MERIS Cyclic Report 47th

17th April 2006 – 22nd May 2006
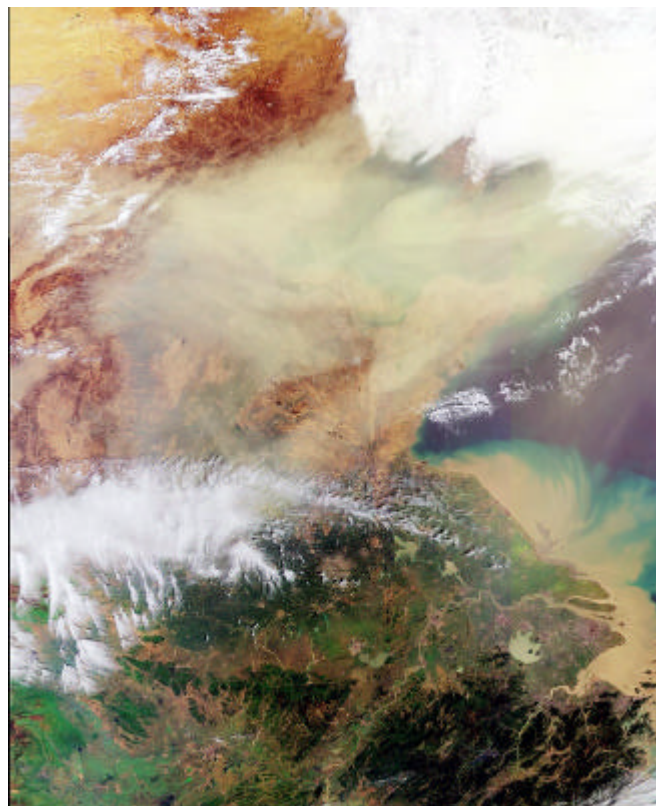
17 April 2006 – Dust Storm over Beijing

A P P R O V A L

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T A B L E O F C O N T E N T S

8   **FIRST 2003 MERIS ARCHIVE REPROCESSING** **16**

9   **SECOND 2005 MERIS ARCHIVE REPROCESSING** **16**

10   **MERIS PROCESSOR EVOLUTION** **16**

11   **VALIDATION ACTIVITIES AND RESULTS** **17**

12   **WATER VAPOUR AND BROWSE MAPS** **17**

13   **HOW TO GET MERIS DATA** **17**

14   **GENERAL INFORMATION** **17**

T A B L E   O F   I L L U S T R A T I O N S

1 INTRODUCTION

The MERIS Cyclic Report is distributed by ESRIN-PCF (Product Control Facility) to keep the MERIS Community informed of any modification regarding the processor, updates of auxiliary products, anomalies of the instrument behaviour, data acquisition and processing, and finally the status of the calibration, validation, and quality control activities.

The Cyclic Report collects the inputs coming from different groups involved in MERIS data exploitation:

- ESRIN- Product Control Facility (PCF)
- Quality Working Group (QWG)
- MERIS/AATSR validation team (MAVT)
- Brockmann Consult (BC)
- ACRI-st
- Laboratoire d'Océanographie de Villefranche (LOV)
- Centre National d'Études Spatiales (CNES)
- Frei Universitat Berlin (FUB)
- Laboratoire Interdisciplinaire en Sciences de l'Environnement (LISE)

The main objective of the Cyclic Report is to provide the users community with useful information regarding the instrument performances, the data production chain, the results of calibration activities and validation campaigns, at the end of each ENVISAT cycle, which represents 501 orbits, about 35 days.

1.1 Acronyms and abbreviations

ADF	Auxiliary Data File
ADS	Auxiliary Data Server
ARF	Archiving Facility (PDS)
CNES	Centre National d'Études Spatiales
CTI	Configuration Table Interface
CR	Cyclic Report
DAC	Diffuser Ageing Calibration
DMOP	Detailed Mission Operation Plan
DOY	Day Of Year
DS	Data Server
DSD	Data Set Descriptor
EDAC	Error Detection And Correction
FR	Full Resolution
FUB	Freie Universitat Berlin
GS	Ground Segment
IAT	Interactive Analysis Tool
IDL	Interactive Data Language
IECF	Instrument Engineering and Calibration Facilities
IPF	Instrument Processing Facilities (PDS)

INV	Inventory Facilities (PDS)
JRC	Joint Research Centre
LAN	Local Area Network
LISE	Laboratoire Interdisciplinaire en Sciences de l'Environnement
LOV	Laboratoire d'Océanographie de Villefranche-sur-mer
MERIS	Medium Resolution Image Spectrometer
MPH	Main Product Header
OP	Operational Phase of ENVISAT
OCL	Offset Control Loop
PAC	Processing and Archiving Centre (PDS)
PDCC	Payload Data Control Centre (PDS)
PDHS	Payload Data Handling Station (PDS)
PDS	Payload Data Segment
PEP	Payload Exploitation Plan
QC	Quality Control
QWG	Quality Control Working Group
QUARC	Quality Analysis and Reporting Computer
RGC	Radiometric Gain Calibration
RR	Reduced Resolution
SEU	Single Event Upset
SPH	Specific Product Header
SQADS	Summary Quality ADS
WV1	Wavelength type 1 calibration
WV2	Wavelength type 2 calibration

2   SUMMARY

Cycle #47 starts on the 17th of April 2006 and stops on the 22nd of May 2006.

- No auxiliary files were disseminated during the reporting period.
- Three types of routine calibrations have been successfully executed in the reporting period
- No Instrument unavailability occurred during the reporting period.
- Two data unavailabilities have occurred during the reporting period.

Details about the start and stop of the cycle can be found in the table below.

Cycle number	47
Start time	17 April 2006, 21:59:29
Stop time	22 May 2006, 21:59:29
Start orbit	21598
Stop orbit	22098

Table 1 – Cycle Characteristics

3   PROCESSOR VERSION AND PROCESSING CONFIGURATION

3.1   MERIS Processor Release

During the reporting period, the IPF has been upgraded from version 4.10 to 5.02 at the MERIS processing centres (stations and PACs). Two different configurations have been used as described in the table below:

IPF Version	Validity	Reference Documents
4.10	→ 2006/05/08 08:00 UTC Orbit # 21889	1. ENVISAT Product Specification [Iss_4_Rev_A / PO-RS-MDA-GS-2009] 2. MERIS Input/Output Data Definition [Iss_6_Rev_1a_010914 / PO-TN-MEL-Gs-0003] 3. MERIS Level 1b Detailed Processing Model [Iss_6_Rev_1a_010914 / PO-TN-MEL-GS-0002] 4. MERIS Level 2b Detailed Processing Model [Iss_6_Rev_1a_010914 / PO-TN-MEL-GS-0006]

Table 2 – MERIS processor parameters – version 4.10

IPF Version	Validity	Reference Documents
5.02	8th May 2006 08:00 UTC Orbit # 21890 ➜	1. ENVISAT Product Specification [Iss_5_Rev_A] 2. MERIS Input/Output Data Definition [Iss_7_Rev_3a] 3. MERIS Level 1b Detailed Processing Model [Iss_7_Rev_0a] 4. MERIS Level 2b Detailed Processing Model [Iss_7_Rev_2a]

Table 3 – MERIS processor parameters – version 5.02

3.2 Auxiliary data files (ADF)

Product description	Product name	Comment
Level 1 aux files		
Instrument Characterization Data	MER_INS	No changes
Processing Level 1 Control Parameters data	MER_CP1	No changes
Radiometric Calibration data	MER_RAC	No changes
Digital Roughness Model	MER_DRM	No changes
Digital Elevation Model	AUX_DEM	No changes
Land Surface Map	AUX_LSM	No changes
Attitude data file	AUX_ATT	No changes
Level 2 aux files		
Aerosol Climatology data	MER_AER	No changes
Atmosphere Parameter data	MER_ATP	No changes
Cloud Measurement Parameters data	MER_CMP	No changes
Processing Level-2 Control Parameters data	MER_CP2	No changes
Land Aerosols Parameters data	MER_LAP	No changes
Land Vegetation Index parameters data	MER_LVI	No changes
Ocean Aerosols Parameters data	MER_OAP	No changes
Ocean I parameters data	MER_OC1	No changes
Ocean II parameters data	MER_OC2	No changes
Water Vapour Parameters	MER_WVP	No changes

Table 4 – Auxiliary Data Files in use for the cycle #47

Note: The other files not included into the list change every time (ECMWF).

3.3 Level 1/Level 2 Configuration (SciHiO2)

The current operational ADF files, used in the processing from Level 0 data to Level 1b or Level 2 products, are listed in the following tables. Note that no new auxiliary files were disseminated during Cycle #47.

- Level 1 ADF configuration:

Product name	Start Validity
MER_INS_AXVIEC20030620_120000_20020321_193100_20121008_190821	21/03/2002
MER_CP1_AXVIEC20030620_120000_20020429_040000_20120920_173421	29/04/2002
MER_RAC_AXVIEC20030620_120000_20021224_121445_20121224_121445	24/12/2003
MER_DRM_AXVIEC20020122_083343_20020101_000000_20200101_000000	01/01/2002
AUX_DEM_AXVIEC20031201_000000_20031201_000000_20200101_000000	01/12/2003
AUX_LSM_AXVIEC20020123_141228_20020101_000000_20200101_000000	01/01/2002
AUX_ATT_AXVIEC20020924_131534_20020703_120000_20781231_235959	03/07/2002

Table 5 – MERIS Level 1 Auxiliary Data Files

- Level 2 ADF configuration:

Product name	Start Validity
MER_AER_AXVIEC20030620_120000_20020321_193100_20200101_000000	21/03/2002
MER_ATP_AXVIEC20030620_120000_20021224_121445_20121224_121445	24/12/2002
MER_CMP_AXVIEC20030620_120000_20021224_121445_20120321_193100	24/12/2002
MER_CP2_AXVIEC20031120_104149_20021224_121445_20121224_121445	24/12/2002
MER_LAP_AXVIEC20030715_151450_20020321_193100_20120321_193100	21/03/2002
MER_LVI_AXVIEC20030620_120000_20020321_193100_20130224_164916	21/03/2002
MER_OAP_AXVIEC20030620_120001_20020321_193100_20120321_193100	21/03/2002
MER_OC1_AXVIEC20030620_120000_20020321_193100_20120321_193100	21/03/2002
MER_OC2_AXVIEC20030620_120000_20020321_193100_20120624_174339	21/03/2002
MER_WVP_AXVIEC20030620_120000_20020321_193100_20120321_193100	21/03/2002

Table 6 – MERIS Level 1 Auxiliary Data Files

3.4 Configuration Table Interface (CTI)

No new CTI disseminated during cycle #47.

3.5   Level 1/ Level 2 RR or FR products

During cycle #47 several format changes or algorithm modifications regarding MERIS RR and FR products were implemented during the operational processor upgrade from v4.10 to v5.02. The data changes decided within the Data Quality Working Group are listed below:

- New Chlorophyll 1 polynomial characterisation from LOV (Laboratoire d'Océanologie de Villefranche – France)
- Chlorophyll 1 validity range set to [0.01,30.], no PCD raise when out of range
- Troposphere-free MAR99 replaces BLUE-⟨=1.5 (from previous BOMEM runs)
- Gothic R Look Up Table from LOV (Laboratoire d'Océanologie de Villefranche – France)
- Chlorophyll 2 conversion factors from GKSS (revised with latest Neural Network delivery)
- Yellow Substance coding offset and scaling factor changes (linear to log scale, same range)
- Chlorophyll coding range changes([-2,2] in log10 scale instead of [-3,3] previously)
- Whitecaps threshold set to 10 m.s-1
- New Case 2 Neural Network from GKSS (with and without linear reflectances as input)
- White scatterer threshold set to 4.8
- MTCI threshold on B13-B8 difference set to 0.05, on B10-B8 to 1e-6 (numerical purpose only), ceiling for B8 set to 0.3, floor for B9 to 0.1
- Preliminary version of LARS Look Up Tables from Hygeos

For further details concerning the changes, please refer to the documentation available at:
http://earth.esa.int/pcs/envisat/meris/documentation/MERIS_IPF_evolution.pdf

4 PDS STATUS

The statistics resulting from the query to the PDS inventory facility (INV) for the MERIS products availability are presented in the following paragraphs.

4.1 MERIS Level 0 products availability

The table below shows the statistics regarding the RR L0 availability (compared to the planned production).

Week	MER_RR__0P %	
	Inventoried	Missing
From 17/04 to 24/04	100	0
From 24/04 to 01/05	100	0
From 01/05 to 08/05	97.476	2.53
From 08/05 to 15/05	99.01	0.99
From 15/05 to 22/05	100	0

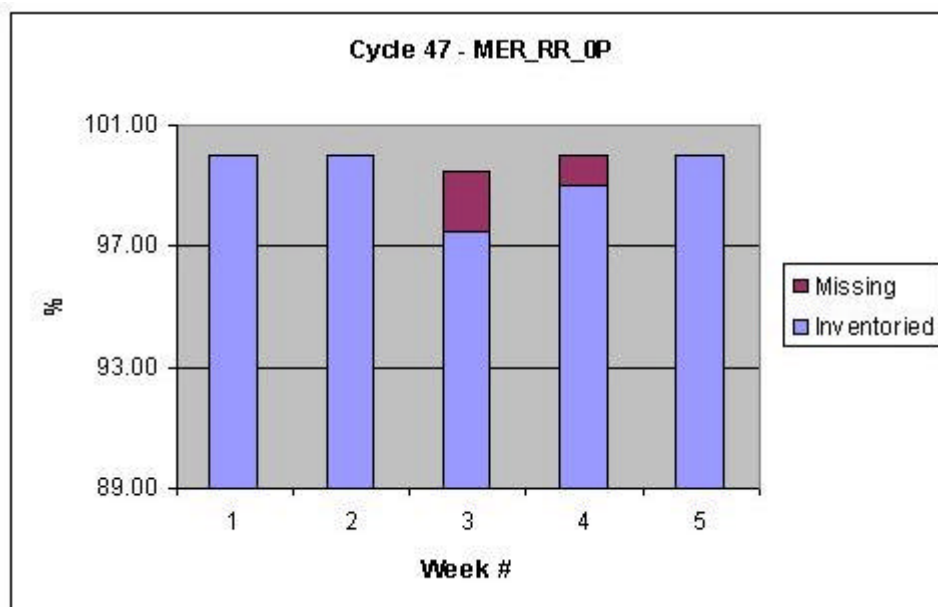**Table 7 – Reduced Resolution Level 0 products availability**

Figure 1 - MER_RR__0P generated/missing by the ground segment during cycle #47

The number of RR Level 0 products acquired during the cycle is about 99.29 % of the planned ones.

The table below shows the statistics regarding the FR L0 availability (compared to the planned production).

Week	MER_FR__0P %	
	Inventoried	Missing
From 17/04 to 24/04	99.78	0.21
From 24/04 to 01/05	99.30	0.70
From 01/05 to 08/05	97.87	2.13
From 08/05 to 15/05	99.90	0.10
From 15/05 to 22/05	91.43	8.57

Table 8 – Full Resolution Level 0 products availability
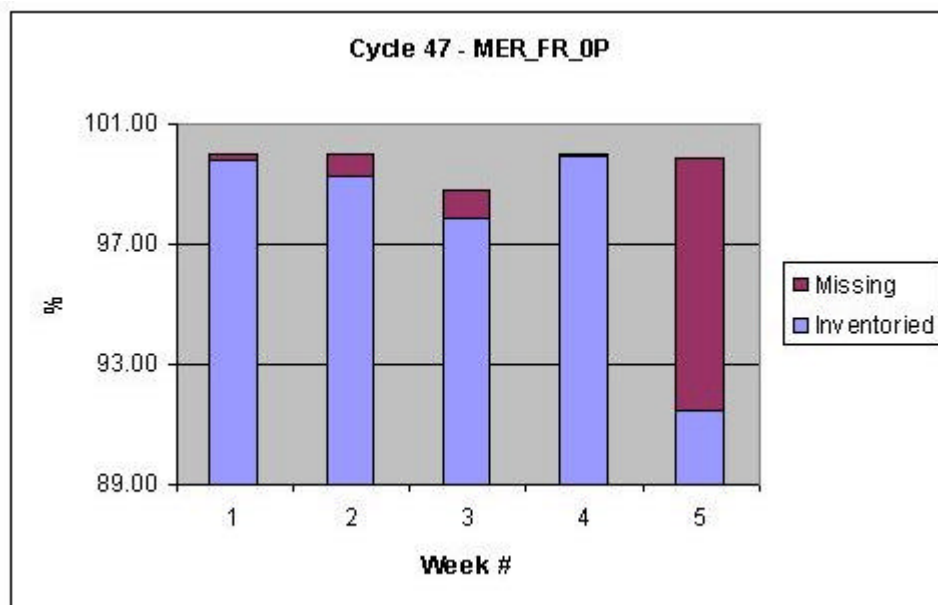
Figure 2 - MER_FR__0P generated/missing by the ground segment during cycle #46

The number of FR Level 0 products generated during the cycle is about 97.66 % of the planned ones.

4.2 MERIS FR acquisitions

The pictures below show the MERIS Full Resolution global coverage for the reporting period. As specified for this type of MERIS products, all lands and coastal areas are covered by MERIS FR acquisitions. Due to technical issues, some pictures are not available.
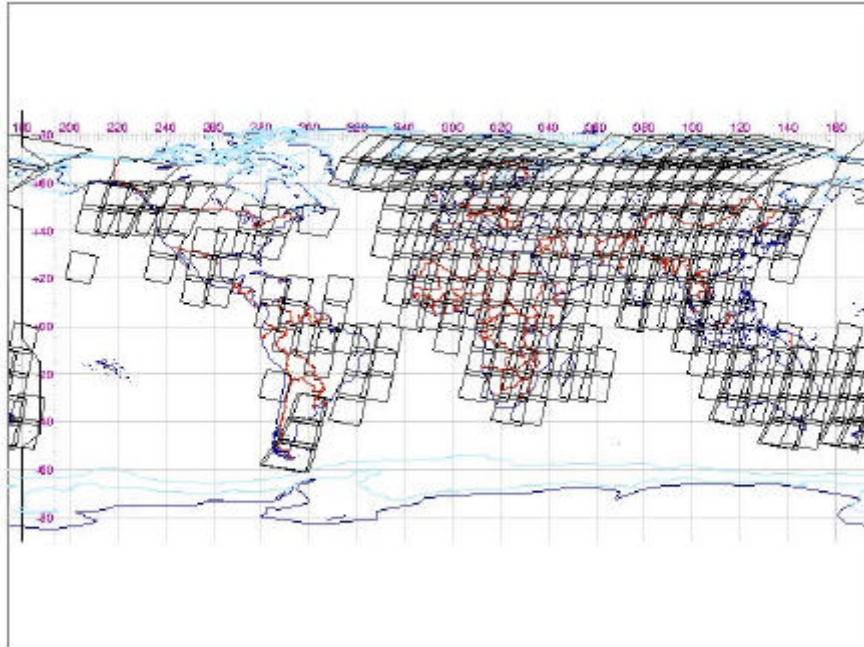
Figure 3 - MERIS Full Resolution Level 0 acquisitions - Part #1 – 18/04/2006 – 22/04/2006

N/A

Figure 4 - MERIS Full Resolution Level 0 acquisitions - Part #2 – 23/04/2006 – 27/04/2006

N/A

Figure 5 - MERIS Full Resolution Level 0 acquisitions - Part #3 – 28/04/2006 – 02/05/2006

N/A

Figure 6 - MERIS Full Resolution Level 0 acquisitions - Part #4 – 03/05/2006 – 07/05/2006

N/A

Figure 7 - MERIS Full Resolution Level 0 acquisitions - Part #5 – 08/05/2006 – 12/05/2006

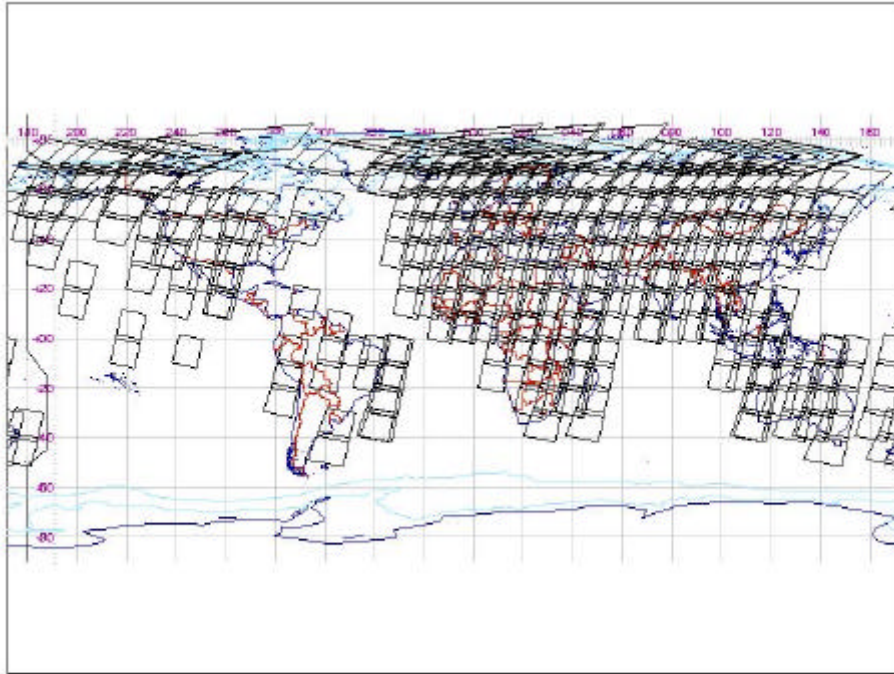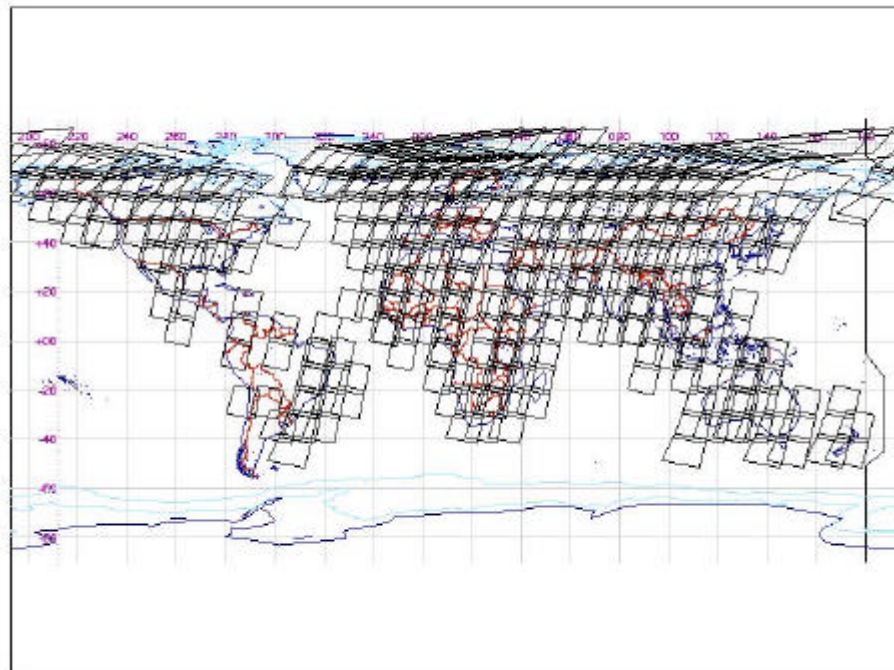**Figure 8 - MERIS Full Resolution Level 0 acquisitions - Part #6 – 13/05/2006 – 17/05/2006**

Figure 9 - MERIS Full Resolution Level 0 acquisitions - Part #7 – 18/05006 – 22/05/2006

4.3 MER_CA__0P Products

During Cycle #47, three RGC radiometric gain routine calibrations have been planned during one orbit each, on the 22nd of April in orbit 21668 and on the 06th and 20th of May in orbits 21868 and 22068 respectively. In the reporting period, one Diffuser Ageing calibration DAC (two orbits) has been planned on 22nd of April in orbits 21658 and 21659 and one Wavelength type 2 spectral calibration WV2 (four consecutive orbits) on 22nd of April in orbits 21660, 21661, 21662 and 21663.
All the calibrations were successfully executed - The list of calibration files is reported below:

	DAC
	DAC
	RGC
MER_CA__0PNPDK20060422_070446_000001782047_00063_21660_0011.N1	WV2
MER_CA__0PNPDK20060422_084522_000001782047_00064_21661_0012.N1	WV2
MER_CA__0PNPDK20060422_102557_000001792047_00065_21662_0013.N1	WV2
MER_CA__0PNPDK20060422_120632_000001792047_00066_21663_0014.N1	WV2
MER_CA__0PNPDK20060506_194805_000001782047_00271_21868_0031.N1	RGC
	RGC

Information concerning the missing calibration files (one DAC and two RGC) will be published in the next Cyclic report (#48).

5 INSTRUMENT/DATA UNAVAILABILITY

5.1 Instrument Unavailability

No instrument unavailability has been reported during cycle #47.

In the reporting period, 44 EDAC-corrected SEU occurred. The dates, times and geolocation of these events are given in the table below:

Date/Time year.day.hr.mn.sc	Lon.	Lat.
2006.114.10.50.28	15.3297° W	17.7200° S
2006.114.14.13.17	67.0163° W	23.4617° S
2006.114.14.14.16	67.9000° W	26.9434° S
2006.114.16.21.48	97.3243° E	55.8770° S
2006.115.04.44.05	140.2440° W	76.7022° N
2006.115.13.38.00	56.0523° W	10.4337° S
2006.116.00.23.13	32.5424° W	20.6823° S
2006.116.02.02.56	56.9244° W	23.8096° S
2006.116.02.03.09	57.1152° W	23.0420° S
2006.116.07.39.19	75.5218° E	76.9887° N
2006.117.01.33.43	51.0585° W	15.3038° S

2006.117.10.57.25	17.7847° W	21.9563° S
2006.119.13.13.25	50.6198° W	14.9669° S
2006.120.14.27.34	72.4946° W	33.2592° S
2006.121.01.07.50	44.57° W	15.39° S
2006.121.03.52.09	86.51° E	32.52° S
2006.122.13.16.06	49.60° W	4.03° S
2006.123.01.43.20	52.33° W	22.02° S
2006.123.12.47.13	43.87° W	13.75° S
2006.124.01.12.49	45.37° W	18.13° S
2006.124.12.17.08	37.24° W	19.19° S
2006.124.13.56.30	61.36° W	14.81° S
2006.126.00.11.22	31.02° W	11.81° S
2006.126.22.35.52	174.32° W	59.35° N
2006.127.23.08.57	15.86° W	8.92° S
2006.129.01.53.01	53.57° W	28.49° S
2006.130.01.20.01	44.32° W	33.38° S
2006.131.13.38.44	58.31° W	23.11° S
2006.131.19.13.29	48.53° E	38.69° S
2006.132.11.25.12	24.13° W	18.43° S
2006.133.01.26.38	46.61° W	30.34° S
2006.133.14.16.01	67.58° W	22.80° S
2006.135.23.55.28	26.16° W	17.31° S
2006.136.12.46.56	49.75° W	43.11° S
2006.139.12.45.40	44.23° W	18.33° S
2006.139.14.31.52	74.68° W	38.12° S
2006.140.01.10.03	44.72° W	17.86° S
2006.141.01.53.09	99.97° E	68.03° S

Table 9 – EDAC corrected Single Event Upsets

5.2 Data Unavailability

There were two periods of data unavailability reported during cycle #47.

- SDPSS switched unexpectedly into PAUSE mode on DOY 127 (07th of May 2006) at 08:31:36z until next DIR&AVG command at 08:55:04z. PAUSE mode started when ENVISAT Lon. was 102.08° E, Lat. 81.36° N (North of Siberia)
- SDPSS switched unexpectedly into PAUSE mode on DOY 132 (12th of May 2006) at 16:31:36z until next DIR&AVG command at 16:32:08z. PAUSE mode started when ENVISAT Lon. was 103.82° W, Lat. 34.71° S

Note:
MPS update to start DIR&AVG extra-commanding 2min after starting MERIS acquisition, 1 command per 2min, will be effective from 15th of May 20:40z (orbit 21998).

6   CALIBRATION AND INSTRUMENT CHARACTERIZATION

6.1   Calibration

6.1.1   Radiometric calibration

During Cycle #47, three radiometric calibrations (RGC type) were successfully executed on the 22nd of April, 06th and 20th of May. For more details see section 4.3.

6.1.2   Spectral calibration

During Cycle #47, one erbium calibration (WV2 type) was successfully executed on the 22nd of April. For more details see section 4.3.

6.1.3   Geolocation

The accuracy specification for MERIS geolocation is 2000 m, with an operational goal of 150 m.
The 290 m (nadir) bands 2, 5, 8 are used to estimate the absolute geolocation accuracy.
This analysis shows significant improvements since launch, with one major upgrade, which occurred in 2003 DOY (Day of Year) 343. The update of the star tracker has been performed to reduce the systematic offset and improve orientation parameters. Global absolute geolocation error (North and South hemispheres) for the three consecutive periods can be summarized as follow:

- (I)   Initially, after the launch, according to results related to the 2002 period, the geolocation accuracy is in the order of ±135 metres along-track and ±207 metres across-track. The RMS absolute geolocation error stays within the range of **251.24 ± 81** m.
- (II)   The 2003 period is characterised by a degradation of the absolute geolocation accuracy where error is around ±209 metres along-track and ±295 metres across-track. For this period, the RMS absolute geolocation error stays within the range of 368.39 ± 67 m.
- (III)   After the update, 2004 period, MERIS geolocation is achieving the goal of 300 m with accuracy of ± 132 m along-track and ± 165 m across-track. The RMS absolute geolocation error remains within the range of **212 ± 22** m.

When correcting products from the systematic offset (centred results), for 2004 period the RMS absolute geolocation error stays within the range of **166 ± 18** m. The amount of products located on northern hemisphere is much larger than the one from the Southern hemisphere. Comparison between the two sets of results is not trivial. For the 2004 period, this study demonstrated the temporal stability of the absolute geolocation. More results are now needed to confirm this trend.
For more details, refer to the Gael Consultant (Fr) report available on the ESA website:
http://earth.esa.int/pcs/envisat/meris/reports/

6.1.4   VEU Temperature Analysis

During one of the operation modes of MERIS, Stabilization mode, a thermal regulation of VEU (Video Electronic Unit) unit is performed in order to stabilise its temperature to reach full performances and insure a safe transition towards Observation and Calibration modes.
During observation, the VEU Temperature has to remain in the operational acceptance temperature range -10°/+50° in order to meet the image quality requirements. The VEU temperature should be maximum +/- 10°C different from the last radiometric calibration for optimum performance.

During cycle #47 the VEU temperature does not show any anomalous behaviour, being in the nominal operating temperature range over all its nominal functioning.
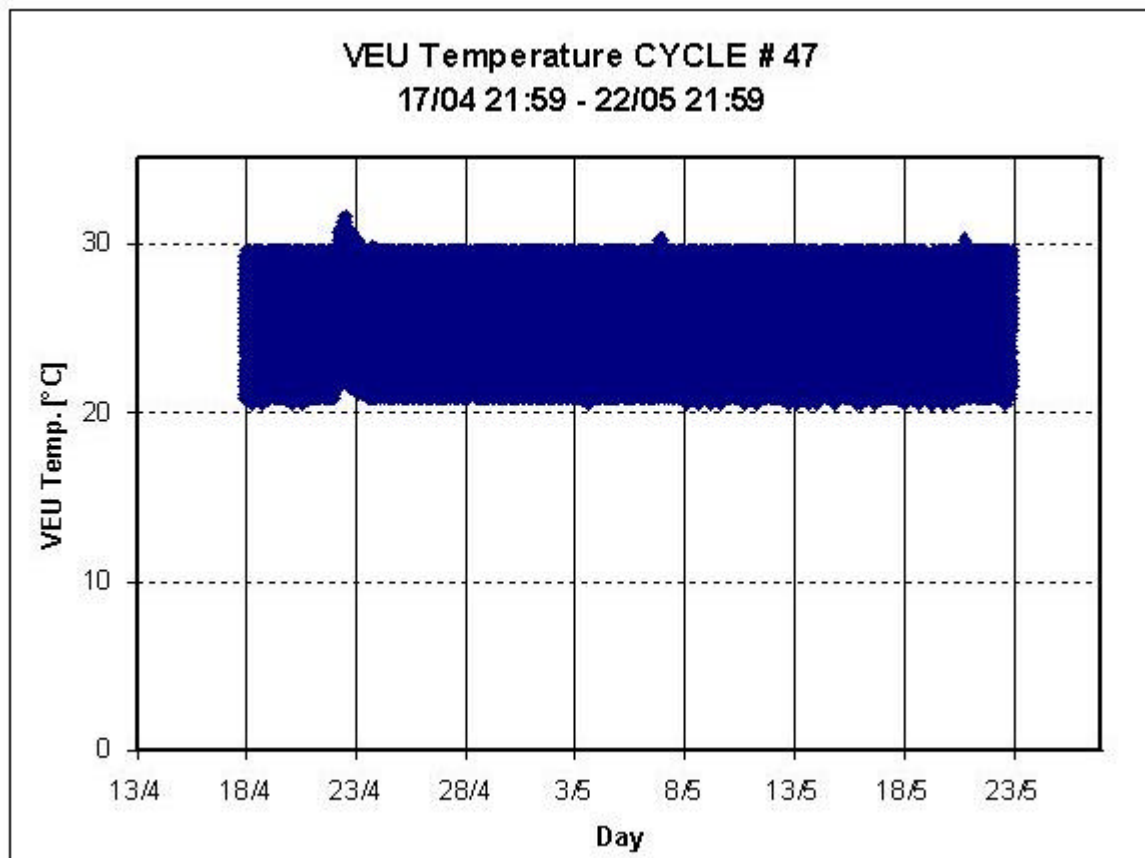.

Figure 10 - VEU Temperature during cycle #47

6.1.5   Vicarious calibration results

For absolute calibration of MERIS by vicarious methods, METRIC2.0 tools are used to perform data extraction and spatial compression from MERIS Level1b products over specified sites following site type specific radiometric and geographic criteria. The child L1b products are ordered systematically on the basis of sites definition and mission analysis. Because the list of sites can be over-dimensioned and vary with season, it has a validity period of 3 months. Each L1b child product is submitted to METRIC with the correct version of auxiliary files MER_INS_AX and MER_CP1_AX used during its generation, and a dedicated resource file which stores all parameters necessary for data filtering (cloud and aerosol screening, distance from coast…). Metric generates one file for each selected site pertaining to the following categories, according to the potential use of the data in the calibration processing: Rayleigh, Glitter, Desert, Snow, and Buoy. Output files have HDF format.
During cycle #24 new overpass tables have been regenerated for all sites of interest updating the relative orbits inside the cycle. The site map is shown in the following picture:
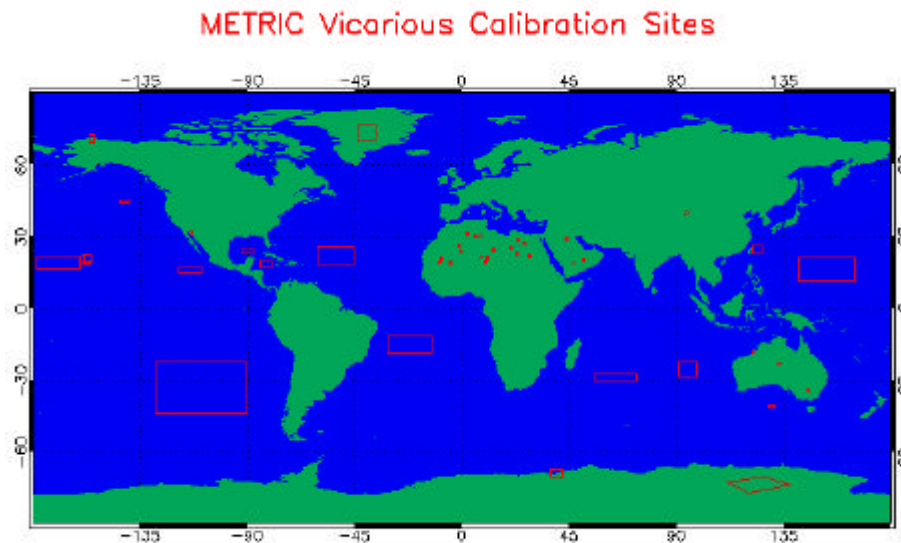
Figure 11 - METRIC calibration site map

Based on the second reprocessing dataset (see section 9), the entire METRIC sites Child products will be generated to be processed with the last version of the METRIC tool (2.0).

This reprocessing started in December 2005 in ACRI premises, and will involve data from ENVISAT launch to present. The METRIC v2.0 tool has been delivered to ESRIN where it will be used in operational mode after the IPF upgrade to the last version of the processing chains (MERISv5.02)

6.2 Instrument Characterization

6.2.1 Instrument degradation

No new results to be shown for cycle #47. For the last updates, refer to Cyclic Report #45 that can be found on the above-mentioned MERIS website (see Section 6.1.3).

6.2.2 Diffuser ageing

No new results to be shown for cycle #47. For the last updates, refer to Cyclic Report #45 that can be found on the above-mentioned MERIS website.

6.2.3 Smile Effect

No new results to be shown for cycle #47. For the last updates, refer to Cyclic Report #23 that can be found on the above-mentioned MERIS website.

6.2.4 Spectral evolution from erbium measurements

No new results to be shown for cycle #47. Please refer to Cyclic Report #23 that can be found on the above-mentioned MERIS website.

7 DATA QUALITY CONTROL

7.1 MERIS products quality status

IPF version 4.10 did not have any impact on the MERIS products quality but on the Level 2 processing time; moreover some minor bugs related to the FR production and specifically to the water vapour product have been fixed (for details see Par. #6.2 of Cyclic Report #32).

7.2 Anomalies and Software Problem Reporting (SPR)

1. Blank records have been identified in some MERIS FR products rejected by visual inspections using the AMALFI system. An Anomaly Report has been opened and the problem is still under investigation.

8 FIRST 2003 MERIS ARCHIVE REPROCESSING

Information concerning the 1st reprocessing of the 2003 MERIS data archive done spring 2004 can be found on the MERIS website:

http://earth.esa.int/pcs/envisat/meris/documentation/First_2003_MERIS_Reprocessing.pdf

The document explains also how to get the reprocessed data.

9 SECOND 2005 MERIS ARCHIVE REPROCESSING

Following the recommendations of the Data Quality Working Group and the Science Advisory Group, improvements to MERIS processing resulted in version 7.4 of the off-line processor MEGS. It is currently being used for a complete reprocessing of the MERIS Reduced Resolution data archive. The corresponding time period extends from June 2002 to June 2005. 2003 and 2004 data will be made available through the MERCI (MERIS Catalogue and Inventory) service by the end of year 2005. For further information see:

http://envisat.esa.int/services/catalogues.html

10 MERIS PROCESSOR EVOLUTION

A detailed description of the MERIS IPF evolution since March 2002 until present, in terms of data format changes and algorithm modifications, can be found on the MERIS website:

http://earth.esa.int/pcs/envisat/meris/documentation/MERIS_IPF_evolution.pdf.

11 VALIDATION ACTIVITIES AND RESULTS

No new results to be presented. Please refer to the previous cyclic reports for further information on the Validation activities.

12 WATER VAPOUR AND BROWSE MAPS

Water Vapour data, retrieved from MER_LRC_2P products, have been used to generate global coverage maps for each day of the cycle. Maps are available on the ESA website:

http://earth.esa.int/pcs/envisat/meris/maps/watervapour/

MERIS tracks for each day of the cycle have been plotted using Browse products. Maps are available on the ESA website:

http://earth.esa.int/pcs/envisat/meris/maps/browse/

13 HOW TO GET MERIS DATA

Information concerning the different ways to access the MERIS data can be found on the MERIS website:

http://earth.esa.int/pcs/envisat/meris/documentation/Access_to_MERIS_data.pdf

14 GENERAL INFORMATION

1. The European Space Agency organised a joint MERIS and (A)ATSR workshop, held at ESRIN, Frascati, Italy, on 26-30 September 2005. All information about the objectives of the workshop as well as the participants' presentations can be found on ESA's official page:

    http://envisat.esa.int/workshops/meris_aatsr2005/

2. The European Space Agency organised the second working meeting on MERIS and AATSR Calibration and Geophysical Validation (MAVT-2006) in ESRIN, Frascati, Italy, from 20 to 24 March 2006. All information about the objectives of the workshop as well as the participants' presentations can be found on ESA's official pages:

    Workshop objectives: http://www.congrex.nl/06M07

    Participants' presentations and talks: http://envisat.esa.int/workshops/mavt_2006/