706_060000_20080706_060000 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	06-JUL-03	See description below.

2.5.2 REC Analysis

Residual spectra are the difference between spectra measured by the instrument and spectra generated by the retrieval forward model at the final iteration. Ideally, these should contain only random measurement noise but in practice a number of features are present indicating systematic errors either in the forward model or the instrument characterisation.

Residual and Error Correlation (REC) analysis is a statistical technique for analysing such data. The principle is to identify correlations between persistent features in the residual spectra and the signatures expected from different atmospheric species, other potential sources of forward model error and calibration errors represented by various derivatives of the spectrum with respect to wavenumber. This is now performed routinely as part of the monitoring of MIPAS data quality.

The following analysis refers only to NRT products.

Results:

1. **Pressure**
   Pressure and Temperature microwindow residuals indicate biases within a few % except at 68 km. Other microwindow residuals indicate overestimates of the order of 10% at all altitudes. Since the previous month, the underestimate between 30-42 km in the non-target microwindows has now become an overestimate consistent with other altitudes.
2. **CH4**
   CH4 microwindow residuals indicate a small overestimate of up to 0.1 ppmv at all altitudes. Other microwindow residuals generally indicate an underestimate of the order of 0.1 ppmv at most altitudes, larger for Polar latitudes. No significant change from previous month.
3. **H2O**
   H2O microwindow residuals indicate an underestimate of 0-2 ppmv from 15-60 km, although an overestimate of 2 ppmv for equatorial latitudes at 12 km. Other microwindow residuals indicate a larger underestimate of 2-10 ppmv in Polar latitudes, an overestimate of 1 ppmv between 15-24 km in equatorial latitudes, but otherwise generally consistent with the target microwindows. The main change from the previous month is that the non-target microwindows are now more consistent with the target microwindows above 24 km (Polar latitudes excepted).
4. **HNO3**
   HNO3 microwindow residuals indicate a slight underestimate of a few %. Other microwindow residuals indicate a much larger overestimate reaching 5-10 ppbv at 33 km, much larger (20 ppbv) for the South Polar Region, also an underestimate of up to 5 ppbv for the Equatorial Region at 12-15 km. No significant change from previous month.
5. **N2O**
   N2O microwindow residuals indicate an underestimate of up to 25 ppbv at 30 km, smaller in the Northern Hemisphere. Other microwindow residuals indicate an underestimate of up to 10 ppbv at 27 km and overestimate of 30 ppbv at 47 km. No significant change from previous month.
6. **NO2**
   NO2 microwindows show residuals equivalent to less than 1 ppbv at all altitudes. Other microwindow residuals indicate underestimates of the order of a few ppbv above 42 km (i.e., above retrieved profile where the ‘initial guess’ climatological profile is assumed) in the Equatorial and North Polar Regions, and the opposite sign in the mid-latitude regions. The South Polar Region has a particularly large residual signature equivalent to an overestimate of 10s of ppbv at high altitude. Compared to the previous month the main change is that the North Polar residual signature has been reduced significantly. This probably just reflects the change in NO2 ‘initial guess’ (climatological) data for the new season.
7. **O3**
   O3 microwindow residuals indicate an overestimate reaching 0.2 ppmv for Equatorial latitudes from 21-33 km, and an underestimate reaching 0.5 ppmv at 52 km. Other microwindow residuals indicate an underestimate of up to 1 ppmv at 27 km and an overestimate of 0.5 ppmv at 42 km. Compared to the previous month, the residual signature

in the non-target microwindows for the North Polar Region is now consistent with other latitudes.

8. **0th Derivative**
   Most microwindows show residual signatures of the original spectrum within 2% of the original magnitude, very approximately related to the 2% radiometric gain error budget. The main departure occurs for the NO2 microwindows, which have residual signatures of 2-5%. Compared to the previous month, the main change is the reduction in residuals in the NO2 microwindows.
9. **1st Derivative**
   Most microwindows show residual 1st derivative signatures corresponding to spectral shifts within the 0.001 cm-1 spectral calibration error budget. The main departures are for high altitude pT microwindows at long wavelengths (both negative and positive shifts), and for high altitude NO2 microwindows (negative shift). There is a general trend for a positive shift from high altitude to low altitude for any one microwindow somewhat larger than the expected 0.0002 cm-1 that would be expected from the relative Doppler shift caused by a 60 km difference in tangent point altitude. The main change from the previous month is the reduction in size of the residuals in the NO2 microwindows.
10. **2nd Derivative**
   The assumed error budget for uncertainty in the width of the apodised instrument lineshape is 2%. Several pT microwindows show positive 2nd derivative signatures at high altitude equivalent to an increase of up to 10%. For NO2 at high altitude there is a variation of +/-5% between microwindows. The main change from the previous month is the reduction in residuals for all microwindows apart from pT.

Explanation of Plots:

Target Species (Fig. 10-16):
Spectral signatures of a large number of error sources are fitted simultaneously for each altitude and latitude band, but only those associated with pressure and the 6 retrieved species are plotted. Different colours/symbols indicate different latitude ranges. X-axis is an approximate conversion of residual signature to VMR or % pressure error based on a mid-latitude daytime profile. Black dashed line indicates +/- climatological 1sigma variability, dotted lines represent +/-10% and 100% of the profile value. Positive values indicate larger signature in atmospheric spectrum than forward model, indicating an underestimate of the `true' profile. Solid symbols represent the residuals fitted using only the target microwindows for each species (e.g., fitting H2O signature in H2O microwindows only) and open symbols represent the residuals fitted for all the other microwindows (e.g., fitting H2O signature in all the non-H2O microwindows).

Spectral Derivatives (Fig. 17-19):
0th, 1st and 2nd derivative signatures are fitted to each microwindow/altitude independently. Colours indicate microwindow target species and symbols indicate altitude range. Microwindow labels are listed in order of increasing wavenumber along the top but the set of small arrows indicates actual position along the x-axis. The y-axis represents a scaling of the signature in terms of some instrumental error. Following this analogy, positive y values indicate an underestimate of either the gain (0^{th} derivative), the wavenumber of atmospheric lines (1st derivative), or the AILS

width (2nd derivative), in the sense of regarding the atmospheric spectra as `true' values compared to the forward model. Only points representing large numbers of residuals are plotted.

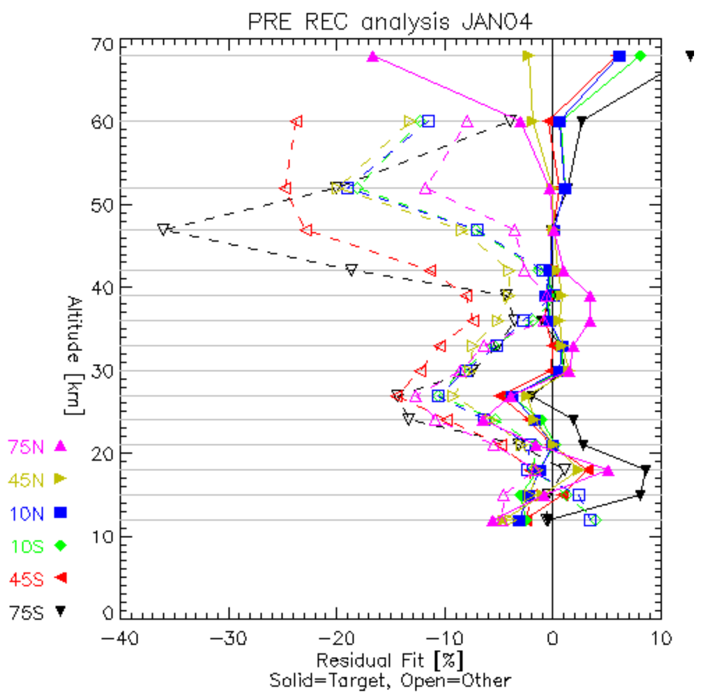

Fig. 10 Pressure REC analysis: January 2004.

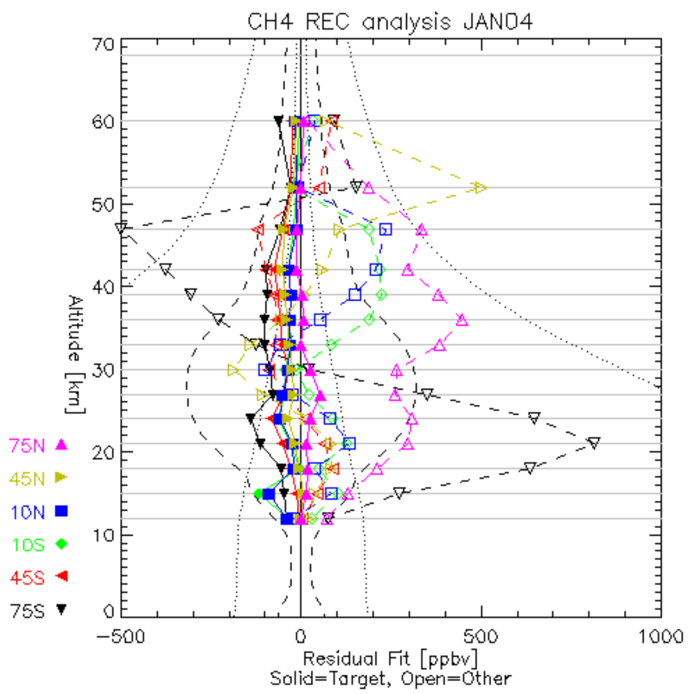

Fig. 11 CH4 REC analysis: January 2004.

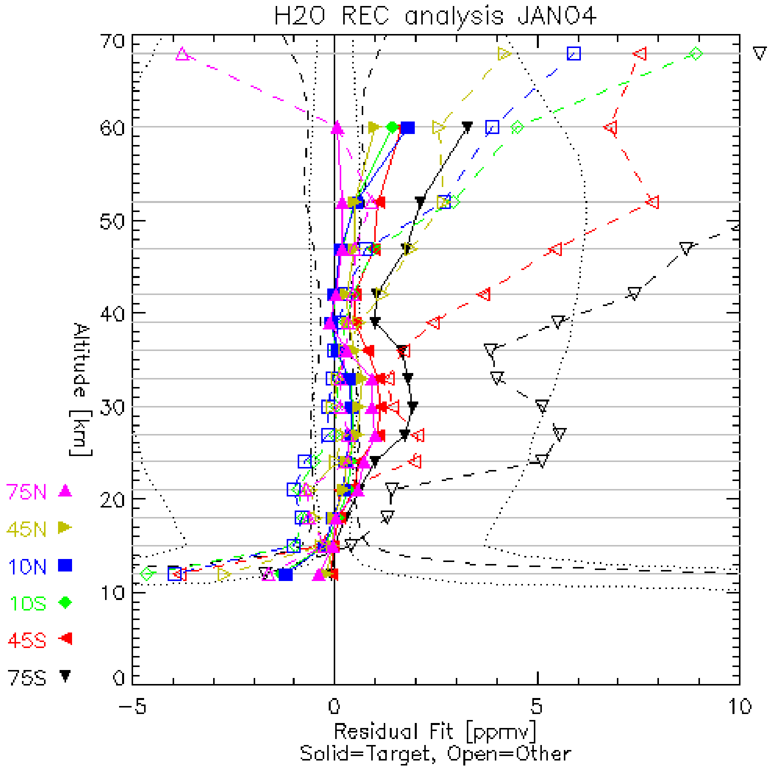

Fig. 12 H2O REC analysis: January 2004.

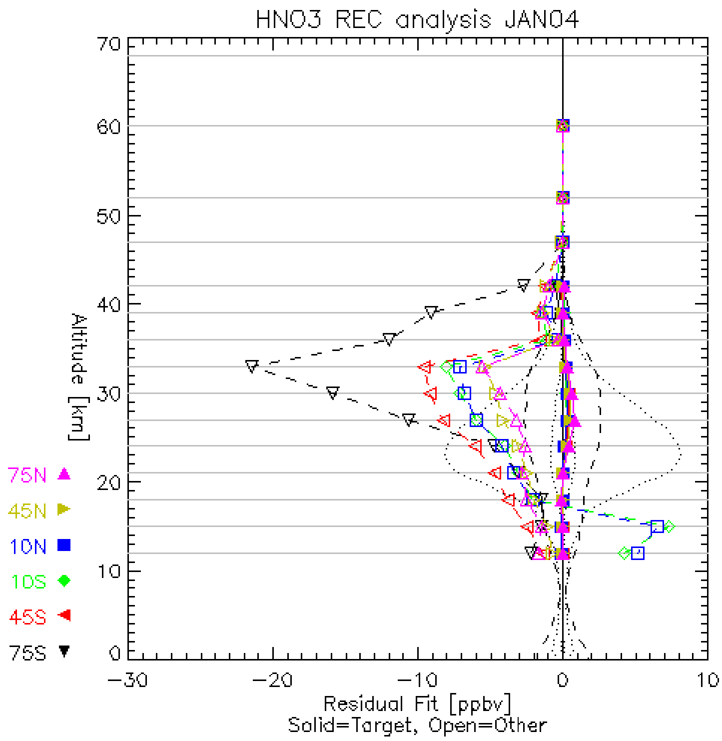

Fig. 13 HNO3 REC analysis: January 2004.

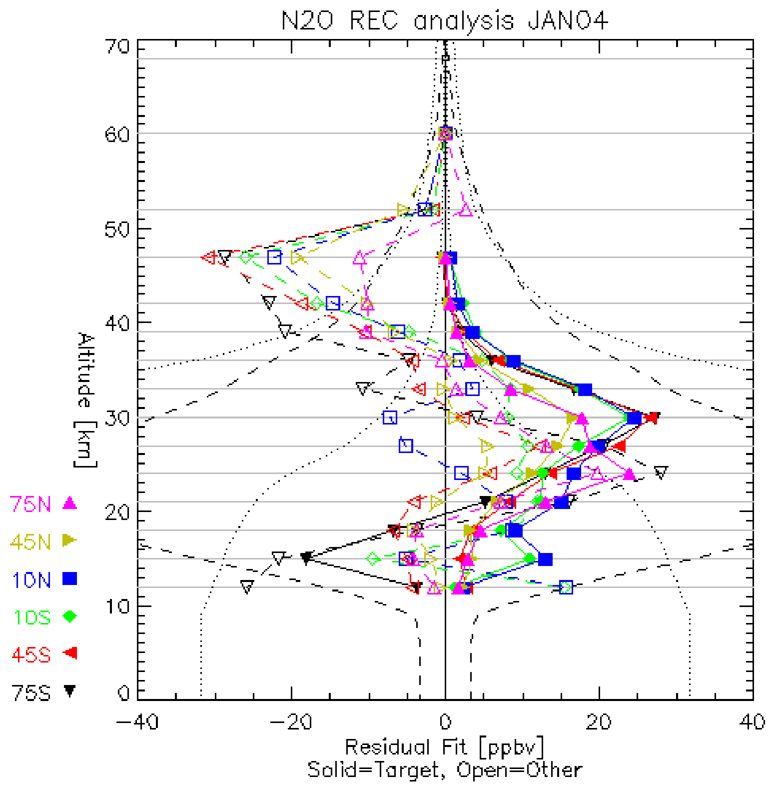

Fig. 14 N2O REC analysis: January 2004.

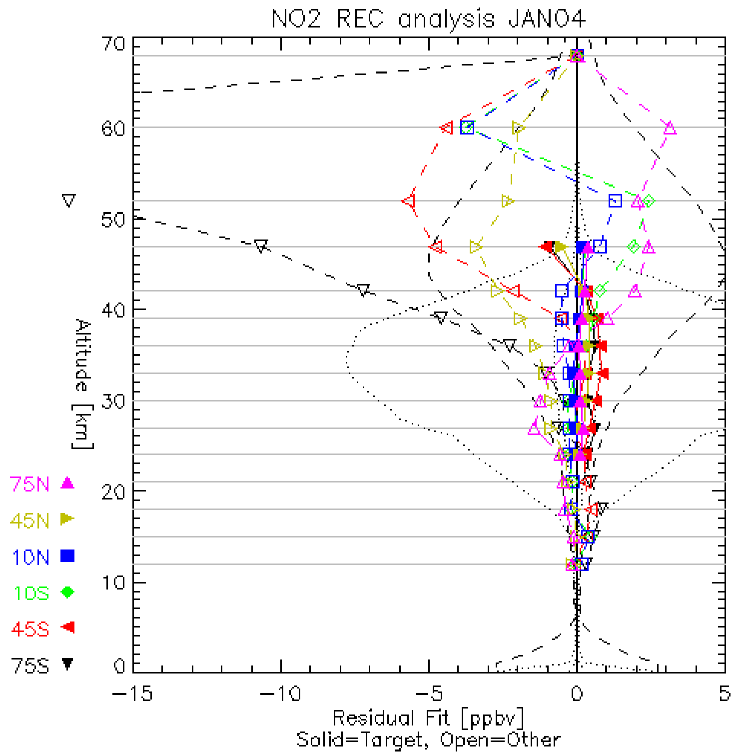

Fig. 15 NO2 REC analysis: January 2004.

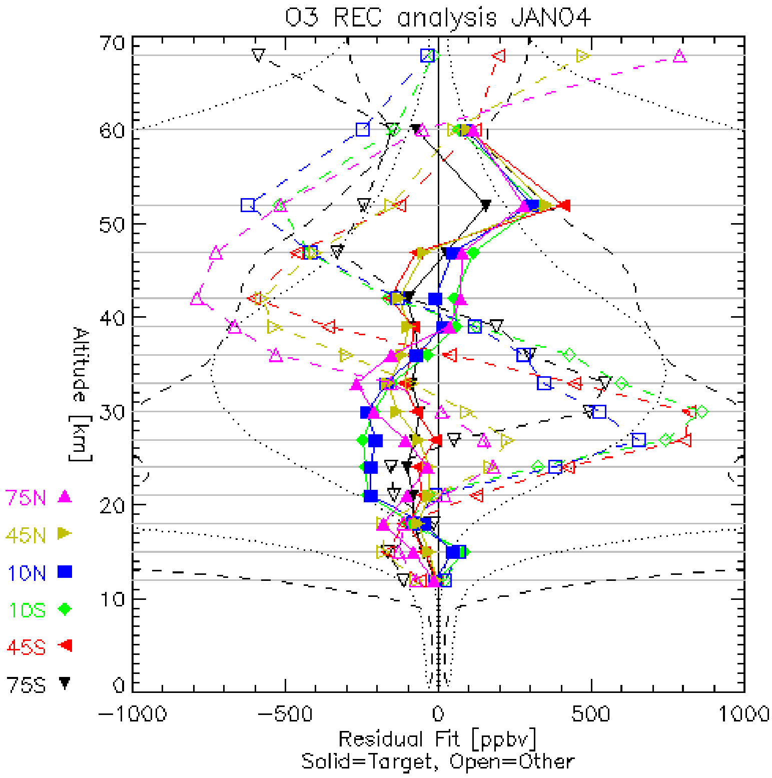

Fig. 16 O3 REC analysis: January 2004.

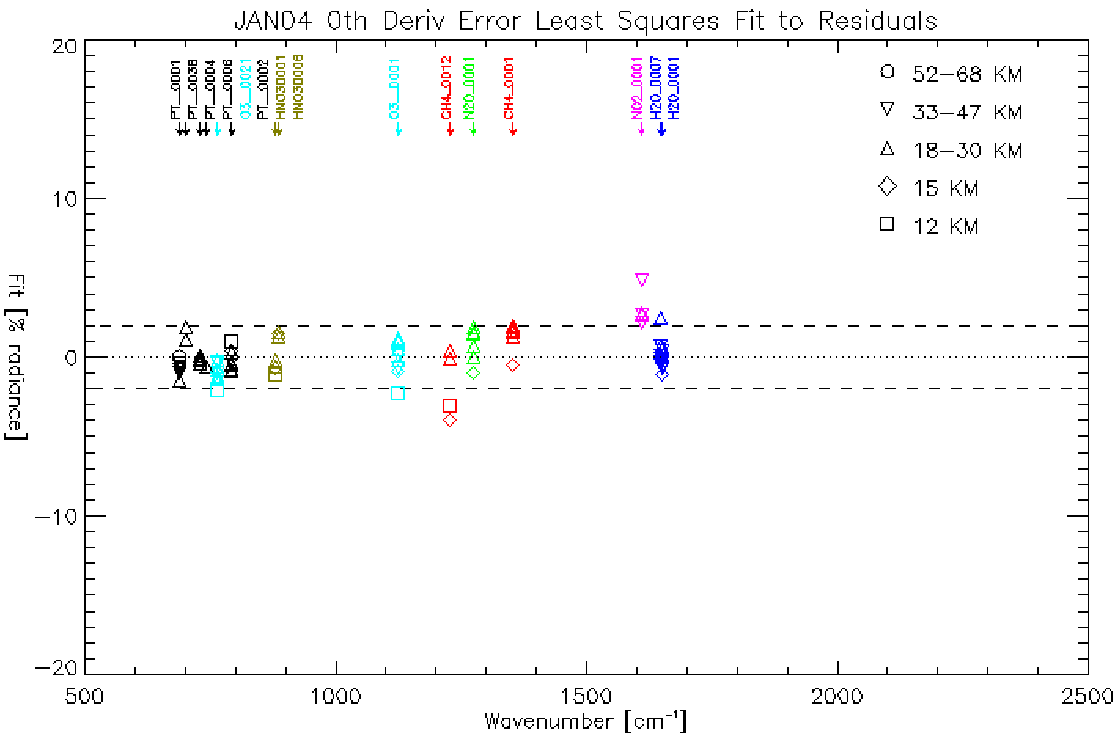

Fig. 17 0^{th} order derivative error: January 2004.

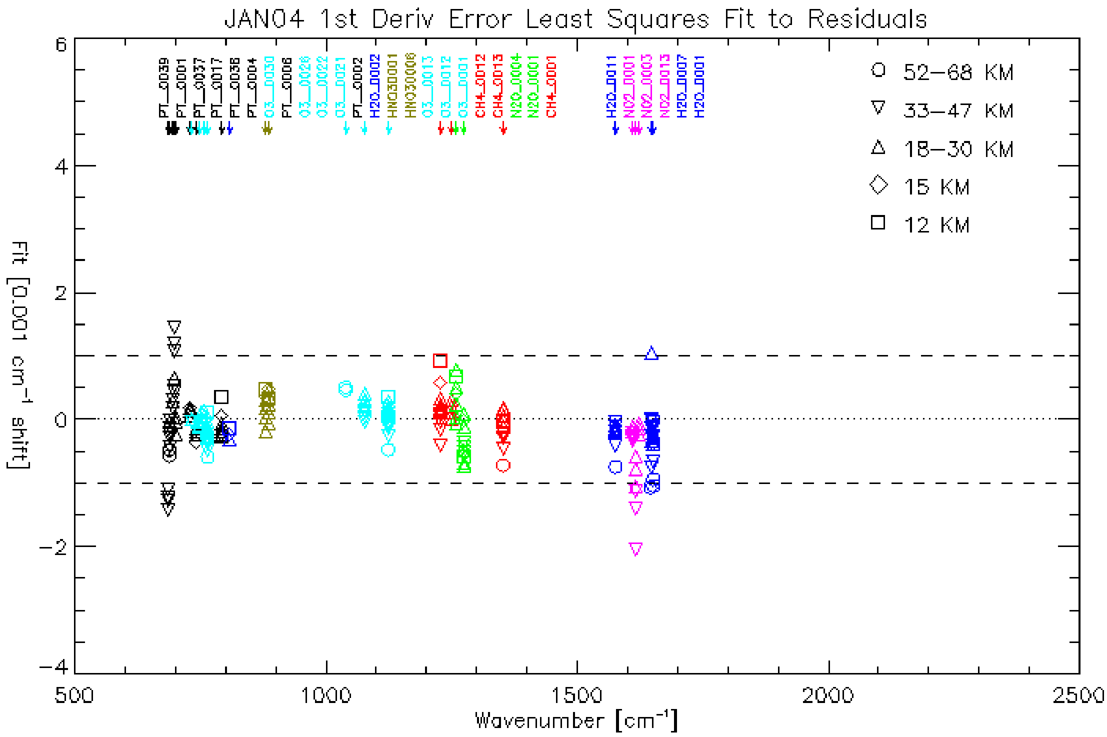

Fig. 18 1st order derivative error: January 2004.

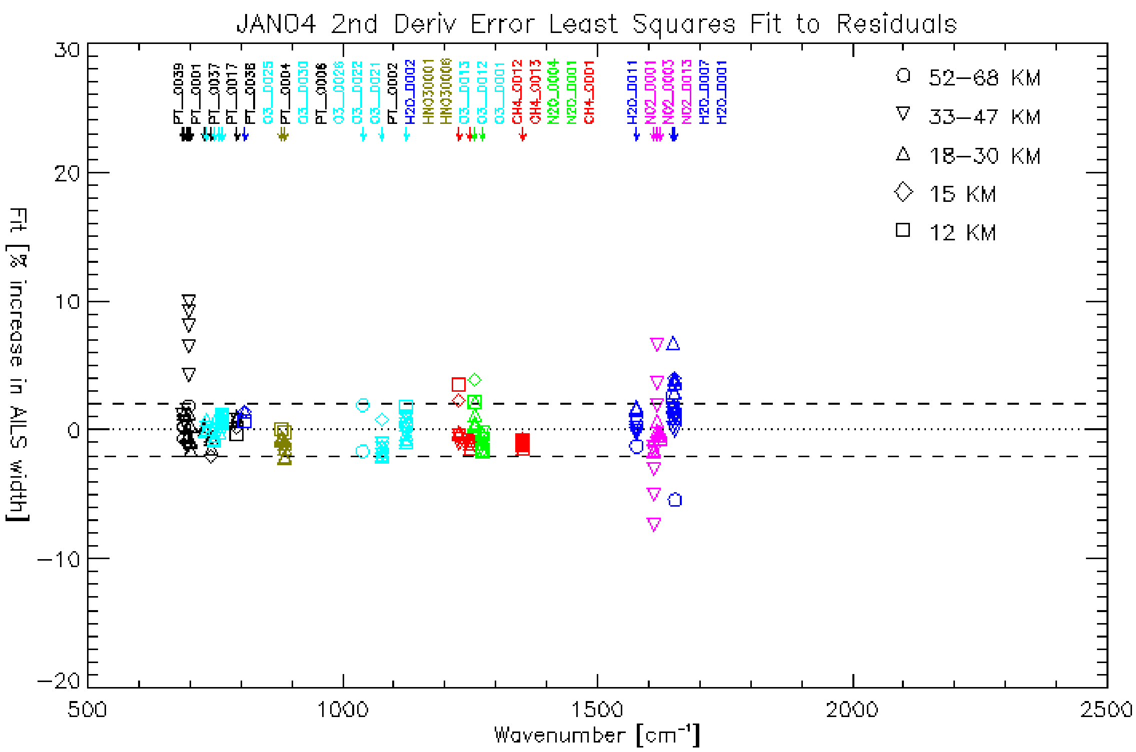

Fig. 19 2nd order derivative error: January 2004.

2.5.3 Occupation Matrix Statistics

An occupation matrix selects the set of microwindows and tangent altitudes used for each retrieval. When all L1B spectra are available for the retrieval, only the ‘nominal’ OMs #001-006 would be used, the different numbers just indicating different latitude bands. Given the width of these latitude bands and the MIPAS orbital coverage, the expected proportion of profiles within each latitude band are given in the Tab. 9.

Tab. 9 Expected proportion of profiles within each latitude band.

Occupation Matrix	Latitude Range	No. Profiles/orbit	Fraction of Profiles
006	65N-90N	10	14%
005	20N-65N	18	25%
004	EQU-20N	8	11%
003	20S-EQU	8	11%
002	65S-20S	18	25%
001	90S-65S	10	14%

Alternative OMs are also available to cope with situations where one or more spectra are unavailable, e.g. corrupt data or if cloud-contamination is detected in the field of view. These each have a 3-digit code, which can be used to identify the situation encountered, the second and third digits being one of the sweep altitudes. OMs with codes beginning with 6 use the same microwindows as the nominal OMs but with all sweeps up to and including a particular altitude excluded, e.g. 615 means that all spectra up to 15 km are excluded from the retrieval. These were specifically generated to cope with cloudy scenes. If the first digit is 1...5 then only one band at one altitude are excluded, (1=A band, 2=AB band, etc). For example code 421 is an occupation matrix, which excludes the C band at 21 km. If the first digit is 0 then all bands at the particular altitude are excluded. These OMs were generated to cope with corrupt data and, unlike the 600 OMs, often use different microwindows to the nominal OM.

The actual OM selected for retrieval is determined according to a priority list, the nominal OMs being always the first in the list. A check is made to see which bands are available and the priority list is searched sequentially until an OM is found which only requires the available bands. For example, if band A at 15 km is corrupt, OMs 015, 115, 615, 618, 621 ... etc could all be used but the one which is selected will be the highest in the priority list which, in theory, should be the one which allows most information to be retrieved from the remaining spectra.

The following analysis refers only to NRT products.

Results:

1. Valid retrievals only received in first half of month, approximately 30% of the number retrieved in the previous month.

2. VMR retrieved successfully from >95% pT profiles for all species, problem with fewer O3 and N2O retrievals in previous month appears to be resolved.

3. 19% (OM002) and 22% (OM005) of retrievals are obtained using the nominal mid latitude OMs (expected 25% in the absence of clouds) - an increase of 1 in Southern latitudes (OM002) and 2% in Northern latitudes (OM005) compared to previous month.

4. 10% (OM001) and 14% (OM006) of retrievals are obtained using each of the nominal high latitude OMs (expected 14% in the absence of clouds) - similar to previous month.

5. 8% (OM003) and 6% (OM004) of retrievals are obtained using the nominal low latitude OMs (expected 11% in the absence of clouds) - an increase of 0.5% compared to previous month.

6. 7.5% retrievals correspond to OMs with 12 km sweep removed (medium level clouds detected) 612 for pT, O3, N2O; 015 for H2O; 115 for HNO3; 312 for CH4 - down by 1.5% compared to previous month.

7. 5.1% retrievals correspond to OMs with both 12 and 15 km sweeps removed (high cloud): 615 for pT, 015 for H2O (again), O3; 615 for HNO3, CH4, and N2O - similar to previous month.

8. 3.2% retrievals correspond to OMs with 12-18 km sweeps removed (very high cloud): 618.

9. 1.3% retrievals correspond to OMs with 27 km sweep removed (027), up 0.5% compared to previous month.

10. NO2, only retrieved from 24-47 km, uses no OM for more than 1% of retrievals except for the nominal OMs.

11. Around 78-79% of all retrievals (expressed as total pT retrievals), used the nominal occupation matrix, up 5% compared to previous month.

Table 10 summarises the results.

Tab. 10 Occupation matrix statistics.

PT		H2O		O3		HNO3		CH4		N2O		NO2	
No. Profiles		No. constituent profiles as % of No. pT profiles											
5858		97.2		96.4		96.4		97.2		95.5		97.1	
Occupation Matrix labels and frequency as % of pT ('etc.' = those contributing <0.1% each)													
OM	**%**	**OM**	**%**	**OM**	**%**	**OM**	**%**	**OM**	**%**	**OM**	**%**	**OM**	**%**
005	21.9	005	21.9	005	21.9	005	21.9	005	21.9	005	21.9	005	25.3
002	18.8	002	18.8	002	18.8	002	18.8	002	18.7	002	18.8	002	21.9
006	14.0	006	14.0	006	14.0	006	14.0	006	14.0	006	14.0	006	15.8
001	9.8	015	10.8	001	9.8	001	9.8	001	9.8	001	9.5	001	11.8
003	8.0	001	9.8	003	7.5	003	7.5	312	7.5	003	7.5	003	10.0
612	7.6	003	7.5	612	7.5	115	7.3	003	7.4	612	7.4	004	9.3
004	6.4	004	6.0	004	6.0	004	6.0	004	6.0	004	6.0	027	1.6
615	3.4	618	4.1	015	3.4	615	3.4	615	3.4	615	3.4	024	1.2

618	2.3	621	1.4	618	2.4	618	3.3	618	3.3	618	3.2	Etc.	0.2
027	1.3	027	1.3	621	1.4	621	1.4	621	1.4	621	1.4		
124	1.1	624	1.1	027	1.3	027	1.3	027	1.3	624	1.2		
021	0.9	627	0.2	624	1.1	624	1.1	624	1.2	018	0.8		
036	0.9	Etc.	0.3	018	0.9	627	0.2	018	0.8	627	0.3		
121	0.9			627	0.2	112	0.2	627	0.2	Etc.	0.1		
030	0.7			Etc.	0.1			060	0.1				
015	0.6							Etc.	0.1				
621	0.5												
127	0.2												
115	0.1												
Etc.	0.3												
Profiles retrieved with nominal occupation matrix (OM001 ... OM006) as % of pT													
79.0		78.0		78.0		78.1		77.9		77.7		94.1	

2.5.4 Altitude Retrieval Performance

THREE-DAY OSCILLATION ANALYSIS

The not corrected software for ENVISAT satellite mispointing produced effects with different frequencies: jump with daily frequency, three-days oscillation and long-term oscillation. An example of daily jump is the GOMOS daily pitch jump shown in Fig. 20.

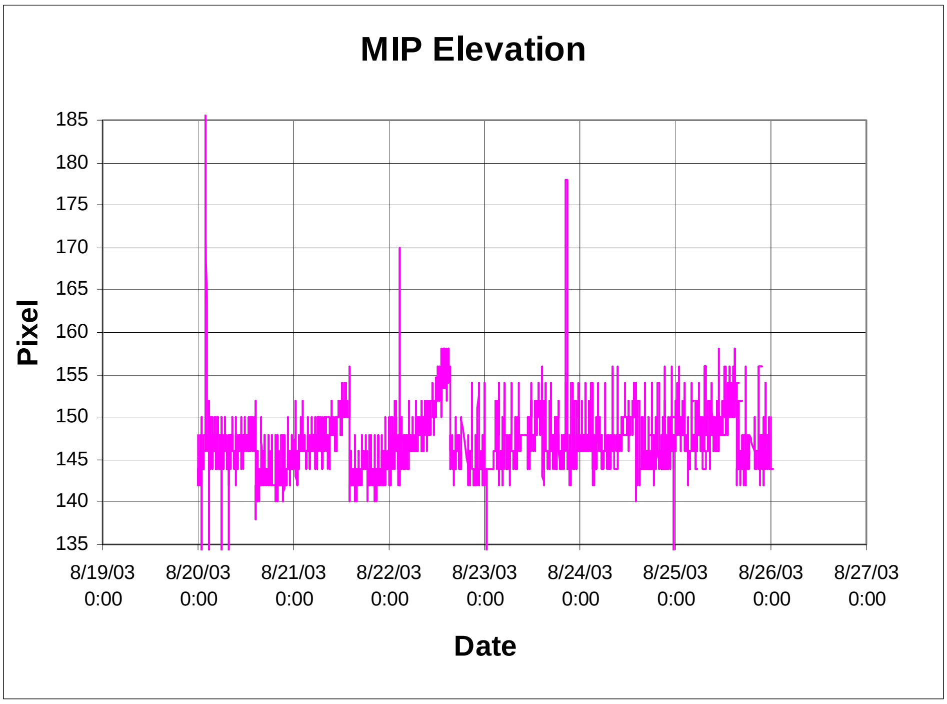

Fig. 20 GOMOS daily pitch jump.

The annual trend of the MIPAS pointing error is an example of long-term oscillation. For what concerns the three-days oscillations, effects have been observed on MIPAS data. In fact, oscillations in tangent point pressure with a three-days period and amplitude of about 2% have been evidenced by an analysis done by the Oxford University (see an example in Fig. 21). The three-days oscillations are probably caused by the bi-daily update of the ENVISAT orbit model.

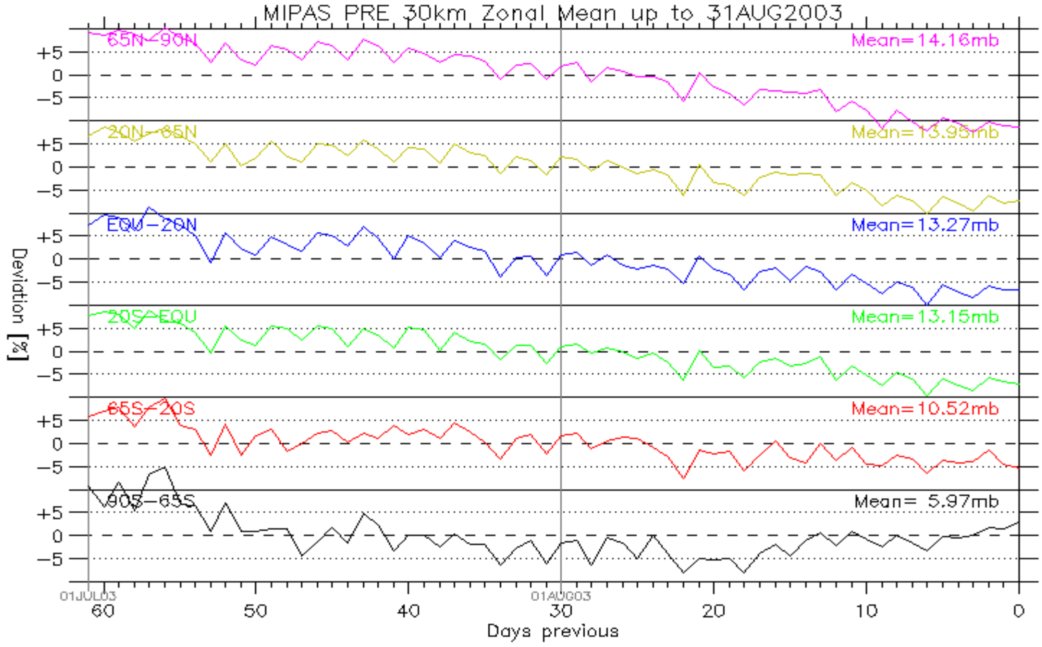

Fig. 21 Standard deviation of the zonal mean tangent point pressure (at 30 km) as a function of time.

The three-days oscillations have been analysed for January and it has been observed that the update done on the pointing software (12 December 2003) has removed the intermediate-term oscillations (see Fig. 22).

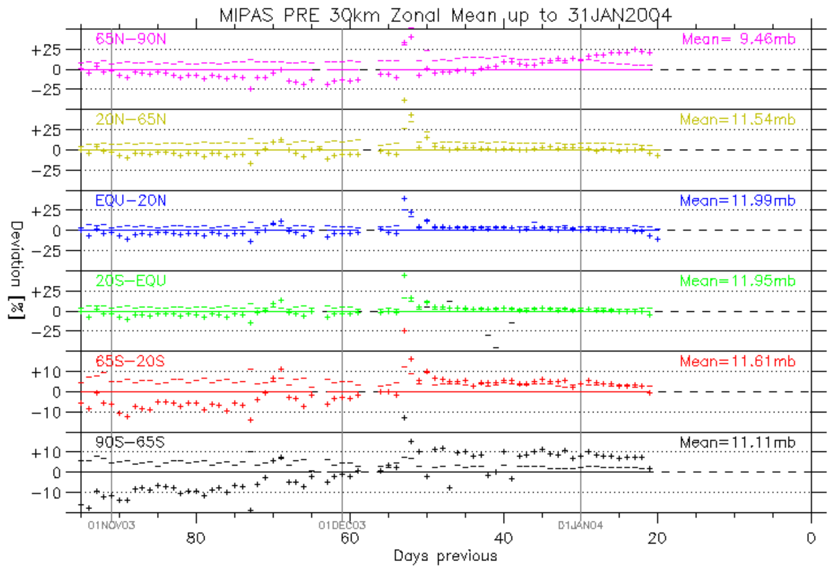

Fig. 22 Standard deviation of the zonal mean tangent point pressure (at 30 km) as a function of time.

NOISY TEMPERATURE

It has been observed that the retrieved temperature became noisier after about the first week in October (see an example in Fig. 23). Corrected altitude and pressure also appear to become noisier. The following sources of problems have been excluded:

- Mispointing: because the pointing noise is less than 4 mdeg.
- Noisy D1 channel: there are no temperature MWs in D1 channel.

The analysis is still ongoing.

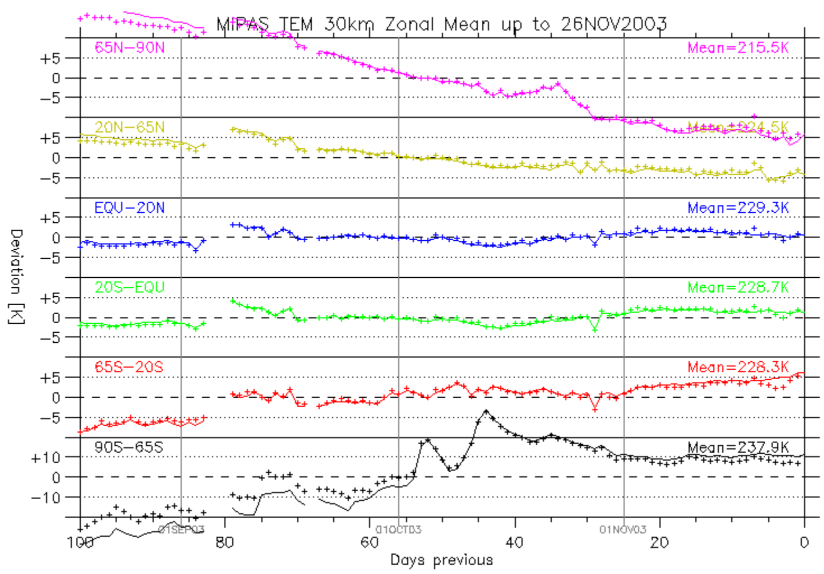

Fig. 23 Standard deviation of the zonal mean tangent point temperature (at 30 km) as a function of time.

ANOMALOUS PROCESSING TIME

An excessive processing time for Level 2 off-line processing characterizes some MIPAS products. This has been tracked down to 2 causes:

1. A discrepancy between processor and prototype processing time.
2. A bug in the processor that is not able to process scans composed by one only altitude level.

In order to quickly remove the second problem, a new MIP_OM2_AX has been generated for both NRT and off-line processing in order to eliminate occupation matrix composed by scans with only one level. The new ADF will be disseminated next month after testing.

INCREASED NOISE LEVEL

For the same reason explained in *Section 2.4.5*, a new MIP_PS2_AX has been generated and will be disseminated next month.

2.5.5 Improvements

2.5.5.1 Improvement done

A modification to the software for MIP_CO1_AX generation has been done to force statistics to one as a workaround for the not correct handling of standard deviation different from one done by the processor.

2.5.5.2 Future improvement

In order to conform the data processing to the new noise level introduced by the interferometer heating new MIP_PS1_AX and MIP_PS2_AX have been generated and will be disseminated next month after testing.

A new MIP_OM2_AX has been generated and will be disseminated next week in order to quickly resolve the problem related to processing of scans composed by one only altitude level.

2.6 VALIDATION ACTIVITIES AND RESULTS

2.6.1 Consistency Verification

The following figures show the comparison of the monthly mean vertical profiles (altitude, pressure, temperature, and species) with the ones obtained the previous month.

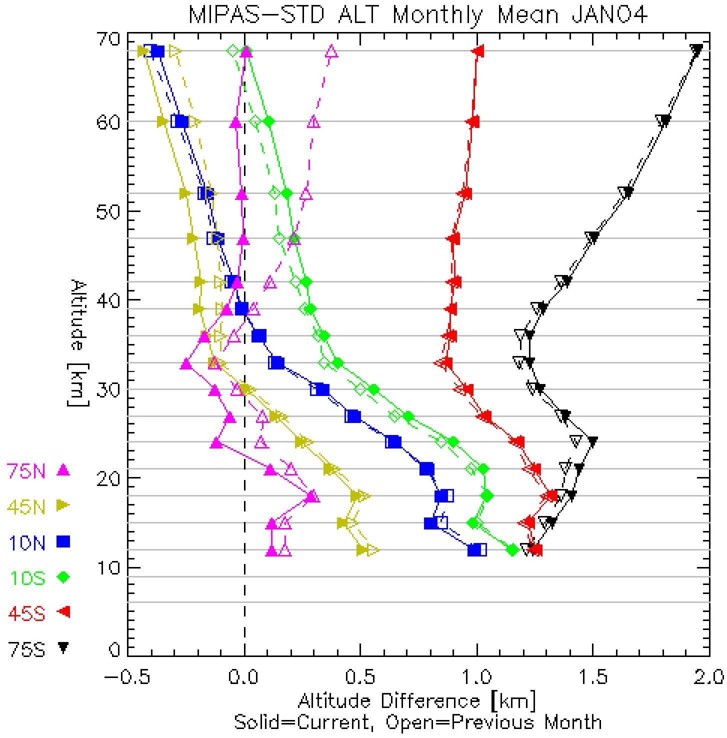

Fig. 24 Profile comparison between January and December: Altitude difference.

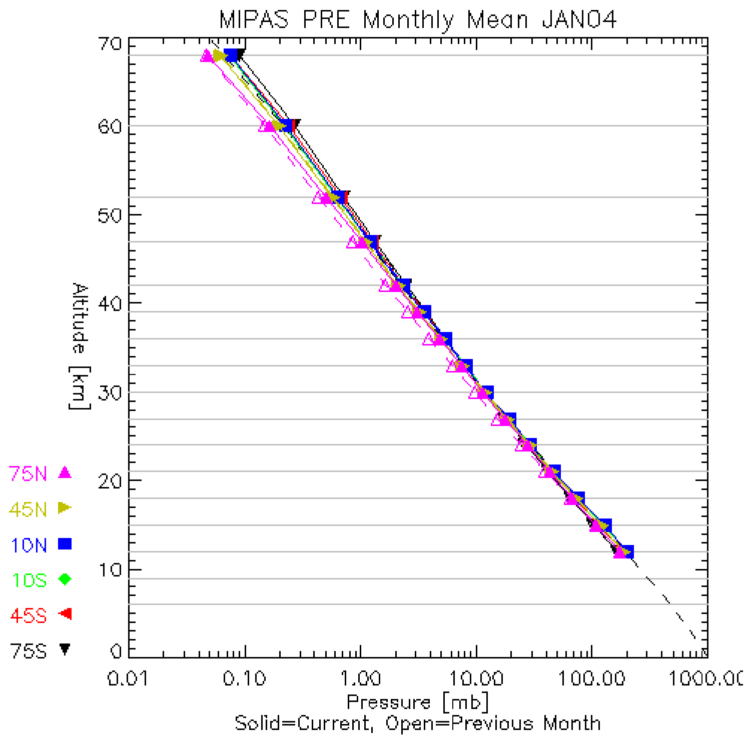

Fig. 25 Profile comparison between January and December: Pressure.

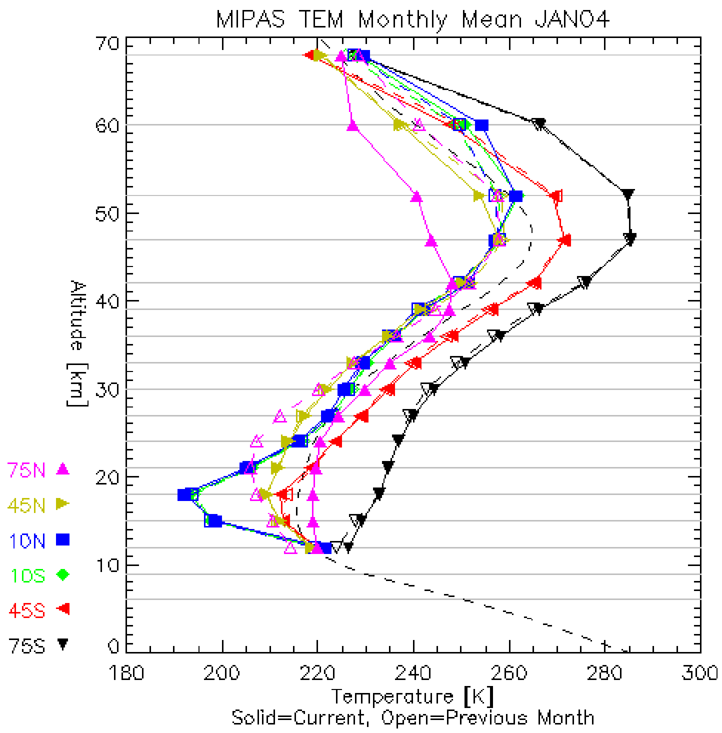

Fig. 26 Profile comparison between January and December: Temperature.

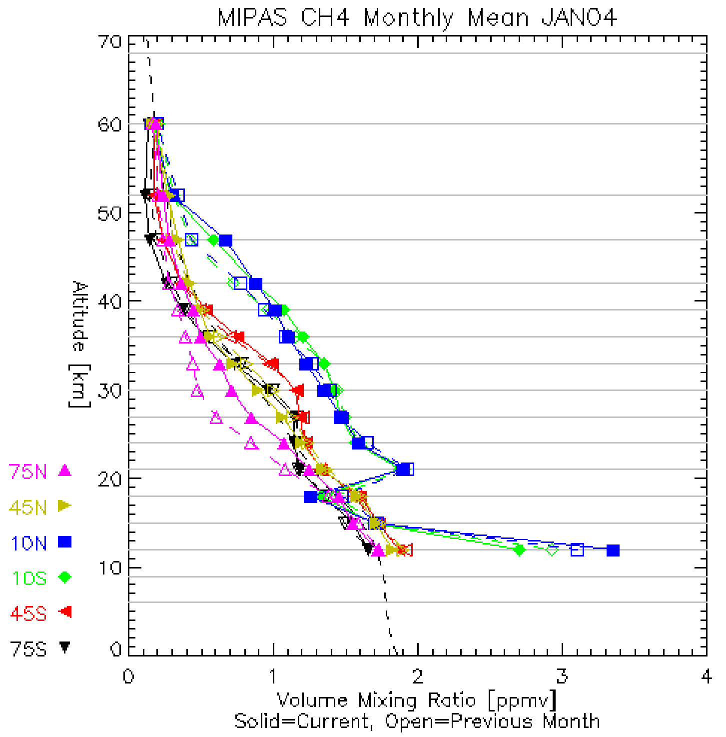

Fig. 27 Profile comparison between January and December: CH4.

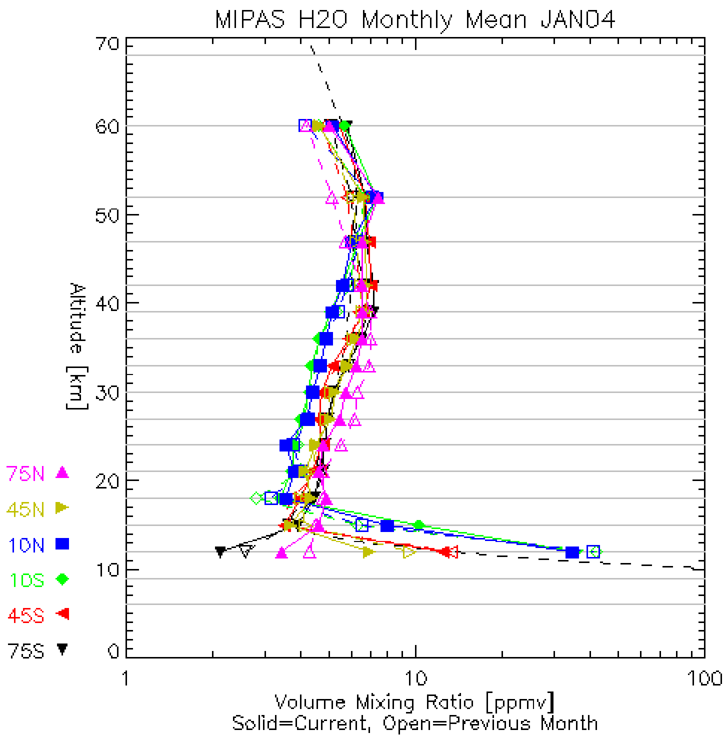

Fig. 28 Profile comparison between January and December: H2O.

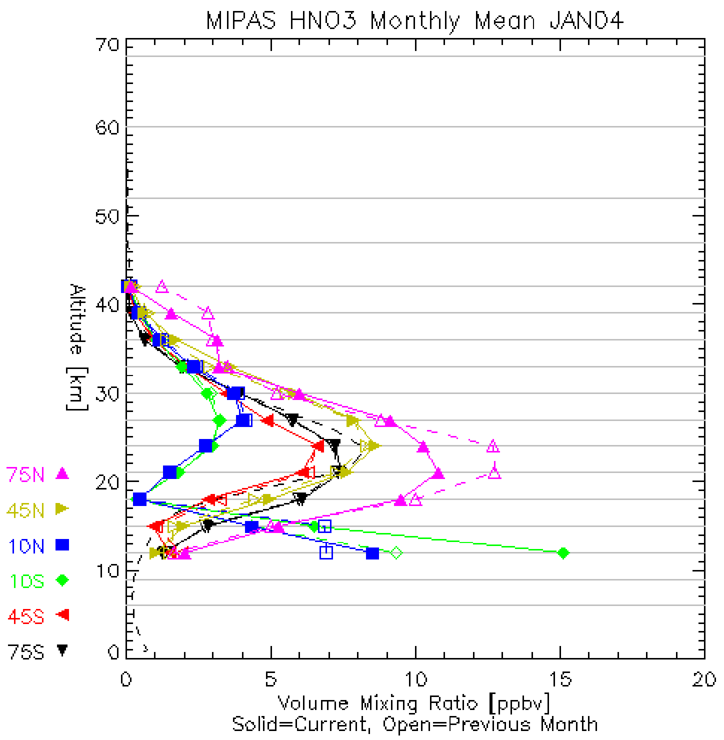

Fig. 29 Profile comparison between January and December: HNO3.

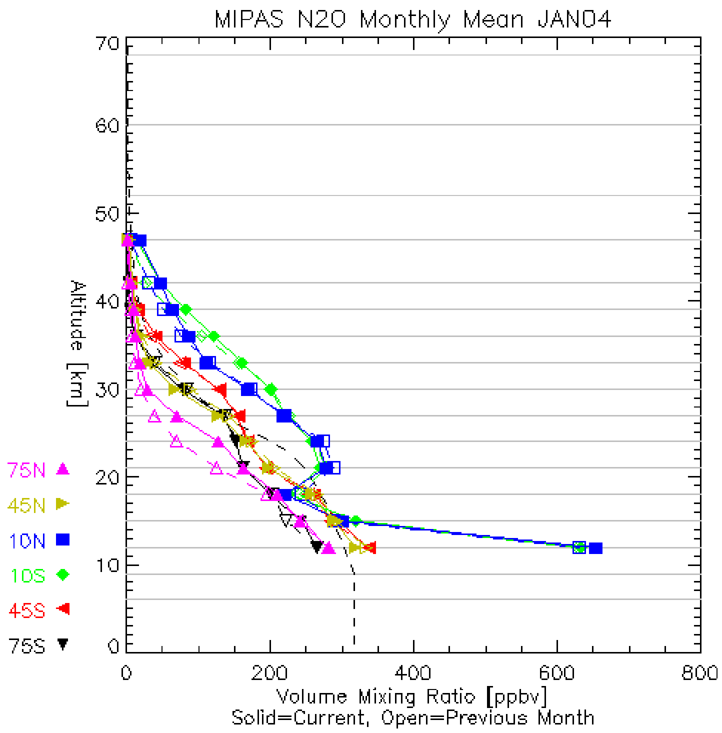

Fig. 30 Profile comparison between January and December: N2O.

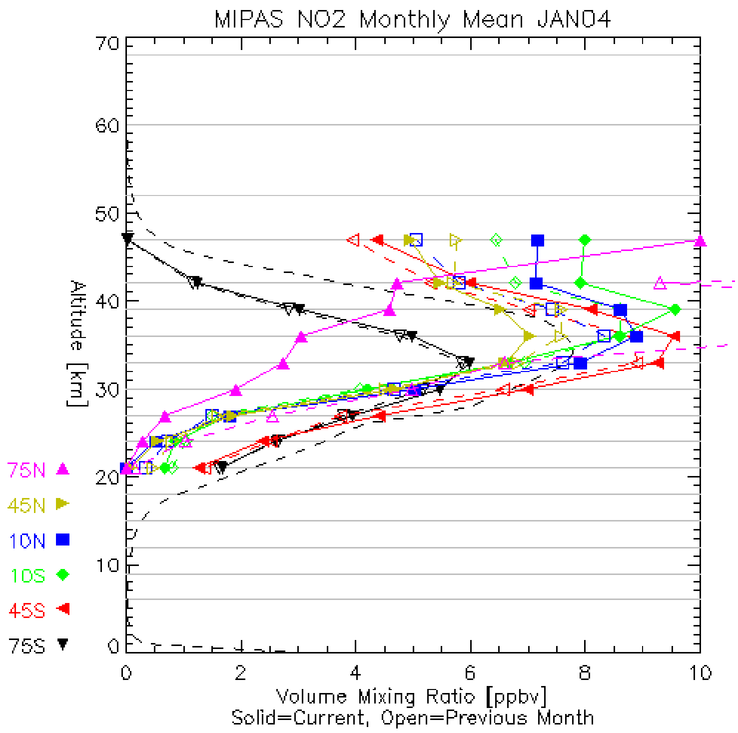

Fig. 31 Profile comparison between January and December: NO2.

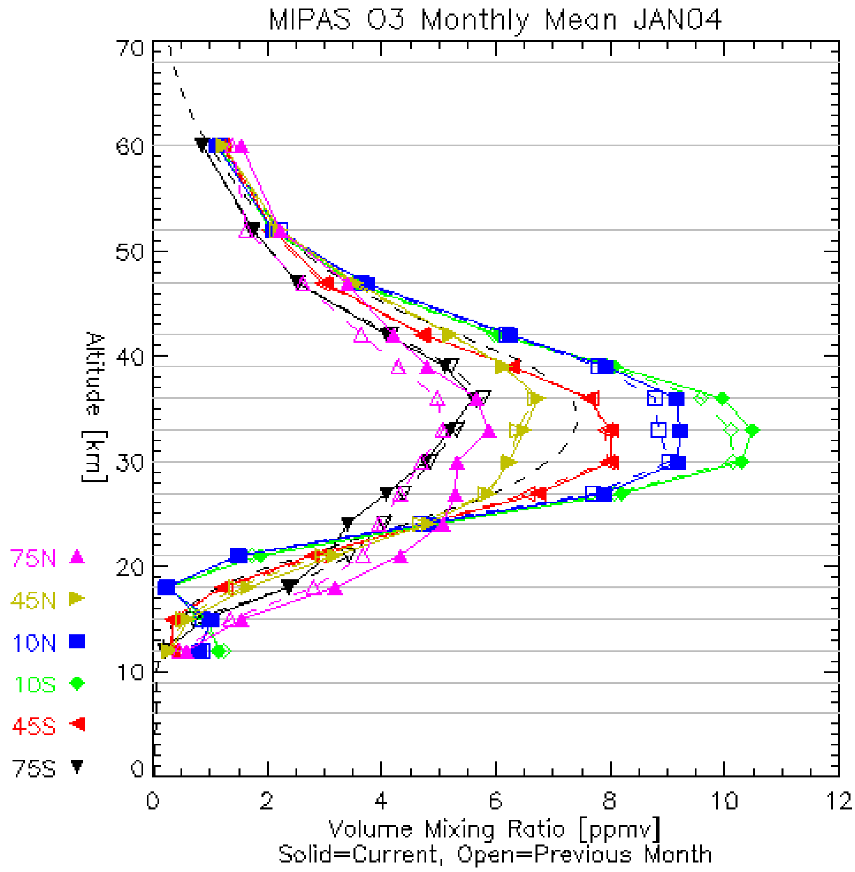

Fig. 32 Profile comparison between January and December: O3.

Comments:

Altitude Difference

Reported altitudes in the Southern Hemisphere, and lower altitudes near the equator, remain about 1km higher than the nominal elevation scan altitudes. No significant change from previous month.

Temperature

The Northern Polar Region shows a 10 K warming in the stratosphere and 10 K cooling in the mesosphere, also a reduction in variability compared to the previous month. No significant change at other latitudes.

Pressure

Increase of tangent pressures in Northern Polar Region reaching 20% at 40 km (stratopause), but no significant difference at other latitudes compared to previous month. However, the variability at all latitudes has been reduced to approximately 50% of the previous month's value.

CH4

Monthly mean profiles for January 2004 are largely similar to those from December 2003, apart from the Northern Polar latitudes. Mixing ratios for this latitude band are higher than December values by around 0.2 ppmv in the altitude range 21-39 km. The Equatorial monthly means show a strange shape below 21 km. However, this is consistent with the shape of the December profiles (and previous months).

H2O

Profiles for both Polar latitude bands are noticeably wetter than December profiles above 42 km. In the North Polar Region between 21-39 km (where CH4 values have increased) H2O values for January are around 0.5 ppmv lower than December values.

HNO3

The underlying retrieved structure remains similar to previous months. The Northern Polar VMR has decreased by 2 ppbv in the peak (21-24 km). Last month's increase at around 38 km has reverted to normal. The Equatorial lowermost levels have once again shown an increase, although this effect soon vanishes with altitude. The remaining profiles show little chance compared to last month.

N2O

Apart from an increase from last month's exceptionally low values in the North Polar Region between 21-27 km, there has been little noticeable difference compared to the previous month.

NO2

North Polar Region: Strange behaviour of the nighttime profile, which is significantly reduced, compared to the previous month although now more consistent with the initial guess climatology (no day-time MIPAS data in North Polar Region). Equatorial Region: no clear nighttime peak around 39 km, but better agreement with respect to IG. Higher nighttime values at 47 km with respect to previous month, but worse agreement with respect to IG.

O3

North Polar Region: increase of 1 ppmv throughout profile, generally giving worse agreement with the initial guess climatology than the previous month above 42 km and better agreement below 39 km. Equatorial Region: slight enhancement (0.5 ppmv) of the peak values compared to the previous month.

2.6.2 Statistics from Intercomparison with External Data

2.6.2.1 Comparison with ECMWF data

No ECMWF MIPAS report received for January 2004 because of the lack of MIPAS data