/document title/ titre du document

SCIAMACHY

Bi-Monthly Report:

May - June 2011

prepared by/préparé par Gabriele Brizzi

reference/réference ENVI-SPPA-EOPG-TN-11-0021
issue/édition 1
revision/révision 0
date of issue/date d'édition 10 August 2011
status/état
Document type/type de document Technical Note
Distribution/distribution

APPROVAL

title titre	SCIAMACHY Bi-Monthly Report: May - June 2011	issue issue	1	revision revision	0

author auteur	Gabriele Brizzi, IDEAS-SERCO; Angelika Dehn, IDEAS-SERCO; Manfred Gottwald, SOST-DLR; Stefan Noël, SOST-IFE; Richard von Hees, SRON	date date	10/08/2011

approved by approuvé by	T. Fehr ESA/ESRIN, D/EOP-GQ	date date	10/08/2011

CHANGE LOG

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

CHANGE RECORD

Issue: 1 Revision: 0

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

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SCIAMACHY
BI-MONTHLY REPORT
MAY - JUNE 2011

1 INTRODUCTION

The SCIAMACHY Bi-Monthly report documents the current status and recent changes to the SCIAMACHY instrument, its data processing chain, and its data products.
The Bi-Monthly Report (hereafter BMR) is composed of analysis results obtained by IDEAS, combined with inputs received from the different groups working on SCIAMACHY operation, calibration, product validation and data quality.
The first part of the report is dedicated to Instrument Configuration and Performance. It is composed of contributions from SOST-DLR, SOST-IFE and SRON. The remainder of the report is dedicated to Level 1b and Level 2 performance assessment and is generated by ESA/ESRIN IDEAS with contributions from ESA/ESTEC PLSO and DLR-IMF.

The structure of the report will be in constant evolution through the ENVISAT mission, as experience with SCIAMACHY data and quality control grows.

1.1 Scope

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

The BMR is composed of the following six sections:

- Summary;
- Instrument Configuration and Performance;
- Degradation monitoring and correction;
- Data Availability Statistics;
- Level 1 Product Quality Monitoring;
- Level 2 NRT and OFL Product Quality Monitoring;
- Validation Activities and Results.

1.2 References

[1] 'Instrument Operation Manual', MA-SCIA-0000DO/01, Issue F R2, 16 Dec. 2004.

[2] 'ENVISAT-1 Products Specifications Volume 15: SCIAMACHY Products Specifications', PO-RS-MDA-GS-2009, Issue 3L version 1.1, 21 January 2010.

[3] 'SCIAMACHY cL0 Statistics', PO-TN-DLR-SH-0012, Issue 1, Rev. 1, 14 April 2005.

[4] SCIAMACHY cL0 Statistics 2003, PO-TN-DLR-SH-0013, Issue 1, Rev. 0, 14 April 2005.

[5] 'SCIAMACHY Consolidated Level 0: Statistics for the Year 2005', PO-TN-DLR-SH-0014, Issue 1, Rev. 0, 11 July 2006.

[6] 'Final SCIAMACHY Consolidated Level 0 Product Status 2002-2008', PO-TN-DLR-SH-0025, Issue 1, Rev. 0, 1 June 2010.

1.3 Acronyms and Abbreviations

ADC	Analogue to Digital Converter
ADF	Auxiliary Data File
ANX	Ascending Node Crossing
AOCS	Attitude and Orbit Control System
APSM	Aperture Stop Mechanism
ASM	Azimuth Scan Mechanism
ATC	Active Thermal Control
BMR	Bi-Monthly Report
CA	Corrective Action
CCA	Communication Area
CTI	Configurable Transfer Item
DAC	Digital Analogue Converter
DLR-IMF	Deutsches Zentrum fuer Luft- und Raumfahrt
EOL	End of Life
ESM	Elevation Scan Mechanism
FAT	Factory Acceptance Test
FPN	Fixed Pattern Noise
HK	Housekeeping
HSM	High Speed Multiplexer
ICE	Instrument Control Electronics
ICU	Instrument Control Unit
IDEAS	Instrument Data quality Evaluation and Analysis Service
IECF	Instrument Engineering and Calibration Facilities
IOM	Instrument Operation Manual
LK1	Leakage Current Auxiliary File (SCI_LK1_AX)
LLI	Life Limited Item
LOS	Line of Sight
MCMD	Macro Command
MPH	Main Product Header
MPS	Mission Planning Schedule
NCWM	Nadir Calibration Window Mechanism
NDFM	Neutral Density Filter Mechanism
NIVR	Netherlands Agency for Aerospace Programmes
NNDEC	Non-nominal Decontamination
NRT	Near Real Time
OAR	Observation Anomaly Report
OBM	Optical Bench Module
OCM	Orbit Control manoeuvre
OCR	Operations Change Request
OFL	Off-line
OSDF	Orbit Sequence Definition File
OSV	Orbit State Vector

PCF	Product Control Facility
PDHS	Payload Data Handling Station (PDS)
PDHS-E	Payload Data Handling Station – ESRIN
PDHS-K	Payload Data Handling Station – Kiruna
PDS	Payload Data Segment
PE1	Pixel to Pixel/ Etalon Auxiliary File (SCI_PE1_AX)
PLSO	Payload Switch OFF
PMD	Polarization Measurement Device
QUADAS	Quality Analysis of Data from Atmospheric Sounders
QWG	Quality Working Group
SAA	South Atlantic Anomaly
SCIAMACHY	Scanning Imaging Absorption Spectrometer for Atmospheric Chartography
SCIAVALIG	SCIAMACHY Validation and Interpretation Group
SCICAL	SCIAMACHY Calibration tool
SEU	Single Event Upset
SLS	Spectral Line Source
SM	Service Module
SMR	Sun Mean Reference
SOST	SCIAMACHY Operations Support Team
SP1	Spectral Calibration Auxiliary File (SCI_SP1_AX)
SU1	Sun Reference Auxiliary File (SCI_SU1_AX)
SZA	Sun Zenith Angle
TC	Thermal Control
TCFoV	Total Clear Field of View
TOA	Top of Atmosphere
TRUE	Tangent height Retrieval by UV-B Exploitation
VCD	Vertical Column Density
WLS	White Light Source
WUR	Wageningen University and Research
YSM	Yaw Steering Mode

2 SUMMARY

- For the reporting period (orbits 47934 – 48809) SCIAMACHY measurements were nominal with respect to planning.

- During the reporting period, regular monthly calibrations were scheduled between orbits

  - 48159-48163 (16/17-May-2011)
  - 48590-48594 (15/16-Jun-2011)

- During the reporting period, occultation measurements with the moon rising on the night side were executed between orbits

  - 48101-48159 (12-May-2011 until 16-May-2011)
  - 48536-48582 (11-Jun-2011 until 15-Jun-2011)

- During the reporting period, one OCR was successfully implemented: OCR_51 for the observation of Venus and Jupiter.

- No TC adjustment was required.

- SCIAMACHY instrument performances and products' quality are checked on a daily basis, monitoring the operational data processing chains. Results are presented by means of Daily Reports published on-line.

  The Level 0 NRT daily reports can be accessed at the following address:
  http://earth.eo.esa.int/pcs/envisat/sciamachy/reports/daily/Level_0/

  The NRT and OFL Level 1b daily reports can be accessed at:
  http://earth.eo.esa.int/pcs/envisat/sciamachy/reports/daily/Level_1/

  The Fast-Delivery and OFL Level 2 daily reports can be accessed at:
  http://earth.eo.esa.int/pcs/envisat/sciamachy/reports/daily/Level_2/

- A web-page reporting anomalies in the SCIAMACHY data production is available at: http://earth.eo.esa.int/pcs/envisat/sciamachy/reports/anomalies/

- Maps of the monthly averaged column densities of O_3, H_2O, BrO and NO_2 generated from SCIAMACHY Level 2 consolidated version 5.01 products can be viewed on the ESA Product Control Service web page at
  http://earth.eo.esa.int/pcs/envisat/sciamachy/reports/monthlymaps/nadir/

3 INSTRUMENT CONFIGURATION AND PERFORMANCE

3.1 In-Flight Status and Performance

Detailed operations, planning and instrument status information can be found on the website of the *SCIAMACHY Operations Support (SOST)* under http://atmos.caf.dlr.de/projects/scops/. These pages are maintained on a daily basis and show the history and actual progress of the SCIAMACHY mission.

3.1.1 Planned Operations and Measurements (SOST-DLR)

The reporting period covers the orbits 47934 (ANX = 01-May-2011, 01:38:59.750) to 48809 (ANX = 30-Jun-2011, 23:22:58.976). Two OSDFs specified the planning baseline. Since the planning was cycle oriented, both OSDFs cover a much wider period.

Orbit		ANX		OSDF
Start	Stop	Start	Stop	
47860	48721	25-Apr-2011 22:01:44.295	24-Jun-2011 20:22:28.953	MPL_OSD_SHVSH_20110302_010101_00000000_36050001_20110425_220146_20110624_220241.N1
48722	49254	24-Jun-2011 22:02:42.935	31-Jul-2011 22:46:38.252	MPL_OSD_SHVSH_20110519_010101_00000000_36060001_20110624_220245_20110801_002650.N1

Table 3.1: SCIAMACHY OSDF planning file from April/May – July 2011, including the reporting period.

Measurements were nominal, i.e. timelines executed limb/nadir sequences with wide swath settings on the dayside of the orbit. Each month they were interleaved with 2 blocks of 14-15 orbits each where the limb state was replaced by the *limb_mesosphere_thermosphere* state (see below). In-flight calibration and monitoring measurements occurred on daily, weekly and monthly timescales. Regular monthly calibration was scheduled between orbits

- 48159-48163 (16/17-May-2011)
- 48590-48594 (15/16-Jun-2011)

The moon was in the limb TCFoV between orbits

- 48099-48193 (12-May-2011 until 19-May-2011)
- 48525-48613 (11-Jun-2011 until 17-Jun-2011)

Occultation measurements with the moon rising on the night side could be executed between orbits

- 48101-48159 (12-May-2011 until 16-May-2011)
- 48536-48582 (11-Jun-2011 until 15-Jun-2011)

Four blocks of *limb_mesosphere_thermosphere* measurements were scheduled.

Orbit		UTC		Remark
Start	Stop	Start	Stop	
47977	47992	04-May-2011 01:29:01	04-May-2011 02:32:31	MIPAS upper atmosphere mode
48192	48207	19-May-2011 00:39:09	20-May-2011 01:42:39	
48408	48423	03-Jun-2011 01:29:31	04-Jun-2011 02:33:01	MIPAS upper atmosphere mode
48623	48638	18-Jun-2011 00:39:38	19-Jun-2011 01:43:08	

Table 3.2: Scheduled *limb_mesosphere_thermosphere* measurements in May – June 2011.

One OCR was successfully implemented. This was

- OCR_051 (*observation of Venus and Jupiter in 2011*): Between orbits 47994-47999 (05-May-2011, Venus) and orbits 48069-48074 (10-May-2011, Jupiter) thebright planets Venus and Jupiter were observed. The measurement of both planets started at an altitude of 100 km and an azimuth of 0° about 4 minutes after sunrise. The implemented observation procedure was the one-scan approach as for Venus in March 2009 (OCR_037).

3.1.2 Instrument Measurement Status (SOST-DLR)

The final flight status as from 10-Jan-2011 remained unchanged.

3.1.3 Executed Operations and Measurements (SOST-DLR)

Measurements and instrument availability

The OSDF planning file has been scheduled as requested except for one period:

- Orbit 48302-48325 (26-May-2011 until 28-May-2011): SCIAMACHY was transferred to STANDBY triggered by a Single Event Upset (SEU).

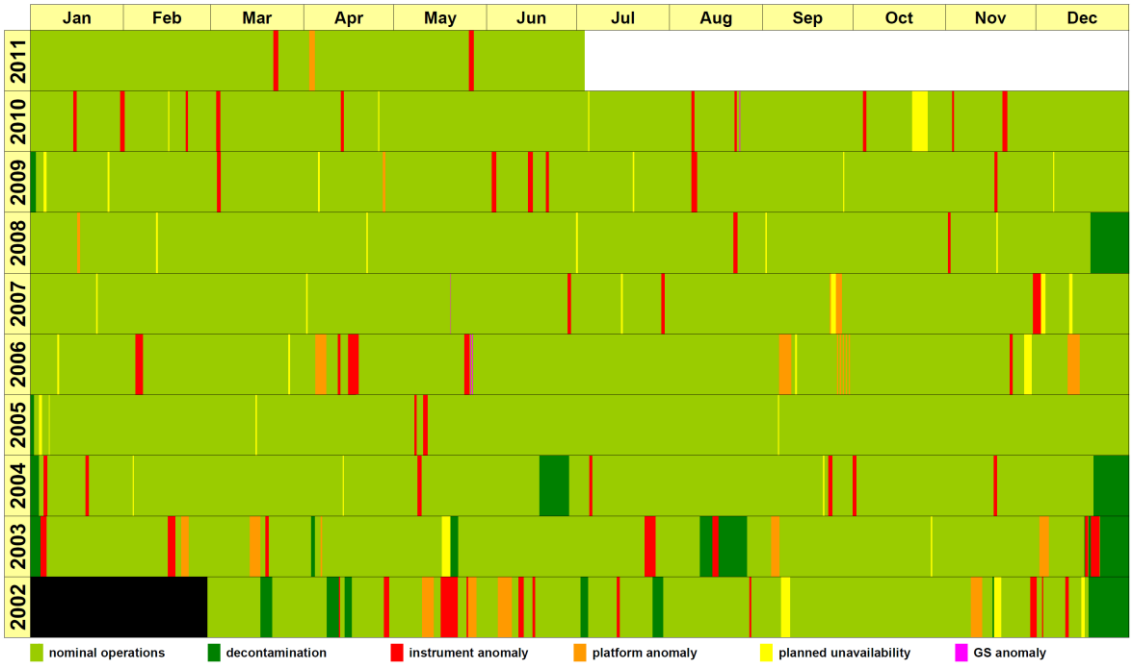


Figure 3.1: Current instrument availability status including the reporting period.

Detector thermal adjustment (TC)

No TC adjustment was required. The TC settings remained at

- DAC1 = 0.53 W
- DAC2 = 0.50 W
- DAC3 = 0.00 W

APSM/NDFM health checks & PMD ADC cal

In the reporting period 1 APSM/NDFM health check and 2 PMD ADC calibrations were executed. All showed nominal results.

APSM/NDFM			PMD ADC	
Orbit	ANX	Result	Orbit	ANX
n.a.	n.a.	n.a.	48296	26-May-2011 07:39:44
48798	30-Jun-2011 06:20:08	ok	48799	30-Jun-2011 07:56:16

Table 3.3: APSM/NDFM health check and PMD ADC calibration.

Special Monitoring Activities

Between orbits 48785-48788 (29-Jun-2011), Non-Nominal Telemetry (NNTM) was scheduled for the execution of state ID 65. This delivered ASM/ESM scanner motor currents (HK telemetry parameters I0116, I0117, I0118, I0126, I0127, I0128) with a time resolution of 1 sec. The parameters are used for scanner monitoring (once per year starting with the mission extension in 2008).

Anomalies

One major and one minor instrument anomaly had occurred:

- Orbit 48302-48325 (26-May-2011 until 28-May-2011): A transfer to STANDBY due to a *PMTC_Tx buffer overflow*, followed by a *PMTC driver timeout* anomaly, was likely caused by a Single Event Upset (SEU). In total measurement data for 23 orbits could not be generated as planned. The same anomaly had occurred on 22-Mar-2011.
- Orbit 48590 (15-Jun-2011): Because of the lunar eclipse the Sun Follower failed to track the moon at the beginning of the moon pointing state ID56 (mop01). About 3 sec later the moon was acquired successfully and the state was executed as planned.

Orbit	Date	Entry - UTC	Level	Entry Type	ID Content/Transition	Mode	Remark
48302	26-MAY-2011	2011.146.16.48.50.433	INSTRUMENT	AUTONOMOUS SWITCHING	ID454 / goto HEATER/REFUSE	HTR/REF	PMTC_Tx_Buffer_Overflow
48302	26-MAY-2011	2011.146.16.48.56.796	INSTRUMENT	AUTONOMOUS SWITCHING	ID455 / goto STANDBY/REFUSE-I	STDBY/REF-I	PMTC_Driver_Timeout
48590	15-JUN-2011	2011.166.18.31.18.191	Instrument	HK PARAMETER LIMIT EXCEEDING	86 (I0107)	MEASUREMENT	State 56 (mop01)
48590	15-JUN-2011	2011.166.18.31.19.117	Instrument	HK PARAMETER LIMIT EXCEEDING	94 (I0119)	MEASUREMENT	ASM control difference due to state 56 warning
48590	15-JUN-2011	2011.166.18.31.19.120	Instrument	HK PARAMETER LIMIT EXCEEDING	100 (I0129)	MEASUREMENT	ESM control difference due to state 56 warning

Table 3.4: Instrument and platform anomalies from May – June 2011.

Data Quality

The period with reduced data quality is caused by the anomaly which transferred SCIAMACHY to a mode lower than MEASUREMENT. Returning to a stable thermal status (ATC/TC) required a certain time.

Orbit		UTC		Event	Affected System
Start	Stop	Start	Stop		
48325	48336	28-May-2011 08:08:43	29-May-2011 01:12:44	recovery from STANDBY	ATC/TC

Table 3.5: Periods with degraded data quality from May – June 2011.

3.1.4 Performance Monitoring - System (SOST-DLR)

Detector and OBM temperatures are monitored according to the requirements of the IOM *[1]*. It requests to ensure that the average temperature per orbit remains within the specified limits.

Detector temperatures

For each detector the average temperatures per orbit are determined from HK telemetry parameters. Figure 3.2 displays the temperatures of all 8 detectors. Colour coding is as on the operational monitoring website, i.e. data from orbits with HK telemetry coverage > 90% are shown in red, for < 90% in green. Minimum/maximum values per orbit are indicated as vertical bars. The temperature limits of each detector are shown as horizontal lines.

The temperatures of channels 1-3 and 6-8 were in limits over the entire reporting period. Channels 4 and 5 exceeded their upper limits. This behaviour has been discussed with calibration and retrieval experts and is currently considered uncritical.

OBM temperatures

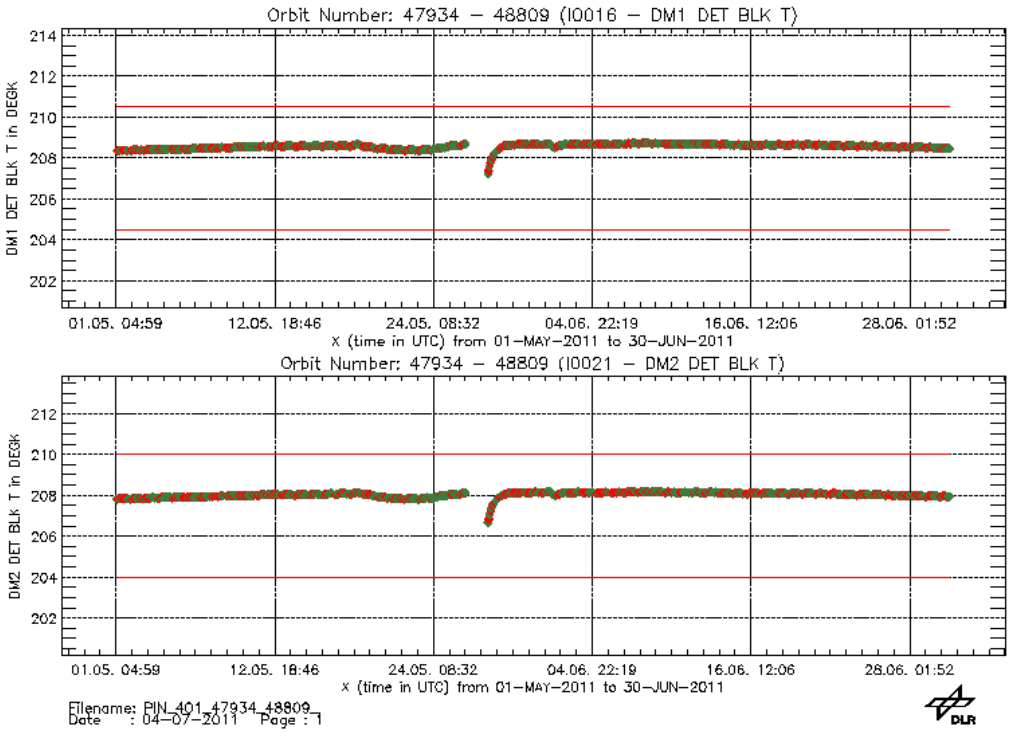
The average OBM temperature per orbit is determined from specific HK telemetry parameters. In addition power readings for the ATC heaters are monitored. Temperatures and ATC heater powers are given in Figures 3.3 and 3.4. Colour coding is as in Figure 3.2.

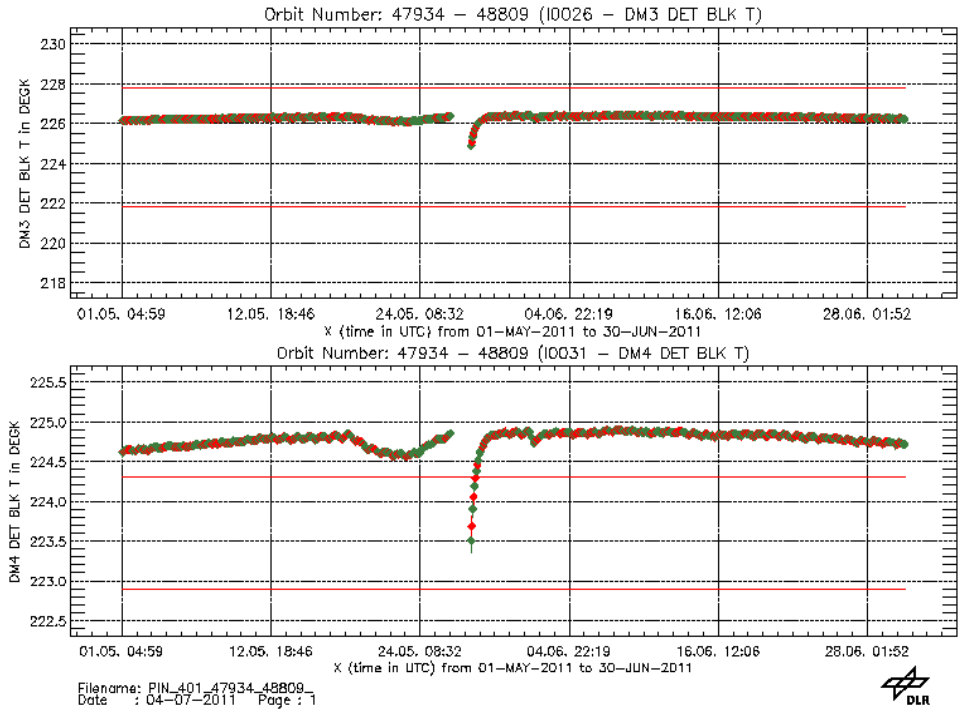
OBM temperatures and ATC heater powers remained within limits during nominal operations.

PMD ADC status

The status of the PMD ADC is monitored according to the requirements of the IOM *[1]*. It requests to ensure that no glitches occur caused by an SEU.

No PMD ADC glitches have been detected.


Orbit Number: 47934 – 48809 (I0016 – DM1 DET BLK T)
DM1 DET BLK T in DEGK
214
212
210
208
206
204
202
01.05. 04:59
12.05. 18:46
24.05. 08:32
04.06. 22:19
16.06. 12:06
28.06. 01:52
X (time in UTC) from 01-MAY-2011 to 30-JUN-2011
Orbit Number: 47934 – 48809 (I0021 – DM2 DET BLK T)
DM2 DET BLK T in DEGK
212
210
208
206
204
202
01.05. 04:59
12.05. 18:46
24.05. 08:32
04.06. 22:19
16.06. 12:06
28.06. 01:52
X (time in UTC) from 01-MAY-2011 to 30-JUN-2011
Filename: PIN_401_47934_48809_
Date : 04-07-2011 Page : 1
DLR


Orbit Number: 47934 – 48809 (I0026 – DM3 DET BLK T)
DM3 DET BLK T in DEGK
230
228
226
224
222
220
218
01.05. 04:59
12.05. 18:46
24.05. 08:32
04.06. 22:19
16.06. 12:06
28.06. 01:52
X (time in UTC) from 01-MAY-2011 to 30-JUN-2011
Orbit Number: 47934 – 48809 (I0031 – DM4 DET BLK T)
DM4 DET BLK T in DEGK
225.5
225.0
224.5
224.0
223.5
223.0
222.5
01.05. 04:59
12.05. 18:46
24.05. 08:32
04.06. 22:19
16.06. 12:06
28.06. 01:52
X (time in UTC) from 01-MAY-2011 to 30-JUN-2011
Filename: PIN_401_47934_48809_
Date : 04-07-2011 Page : 1
DLR

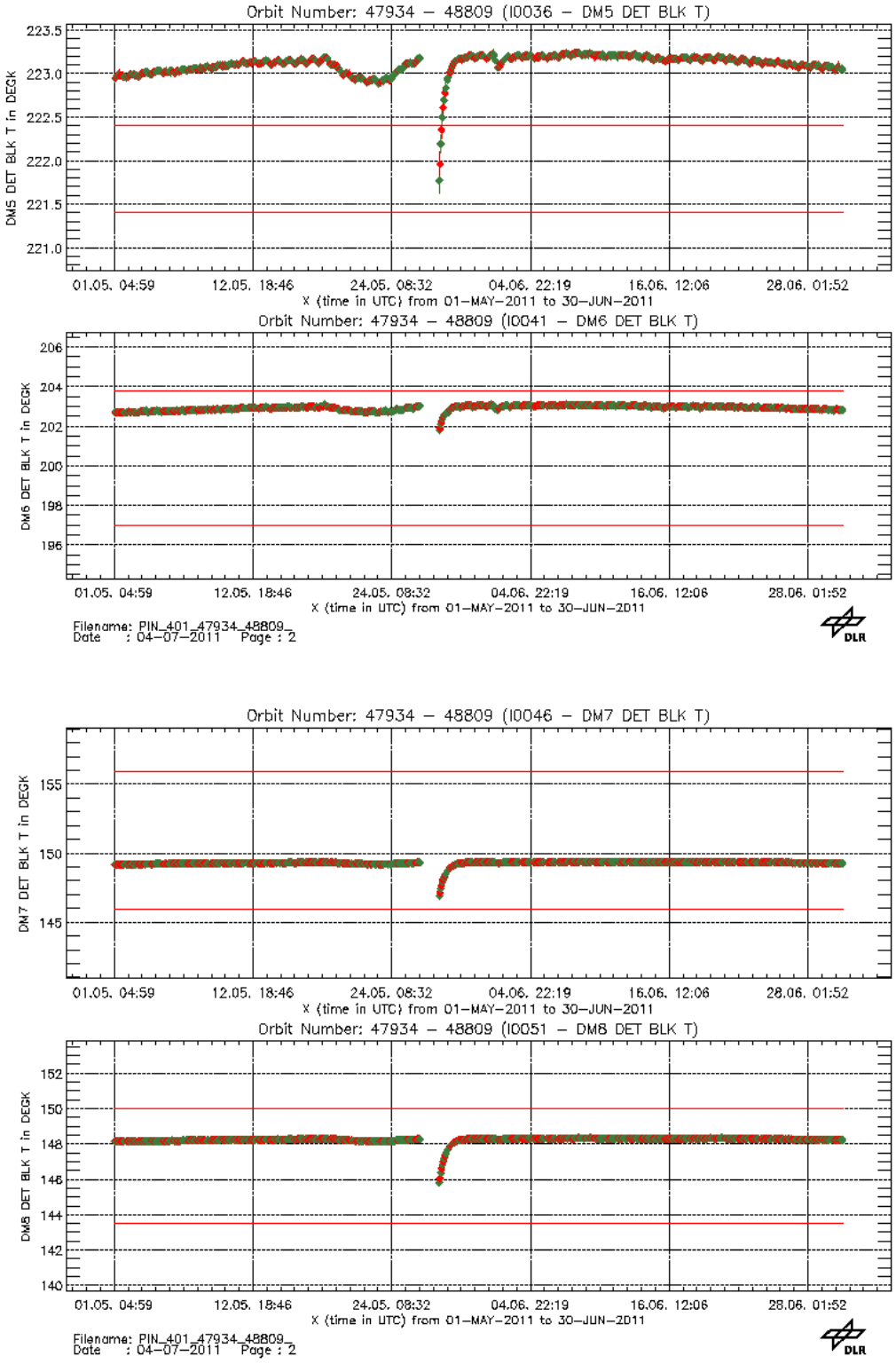


Figure 3.2: Detector temperatures.

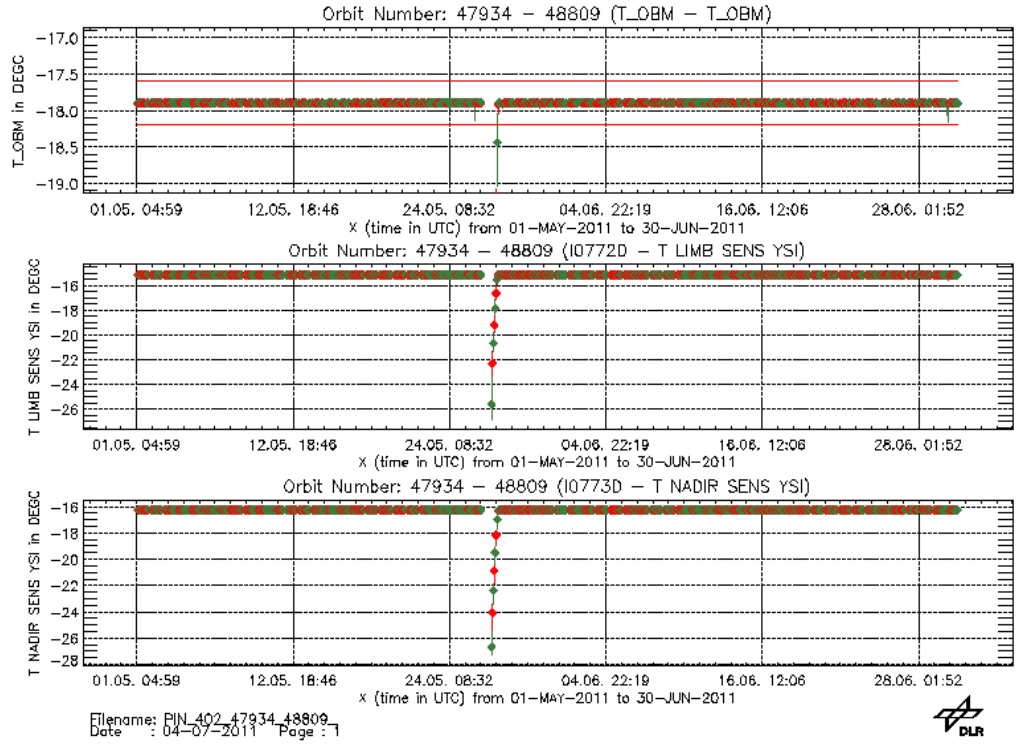


Figure 3.3: OBM temperatures (top: derived OBM, middle: limb sensor, bottom: nadir sensor).

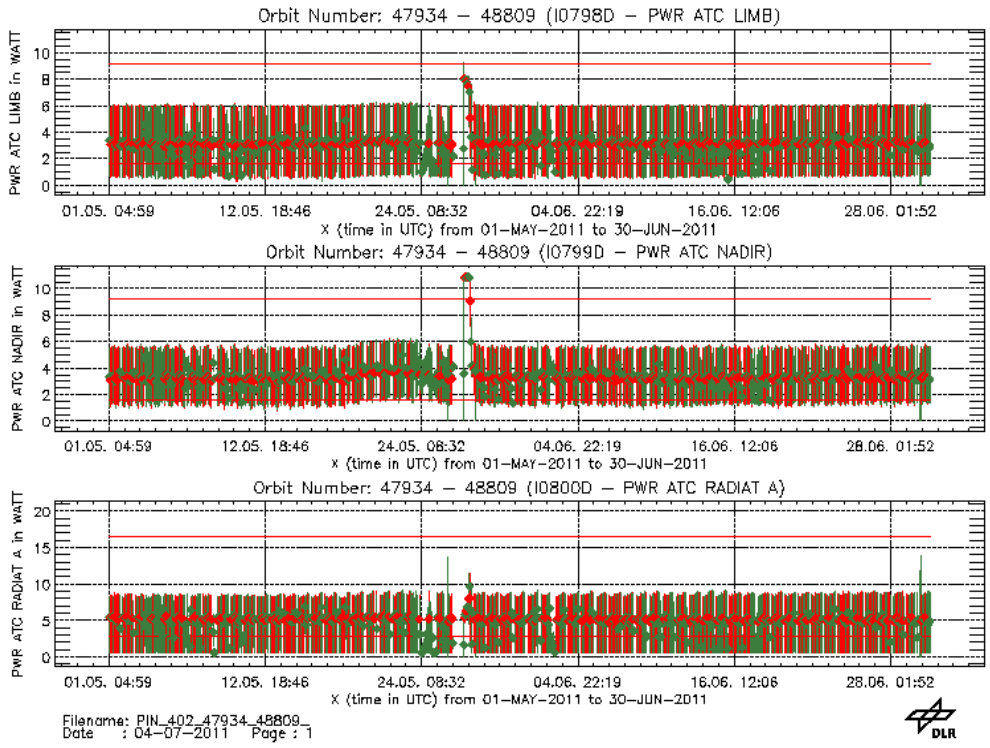


Figure 3.4: ATC heater power (top: ATC limb, middle: ATC nadir, bottom: ATC Rad A).

LLI status

Life Limited Items are monitored based on analysis of the

- OSDF: This yields a predicted LLI usage.
- Report format: This counts the actual LLI switches or used LLI cycles. No WLS/SLS burning times can be derived thereof.

In addition, the in-flight usage of the cryogenic heat pipe is recorded. This subsystem has a limited number of cycles. Each decontamination increases the accumulated number of cycles by 1.

At the end of the reporting period the fractional usage of the LLI relative to the allowed in-flight budget was (based on OSDF prediction)

- NDFM: 0.62
- APSM: 0.57
- NCWM (sub-solar port): 0. 92
- WLS (switches): 0.18
- WLS (burning time): 0.34
- SLS (switches): 0.08
- SLS (burning time): 0.02

For the NDFM and APSM the safety margin factor of 2 is no longer applied in the calculation of the fractional usage since it had been found acceptable to stay below the figures of the life-tests. How the relative LLI usage has accumulated since launch is illustrated in Figure 3.5. 'EOL' assumes a total mission lifetime until end of 2013.

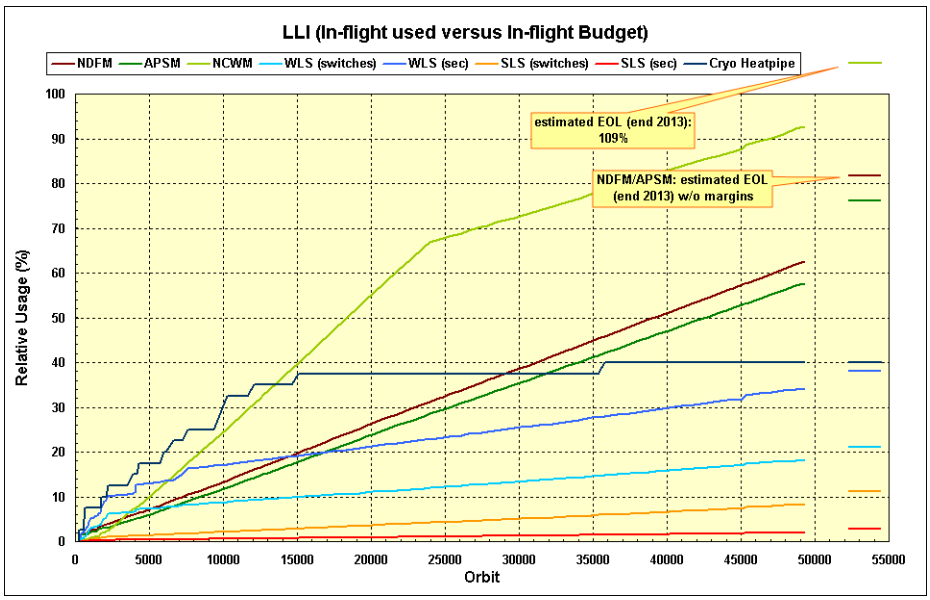


Figure 3.5: Relative usage of LLIs. 'EOL' is derived for a mission lifetime until 2013. For the NDFM and APSM no margin factors have been applied to derive the EOL relative usage.

Note that the NCWM usage exceeding 100% by the end of 2013 has been discussed with the SSAG and SQWG and is currently considered uncritical. Operations of the subsolar port, i.e. execution rates of subsolar states, remain unchanged.

The number of cryogenic heatpipe cycles did not increase (no decontamination). The budget used remained at 40% of the allowed in-flight budget.

Time reference

The times quoted in all planning files refer to the reference orbit. Since the actual orbit differs from the reference orbit (e.g. orbit drift), the times given w.r.t. the reference orbit also do not reflect exactly the actual absolute times of events along the orbit (e.g. ANX, sunrise, sub-solar, moonrise, eclipse). The requirements for orbit maintenance may result in time differences of usually < ±10 sec. In some cases this value may even reach ±1 min, however.

SOST monitors how the reference time deviates from the actual time. This is done by using the predicted time which comes very close to the actual = restituted time. If the predicted times are delayed with respect to the reference orbit, then the difference *predicted – reference time* is > 0 sec; in the other case it is < 0 sec.

Figure 3.6 displays the time difference *predicted – reference*. Orbit manoeuvres cause distinct discontinuities.

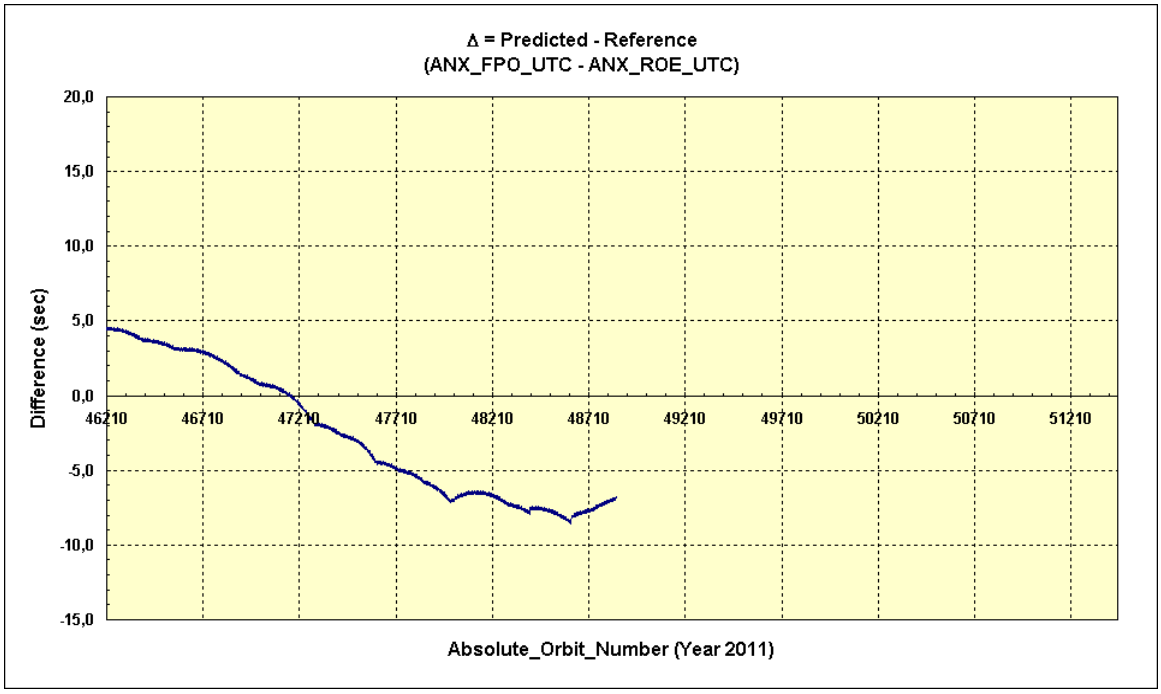


Figure 3.6: Time difference between predicted and reference time.

3.1.5 Performance Monitoring - Light Path (SOST-IFE)

This section summarises the performance monitoring results for the two months time interval covered by this report.
A more detailed description of the performance monitoring activities is given in the SCIAMACHY Bi-Monthly Report May-June 2008.

3.1.5.1 Science Channel Averages

One part of the SOST long-term monitoring activities is the trend analysis of measurements with the internal White Light Source (WLS) and of observations of the unobscured Sun above the atmosphere. In order to monitor the different SCIAMACHY light paths, solar measurements are taken in various viewing geometries: In limb/occultation geometry (via ASM and ESM mirrors), in nadir geometry (via the ESM mirror through the sub solar port), and via the so-called calibration light path involving the ASM mirror and the ESM diffuser. SCIAMACHY long-term monitoring comprises a regular analysis of these measurements. The plots displayed in Figure 3.7 show results of these monitoring activities for the time interval May to June 2011.
Note that the reported channel averages are medians. The currently used scan angle correction is based on Version 6 radiometric key data.

The light path monitoring results presented in this section may be regarded as a first step towards spectrally resolved monitoring factors (m-factors) which is produced based on fully calibrated data.
Daily updated light path monitoring results can be found on the SOST or IUP web site (http://www.iup.uni-bremen.de/sciamachy/LTM/LTM.html).

The following specific features can be identified from the light path monitoring results during the time interval of this report:

- The instrument behaved as expected.
- The throughput of all channels is still slightly increasing (but much slower than in the last reporting period).
- Data gaps on 28-29 May result from an instrument anomaly. Furthermore, due to a temporary non-availability of the DDS receiver in Bremen some Level 0 NRT orbits are missing in June; the coverage is however still sufficient for monitoring.
- The sudden drop in throughput on 2 June is caused by a solar eclipse.
- The throughput in the UV (channels 1 & 2) currently increases by about 0.5% per month.
- The minimum average throughput in channel 1 lies currently still at around 30% (for the limb light path). The throughput of the calibration light path is currently at about 78% in channel 1 and 79% in channel 2, similar to the previous reporting period.

- The overall degradation of channel 3 is still very small (2 – 10%, depending on light path) compared to channels 1 and 2.
- The throughput of channels 3 to 7 remained rather stable (on a sub-percent level) within the two months of this report.
- A slight throughput decrease of about 0.5% is observed in channel 8. The throughput of channel 8 is currently still at about 70%.

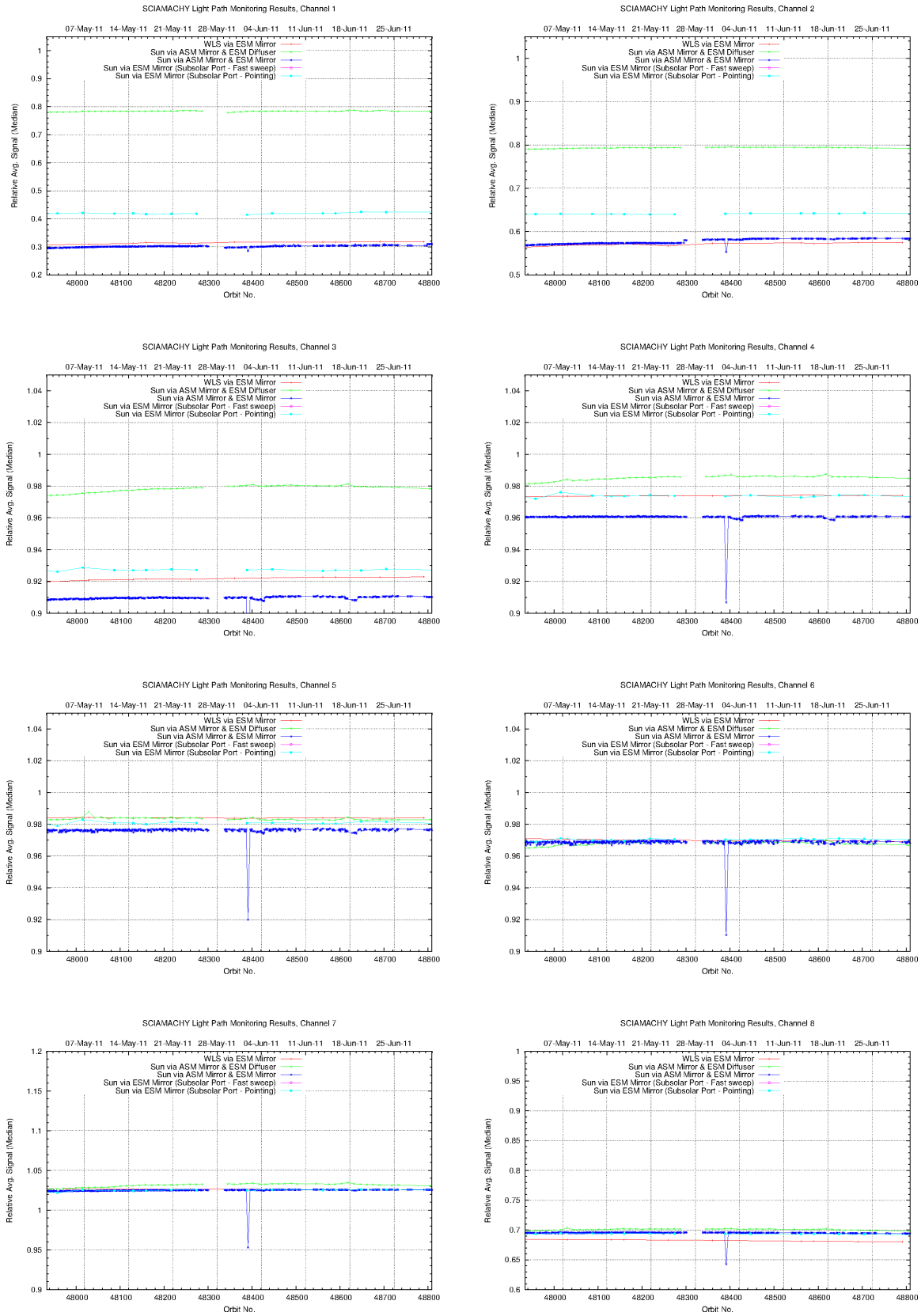


Figure 3.7: Light path monitoring results May to June 2011 (medians).

3.1.5.2 Spectral light path monitoring results

Starting from the Bi-Monthly report January-February 2010, spectral light path monitoring results have been replaced by corresponding m-factor results (based on fully calibrated Level 1 data) shown in Section 4. Nevertheless, the Level 0 based spectral monitoring data are still available via the SOST-IFE web site (see http://www.iup.uni-bremen.de/sciamachy/LTM/LTM_spectral/LTM_spectral.html).

3.1.5.3 PMD monitoring results

The SCIAMACHY PMDs are monitored in a similar way as the science channels, but of course no channel averaging is performed. However, the results presented here are based on the same measurements as the science channel results (but using the PMD low gain signal), and they have been normalized to the same reference times as the spectral results. Figure 3.8 shows the PMD throughput variation for the whole time period between 2 August 2002 and end of June 2011. Note that a constant dark signal for each of the PMDs has been assumed. To verify this assumption, Figure 3.8 also shows the variation of the PMD dark signal over time, which is usually quite low.

Considering the broadband character of the PMDs, the observed PMD throughput changes are (except for PMD 4 and 7) very similar to those of the science channels.

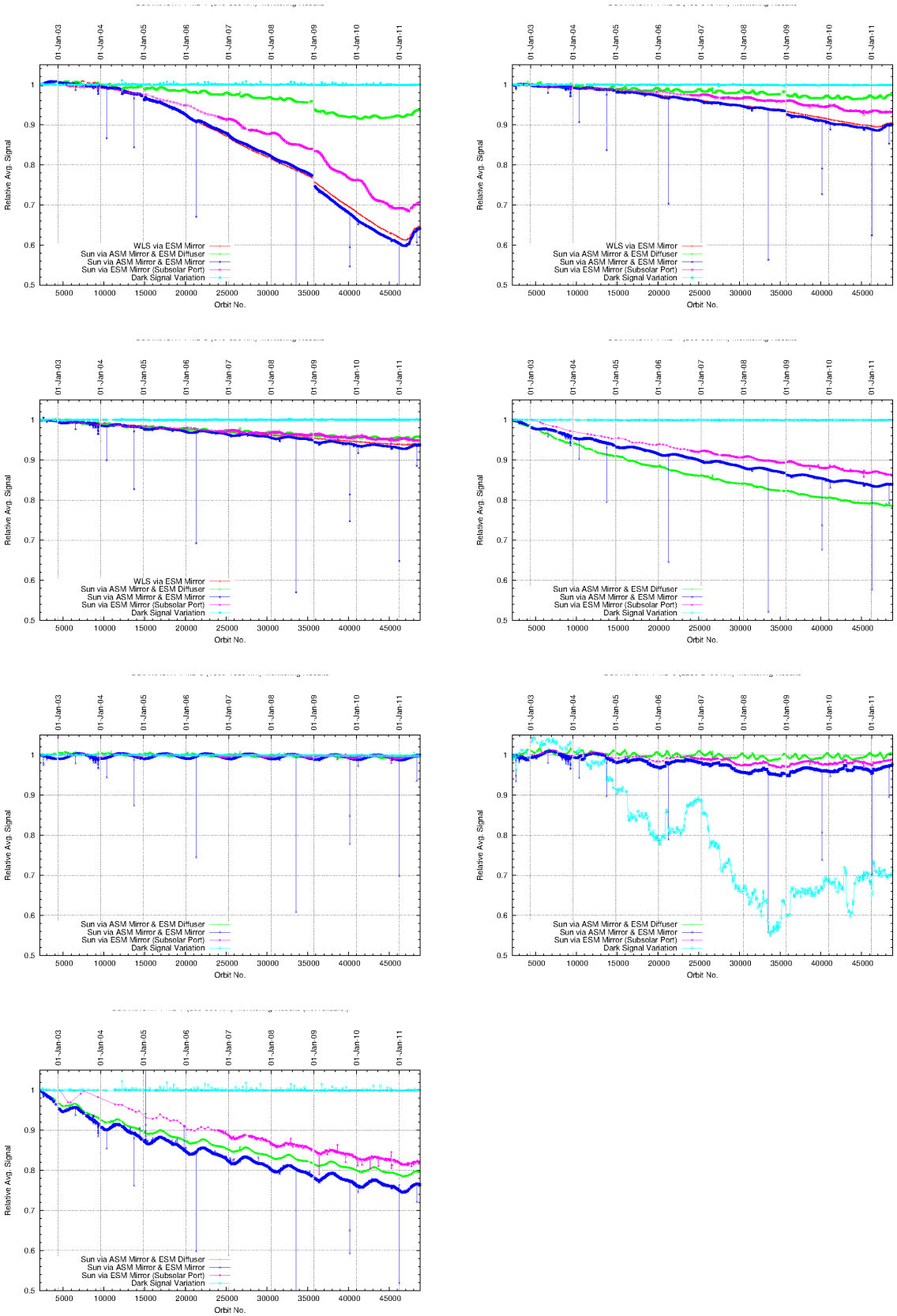


Figure 3.8: PMD monitoring results August 2002 to June 2011.

4 DEGRADATION MONITORING AND CORRECTION

Since Level 2 product version 5.01, a correction for the radiometric degradation of SCIAMACHY is included in the operational processing. This degradation correction is performed by so-called m-factors. An m-factor is defined as the ratio between a measured spectrum of a constant light source (typically the sun) at a certain time to a spectrum obtained for the same optical path at a reference time. M-factors therefore provide an end-to-end degradation correction for each individual light path.
In general, m–factors have an impact on the polarization correction and on the absolute radiometric calibration. The m–factors for the science detectors are multiplicative factors to the absolute radiometric calibration of SCIAMACHY. The m–factors for the PMDs influence in a non-linear way the polarization correction of SCIAMACHY. Currently, only the science channel m-factors are used in operational data processing.
M-factors are regularly calculated by SOST-IFE and provided to ESA.

More details on m-factors and also the m-factors themselves can be found on the IUP Bremen web site under http://www.iup.uni-bremen.de/sciamachy/mfactors.

Figures 4.1 to 4.3 show plots of the science channel degradation (=1/m-factor) observed for each of the SCIAMACHY light paths (nadir, limb, calibration). The current plots cover the time range 2 August 2002 (reference time) to end of June 2011. For each science channel, the plots consist of three main areas: The central part is the contour plot of the degradation. On top of it is the median of the degradation over the detector pixels plotted, showing the overall behaviour of the channel. Right of the main area, the degradation of the last plotted day is shown. The grey bars in the plot are times of instrument unavailabilities (no data at all or the instrument was not in nominal state).
The current status of the degradation can be summarised as follows:

- The increase of throughput observed in the level 0 based monitoring data is also visible in the m-factor medians. The changes are however too small to be seen in the contour plots.
- The throughput is below 40% over almost the whole limb light path in channel 1 (i.e. below about 310 nm). In the nadir light path the throughput is lower than 40% below about 270 nm.
- The minimum throughput around 350 nm in channel 2 is currently about 50%.
- The minimum throughput in channel 3 is currently about 80% (not considering the overlaps).
- The throughput of channels 4 and 5 is rather stable over the whole spectral range (except for the overlaps).
- Channel 6 shows a small throughput decrease at the lower wavelength edge, which is an indication for ice growth.
- The throughput of channels 7 and 8 remains rather stable (except for dead/bad pixels).

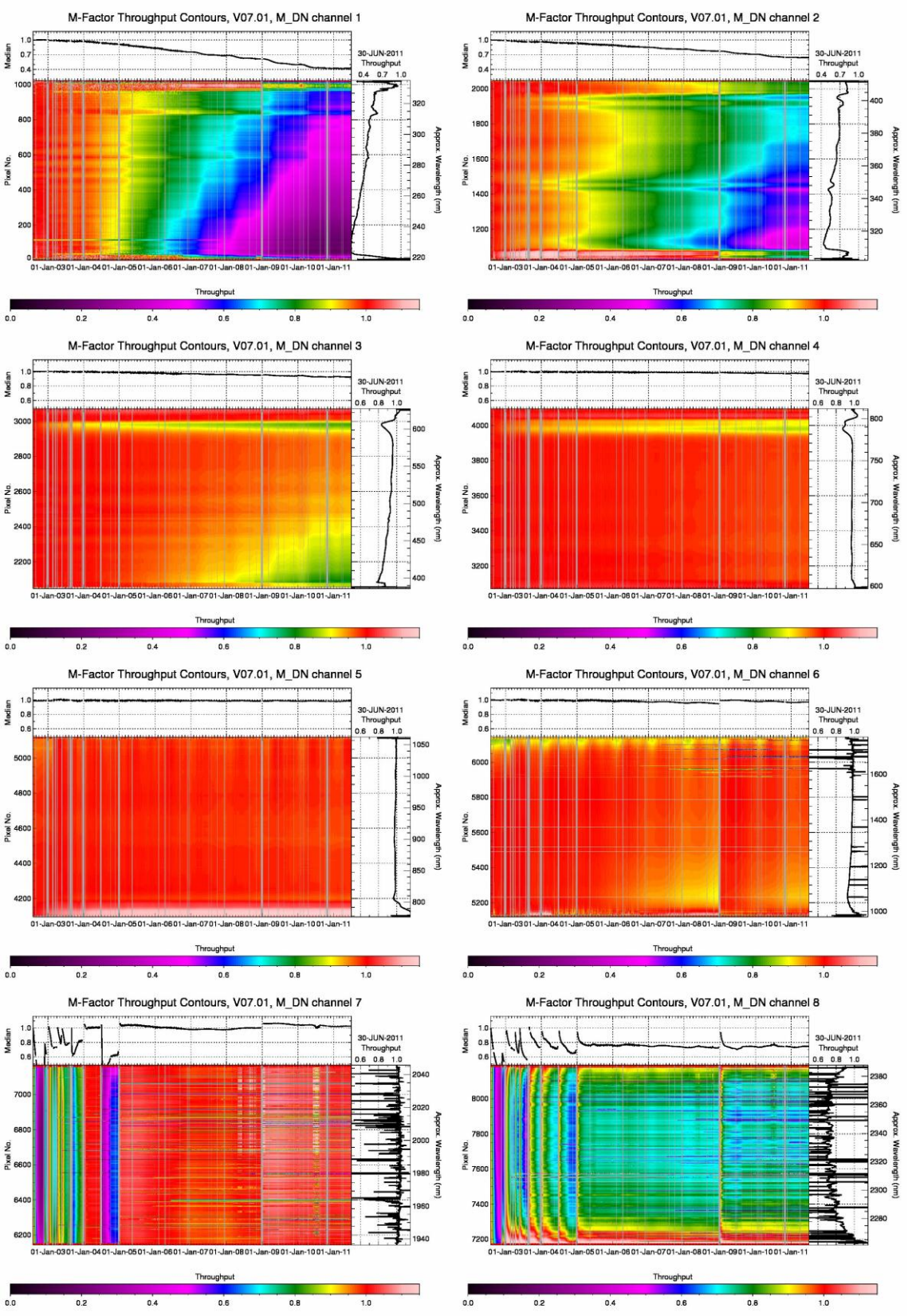


Figure 4.1: Degradation derived from m-factors August 2002 to June 2011 (nadir light path).

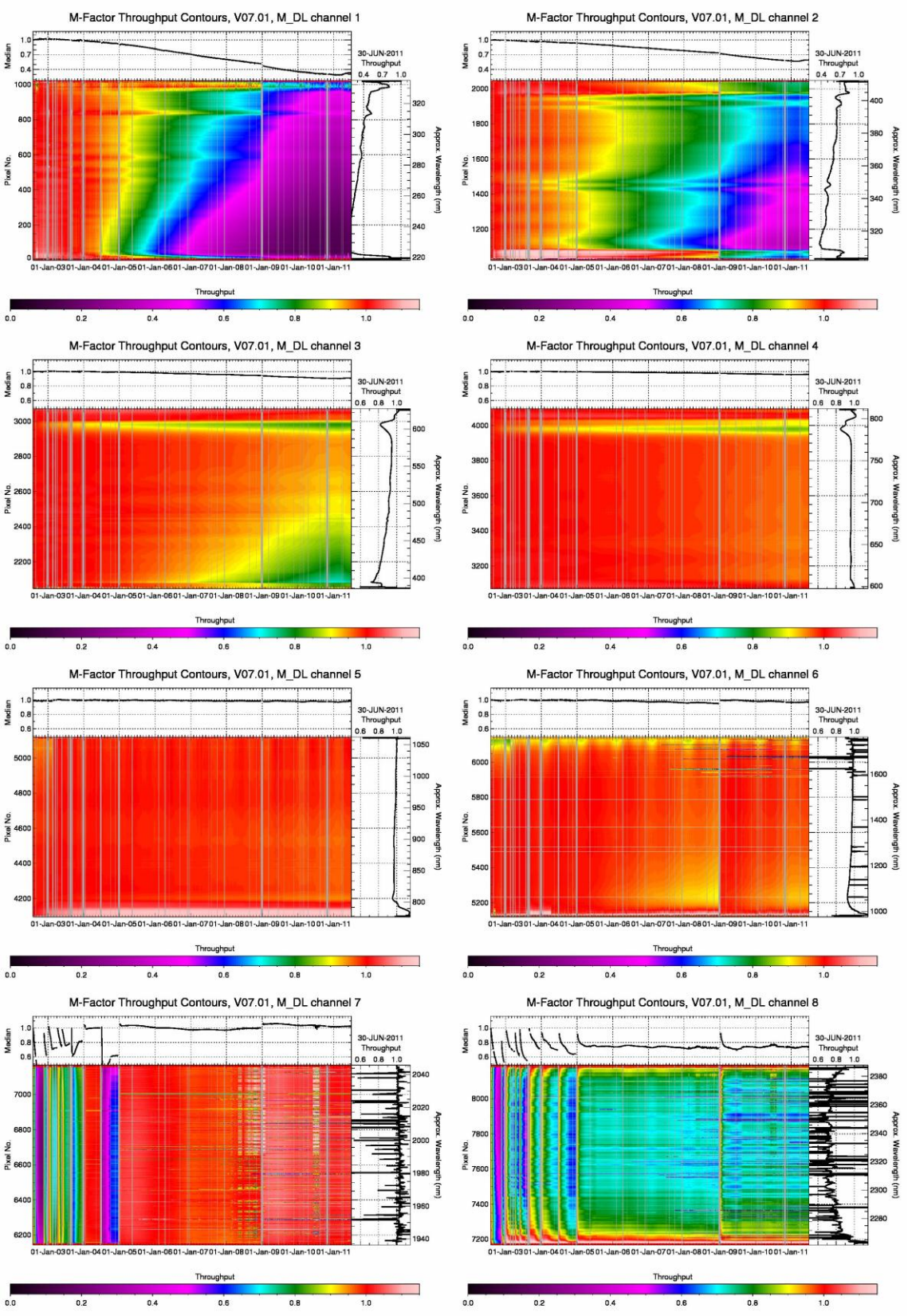


Figure 4.2: Degradation derived from m-factors August 2002 to June 2011 (limb light path).

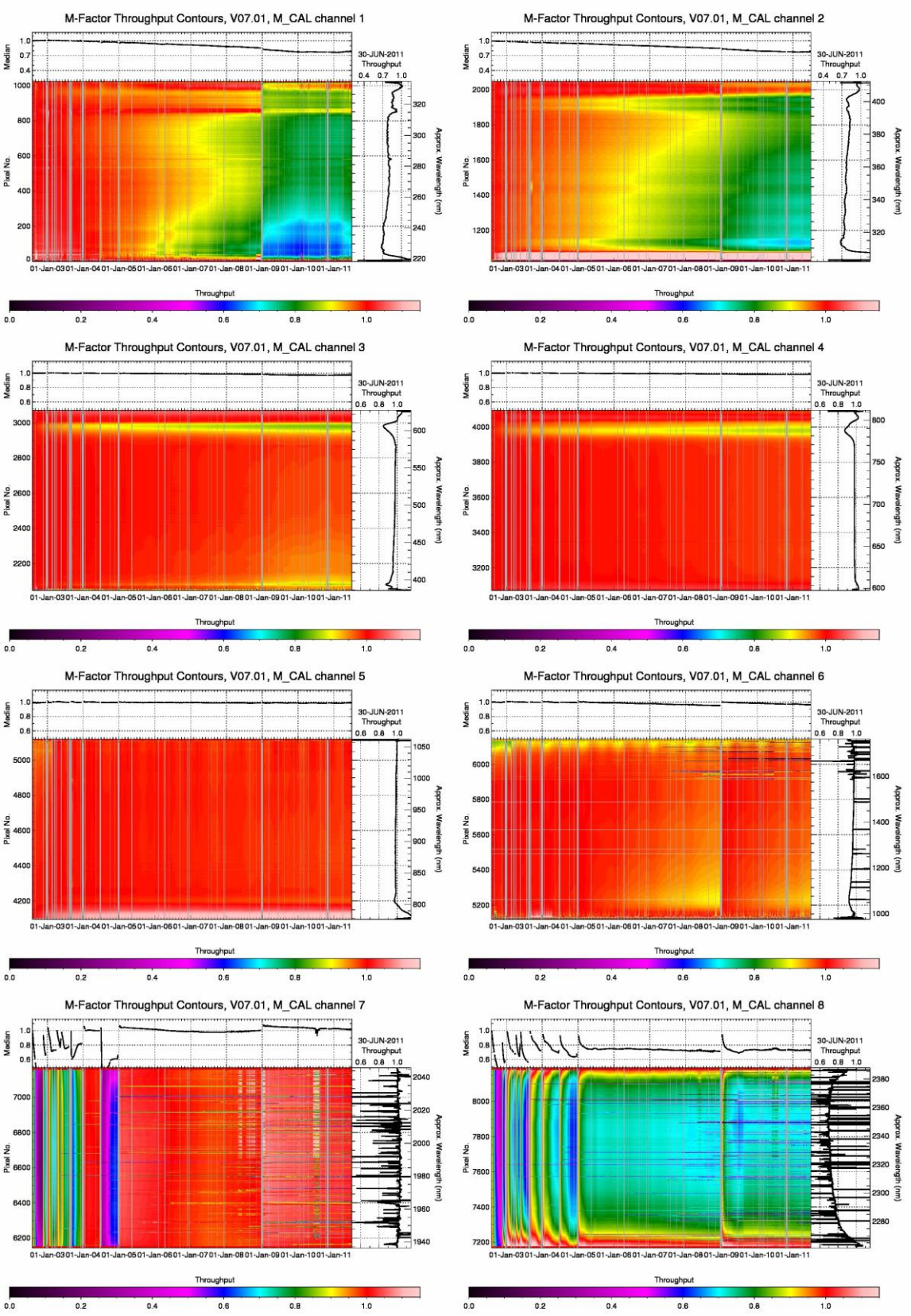


Figure 4.3: Degradation derived from m-factors August 2002 to June 2011 (calibr. light path).

5 DATA AVAILABILITY STATISTICS

5.1 Downlink/Acquisition Performance

For the reporting period, problems are known for the Level 0 products listed in Table 5.1.

Day	Filename	Description
09-05-2011	SCI_NL__0PNPDK20110509_053727_000000003102_00192_48051_4568.N1 SCI_NL__0PNPDK20110509_053727_000000003102_00192_48051_4570.N1 SCI_NL__0PNPDK20110509_053727_000000003102_00192_48051_4571.N1 SCI_NL__0PNPDK20110509_053727_000000193102_00192_48051_4569.N1 SCI_NL__0PNPDK20110509_053213_000003003102_00192_48051_4567.N1	Duplicates with incomplete size
03-06-2011	SCI_NL__0PNPDE20110603_040948_000000473103_00119_48409_6495.N1 SCI_NL__0PNPDE20110603_040948_000000003103_00119_48409_6497.N1 SCI_NL__0PNPDE20110603_040948_000000513103_00119_48409_6500.N1 SCI_NL__0PNPDE20110603_040948_000000003103_00119_48409_6501.N1 SCI_NL__0PNPDE20110603_040948_000000553103_00119_48409_6502.N1 SCI_NL__0PNPDE20110603_040948_000000003103_00119_48409_6503.N1 SCI_NL__0PNPDE20110603_040948_000000003103_00119_48409_6505.N1 SCI_NL__0PNPDE20110603_040948_000000003103_00119_48409_6508.N1 SCI_NL__0PNPDE20110603_040948_000000693103_00119_48409_6509.N1 SCI_NL__0PNPDE20110603_041057_000000003103_00119_48409_6510.N1 SCI_NL__0PNPDE20110603_041057_000000003103_00119_48409_6512.N1 SCI_NL__0PNPDE20110603_041057_000000003103_00119_48409_6513.N1 SCI_NL__0PNPDE20110603_041057_000000003103_00119_48409_6514.N1 SCI_NL__0PNPDE20110603_041057_000000003103_00119_48409_6516.N1	
04-06-2011	SCI_NL__0PNPDK20110604_115653_000000003103_00138_48428_4797.N1 SCI_NL__0PNPDK20110604_115653_000000173103_00138_48428_4796.N1	
	SCI_NL__0PNPDK20110604_111949_000060683103_00138_48428_4800.N1	Duplicate
09-06-2011	SCI_NL__0PNPDK20110609_095707_000000003103_00209_48499_4848.N1 SCI_NL__0PNPDK20110609_095707_000000003103_00209_48499_4849.N1 SCI_NL__0PNPDK20110609_095707_000001913103_00209_48499_4856.N1	Duplicates with incomplete size

Table 5.1: Level 0 products containing format errors or duplicated.

5.2 Statistics on unconsolidated data (SCI_NL__0P, SCI_NL__1P)

This paragraph reports the availability of NRT data on a monthly basis. The statistics in Figure 5.1 are based on Level 0 and Level 1 data inventoried in the ground segment. Unavailability periods due to instrument anomalies or satellite switch-offs are excluded. The gaps considered are only interfile gaps. Statistics of Level 1 NRT data production are calculated with respect to Level 0 product availability.

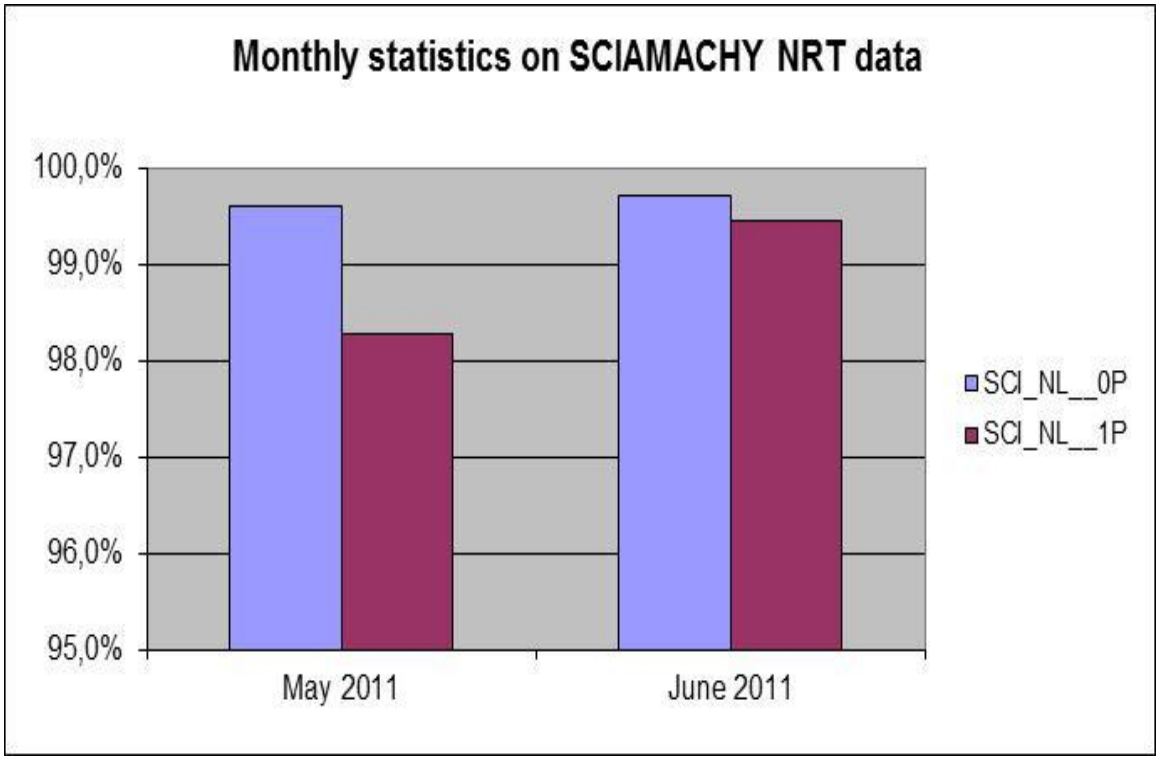


Figure 5.1: Statistics on available unconsolidated Level 0 and Level 1b products.

5.3 Statistics on consolidated data

In this Chapter an overview about operational off-line data (consolidated data) is provided.

5.3.1 Anomalies on Level 0 consolidated data products

In the past it had been reported by SOST-DLR that the SCIAMACHY consolidated Level 0 data contain errors and are not complete. The following specific problems have been identified and are reported in detail in the technical notes *[3]*, *[4]*, *[5]*, *[6]*:

- For one orbit there can be more than one consolidated Level 0 product. These products may be identical or different in content (disregarding the product type file counter).
- Some orbits are not covered by consolidated Level 0 products although SCIAMACHY was operational.
- Some orbits are covered by consolidated Level 0 products but the product duration does not comply with the actually planned and executed instrument operations in that particular orbit.

- Some consolidated Level 0 products exceed the Reed Solomon correction threshold and are flagged accordingly. The occurrence of Reed Solomon errors is non-uniform.
- Until late October/early November 2003 consolidated Level 0 data are hampered by an incorrect orbit number.

More details on consolidated Level 0 anomalies can be found on the SOST web page, which contains a catalogue of available Level 0 consolidated data and description of errors (http://atmos.caf.dlr.de/projects/scops/data_availability/availability.html).

The consolidation activity, reprocessing erroneous Level 0 data, has been completed up to year 2010. The overall goal is to achieve a Level 0 consolidated data 'master set' that allows data reprocessing of improved data quality.

5.3.2 Availability of consolidated SCI_NL__1P products

SCIAMACHY Level 1b consolidated data are generated at D-PAC using the consolidated Level 0 products as input for processing. The available Level 1b off-line products on the D-PAC ftp-server are regularly checked for completeness, an overview for May and June 2011 is summarised here considering flight segment and ground segment anomalies. Note that also interfile gaps are considered, but no data gaps inside the products.

The SCIAMACHY historic Level 1b data set from August 2002 to January 2010, processed with the previous processor version 6 and processing flag "R" (SCI_NL__1PR), initially migrated to a dedicated user account at D-PAC (scia1old on eoa-dp.eo.esa.int), was put off-line on November 2010.

The operational SCIAMACHY Level 1b off-line data production (IPF versions 7.03 and 7.04) with processing flag "U" (SCI_NL__1PU) is nominally accessible as before from the D-PAC FTP server (ftp-ops-dp.eo.esa.int, scia1usr account). The scia1usr account also hosts reprocessed Level 1b products generated with IPF version 7.03 for the full mission (from 02 August 2002 to 22 January 2010 orbit 41287).

Science users are recommended to use the data set processed with the newest processor version 7.

Access details can be obtained from the Earth Observation Helpdesk.

The overall status of the SCIAMACHY consolidated Level 1b data set for the full-mission as resulting from the reprocessing campaign and from the operational processing can be viewed at
http://earth.eo.esa.int/pcs/envisat/sciamachy/full_mission_dataset/statusDPACL1OL.html

Month/Year	Planned orbit range	Number of products unavailable due to anomalies	Number of unique products available at D-PAC	Expected number of products (considering anomalies)	Availability in percentage during month
May 2011	47934-48378	22	423	423	97,77%
June 2011	48379-48809	0	427	431	93.36%

Table 5.2: Statistics on consolidated Level 1b products.

5.3.3 Availability of consolidated SCI_OL__2P products

SCIAMACHY Level 2 consolidated data are generated at D-PAC using the consolidated Level 1b products as input for processing. The Level 2 off-line products stored on the D-PAC ftp-server are regularly checked for completeness; an overview for May and June 2011 is reported in

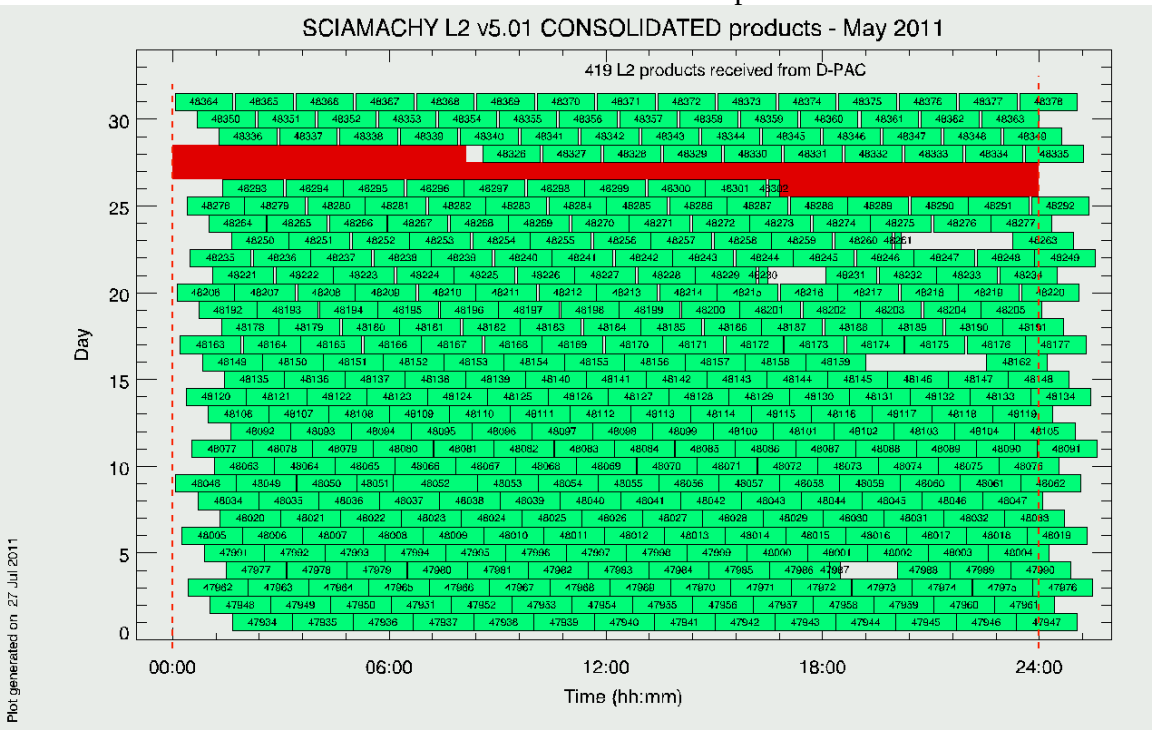


Figure 5.2 and Figure 5.3. For the reporting months, 419 and 424 Level 2 products are available respectively.

Orbits missing in the plots indicate

- Instrument unavailabilities (highlighted in red).

- Level 2 products not generated at D-PAC as a consequence of processing failures or missing inputs (either consolidated Level 0 or Level 1b files). Recovery of the missing products will be performed when possible.

- Orbits sensed during monthly calibrations for which Nadir or Limb measurements were not planned. For the reporting months orbits 48160, 48161 (16/05) and 48591, 48592 (15/06) were not processed up to Level 2 products.

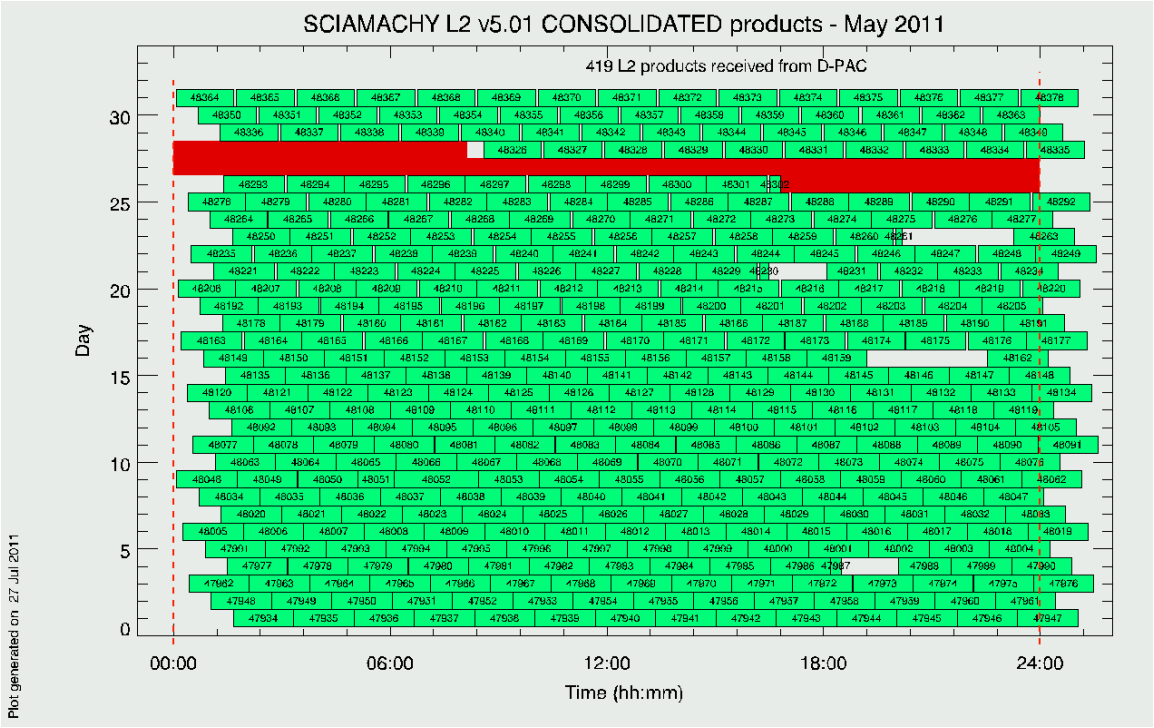


Figure 5.2: SCIAMACHY Level 2 off-line data production at D-PAC for May 2011.

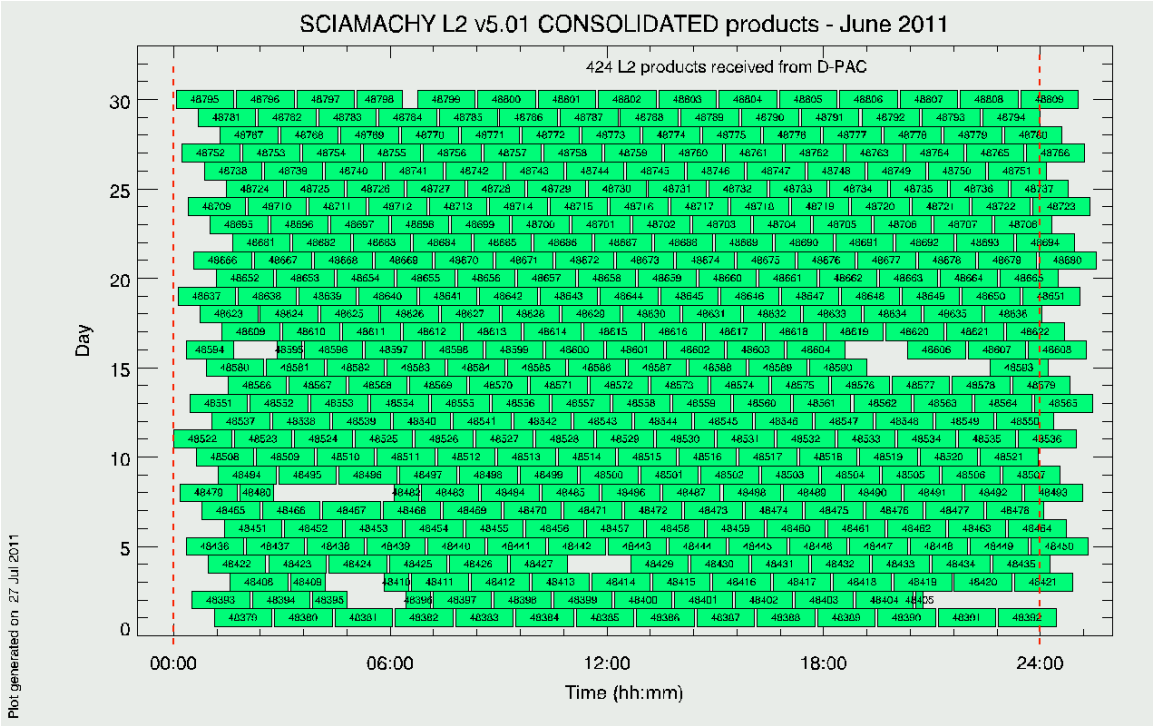


Figure 5.3: SCIAMACHY Level 2 off-line data production at D-PAC for June 2011.

5.4 Statistics on reprocessed data

5.4.1 Level 1b re-processing

The full-mission reprocessing of the SCIAMACHY Level 1 data set with processor version 7.03 covering the time range from 02 August 2002 (orbit 2203) to the activation of the off-line forward processing (22 January 2010, orbit 41287) was completed in 2010. The re-processed IPF 7.03 Level 1b data set with processing flag U is available on the operational D-PAC FTP server (scia1usr account on ftp-ops-dp.eo.esa.int). Access details can be obtained contacting the Earth Observation Helpdesk.

SCIAMACHY consolidated Level 1 products generated with IPF version 7.03 during the last full-mission reprocessing campaign were found affected by incorrect calibrations impacting the data quality. Following instrument decontamination periods between 2002 and 2009 the dead and bad pixel mask was not properly updated. Further, the solar calibration presents wrong mirror position of the ASM for year 2002 and missing updates of the D0 SMR along the entire mission. Part of the affected products was removed from the D-PAC FTP server. Removal will be completed and a new reprocessing campaign with IPF 7.04 adopting correct auxiliary files will be performed in the coming months. The operational forward Level 1b data production from orbit 43347 (Jan. 2010) is not affected.

The overall status of the SCIAMACHY consolidated Level 1b data set for the full-mission hosted at D-PAC as resulting from the reprocessing campaign and from the operational processing can be accessed at:

http://earth.eo.esa.int/pcs/envisat/sciamachy/full_mission_dataset/statusDPACL1OL.html

Currently, 582 Level 1b consolidated products for years 2002-2010 result to be missing at D-PAC for unavailable or corrupted Level 0 inputs. The following table summarizes for every year of the mission the number of orbits planned, orbits lost for instrument unavailability, and the number of Level 1b products missing for processing failures or incorrect transfer of input files.

	Orbits			
Year	**Planned**	**SCIAMACHY off**	**Ground Segment Unavailability**	**Missing**
2002	2176	229	N/A	131
2003	5224	447	N/A	64
2004	5238	144	N/A	99
2005	5226	65	N/A	132
2006	5225	377	N/A	53
2007	5224	181	N/A	50
2008	5240	77	N/A	20
2009	5224	165	13	26
2010	5229	239	11	8
Total	**44006**	**1924**	**24**	**583**

Table 5.3: Statistics on consolidated Level 1b products for the full-mission.

5.4.2 Level 2 re-processing

The full-mission reprocessing of SCIAMACHY consolidated Level 2 data with the new processor version 5.01 was commenced at D-PAC end July 2010. Level 2 version 5.01 data have been processed sequentially and made available progressively on the usual FTP account at DPAC (sciaol2usr on the ftp-ops-dp.eo.esa.int server). The reprocessing activity involves SCIAMACHY data products for the time range from 02 August 2002 (orbit 2203) to 22 January 2010 (orbit 41287). At the beginning of September 2010, the SCIAMACHY Level 2 reprocessing was discontinued on the basis of results from the preliminary validation activities. While most of the new and updated geophysical parameters show very good to acceptable quality, Carbon Monoxide (CO) did fail the validation: the CO column densities contained in SCIAMACHY Level 2 version 5.01 products are of unreliable quality. Users shall not use the CO information in its current implementation.

The Level 2 reprocessed data set version 5.01 (SCI_OL__2PU) is available for the time range from August 2002 to August 2004.

Operational SCIAMACHY Level 2 data products (version 5.01) from the off-line forward processing are nominally accessible as before starting from sensing orbit 41287.

Please note that a new Level 2 processor fixing the shortcomings identified in the Level 2 processing is being currently tested and will be soon activated for the

operational Level 2 forwards processing. A new Level 2 reprocessing for the full-mission will be scheduled afterwards.

All the Level 2 files with processing stage flag R (SCI_OL__2PR from August 2002 to January 2010) generated with the previous processor version 3.01 were migrated to the account sciaol2old of the D-PAC FTP server (ftp-ops-dp.eo.esa.int). This data set will remain available to the users up to completion of the new full-mission reprocessing.

Access details can be obtained contacting the Earth Observation Helpdesk.

6 LEVEL 1 PRODUCT QUALITY MONITORING

6.1 Processor Configuration

6.1.1 Version

The IPF currently in use at Kiruna and ESRIN PDHS for the operational processing of near-real-time SCIAMACHY Level 1b data is version 7.04 since 15 June 2010. The same IPF is adopted at D-PAC for the forward processing of Level 1b off-line data and was activated since acquisition data from 17 June 2010, orbit 43375.

IPF 7.04 was developed in the frame of the ENVISAT 2010+ mission extension project which implemented the lowering of the satellite's orbit to extend the mission until end 2013. SCIAMACHY orbit change manoeuvres were successfully executed in October 2010. Details can be found on the ESA news available at

http://earth.esa.int/object/index.cfm?fobjectid=6999
http://earth.esa.int/object/index.cfm?fobjectid=7024
http://earth.esa.int/object/index.cfm?fobjectid=7223

IPF 7.04 did not introduce evolution aspects in the algorithm compared to prior IPF 7.03, but just updated the CFI library to version 5.8.1 (http://eop-cfi.esa.int/CFI/Registration.html). No format change has been introduced in the new Level 1b product version 7.04.

Starting from the operational Level 1b data version 7.03, a new type of limb state is available; Mesospheric Limb Measurements (state ID 55) are performed scanning altitudes between 60 and 150 km. The measurements are performed instead of "normal" limb states for 30 orbits every month split on two separate days. The operational Level 2 processor does not process these scientific Mesospheric Limb Measurements.

The radiometric degradation of SCIAMACHY can be compensated using m-factors, calculated from the new NRT Level 1b data. M-factors are not part of the Level 1b product and are not used at present in the Level 0-1b processing itself. They are applied in the Level 2 data processing. The m–factors are provided by an external database accessible at http://www.iup.uni-bremen.de/sciamachy/mfactors/.

The corresponding Product Specification is Volume 15 issue 3L version 1.1 *[2]*. This document is available at
http://earth.eo.esa.int/pub/ESA_DOC/ENVISAT/Vol15_Sciamachy_3L_1.1.pdf

The Product Quality Disclaimer at

http://envisat.esa.int/dataproducts/availability/disclaimers/SCI_NL__1P_Disclaimers.pdf is updated corresponding to the IPF version 7.03 and describes known artefacts as well as major improvements with respect to the previous IPF versions.

Table 6.1 gives a brief overview of changes implemented in the SCIAMACHY Level 0 to Level 1b processing baseline compared to prior processor versions.

IPF Version	Description	Proc Centre	Date	Start Orbit
7.04	In view of the ENVISAT 2010+ mission extension requiring the lowering of the satellite's orbit, the new IPF 7.04 was developed without introducing changes in the algorithm but updating the CFI library to version 5.8.1.	D-PAC	17-JUN-2010	43375
		PDHS-E	15-JUN-2010	43355
		PDHS-K	15-JUN-2010	43347
7.03	Following changes are implemented with IPF 7.03: • Degradation correction using m-factors implemented in SciaL1c. • Improved spectral stray light correction using a matrix approach in channel 2. • Mesospheric Limb Measurements included in the Limb MDS. • Correction of the Scanner encoding values.	D-PAC	22-JAN-2010	41287
		PDHS-E	04-FEB-2010	41479
		PDHS-K	04-FEB-2010	41472
6.05	No evolution in the algorithm has been introduced with IPF 6.05 but the processor was ported from AIX to LINUX operating system.	D-PAC	05-OCT-2009	39634
		PDHS-E	29-SEP-2009	39633
		PDHS-K	29-SEP-2009	39639
6.03	The following changes are implemented with IPF 6.03 • New pointing correction (new SCI_LI1_AX) • Updated of the ESA CFI (5.6) software • Correction of a non compliancy report, impacting the Leakage GADS in the consolidated data processing chain (channels 6-8)	D-PAC	04-JUL-2007	27937
		PDHS-E	19-JUL-2007	28153
		PDHS-K	19-JUL-2007	28145

Table 6.1: Processor version and main changes.

6.1.2 Anomalies

SCIAMACHY consolidated Level 1 products generated with IPF version 7.03 during the last full-mission reprocessing campaign were found affected by incorrect calibrations impacting the data quality.

Following instrument decontamination periods between 2002 and 2009 the dead and bad pixel mask was not properly updated. Further, the solar calibration presents wrong mirror position of the ASM for year 2002 and missing updates of the D0 SMR along the entire mission.

Part of the affected products was removed from the D-PAC FTP server. Removal will be completed and a new reprocessing campaign with IPF 7.04 adopting correct auxiliary files will be performed in the coming months. The operational forward Level 1b data production from orbit 43347 (Jan. 2010) is not affected.

6.2 Auxiliary Data Files

For operation of the SCIAMACHY Level 1 processor, a set of auxiliary files as input is required. One subset of these auxiliary files usually changes only in correspondence with a new IPF version, namely the Initialisation file (SCI_LI1_AX) and the Key Data file (SCI_KD1_AX).

Table 6.2 lists the actual Key Data File and Initialisation File used with IPF 7.03.

Table 6.2: Key Data and Initialisation configuration

SCI_KD1_AXNIEC20091126_123849_20020301_000000_20991231_235959
SCI_LI1_AXNIEC20091126_125714_20020701_000000_20991231_235959

Another subset of auxiliary files is the in-flight calibration data files, which are generated when calibration measurements are included in the set of Level 0 data to be processed.

Four types of in-flight calibration auxiliary files exist:

- Leakage Current Calibration (SCI_LK1_AX - updated on orbital basis)
- Solar Reference Spectrum (SCI_SU1_AX - updated on daily basis)
- Spectral Calibration Parameters (SCI_SP1_AX - updated on a weekly basis)
- Pixel-to-Pixel Gain and Etalon Parameters (SCI_PE1_AX - updated on orbital basis).

Figure 6.1 shows statistics of the SU1, LK1, PE1 and SP1 auxiliary data files (ADFs) generated operationally with SciCal 2.2 for May and June 2011. Statistics are based on the SciCal ADFs production/distribution to PDGS and are calculated with respect to the number of auxiliary files expected. It has to be noted that unavailability periods are

excluded from statistics as well as duplicated products identified on the basis of the start/stop validity time in the filename.

LK1 statistics are calculated dividing the number of LK1 auxiliary files (generated on orbital basis) by the number of available (to SciCal) Level 0 products. These statistics do not exclude dark measurements that cannot be used for ADF generation due to SAA and orbit phase constraints leading to an over-estimation of missing files. SU1, SP1 and PE1 statistics are calculated with respect to the number of ADFs expected for the reporting months.

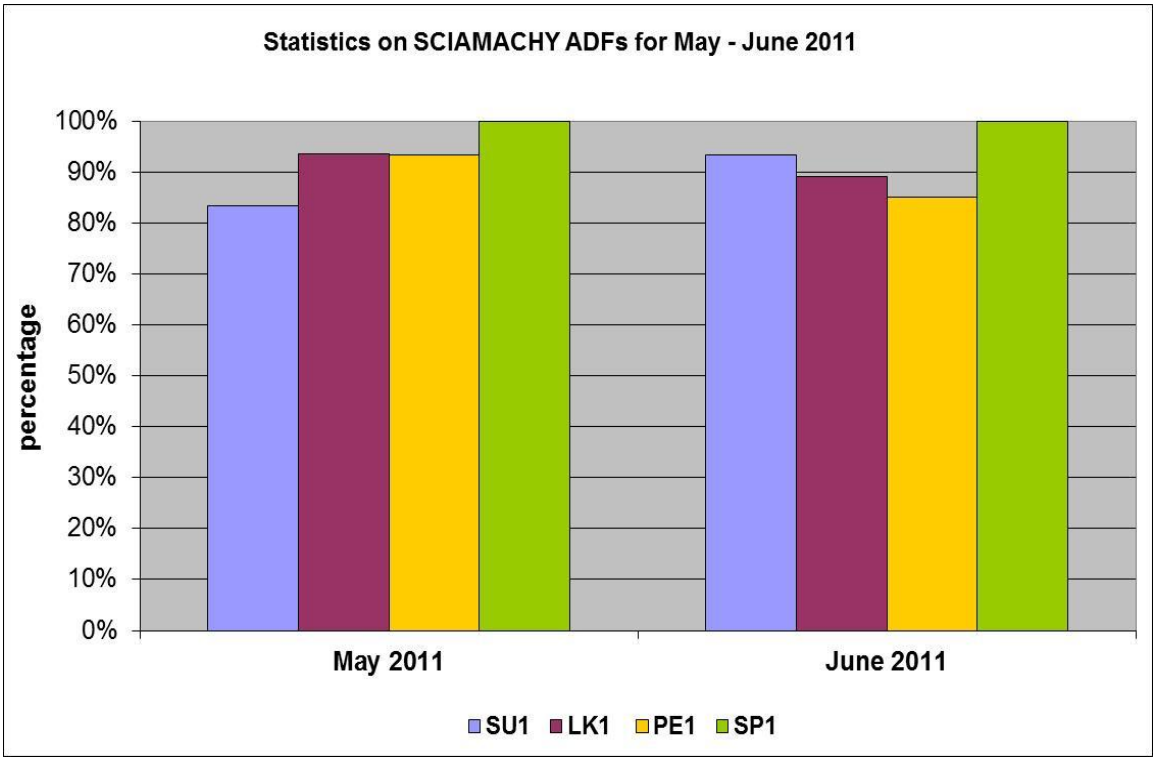


Figure 6.1: Statistics on SU1, LK1, PE1 and SP1 productions.

6.2.1 Auxiliary Data File quality analysis

6.2.1.1 SMR analysis

SciCal generates daily SU1 Auxiliary Files. Solar spectra obtained from ESM and ASM calibration measurements are provided in two ways:

- fully calibrated
- not radiometrically calibrated.

The different types of spectra can be recognized by the so called identifier in the solar reference global annotation data set record.

Note the following recommendation:

- Use a not radiometrically calibrated ASM diffuser spectrum (A0) for DOAS type applications.
- All retrieval methods requiring absolute calibrated radiance and irradiance are obliged to use the calibrated ESM diffuser spectrum (D0) (see also disclaimer).

From Figure 6.2 to Figure 6.5, plots show the ratios of SMR spectra derived from calibrated SMR/ESM (D0) during the months May - June 2011. The ratios were determined by dividing the spectra of a set of days during each month to a spectrum at the beginning of each month. Ratios are not corrected for variation of distance Earth/Sun.
In detail the spectra used for the ratios of each month are the following:

- **May 2011**
  Reference SMR - 01 May 2011
  SMR used for ratios: 02, 05, 06, 07, 08, 09, 10, 11, 12, 14, 22, 31 May 2011.
- **June 2011**
  Reference SMR - 01 June 2011
  SMR used for ratios: 02, 03, 04, 05, 06, 07, 08, 09, 10, 14, 21, 30 June 2011.

The overall changes lie usually at about 1-2 % during one month for all channels, which is at least partially caused by the decreasing distance between Sun and Earth.
In channel 1, around pixel 550 (at 282 nm), some strong features can be noticed, as well as in channel 2 near pixel 840 (near 393 nm). These strong features coincide with the Mg II and Ca Fraunhofer lines respectively. These lines are partially formed in the solar Chromosphere and are known to change with solar variability.
The weaker spectral features in channel 2 (e.g. near pixels 550, 650,750), on the other hand, correlate with strong Fraunhofer lines, which are not chromospheric. These features probably arise from small wavelength shifts (order of 1/100 of a pixel).
Generally a spectral feature could have significant impact on the product quality, especially when the affected spectral parts are used for DOAS retrieval.

The large features in the end of channel 6 (channel 6+) and channels 7 and 8 are due to bad pixels. Note that the bad pixel mask used is still from the on-ground calibration.
A regular update of the bad pixel mask is implemented starting with IPF 6.02. However a bad pixel correction will not be applied to the SMR spectra, but only to PMD out-of-band factors, in order to enable the user to apply a different mask from the one provided by the ADF.

Figure 6.6 and Figure 6.7 show SMR ratios as long term trends; plots are obtained dividing the ESM spectra from day 31 May 2011 and 30 June 2011, respectively with spectra from 31 May 2003 and 29 June 2003.
The first spectrum available exists for 18 July 2002. However to consider Sun/Earth distance, the ratio was performed with spectra from same calendar days. All SCI_SU1_AX files used were generated with SciCal version 2.2.

What can be concluded is that for channels 1 and 2 an average degradation in 6 years of about 10-15% is observed, channels 3 degrades by about 2% and channels 4-5 degrade by less than 1%, channel 6 by about 4-5%. The signal in channel 7 has increased with

respect to the SMR of year 2003. This is due to the impact of the icing of the IR detectors. This is consistent with the Light Path monitoring at SOST-IFE and available at http://www.iup.uni-bremen.de/sciamachy/LTM/LTM_spectral/LTM_spectral.html.

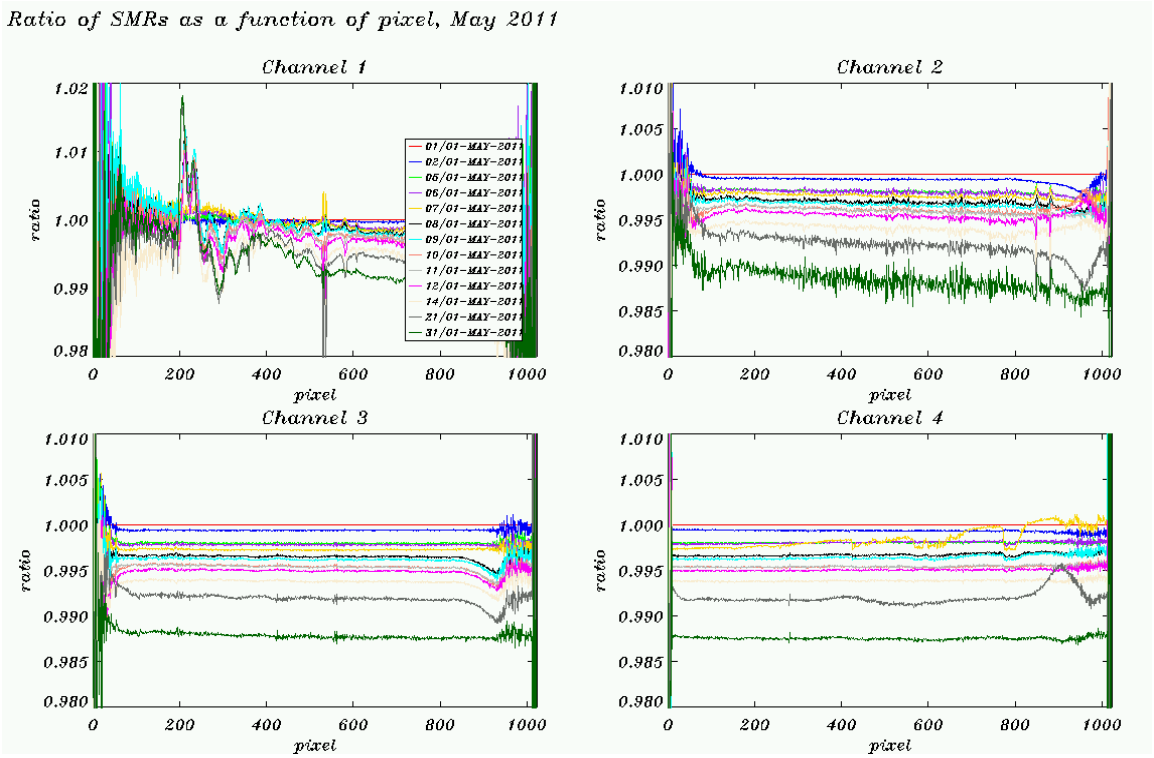


Figure 6.2: SMR ratios per detector channel 1-4 (changes during May 2011).

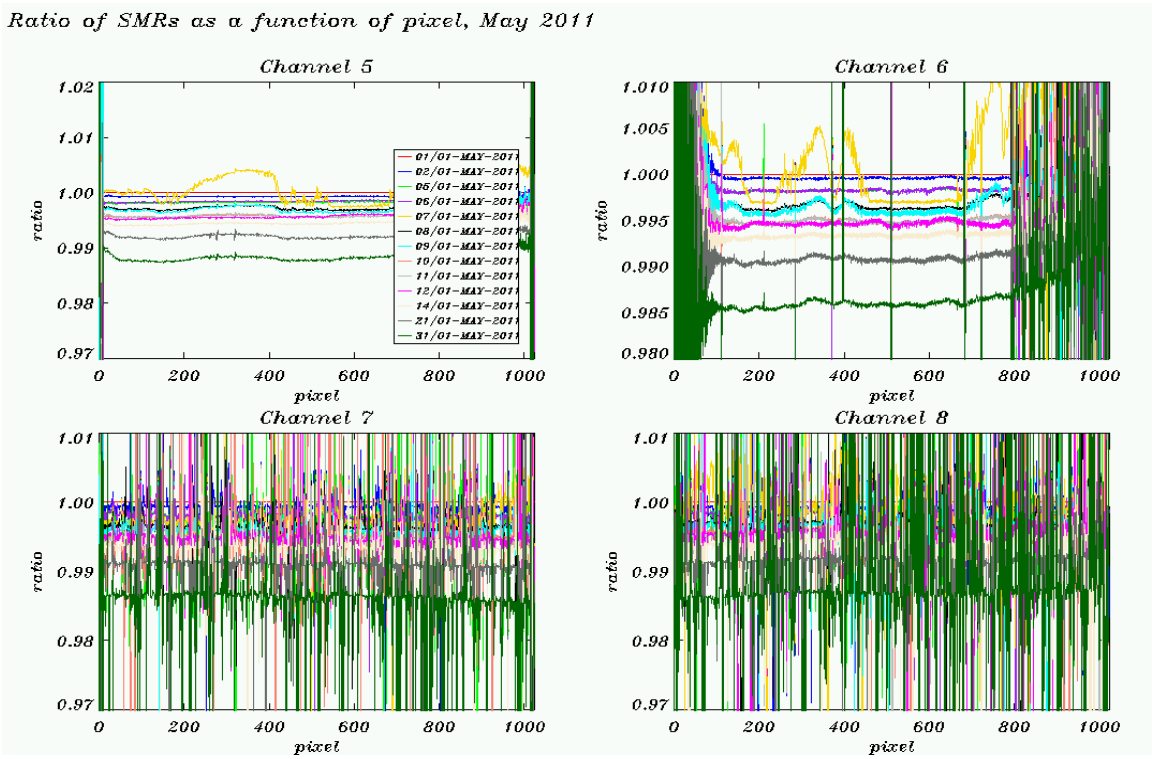


Figure 6.3: SMR ratios per detector channel 5-8 (changes during May 2011).

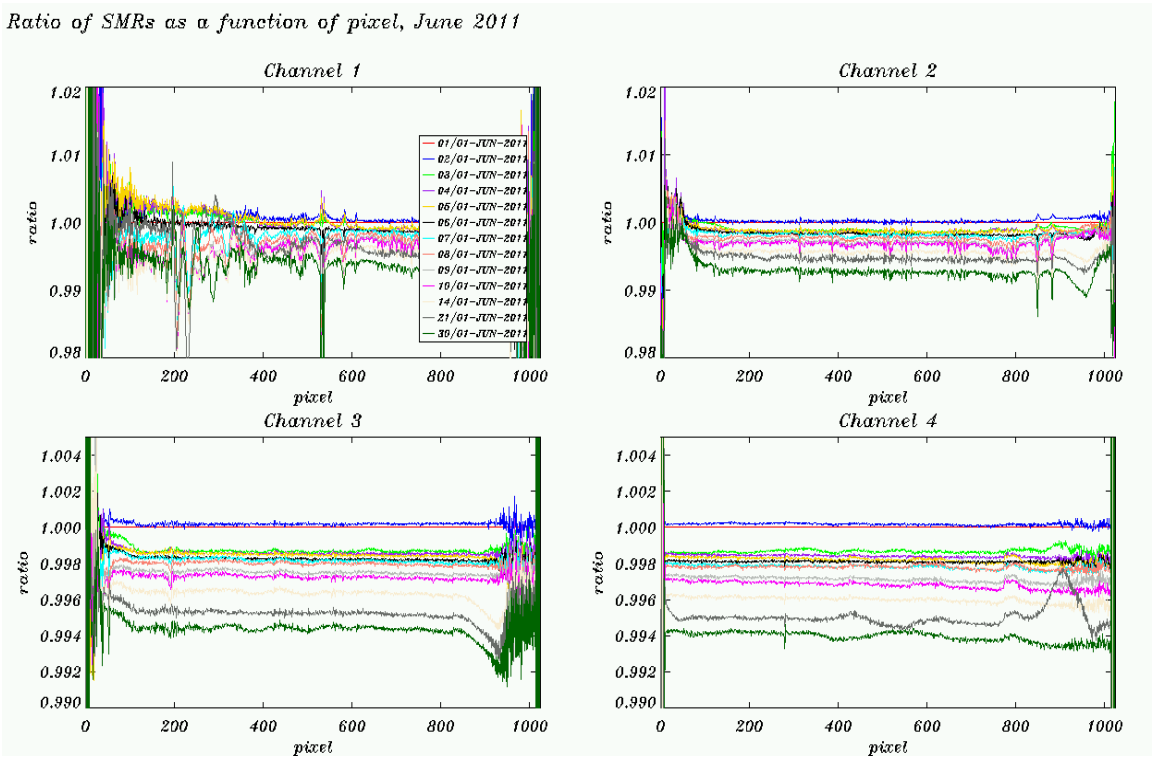


Figure 6.4: SMR ratios per detector channel 1-4 (changes during June 2011).

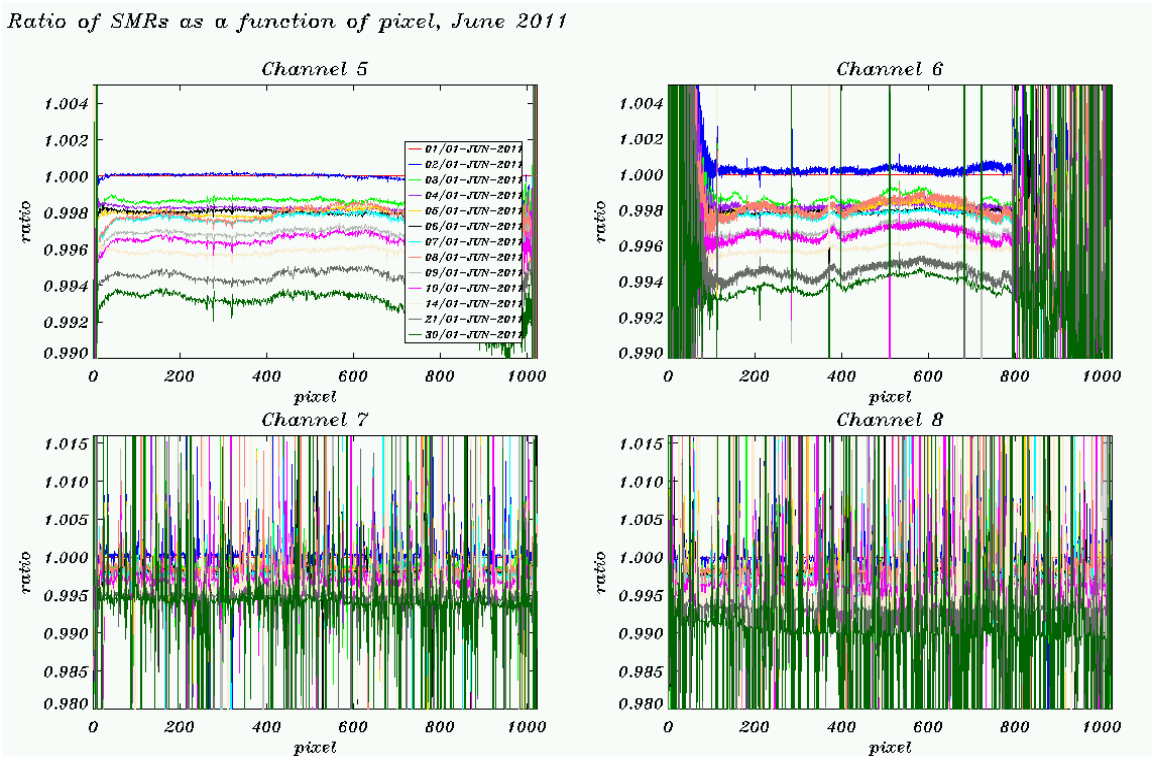


Figure 6.5: SMR ratios per detector channel 5-8 (changes during June 2011).

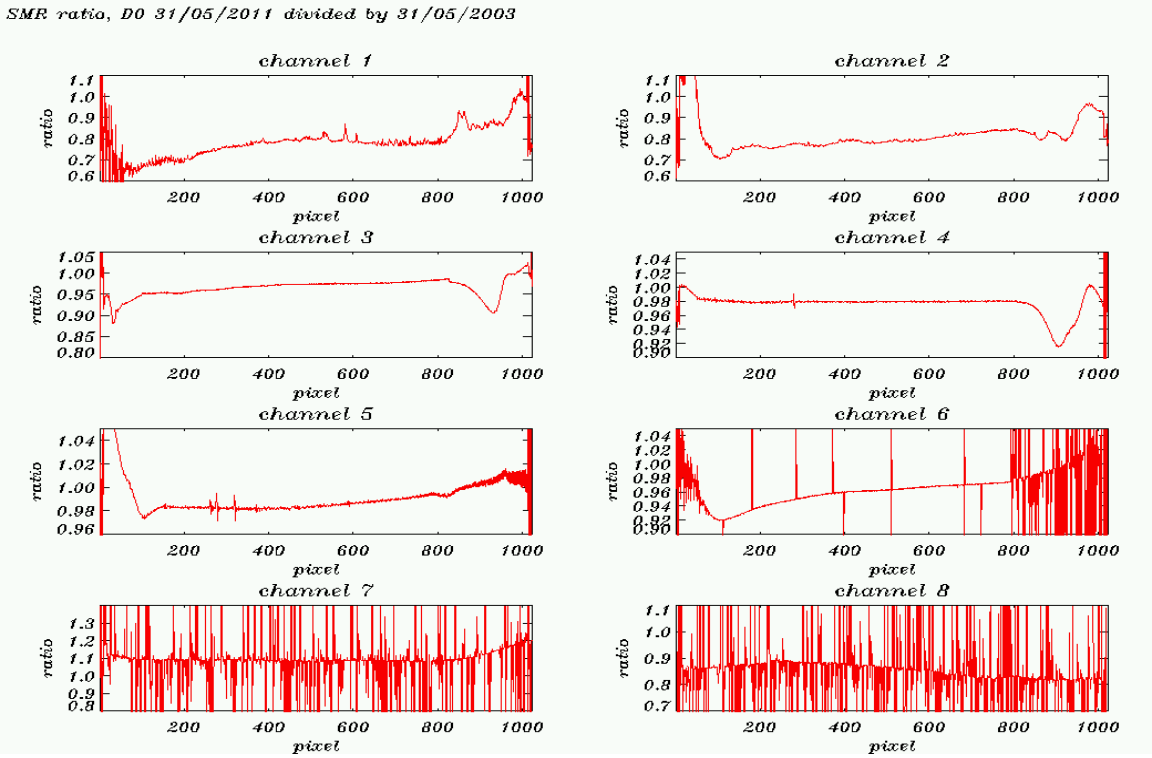


Figure 6.6: SMR ratios per detector channel on Long Term Trend 31/05/2011 divided by 31/05/2003.

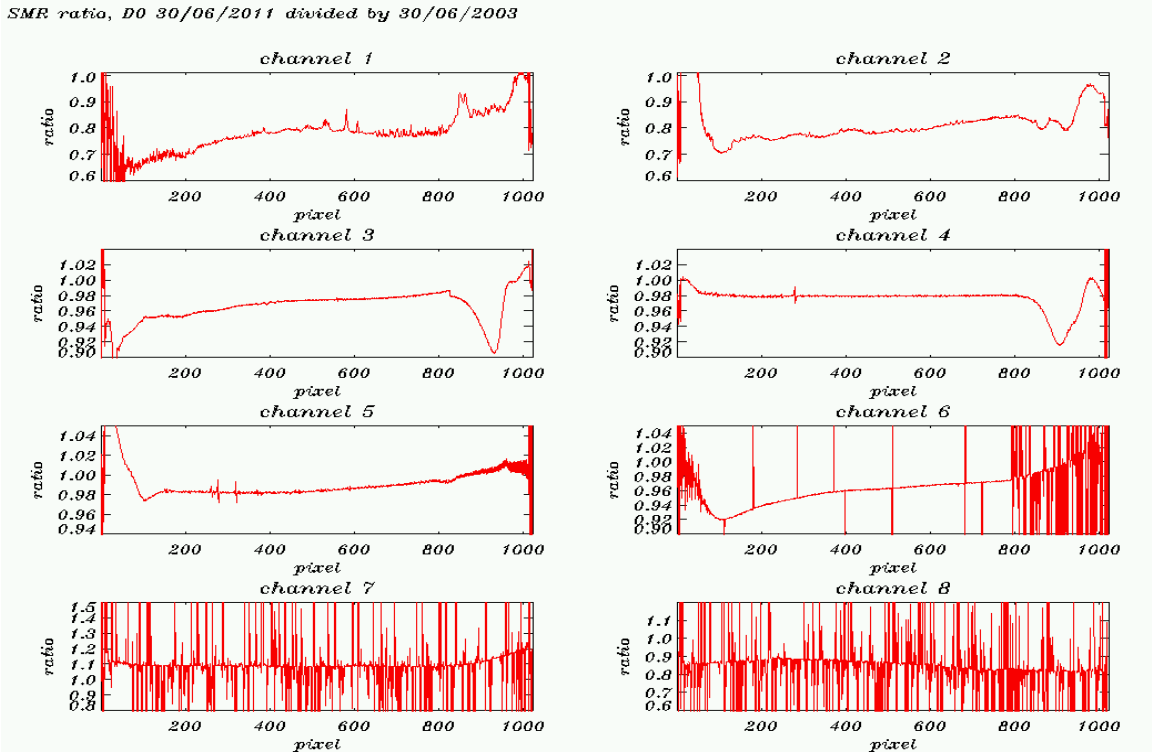


Figure 6.7: SMR ratios per detector channel on Long Term Trend 30/06/2011 divided by 30/06/2003.

6.2.1.2 LK1 analysis

6.2.1.2.1 Leakage Constant part

On an orbital basis a leakage current calibration is performed, whenever measurement data do not lie in the South Atlantic Anomaly region.

In plots from to Figure 6.10 to Figure 6.11 the leakage constant part FPN (fixed pattern noise) of the LK1 ADFs is analysed by determining the ratios of the FPN of each month with a time distance of one orbit, one day, one week, two weeks, three weeks and a month.
For channels 1-5 and the first part of channel 6, during up to three weeks nearly no changes can be noticed. Sudden jumps however between the different dark current ratios can be seen for channels 1, 2, 4 and 5 between 4 weeks. They are very small but above the noise level.

The IR channels show a lot of noise.

Note that since the processor version IPF 6.03, the time dependent part of the leakage current is considered as well (see 6.2.1.2.2).

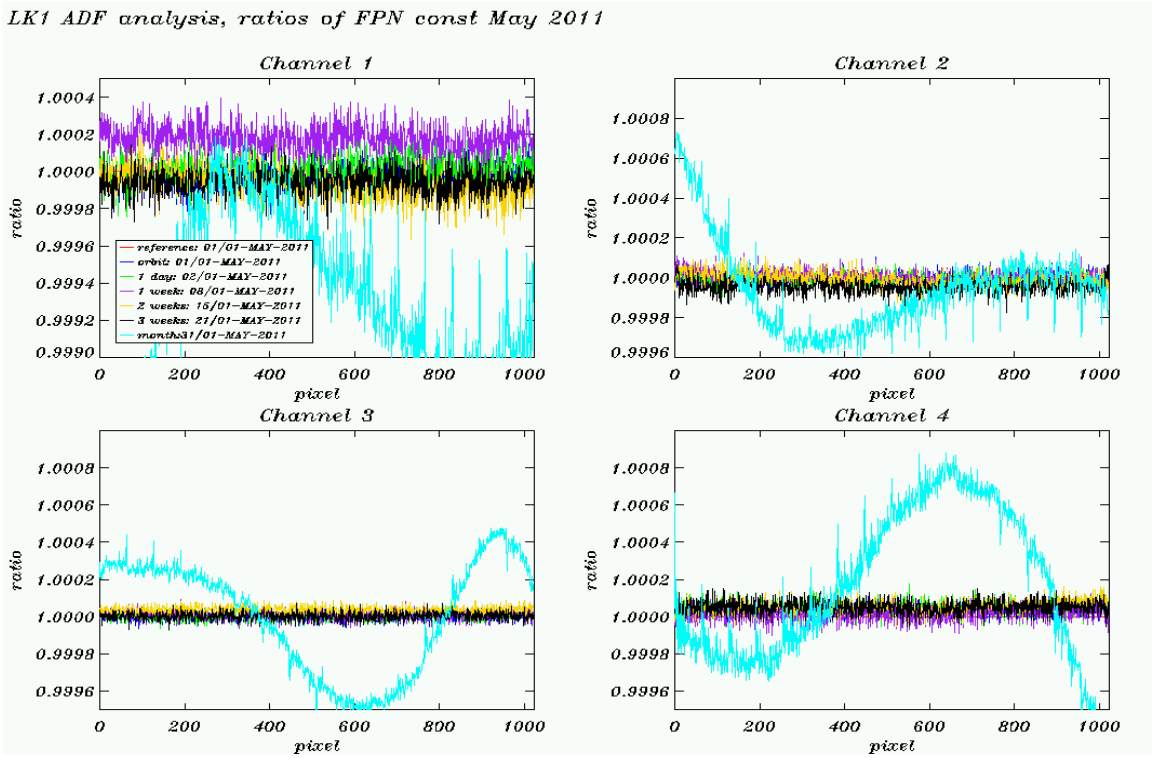


Figure 6.8: Dark current ratios (constant part) channels 1-4 during May 2011.

Reference spectrum used: Orbit 47937, 01 May 2011.

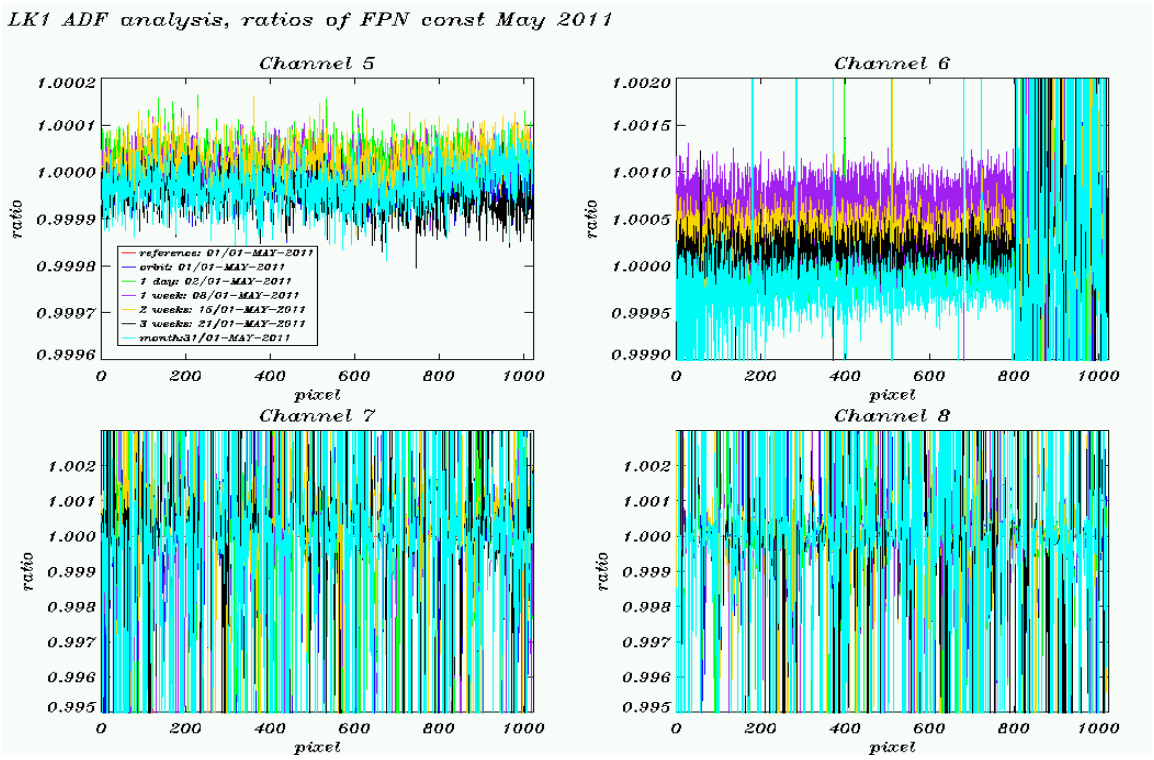


Figure 6.9: Dark current ratios (constant part) channels 5-8 during May 2011.

Reference spectrum used: Orbit 47937, 01 May 2011.

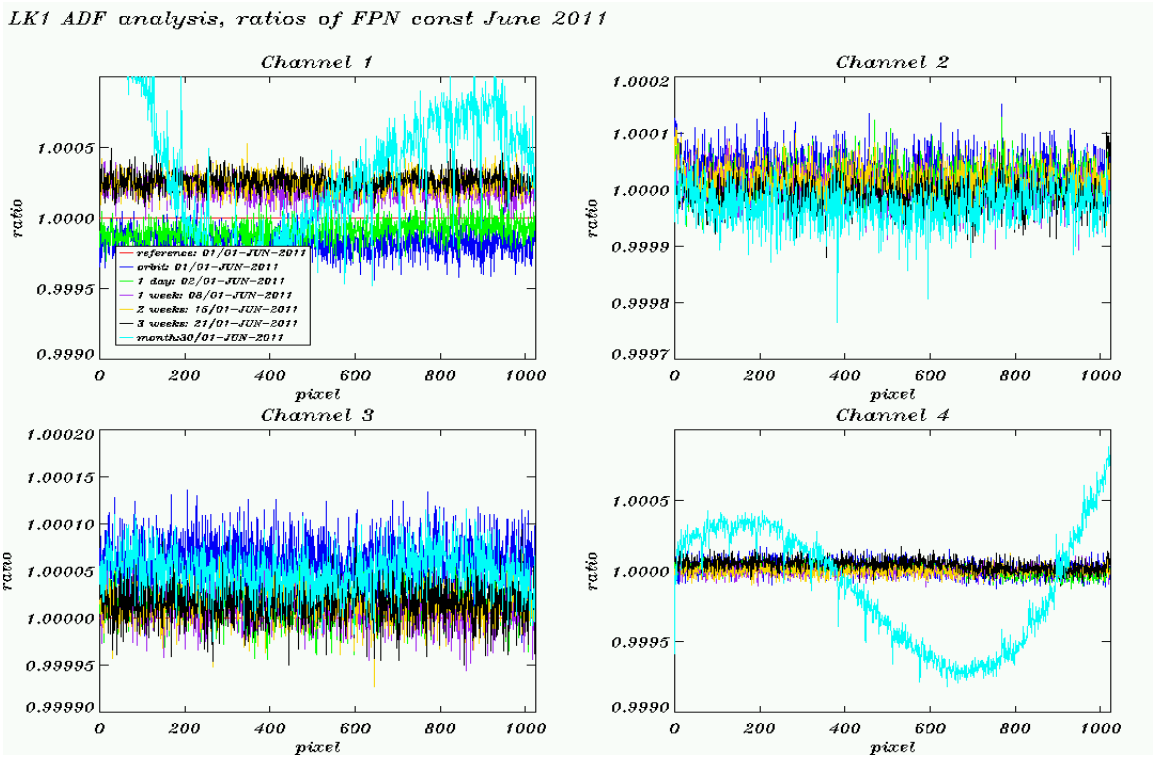


Figure 6.10: Dark current ratios (constant part) channels 1-4 during June 2011.

Reference spectrum used: Orbit 48383, 01 June 2011.

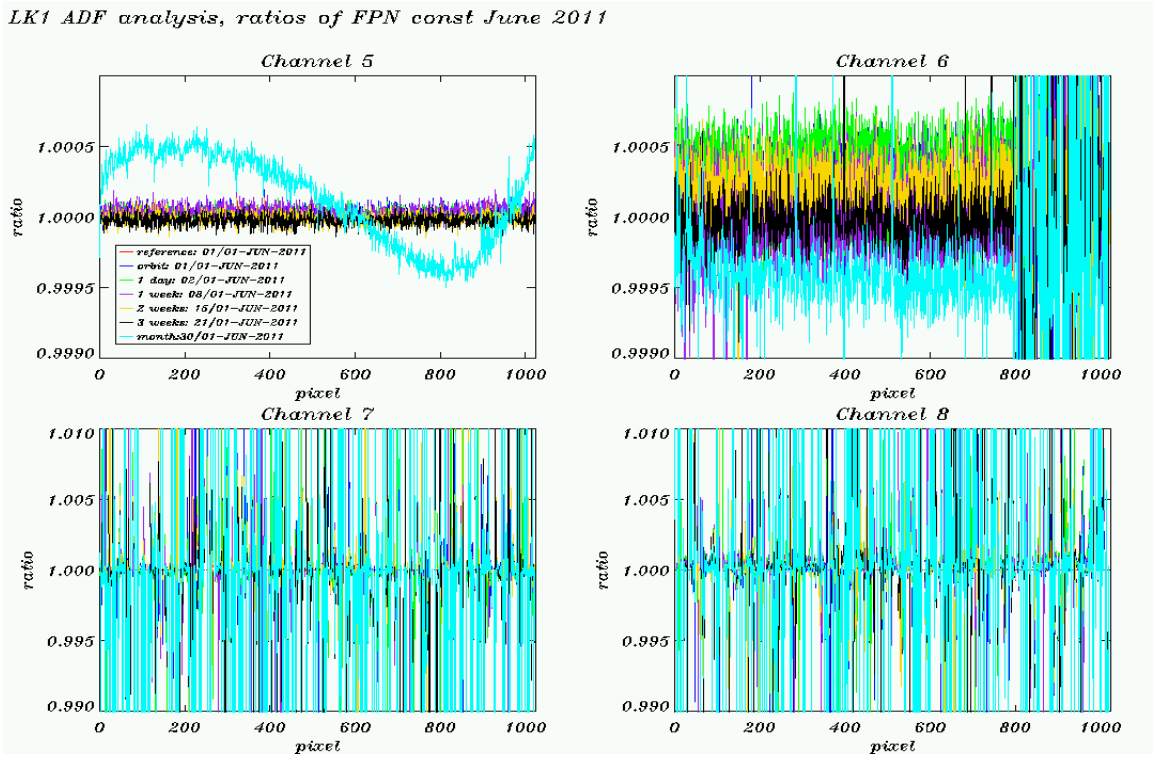


Figure 6.11: Dark current ratios (constant part) channels 5-8 during June 2011.

Reference spectrum used: Orbit 48382, 01 June 2011.

6.2.1.2.2 Leakage Variable part

Starting with IPF 6.03, the orbital dependency of channel 6 to 8 leakage current is considered. SCIAMACHY detector channels 6 - 8 have a time dependent leakage dark signal that consists of two components, the leakage current of the detector pixel and second a component due to thermal background that varies along the orbit. The implementation of the orbital variation of the leakage current is expected to improve retrieval especially in detector channel 8 for infrared products.

Figure 6.12 shows the evolution of the leakage variable part of the SCI_LK1_AX ADF during the time span from 01 May 2011 to 30 June 2011. The leakage variation for pixel 222 in channel 7 corresponding to orbit phase 6 is shown.
Updates of the leakage variable values are expected after the processing of the monthly calibration orbits, usually once per month. During the reporting period, monthly calibration sequences were scheduled between orbits:

- 48159-48163 (16/17-May-2011)
- 48590-48594 (15/16-Jun-2011)

For these dates, the change of the Leakage Variable value can be clearly seen in Figure 6.12, demonstrating that calibrations were performed successfully.

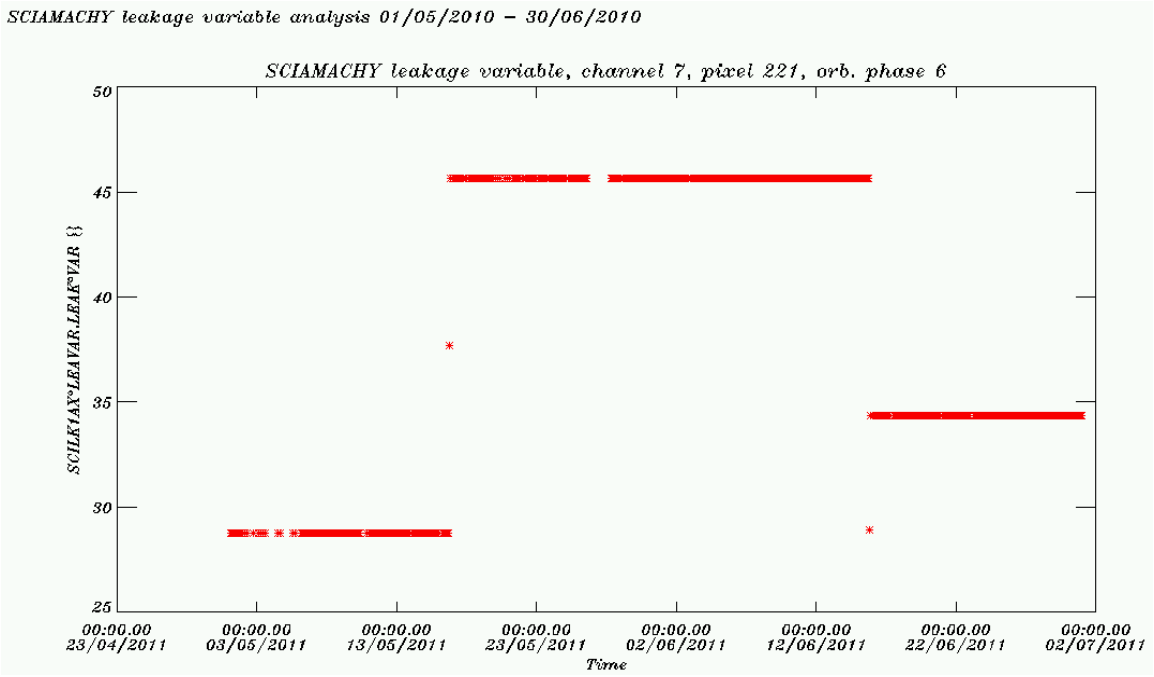


Figure 6.12: Leakage variable part from 01 May 2011 to 30 June 2011, for channel 7, orbit phase 6, pixel 221.

6.3 Bad and Dead Pixel Mask

The SWIR channels 6-8 suffer from a rising number of bad pixels that are not (or only to a small degree) usable for retrieval. The reason is a lattice constant mismatch between the substrate material and the light detecting material of the detectors. The bad pixels are detected using dark, WLS and sun measurements. The number of bad pixels rises with the life time of the instrument due to proton impact. The mask is calculated on an orbital basis.

6.3.1 Operational Processor Analysis

Starting from the Level 1b IPF 7.03 baseline, SCIAMACHY bad and dead detector pixel masks are generated on an orbital basis. The PPG/Etalon correction parameters required for the SCIAMACHY Level 0 to 1b processing are calculated by SciCal and enclosed in the SCI_PE1_AX auxiliary data files. The set of parameters generated is then written into the Level 1b Pixel-to-Pixel Gain *(PPG) ETALON* GADS indicating the position of pixels which may not be used for further processing. In the next BMR, results for the operational Bad and Dead Pixel Mask will be presented. The mask currently provided in the Level 1b products is not identical to the mask generated at SRON. It is planned to align the two masks in future processor versions.

6.3.2 SRON Analysis

SRON performs routinely analysis on the SCIAMACHY Bad and Dead Pixel Mask identifying bad pixels of the detector arrays with the SCIAMACHY Detector Monitoring Facility (SDMF) using 11 flagging criteria. These criteria are based on the dark signal model, transmission, gain and noise of a pixel. Bad pixel masks are calculated on an orbital basis and combined into a "smoothmask" with masks from about 50 orbits. In Figure 6.13 we show the number/fraction of pixels that is flagged as bad for channels 6, 6+, 7 and 8. Note that channel 6 consists of two parts employing different detector materials. Channel 6+ starts at pixel 794. The rate at which the number of pixels that is flagged is increasing is similar for the IR channels 6+, 7 and 8. The fraction of flagged pixels in channel 6 is much lower and almost constant over the mission, because of the different detector materials used in this part of the channel.

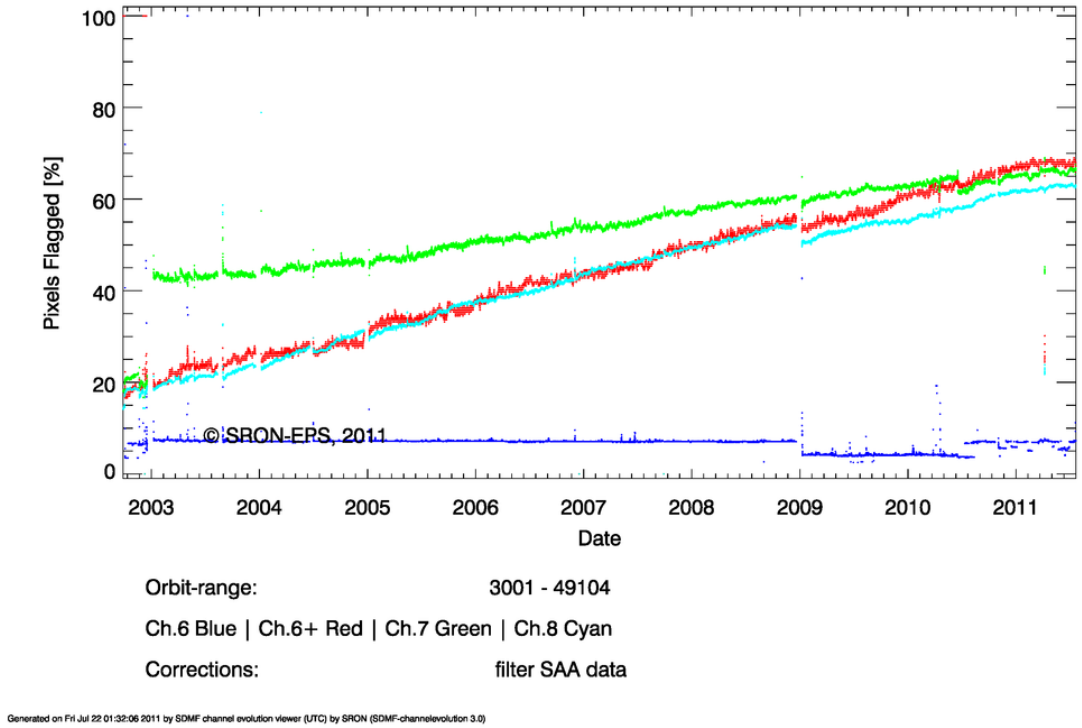


Figure 6.13: Number/Fraction of pixels that is flagged as bad by the SDMF smoothmask for channels 6 (blue), 6+ (red), 7 (green) and 8 (cyan). Orbits during SODAP or decontaminations have been removed. Note the temporary decrease in the number of bad pixels after the last decontamination, for channel 8 about 6%, a few percent more than after the previous decontaminations.

6.4 Pointing Performance

No updates to present in the reporting period.

6.5 SciaL1c tool

The SciaL1c tool is an application provided to the users of SCIAMACHY Level 1b products. This application allows selecting specific calibrations to apply to Level 1b data, which are in case of SCIAMACHY defined as not fully calibrated Level 0 channel information in combination with calculated calibration data. The generated Level 1c products are suitable for the user's particular applications.

The SciaL1c Calibration and Extraction Software was upgraded to be compatible with IPF 6.03 data. It is downward compatible, i.e. it can also be used with data from older IPF versions. SciaL1c can be downloaded at: http://envisat.esa.int/scial1c/

LINUX, Sun Solaris, LINUX on DEC-Alpha and HP-UX on IA64 versions are available.

The latest updated version 2.1 of the SciaL1c tool was provided to the users end of November 2008.

Please, note that an anomaly in the handling of the m-factor file during the calibration of SCIAMACHY Level 1b data was observed. The m-factor file (SCI_MF1_AX) is not correctly reported into the child product restituted from the SciaL1c processing. In particular, the MF1 ADF filename does not fully appear in the DSD descriptor. The quality of the product is not impacted; the anomaly will be fixed in the next delivery of SciaL1c.

7 LEVEL 2 NRT PRODUCT QUALITY MONITORING

7.1 Processor Configuration

7.1.1 Version

Since 08 May 2006, the near-real-time processing of SCIAMACHY Level 2 data has been suspended, evolution is restricted to the Level 2 off-line processor (see Section 8).
The last IPF version used was 5.04. The corresponding product specification is *[2]*.
The Product Quality Disclaimer at
http://envisat.esa.int/dataproducts/availability/disclaimers/SCI_NL__2P_Disclaimers.pdf
describes known artefacts.

An overview on the implementation dates of the IPF at the different PDS processing centres and the main modifications implemented can be found in previous BMR (June-May 2007).

An overview of Auxiliary Files being used as input for SCI_NL__2P products can be found in BMR May-June 2007.

With the activation of the SCIAMACHY Level 2 processor Version 5.01, the Fast Delivery processing of Level 2 products has operationally started at D-PAC. Level 1b near real time products and predicted instead of consolidated Auxiliary Data Files are used as input for the Level 2 off-line processor. With this new service ESA provides to the users within 24 hours from data acquisition the full SCIAMACHY Level 2 products.
Data monitoring of the SCIAMACHY Level 2 Fast Delivery processing chain is routinely performed and the corresponding Daily Reports are published on ESA's PCS web-pages at the link*:* http://earth.eo.esa.int/pcs/envisat/sciamachy/reports/daily/Level_2/

The main difference between SCIAMACHY off-line and Fast Delivery products is that the Restituted Attitude file cannot be used for processing. It also adopts Level 1b NRT data, which can differ in the used calibration measurements from the consolidated data. However, the difference between off-line processor products and fast delivery products is small in most cases.

8 LEVEL 2 OFF-LINE PRODUCT QUALITY MONITORING

8.1 Processor Configuration

8.1.1 Version

The current Level 2 processor for the off-line processing chain at D-PAC is version 5.01 since 09 February 2010 in alignment with the activation of the Level 1b IPF 7.03.

The new processor version introduces the following changes:

- M-Factors implemented in Level 1b-2 processing step
- Changes in the NO_2 retrieval settings
- New AAI algorithm
- Improvements in Limb retrieval
- Nadir SO_2 total columns for anthropogenic and "volcanic" scenarios
- Nadir BrO total columns
- Nadir H_2O total columns
- Nadir CO columns
- Nadir OClO slant columns
- Limb BrO profile
- Limb Cloud product

Note that the new version includes an update in the Level 2 data format.

The Product Specification corresponding to the Level 2 off-line processor 5.01 is Volume 15, issue 3L, version 1.1 *[2]* and can be found at
http://earth.eo.esa.int/pub/ESA_DOC/ENVISAT/Vol15_Sciamachy_3L_1.1.pdf

The Product Quality Disclaimer at
http://envisat.esa.int/dataproducts/availability/disclaimers/SCI_OL__2P_Disclaimers.pdf
has been updated in relation to the new processor version 5.01 and describes known artefacts.

SCI_OL__2P products contain geo-located vertical column amounts of trace gases retrieved from Nadir measurements, as well as stratospheric Limb profiles of O_3, NO_2 and BrO. Additionally fractional cloud coverage, cloud-top height, and cloud optical thickness are derived and provided as product to the user. The major upgrades with respect to prior processor versions are summarised in Table 8.1.

Processor Version	Description	Proc Centre	Date	Start Orbit
5.01	Main processor changes: • Nadir MDS now contain additional trace gas columns: SO2, BrO, H2O, OClO and CO. • Limb MDS now contain the trace gas profiles of BrO. • Limb Cloud MDS Contains height resolved indicators for cloud presence and type (water clouds, PSCs and NLCs).	D-PAC	23-JAN-2010	41295
3.01	Main processor changes: • Updated SACURA cloud algorithm • Offset applied in NO_2 slant column processing was removed • Number of retrieved profiles per state was set from one to four (4) • Cloud and Aerosol MDS are filled with the next valid value instead of being set to zero • Molecular Ring correction applied on NADIR O_3 slant column density Non-compliance corrections: • Inter change of Pressure and Temperature values in LIMB MDS • Erroneous Cloud and Aerosol Quality Flags • AAI erroneously set to zero in Cloud and Aerosol MDS • Scaling of too large NO_2 error estimate	D-PAC	23-SEP-2007	29092

Table 8.1: Level 2 off-line Processor configuration.

8.1.2 Anomalies

No anomalies identified for the reporting period.

8.1.3 Auxiliary Data Files

Input for Level 2 off-line processing is the so-called Initialization File.
For processor version 5.01 a new Initialization file became active which is

SCI_IN__AXNPDE20090615_120000_20090615_000000_20991231_235959

This ADF is usually changed only in case of a processor upgrade.

8.2 Monitoring results

8.2.1 Nadir: NO_2 consistency checking

The world map plots of Nadir NO_2 vertical column density (VCD) values averaged over one month are generated from the SCI_OL__2P Nadir products. Figure 8.1 and Figure 8.3 show the monthly world map plots for May and June 2011.

Figure 8.2 and Figure 8.4 show errors for the VCD monthly average plots. The errors are given in absolute values (molec/cm^2). Generally the equator region has NO_2 values with higher errors.
An overall reduction of the error associated to NO_2 mean VCDs has been obtained with the new processor version 5.01.

High concentration of NO_2 is expected over industrial regions, such as over North America, especially the East coast, over central Europe, China and South Africa, which is reflected in the world maps.

8.2.1.1 Nadir: VCD NO_2 map May 2011

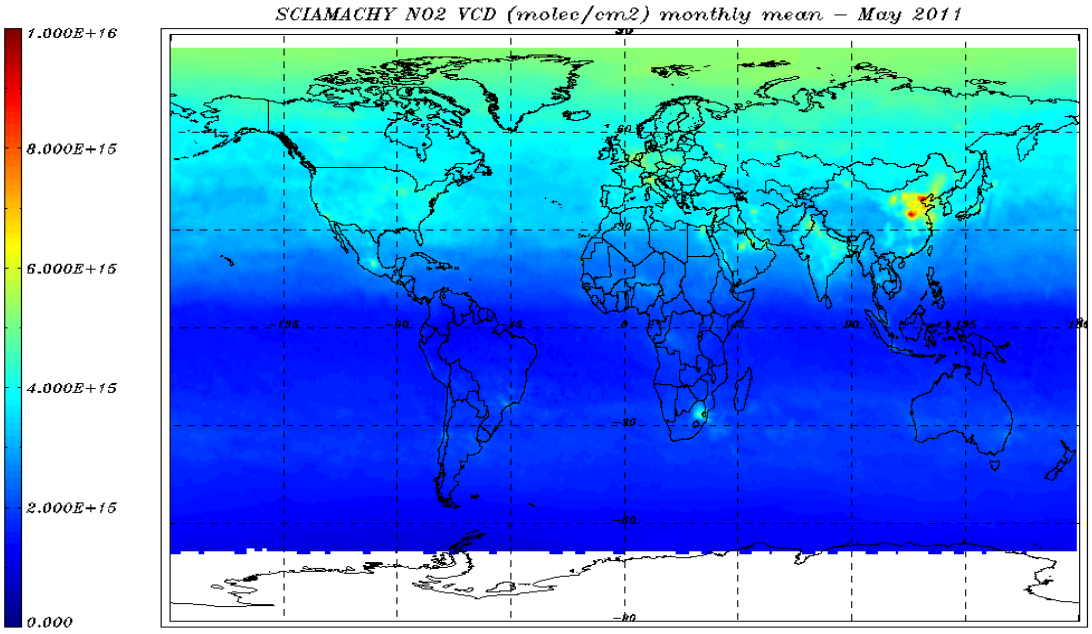


Figure 8.1: NO_2 VCD (molec/cm^2) world map for 01 - 31 May 2011 – monthly average.

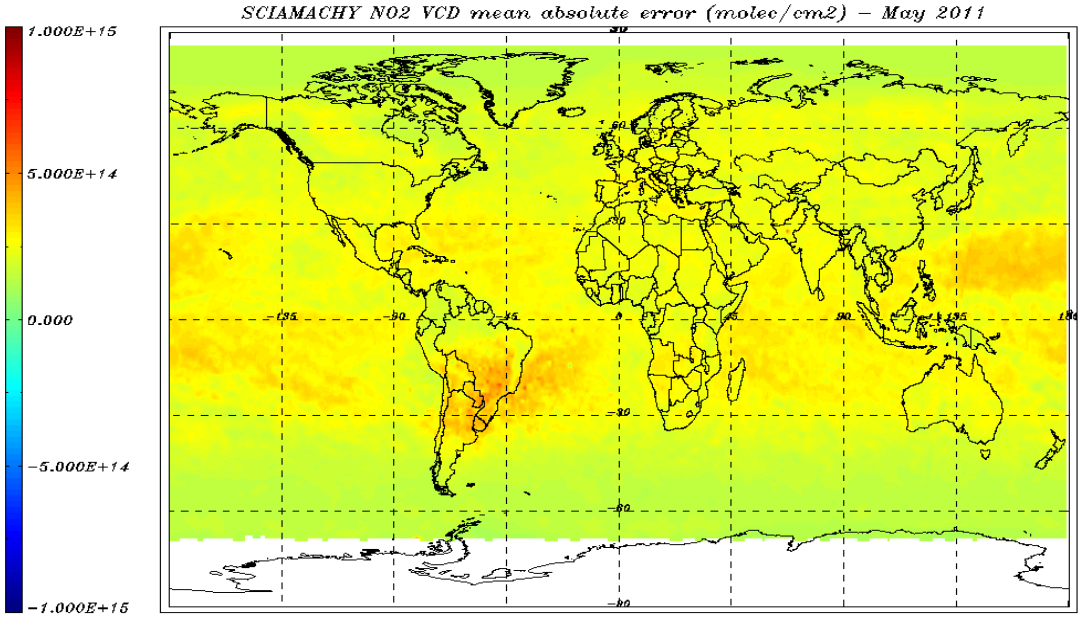


Figure 8.2: NO_2 VCD error (molec/cm^2) for 01 - 31 May 2011 - monthly average.

8.2.1.2 Nadir: VCD NO2 map June 2011

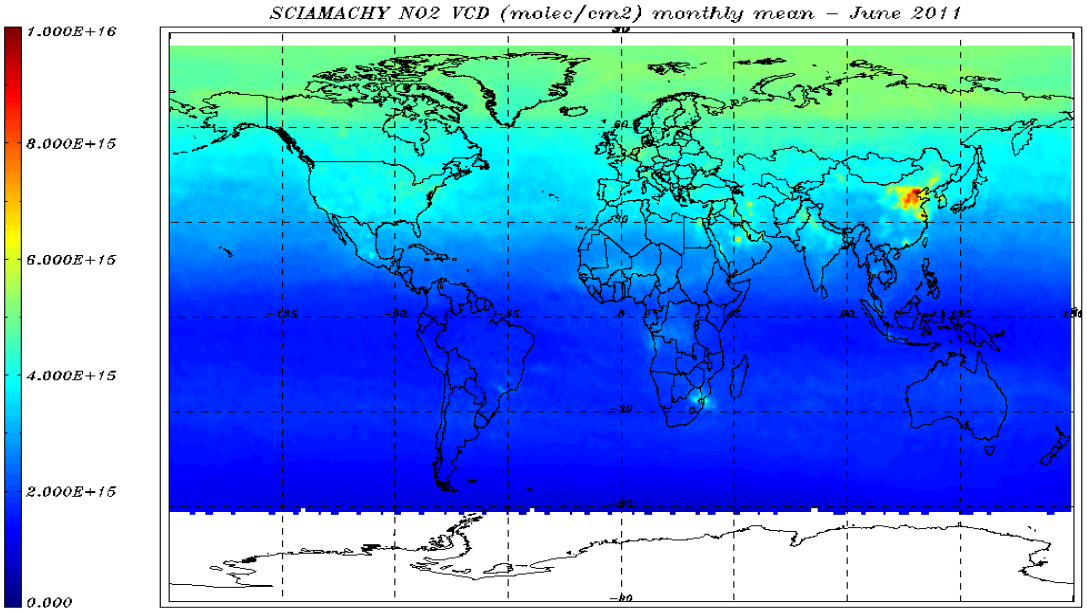


Figure 8.3: NO_2 VCD (molec/cm^2) world map for 01 – 30 June 2011 – monthly average.

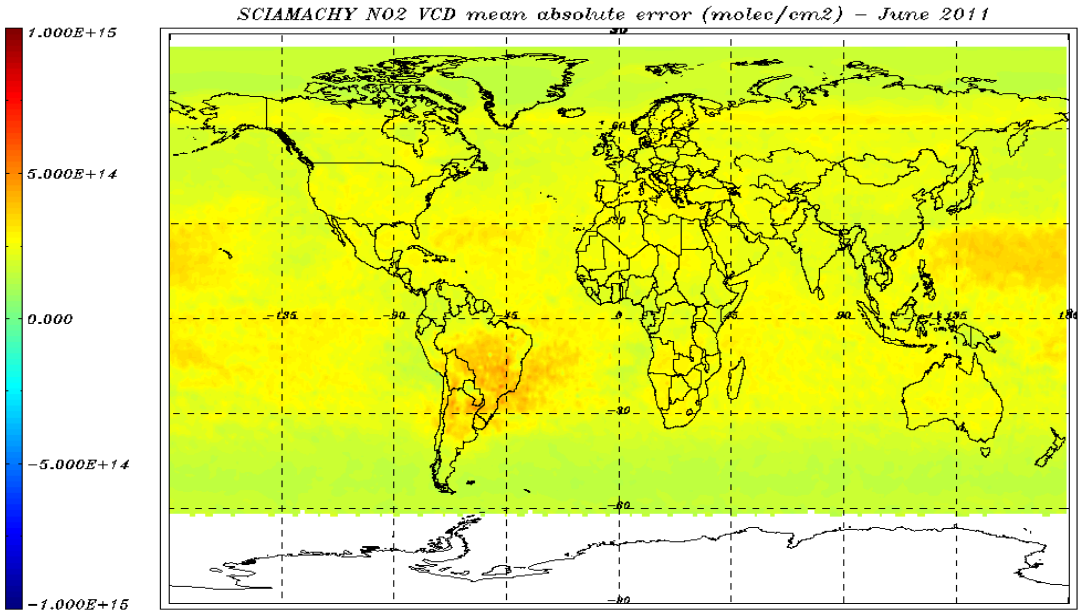


Figure 8.4: NO_2 VCD error (molec/cm^2) for 01 – 30 June 2011- monthly average.

8.2.2 Nadir: O_3 consistency checking

Analogous to the NO_2 world maps, O_3 vertical column density (VCD) values averaged over one month are generated from the SCI_OL__2P Nadir products and plotted on a world map. Figure 8.5 and Figure 8.7 show the ozone distribution converted to Dobson units for May and June 2011. The VCD error as monthly average plots is shown in Figure 8.6 and Figure 8.8 as relative fraction.

8.2.2.1 Nadir: VCD O_3 map May 2011

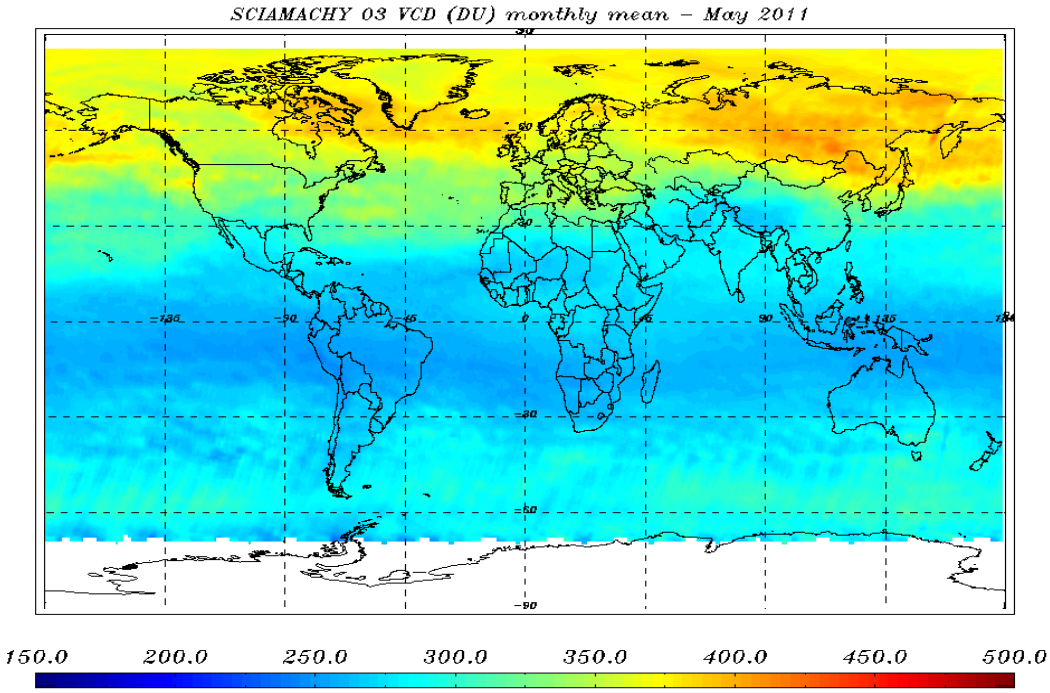


Figure 8.5: O_3 VCD (DU) world map for 01 - 31 May 2011 – monthly average.

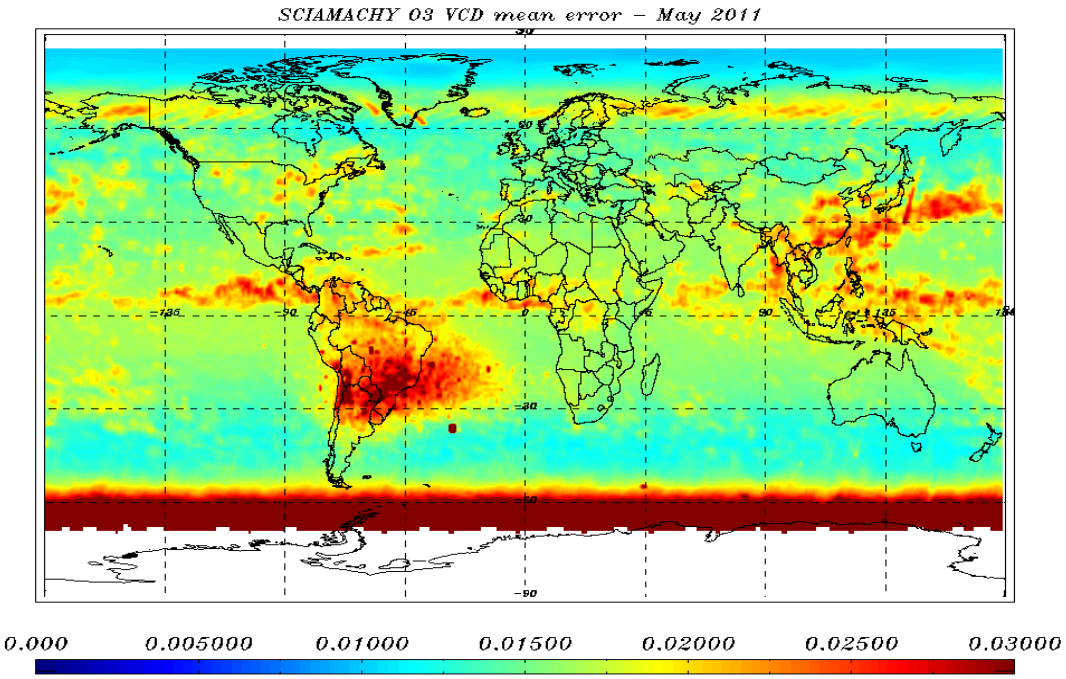


Figure 8.6: O3 VCD error for 01 - 31 May 2011 - monthly average.

8.2.2.2 Nadir: VCD O3 map June 2011

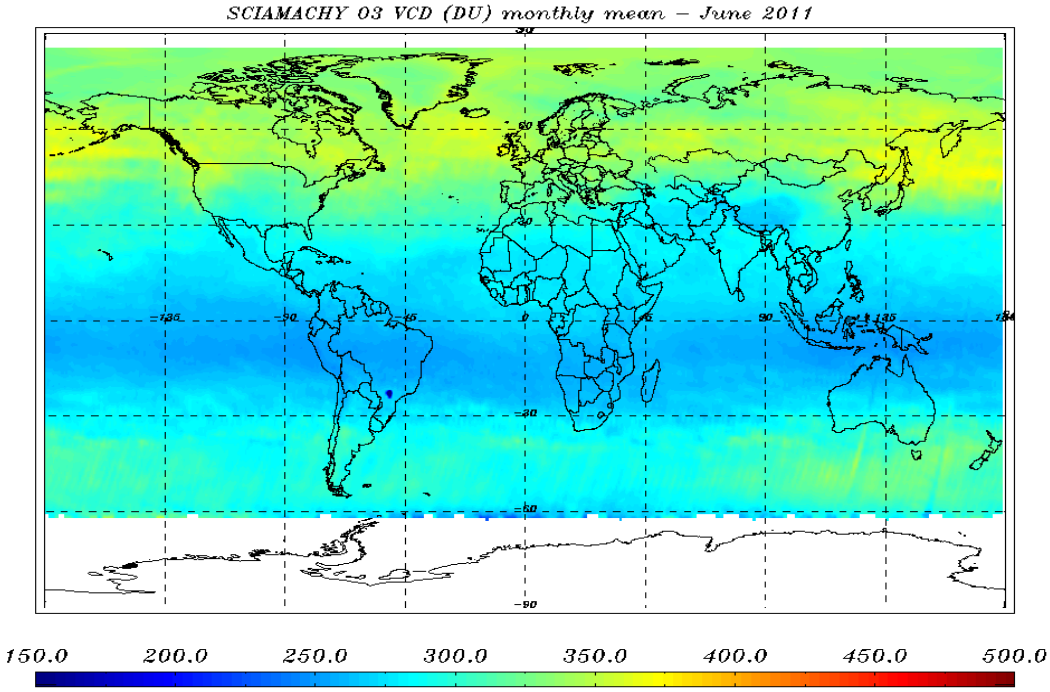


Figure 8.7: O_3 VCD (DU) world map for 01 - 30 June 2011 – monthly average.

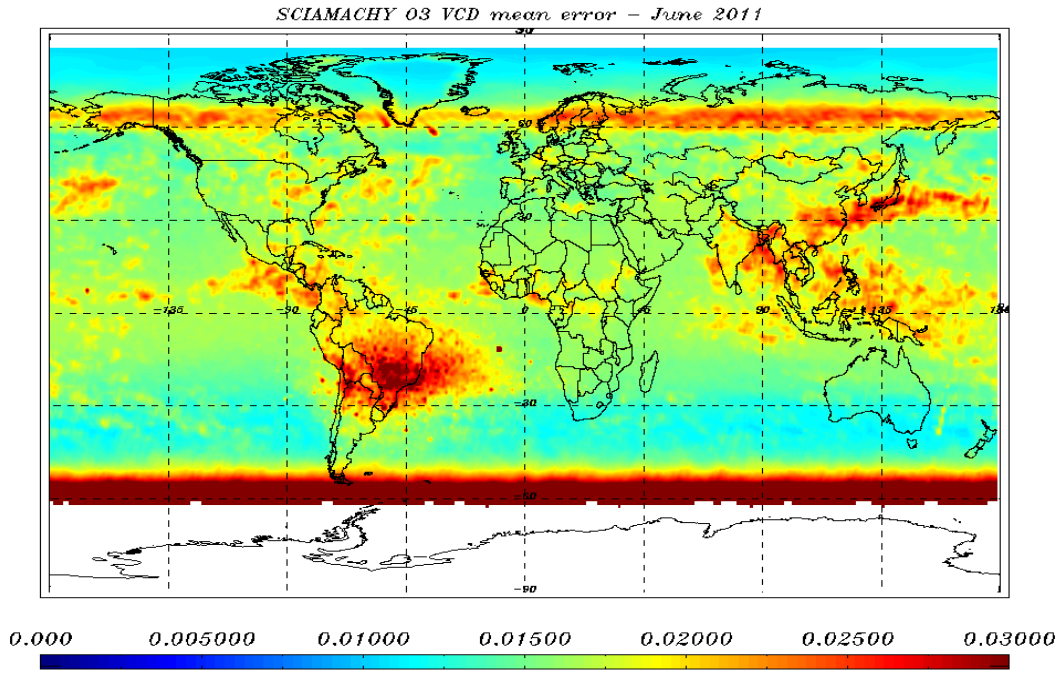


Figure 8.8: O_3 VCD error for 01- 30 June 2011 - monthly average.

8.2.3 Nadir: H_2O consistency checking

The world map plots of Nadir H_2O vertical column density (VCD) values in g/cm^2 averaged over one month are generated from the SCI_OL__2P Nadir products version 5.01. Figure 8.9 and Figure 8.11 show the monthly plots for May and June 2011. Figure 8.10 and Figure 8.12 show the VCD error for the monthly average plot. Errors are absolute values (g/cm^2).

In the plots, data over high mountain areas (Himalayas and the Andes range) are masked out by the processor's internal quality checks. No correction for surface elevation is performed.

Please note that these plots are preliminary results after the implementation of the new processor version and are still under review.

8.2.3.1 Nadir: VCD H_2O map May 2011

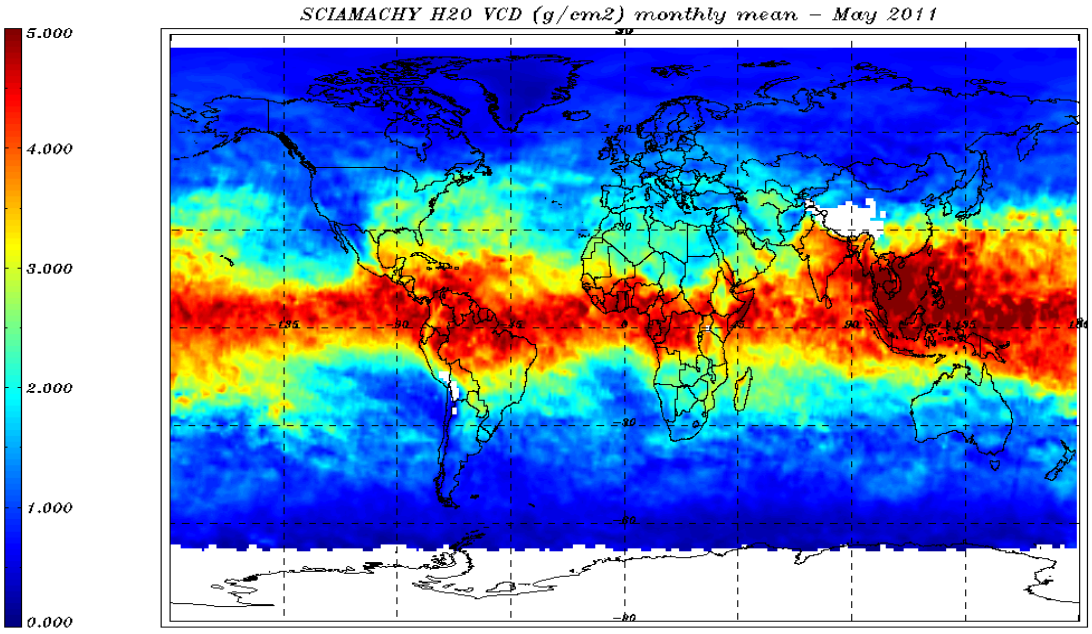


Figure 8.9: H2O VCD (g/cm^2) world map for 01 - 31 May 2011 – monthly average.

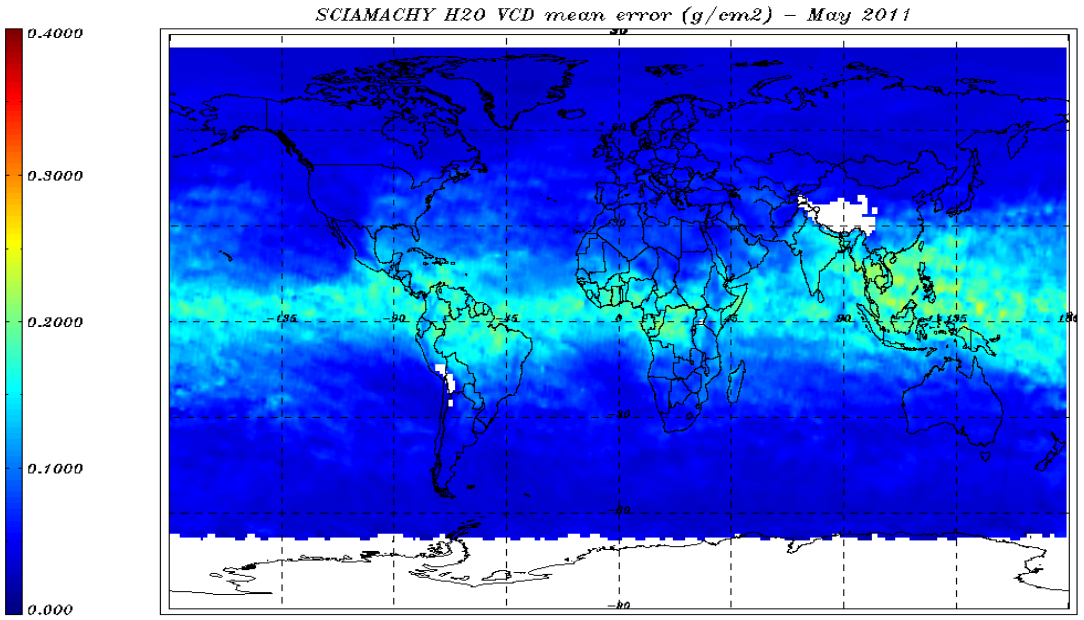


Figure 8.10: H2O VCD (g/cm^2) error for 01 - 31 May 2011 - monthly average.

8.2.3.2 Nadir: VCD H_2O map June 2011

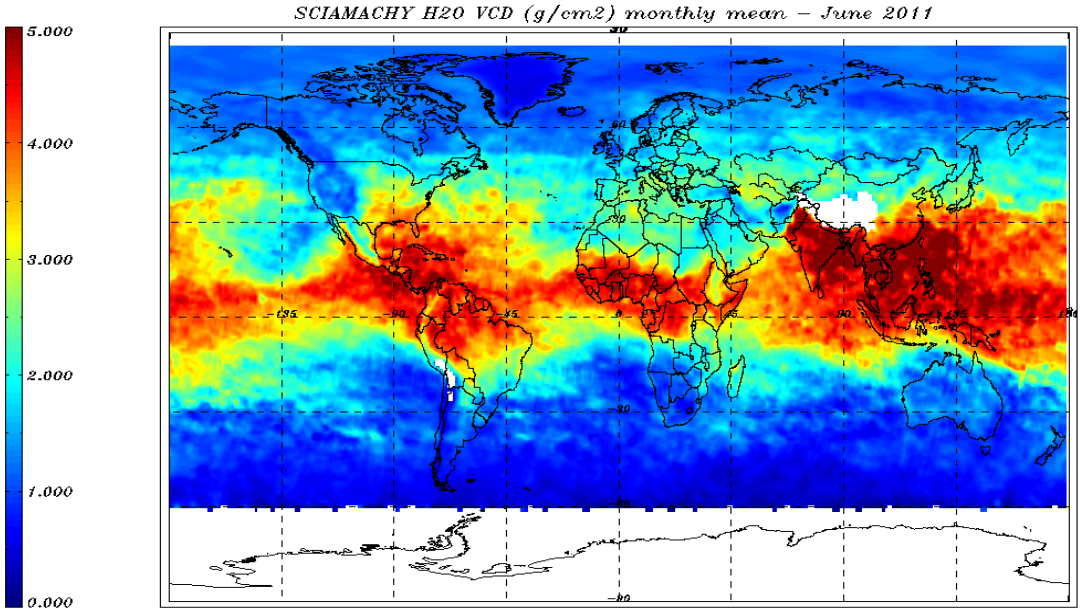


Figure 8.11: H_2O VCD (g/cm^2) world map for 01 – 30 June 2011 – monthly average.

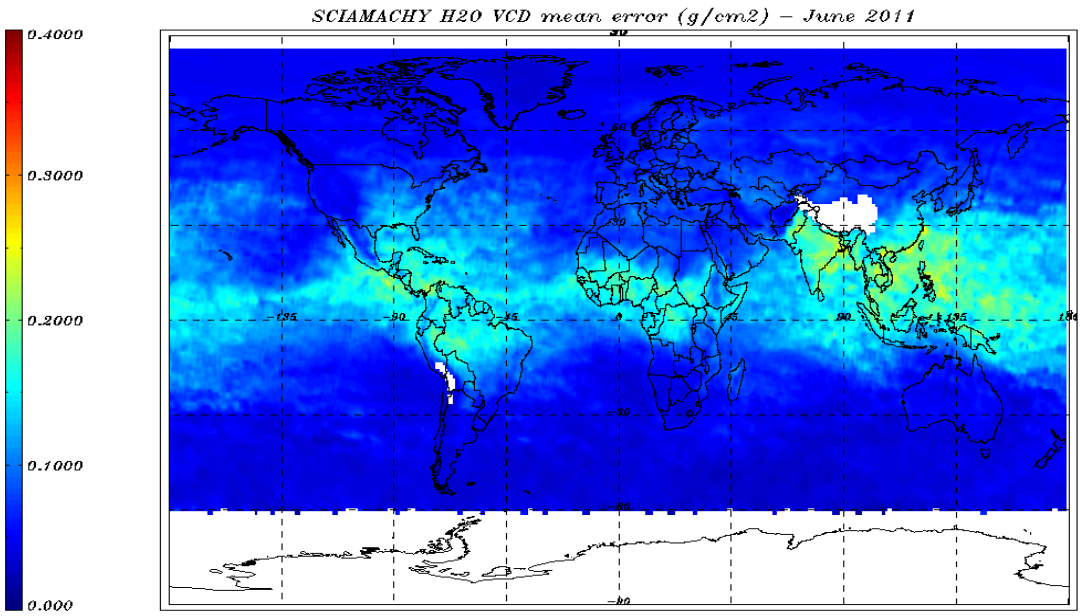


Figure 8.12: H_2O VCD (g/cm^2) error for 01 – 30 June 2011- monthly average.

8.2.4 Nadir: BrO consistency checking

The world map plots of Nadir BrO vertical column density (VCD) values averaged over one month are generated from the SCI_OL__2P Nadir products version 5.01. Figure 8.13 and Figure 8.15 show the monthly world map plots for May and June 2011.

Figure 8.14 and Figure 8.16 show the VCD errors for the monthly average plots. Errors are given in absolute values (molec/cm^2).

Large emissions of inorganic bromine are expected in the Tropospheric Polar Regions at the end of the winter (bromine explosion event) and in the troposphere and possibly in the stratosphere as a consequence of active volcanoes. Low values are present in correspondence with the SAA.

Please note that these plots are preliminary results after the implementation of the new processor version and are still under review.

For year 2002 the BrO column densities are substantially too low with a lot of negative values. We recommend users not to use the 2002 BrO data in the current implementation.

8.2.4.1 Nadir: VCD BrO map May 2011

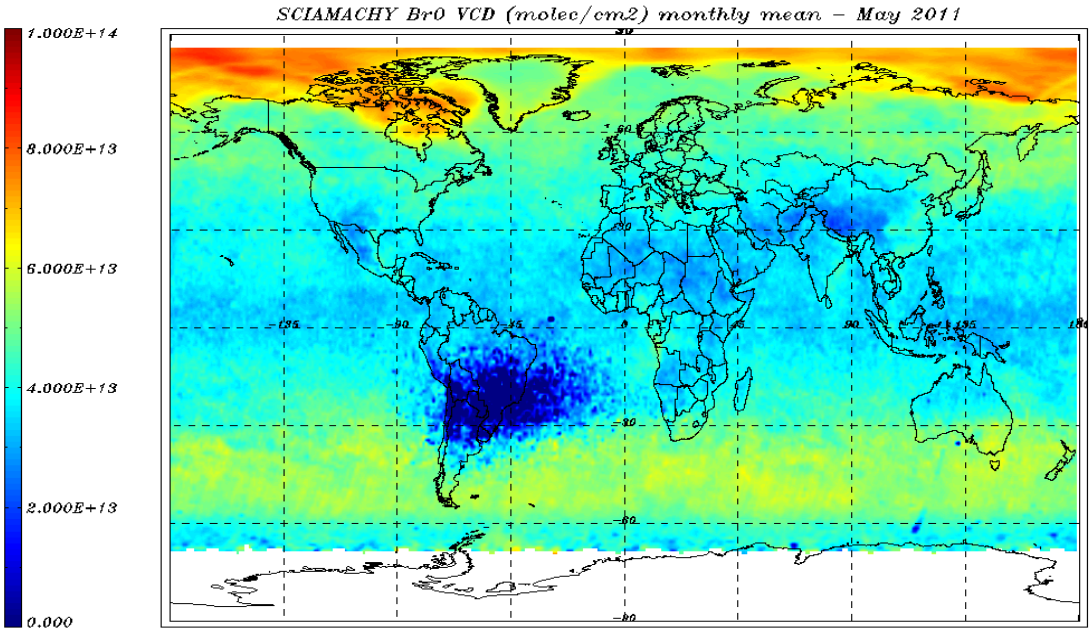


Figure 8.13: BrO VCD (molec/cm^2) world map for 01 – 31 May 2011 – monthly average.

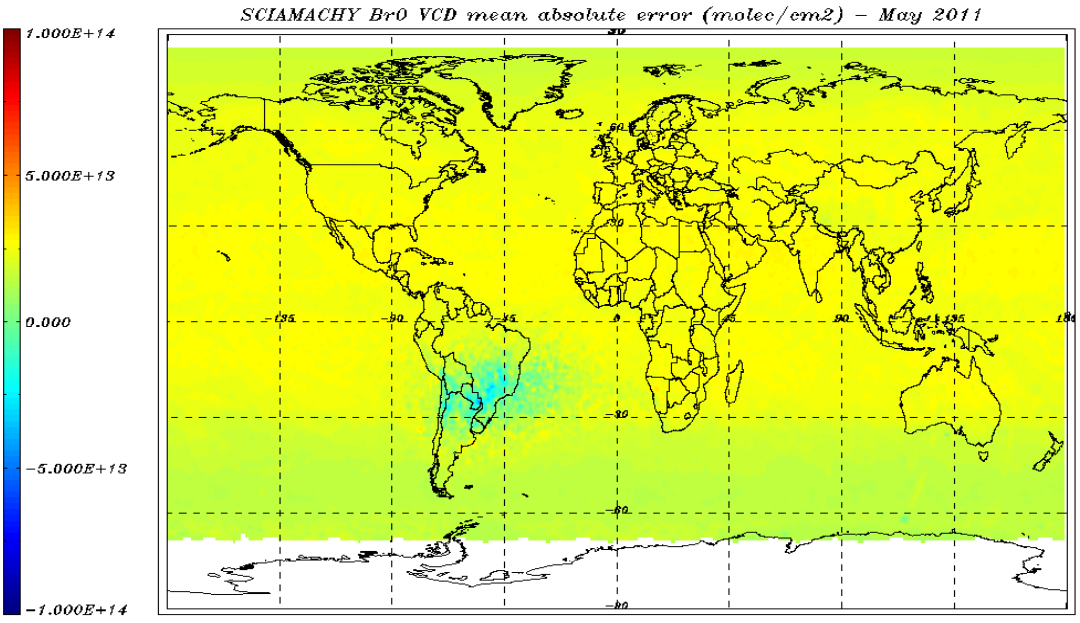


Figure 8.14: BrO VCD error (molec/cm^2) for 01 – 31 May 2011- monthly average.

8.2.4.2 Nadir: VCD BrO map June 2011

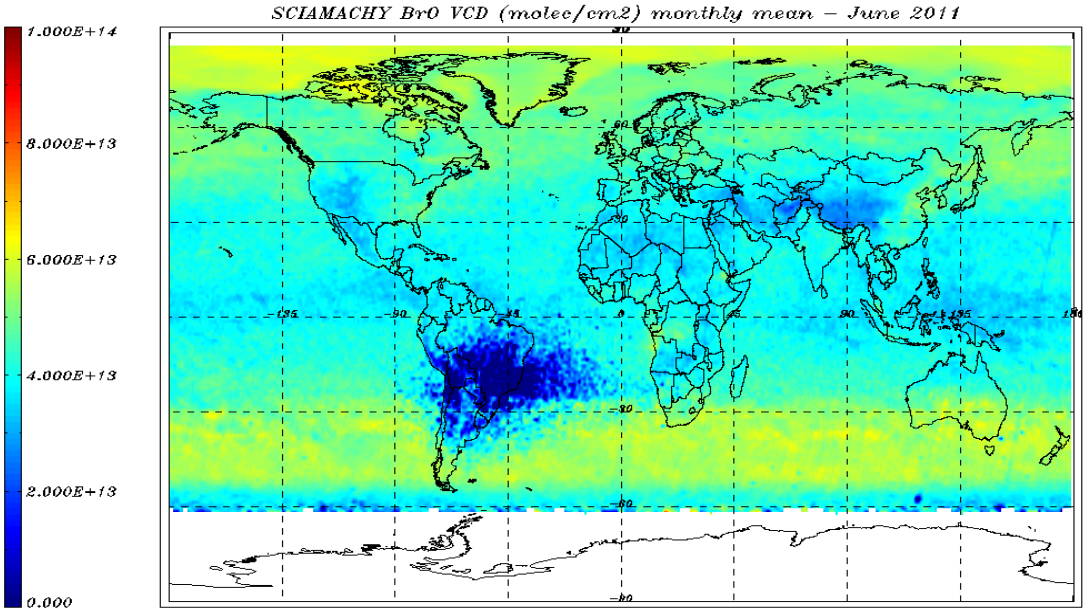


Figure 8.15: BrO VCD (molec/cm^2) world map for 01 – 30 June 2011 – monthly average.

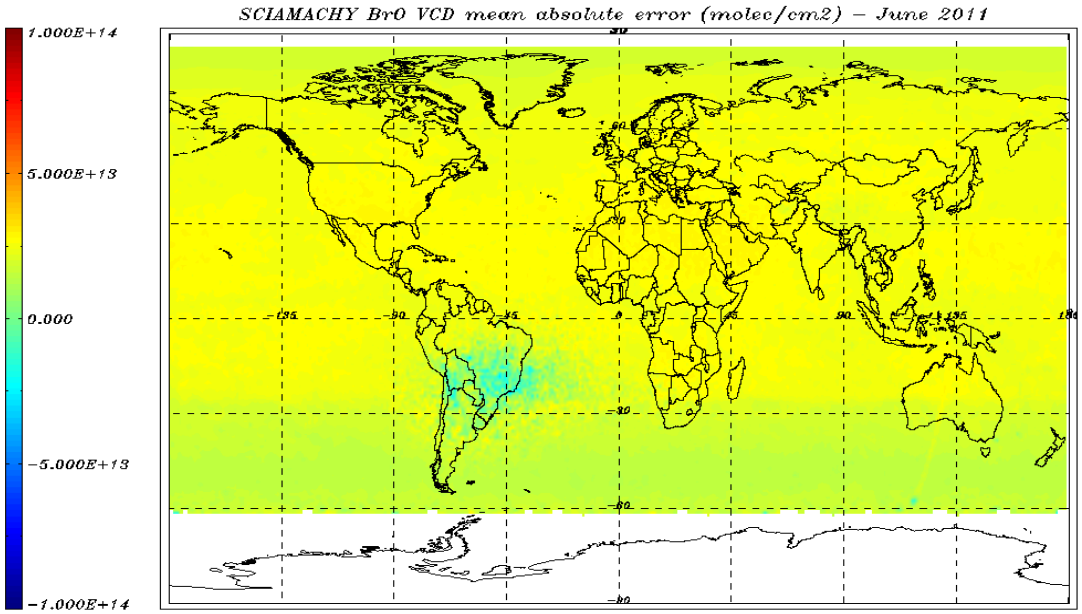


Figure 8.16: BrO VCD error (molec/cm^2) for 01 – 30 June 2011- monthly average.

8.2.5 Nadir: SO_2 consistency checking

The world map plots of Nadir SO_2 vertical column density (VCD) values in molec/cm^2 averaged over one month are generated from the SCI_OL__2P Nadir products version 5.01. Each Level 2 product now contains one MDS for an anthropogenic scenario (SO_2 present in the boundary layer) and one MDS for the volcanic scenario (SO_2 layer between 10 and 11 km).

Since SO_2 distribution varies to a large degree between an anthropogenic scenario (pollution dominated) and a volcanic scenario, the AMF cannot be determined for both with a single climatology. Two types of AMF for the calculation of the "anthropogenic" SO_2 vertical columns and the "volcanic" ones are derived assuming a constant profile shape for two typical scenarios:

- a profile with 1 DU of SO_2 from surface to 1 km height simulating an Anthropogenic Pollution scenario;
- a profile with 10 DU of SO_2 between a 10 and 11 km simulating a volcanic eruption.

Accordingly, two types of SO_2 vertical columns - anthropogenic and volcanic - are computed and written into two different MDSs of the Level 2 products.

Both retrievals use the same background subtracted slant column as input, calculated from a reference sector over the Pacific Ocean as a pollution free correction.

Figure 8.17, 8.19, 8.21 and 8.23 show the monthly world map plots for anthropogenic and volcanic vertical columns for May and June 2011. Figure 8.18, 8.20, 8.22 and 8.24 show the VCD errors for the monthly average plots. Errors are given in absolute value (molec/cm2). SO2 values measured in the ascending node (the satellite moving northwards) have been filtered out.

Please note that these plots are preliminary results after the implementation of the new processor version and are still under review. The operational SO_2 product picks-up the main relevant features, but VCDs are strongly affected by negative values, presumably resulting from problems with the reference sector subtraction. Due to the poor results, it is recommended not to use the current version of the anthropogenic columns for quantitative studies. Usage of the volcanic columns as indicator of volcanic eruptions seems to be feasible.

8.2.5.1 Nadir: SO_2 Anthropogenic scenario - May 2011

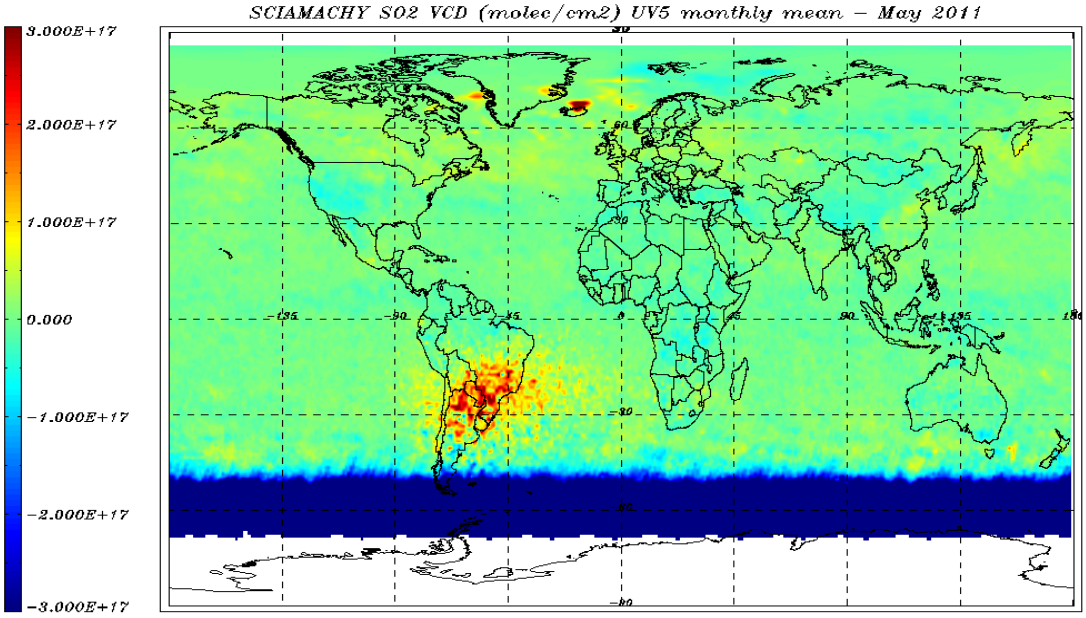


Figure 8.17: SO_2 VCD (molec/cm^2) world map for 01 –31 May 2011 – monthly average.

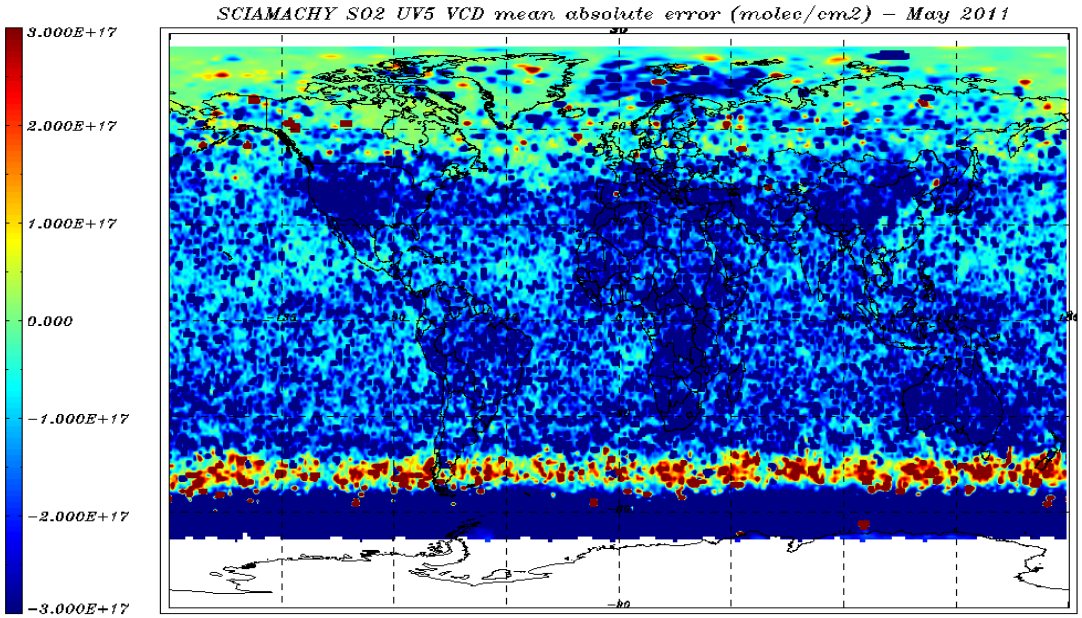


Figure 8.18: SO_2 VCD error (molec/cm^2) for 01 –31 May 2011- monthly average.

8.2.5.2 Nadir: SO_2 Anthropogenic scenario - June 2011

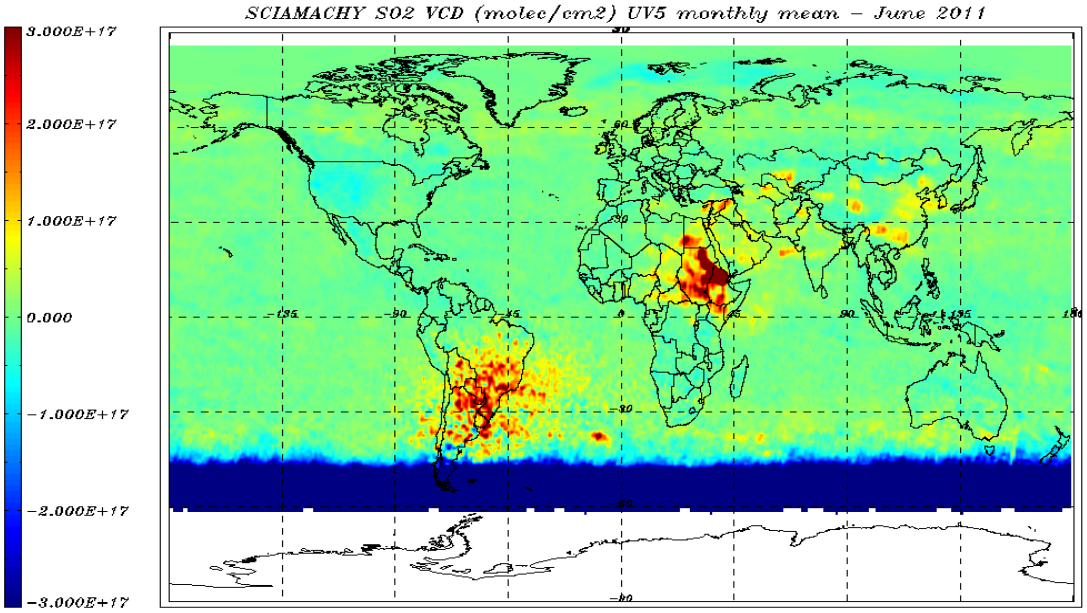


Figure 8.19: SO_2 VCD (molec/cm^2) world map for 01 – 30 June 2011 – monthly average.

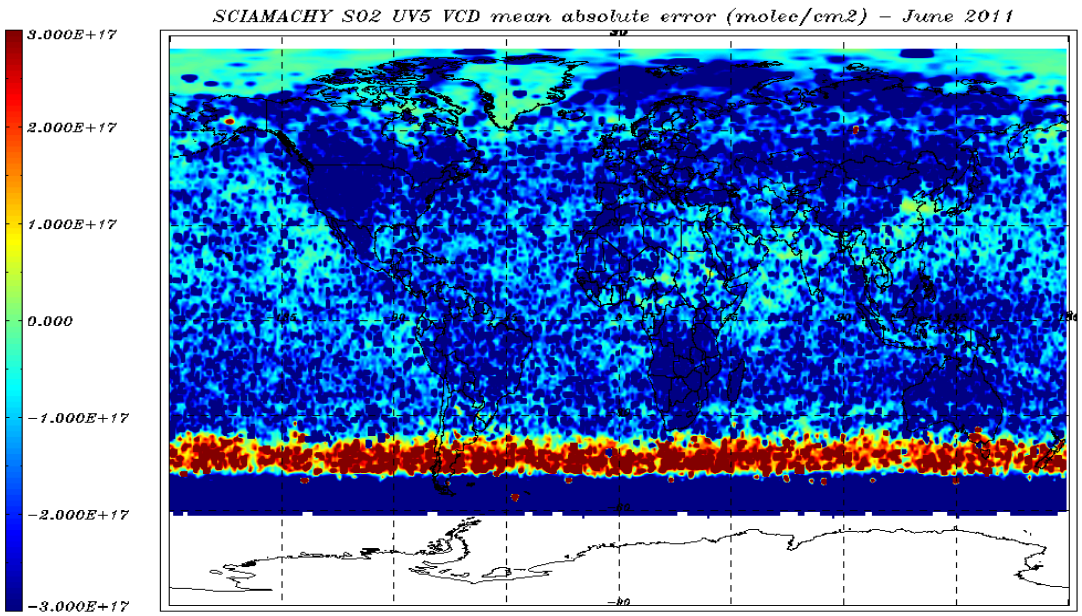


Figure 8.20: SO_2 VCD error (molec/cm^2) for 01 – 30 June 2011- monthly average.

8.2.5.3 Nadir: SO_2 Volcanic scenario - May 2011

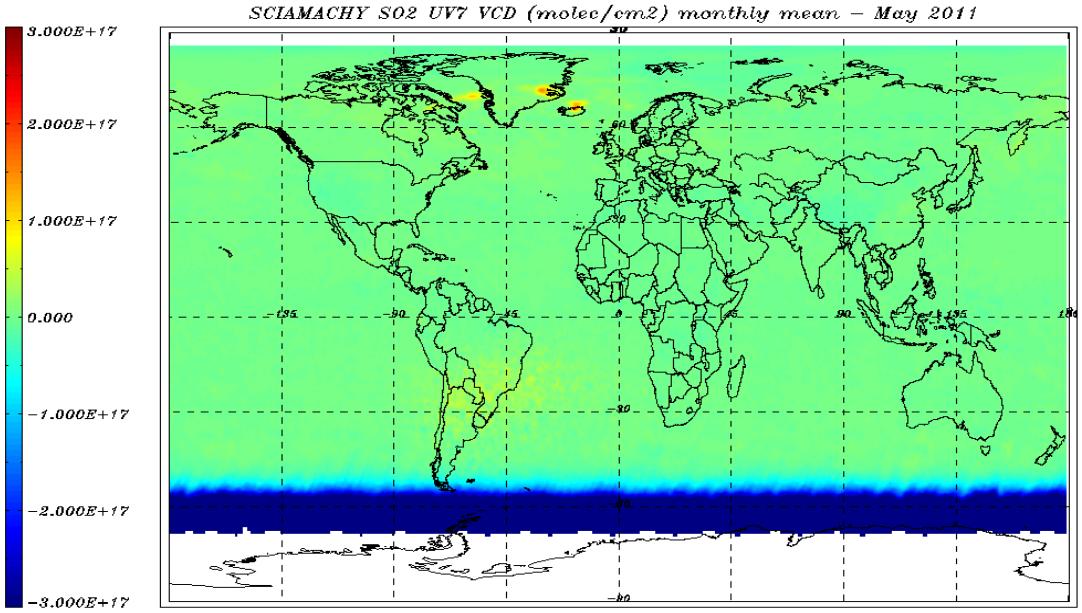


Figure 8.21: SO_2 VCD (molec/cm^2) world map for 01 –31 May 2011 – monthly average.

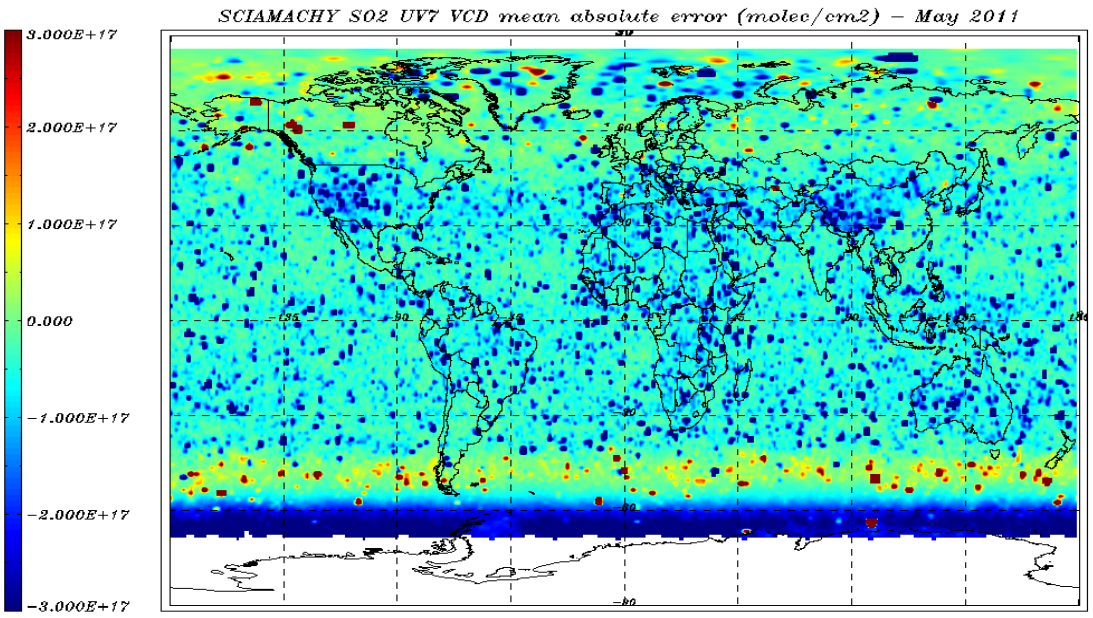


Figure 8.22: SO_2 VCD error (molec/cm^2) for 01 – 31 May 2011 – monthly average.

8.2.5.4 Nadir: SO_2 Volcanic scenario - June 2011

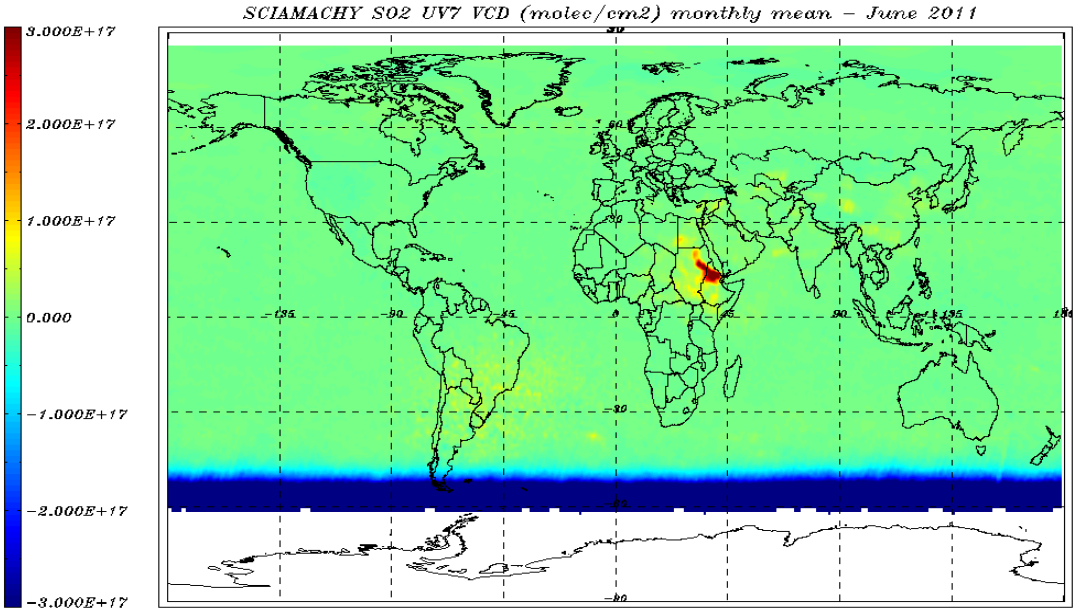


Figure 8.23: SO_2 VCD (molec/cm^2) world map for 01 – 30 June 2011 – monthly average.

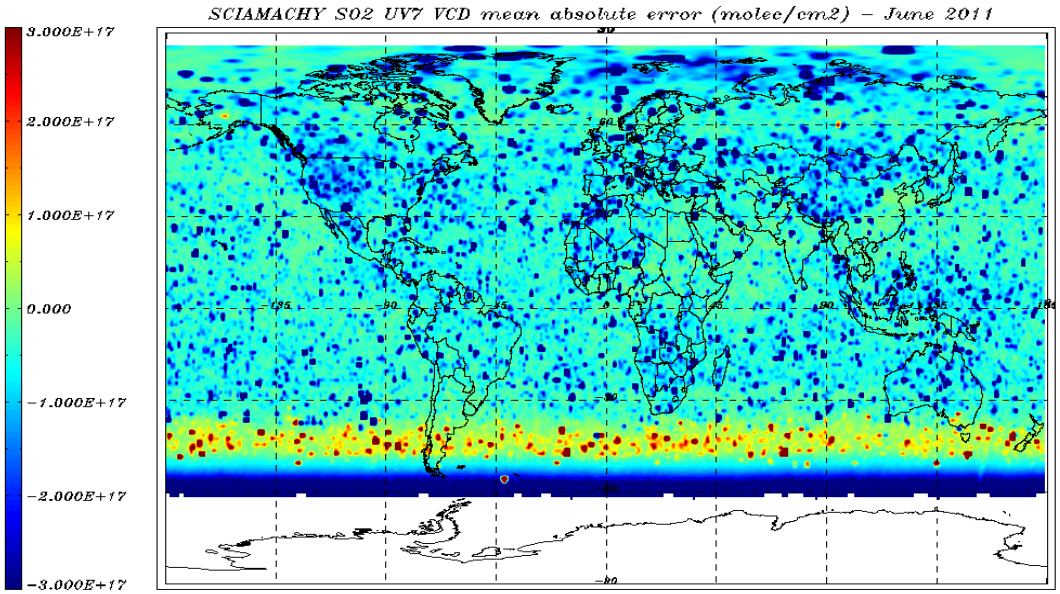


Figure 8.24: SO_2 VCD error (molec/cm^2) for 01 – 30 June 2011 – monthly average.

8.2.6 Nadir: OClO consistency checking

The polar maps of Nadir OClO slant column density (SCD) values averaged over one month are generated from the SCI_OL__2P Nadir products version 5.01.
Figure 8.25 and Figure 8.27 show the monthly SCD values for May and June 2011 over the Northern and the Southern Hemisphere respectively. Figure 8.26 and Figure 8.28 show the corresponding SCD absolute errors for the monthly average plots.

Computation of VCD is difficult for the rapid photochemistry of OClO. The vertical column given in the product does not contain any correction for photochemical effects and should thus not be used as given.

Significant amounts of OClO are expected only in the activated polar vortex. OClO values measured in the ascending node (the satellite moving northwards) introduce artefacts in the plots (i.e. spurious high OClO values in the summer hemisphere in the absence of chlorine activation) and have been filtered out from the monthly maps. The exclusion of these measurements permits to remove spurious high OClO values in the summer hemisphere maps not associated to chlorine activation.

Please note that these plots are preliminary results after the implementation of the new processor version and are still under review.

8.2.6.1 Nadir: SCD OClO maps May 2011

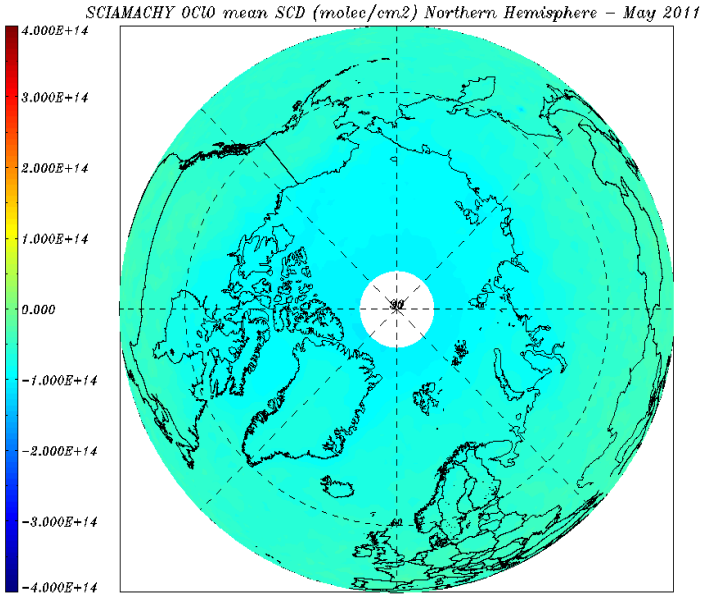


Figure 8.25: OClO SCD (molec/cm^2) for 01 – 31 May 2011 – monthly average over the Northern Hemisphere.

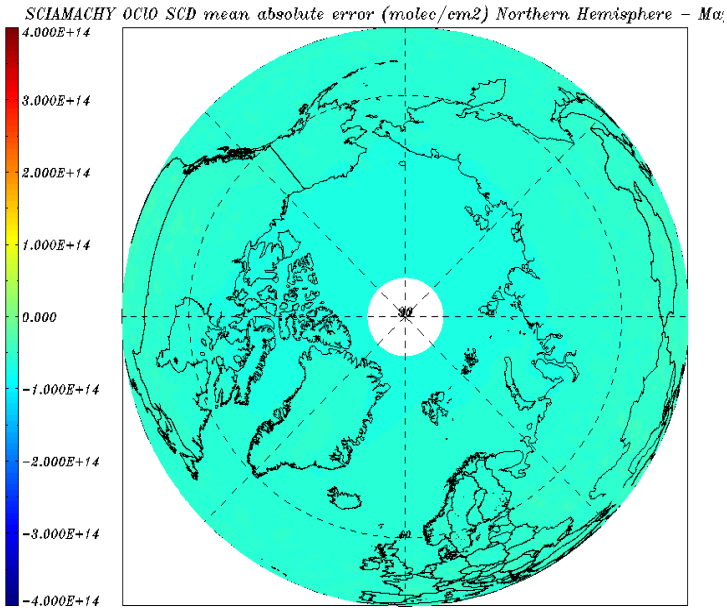


Figure 8.26: OClO SCD error (molec/cm^2) for 01 – 31 May 2011- monthly average over the Northern Hemisphere.

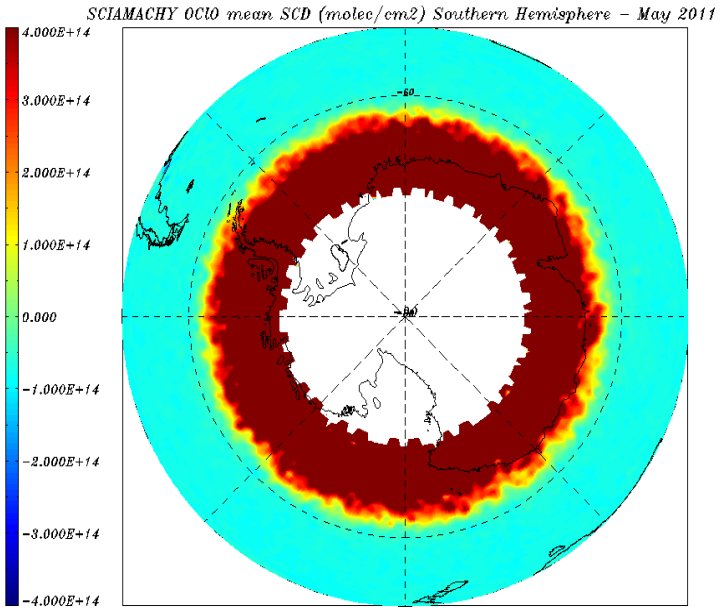


Figure 8.27: OClO SCD (molec/cm^2) for 01 – 31 May 2011 – monthly average over the Southern Hemisphere.

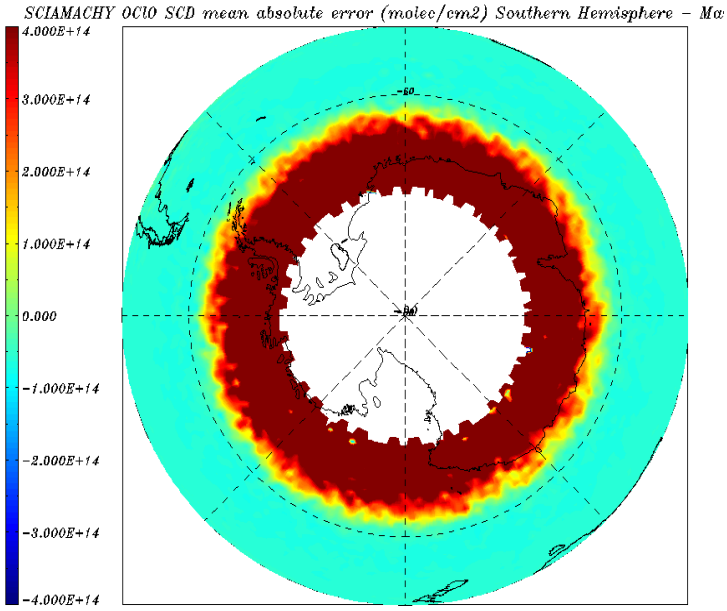


Figure 8.28: OClO SCD error (molec/cm^2) for 01 – 31 May 2011- monthly average over the Southern Hemisphere.

8.2.6.2 Nadir: SCD OClO maps June 2011

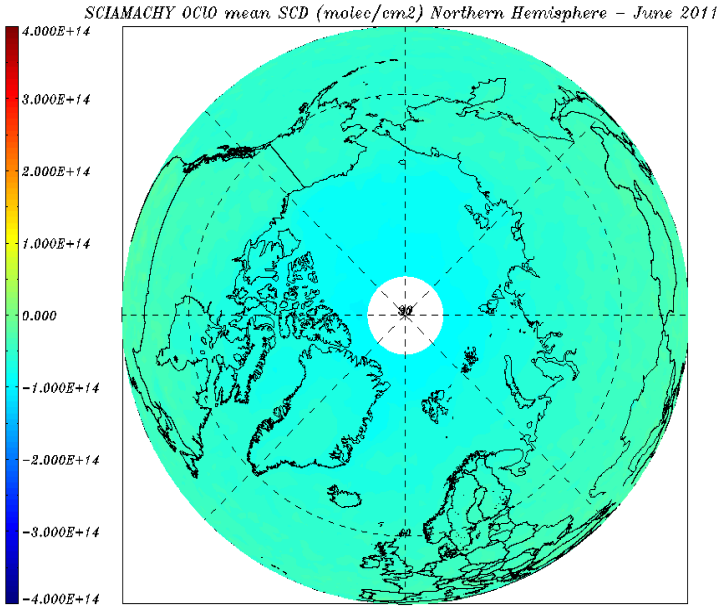


Figure 8.29: OClO SCD (molec/cm2) for 01 – 30 June 2011 – monthly average over the Northern Hemisphere.

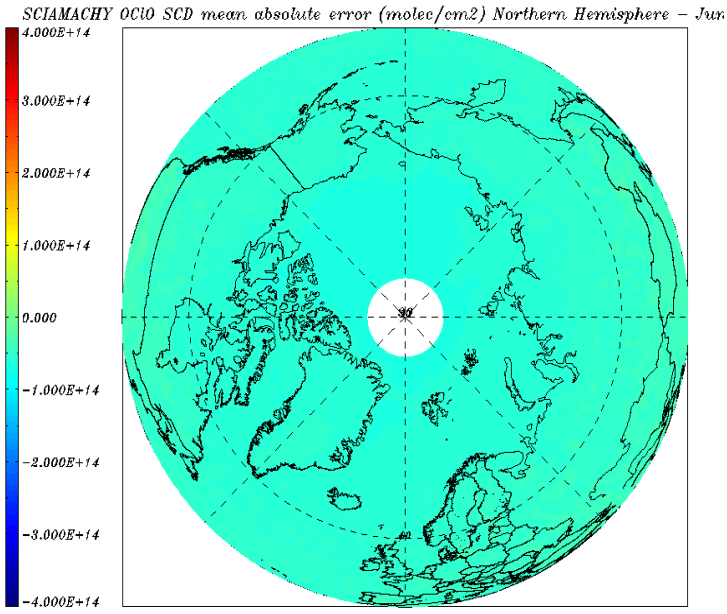


Figure 8.30: OClO SCD error (molec/cm^2) for 01 – 30 June 2011- monthly average over the Northern Hemisphere.

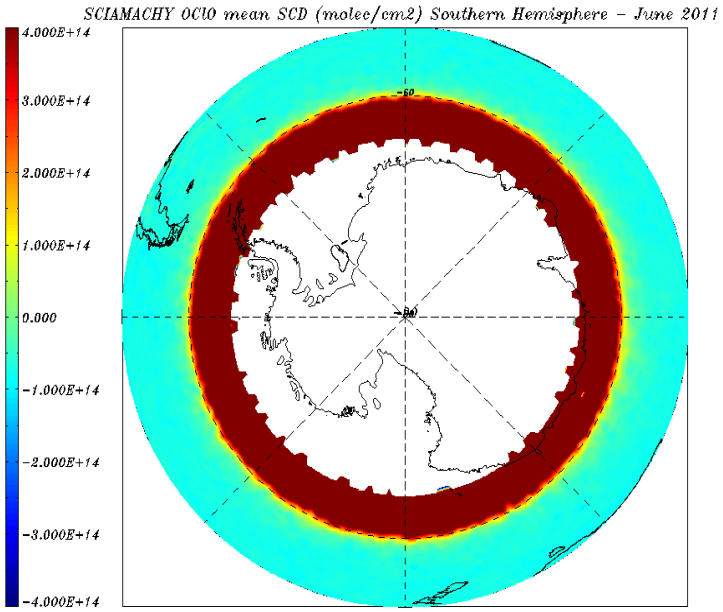


Figure 8.31: OClO SCD (molec/cm^2) for 01 – 30 June 2011 – monthly average over the Southern Hemisphere.

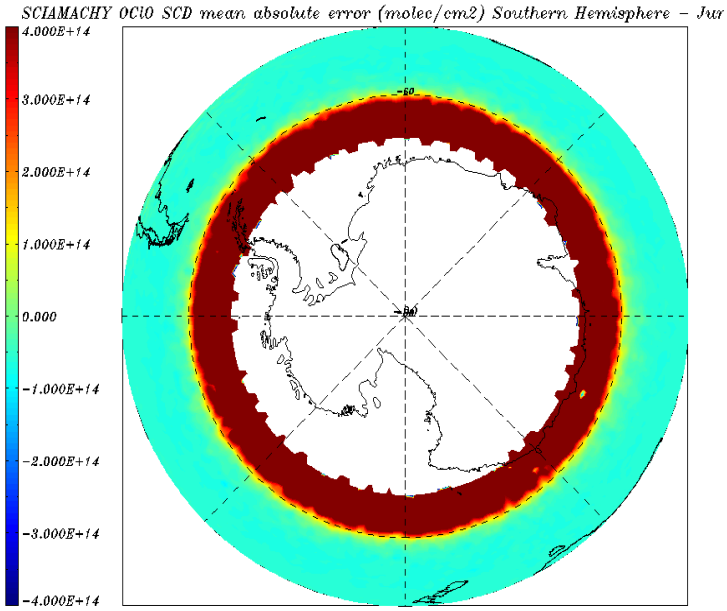


Figure 8.32: OClO SCD error (molec/cm^2) for 01 – 30 June 2011- monthly average over the Southern Hemisphere.

8.2.7 Nadir: CO consistency checking

Due to erroneous retrieval settings in the operational software, the CO column densities from Level 2 version 5.01 products are not reported in the bi-monthly report. Users are recommended not to use the CO data set.

8.2.8 Limb: Ozone profile averages

This paragraph reports on the monitoring of SCIAMACHY limb profiles on a monthly basis, showing the results for Ozone limb profiles binned for two tangent height regions.

Starting with processor version 5.01, a new limb retrieval grid of 27 tangent altitudes has been adopted instead of the 19 values grid used by processor 3.01. As a consequence, the limb profile average plots in this section use different altitude bins with different thickness according to the new product's configuration for limb measurements.

In particular, for the O_3 limb VMR profile extracted from Level 2 products version 5.01, the average plots are reported for the following two tangent height bins

- 22.75 – 24.5 km
- 36.75 – 38.5 km.

The data of the first half of each month (calendar days 1 - 15) and the second half (calendar days 16 - 31) are averaged for selected tangent heights into geo-location bins of 10 degrees longitude and 5 degrees latitude. The binning algorithm uses a single longitude and latitude value for the entire profile, being the value for the middle of the integration time as reported in the Geo-location Limb Dataset. The corresponding error is averaged as well.
The world maps of the averaged Ozone values show comparably low errors over the SAA region, which is not as expected. Investigation showed that the low SAA errors result from irregular conditions of the limb retrieval in that region.
Figures from 8.33 to 8.36 show the results for the months of May and June 2011 and for the two different tangent height regions.

8.2.8.1 Ozone limb profiles May 2011

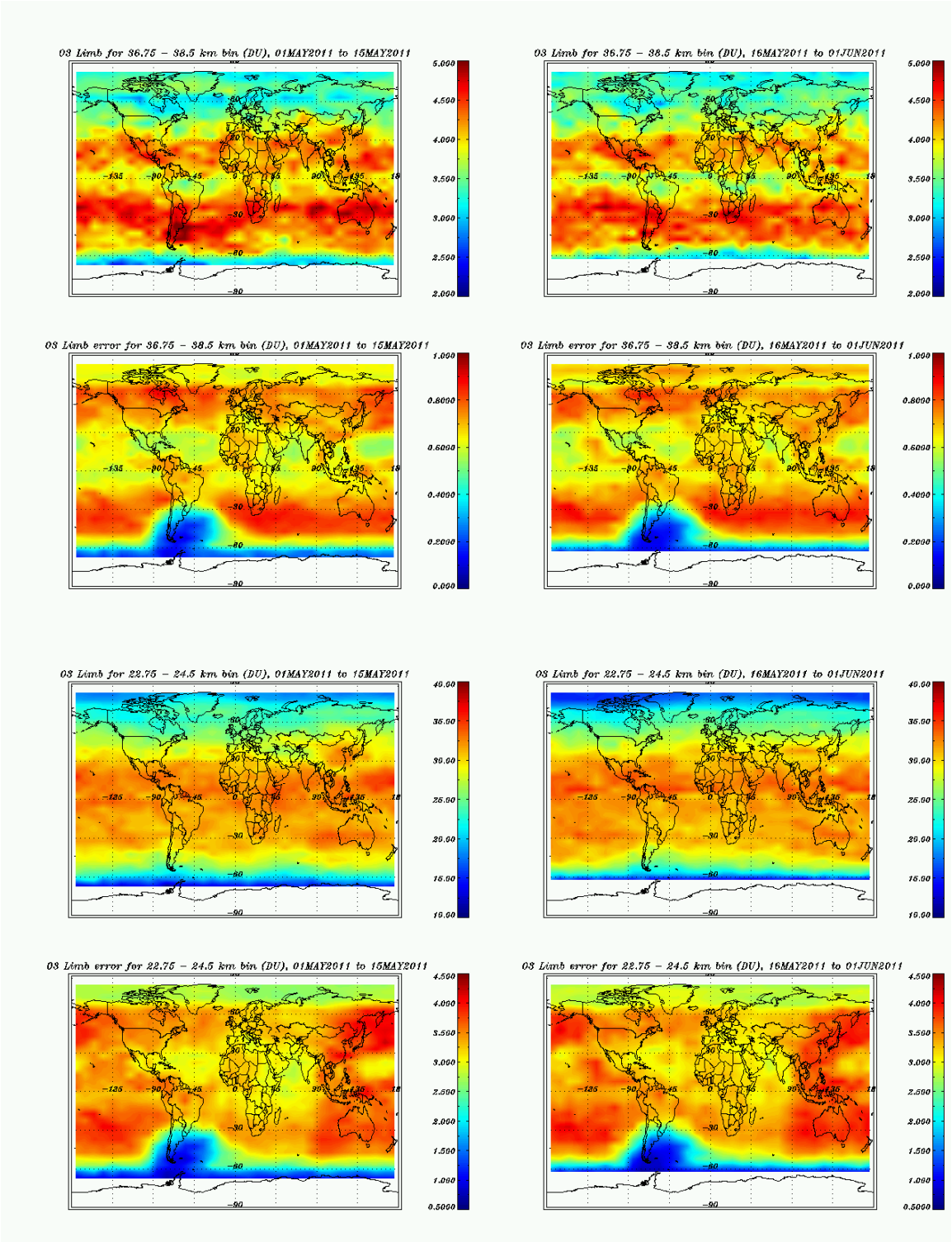


Figure 8.33: Limb Ozone profiles, binned over 22.75 – 24.5 km, May 2011.

Figure 8.34: Limb Ozone profiles, binned over 36.75 – 38.5 km, May 2011.

8.2.8.2 Ozone limb profiles June 2011

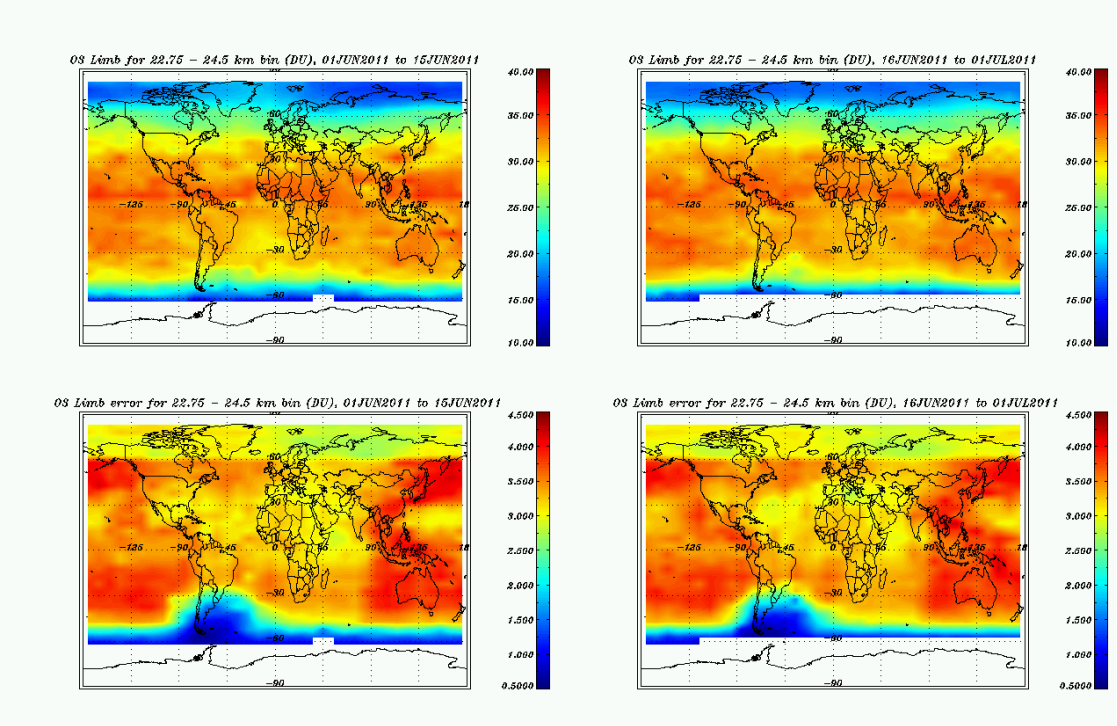


Figure 8.35: Limb Ozone profiles binned over 22.75 – 24.5 km, June 2011.

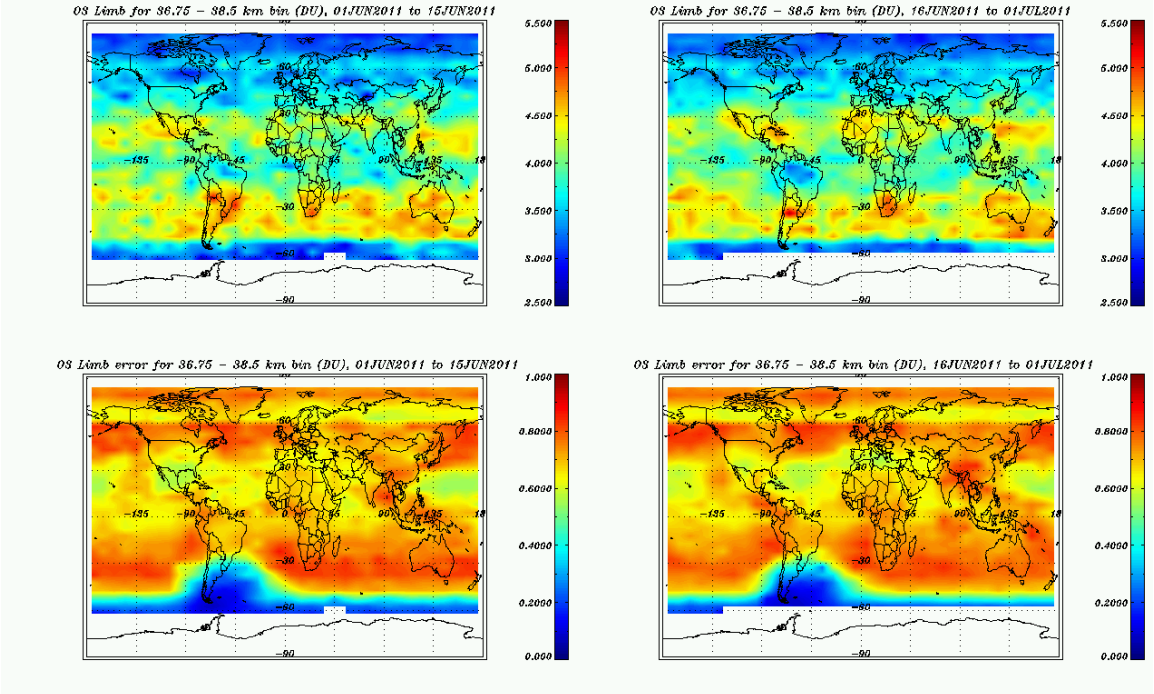


Figure 8.36: Limb Ozone profiles binned over 36.75 – 38.5 km, June 2011.

8.2.9 Limb: NO_2 profile averages

Analogous as for the limb Ozone profiles monthly averages for NO_2 limb averages were generated. For the new Level 2 products version 5.01, the tangent height region chosen is:

- 24.5-26.25 km.

As for the ozone averages the data of the first half of each month (calendar days 1 - 15) and the second half (calendar days 16 - 31) are averaged for selected tangent heights into geo-location bins of 10 degrees longitude and 5 degrees latitude. The binning algorithm used is the same as the described in 8.2.8. The corresponding error is averaged as well.
Figures 8.37 and 8.38 show the results for the months of May and June 2011 respectively.

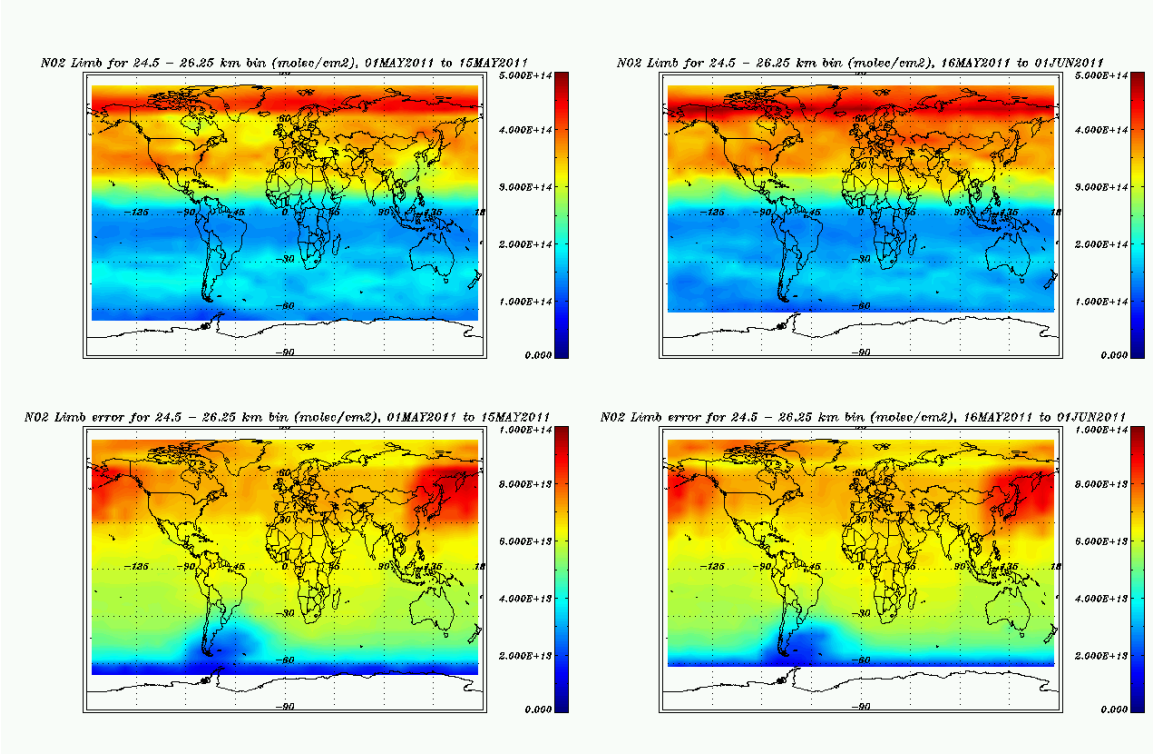


Figure 8.37: Limb NO_2 profiles binned over 24.5 – 26.25 km, May 2011.

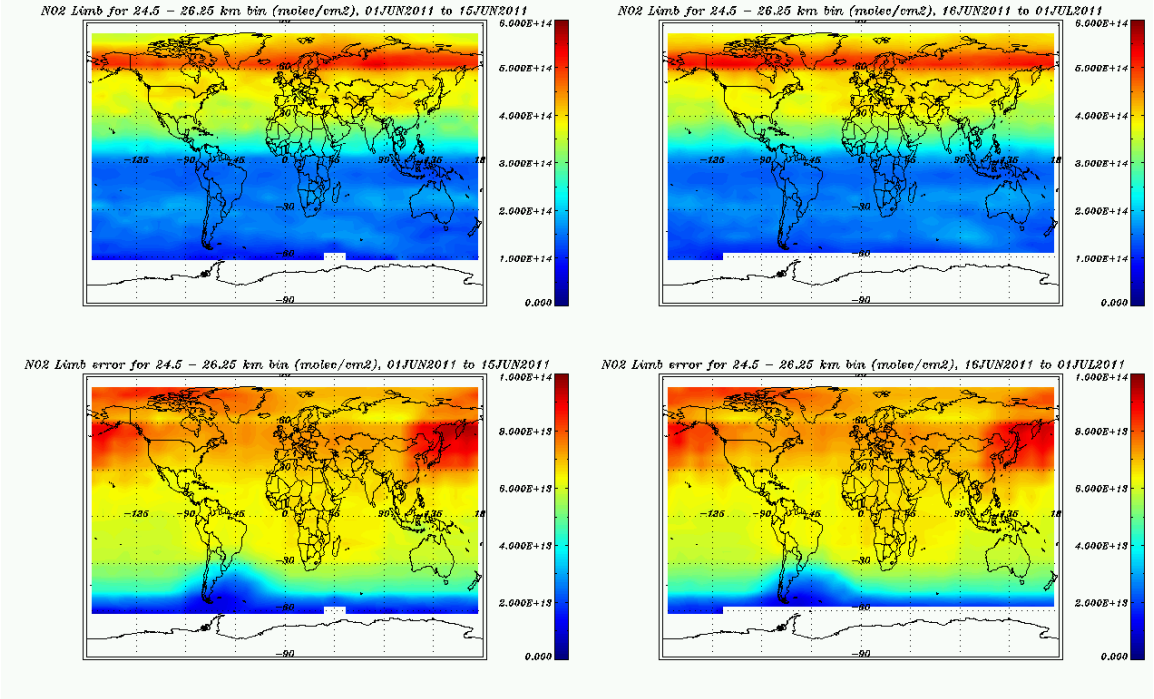


Figure 8.38: Limb NO_2 profiles binned over 24.5 – 26.25 km, June 2011.

8.2.10 Limb: BrO profile averages

Analogous as for the limb O_3 and NO_2 profiles, monthly averages of BrO limb profiles were generated. The tangent height region chosen is:

- 24.5-26.25 km.

As for the ozone averages, data of the first half of each month (calendar days 1 - 15) and the second half (calendar days 16 - 31) are averaged for selected tangent heights into geo-location bins of 10 degrees longitude and 5 degrees latitude. The binning algorithm used is the same as the described in Section 8.2.8. The corresponding error is averaged as well.

Figure 8.39 and Figure 8.40 show the results for the months of May and June 2011 respectively.

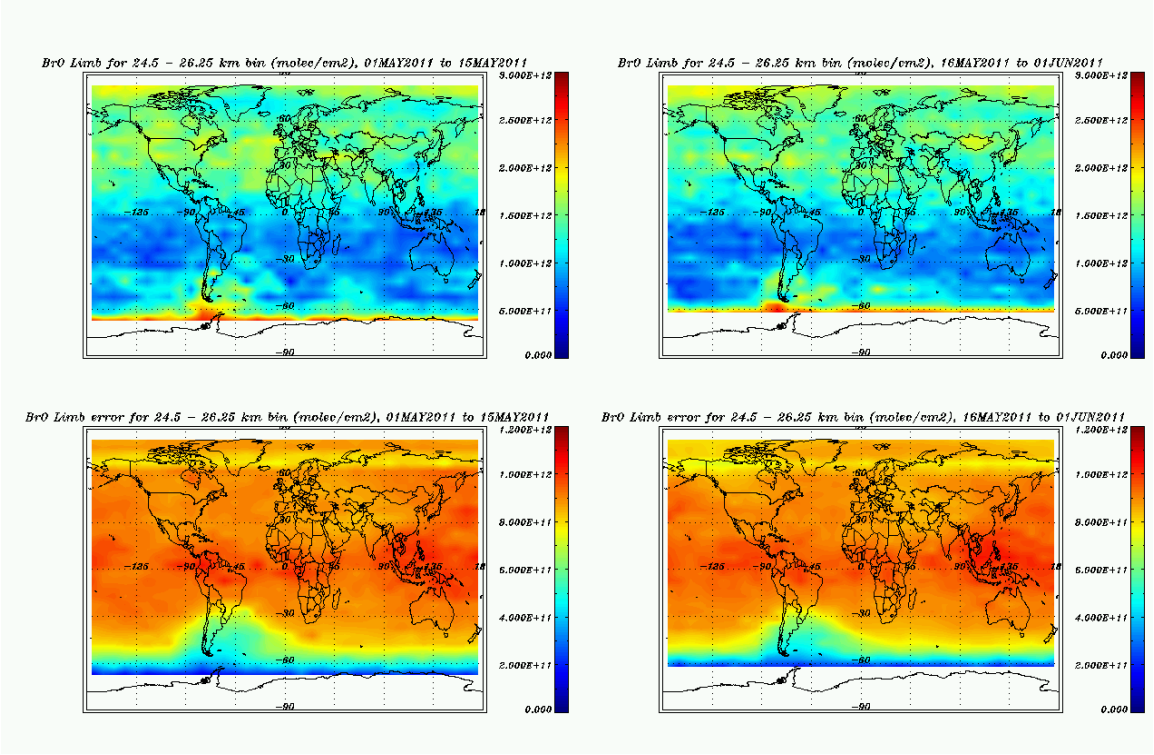


Figure 8.39: Limb BrO profiles binned over 24.5 – 26.25 km, May 2011.

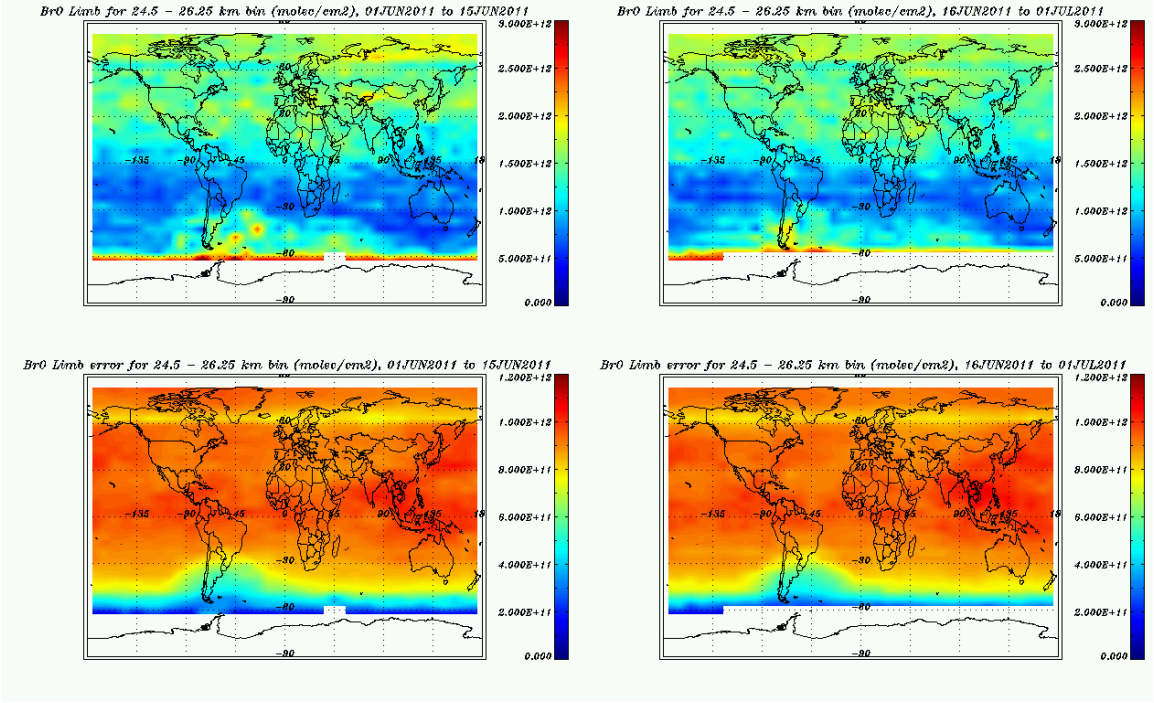


Figure 8.40: Limb BrO profiles binned over 24.5 – 26.25 km, June 2011.

9 VALIDATION ACTIVITIES AND RESULTS

Validation activities of products from re-processing with Level 1b IPF 7.03 and Level 2 off-line processor 5.01 are on-going. A first validation meeting organised by SCIAVALIG took place on 06/07 September 2010. While most of the new and updated geophysical parameters retrieved show very good quality, the retrieval of CO and SO_2 has resulted unreliable in their current implementation. As a consequence the Level 2 reprocessing has been interrupted.

The Product Quality Disclaimers, describing data quality and known issues, will be soon updated with the results from the validation activity. It is recommended users to not use the SO_2 and CO data sets, also with BrO data for year 2002, due to low quality.

Validation was done on the basis of the SCIAMACHY validation data set and the forward processed data. The data set covers around 1900 selected orbits identified by the core validation teams for the complete mission until 2010.

The quality of the SCI_OL__2PU data re-processed with off-line processor version 5.01 has been checked and can be viewed via the Level 2 daily reports that are available at http://earth.eo.esa.int/pcs/envisat/sciamachy/reports/daily/Level_2/

Validation of products from the previous re-processing campaign (Level 1 IPF 6.03 and Level 2 off-line processor 3.01) was performed by the SCIAMACHY Validation and Interpretation Group (SCIAVALIG). Results are published at

http://www.sciamachy.org/validation/documentation/technotes/SCIAVALIG/Summary_operational_product_quality_20080326.pdf