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# **MERIS CYCLIC REPORT 18<sup>TH</sup>**

# JULY $7^{\text{TH}}$ – AUGUST $11^{\text{TH}}$ 2003



MERIS image acquired on the 5<sup>th</sup> of August 2003

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# **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 behavior, 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

ADS	Auxiliary Data Server
ARF	Archiving Facility (PDS)
CNES	Centre National d'Études Spatiales
CTI	Configuration Table Interface
CR	Cyclic Report
DMOP	Detailed Mission Operation Plan
DS	Data Server
DSD	Data Set Descriptor
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)

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JRC	Joint Research Center
LAN	Local Area Network
LISE	Laboratoire Interdisciplinaire en Sciences de l'Environnement
LOV	Laboratoire d'Océanograhie de Villefranche-sur-mer
MERIS	Medium Resolution Image Spectrometer
MPH	Main Product Header
OP	Operational Phase of ENVISAT
PAC	Processing and Archiving Center (PDS)
PDCC	Payload Data Control Center (PDS)
PDHS	Payload Data Handling Station (PDS)
PDS	Payload Data Segment
QC	Quality Control
QWG	Quality Control Working Group
QUARC	Quality Analysis and Reporting Computer
SPH	Specific Product Header
SQADS	Summary Quality ADS

# 2 SUMMARY

Cycle #18 starts on July 7<sup>th</sup> and ends on August 11<sup>th</sup>, 2003.

A new auxiliary file for the Level 2 processing has been disseminated during the cycle in order to remove the reclassification problems identified in the areas affected by sun glint. Also two radiometric calibrations have been successfully executed.

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

Cycle number	18
Start time	07 July 2003, 21:59:29
Stop time	11 August 2003, 21:59:29
Start orbit	7069
Stop orbit	7569

# **3** SOFTWARE VERSION AND PROCESSING CONFIGURATION

#### 3.1 Software version

The list of documents applied to the current release, IPF4.06, is given in the following.

MERIS IPF: 04.06 Prototype Version: MEGS V6.2p3 Applicable and Reference Documents:

1. I	ENVISAT Product Specification	Iss_3_Rev_J	PO-RS-MDA-GS-2009
2.1	MERIS Input/Output Data Definition	Iss_6_Rev_1a_010914	PO-TN-MEL-Gs-0003
3. I	MERIS Level 1b Detailed Processing Model	Iss_6_Rev_1a_010914	PO-TN-MEL-GS-0002
4.1	MERIS Level 1b Detailed Processing Model	Iss_6_Rev_1a_010914	PO-TN-MEL-GS-0006

Issues 6.1a consist in issue 6.1 augmented/corrected by change pages issued as 6.1a

#### 3.2 Auxiliary data files

A new auxiliary product has been disseminated during the cycle. Detailed information is in the table below.

Product description	Product	Comment
	name	

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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	Band set for water/land reclassification changed from 865 to 665 nm in order to remove reclassification problems in areas affected by sun glint.
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

Note: The other files not listed change every time (ECMWF).

## 3.2.1 LEVEL 1/LEVEL 2 CONFIGURATION

The configuration used to process MERIS data from Level 0 to Level 1/Level 2 is the following:

• Level 1 Configuration

	~
Product name	Start
	Validity
MER_INS_AXVIEC20030620_120000_20020321_193100_20121008_190821	21/03/02
MER_CP1_AXVIEC20030620_120000_20020429_040000_20120920_173421	29/04/02
MER_RAC_AXVIEC20030620_120000_20021224_121445_20121224_121445	24/12/03
MER_DRM_AXVIEC20020122_083343_20020101_000000_20200101_000000	01/03/02
AUX_DEM_AXVIEC20020123_121901_20020101_000000_20200101_000000	01/03/02
AUX_LSM_AXVIEC20020123_141228_20020101_000000_20200101_000000	01/03/02
AUX_ATT_AXVIEC20020924_131534_20020703_120000_20781231_235959	03/07/02

• Level 2 Configuration

Product name	Start Validity
MER_AER_AXVIEC20030620_120000_20020321_193100_20200101_000000	21/03/02
MER_ATP_AXVIEC20030620_120000_20021224_121445_20121224_121445	24/12/02
MER_CMP_AXVIEC20030620_120000_20021224_121445_20120321_193100	24/12/02
MER_CP2_AXVIEC20030620_120000_20021224_121445_20121224_121445	24/12/02
MER_LAP_AXVIEC20030715_151450_20020321_193100_20120321_193100	21/03/02
MER_LVI_AXVIEC20030620_120000_20020321_193100_20130224_164916	21/03/02
MER_OAP_AXVIEC20030620_120000_20020321_193100_20120321_193100	21/03/02
MER_OC1_AXVIEC20030620_120000_20020321_193100_20120321_193100	21/03/02
MER_OC2_AXVIEC20030620_120000_20020321_193100_20120624_174339	21/03/02
MER_WVP_AXVIEC20030620_120000_20020321_193100_20120321_193100	21/03/02

## 3.3 Configuration Table Interface (CTI)

New Configuration Tables have been disseminated at the end of July. Two spectral campaigns, with special band settings for Oxygen and Fraunhofer lines, have been planned for the end of August, as required by the Cal/Val Team.

### 3.4 Level 1/ Level 2 RR or FR products

During cycle #18 no changes regarding format or algorithms for L1b/ L2 products have been applied.

# 4 PDS STATUS

The results of the query to the PDS inventory facility (INV) made by the GANTT tool for the MERIS products availability are presented in the following.

#### 4.1 MERIS RR/FR Level 0 products

The number of RR Level 0 products acquired during the cycle is about 98.2% of the planned ones. Below are plotted respectively the received and the missing data by PDS for both RR and FR products.

a) MER\_RR\_0P products received by the ground segment during cycle #18

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b) MER\_RR\_0P products missing according to DMOP for cycle #18





c) MER\_FR\_0P products received by the ground segment during cycle #18

d) MER\_FR\_0P products missing according to DMOP for cycle #18



## 4.2 MER\_CA\_\_0P products

During cycle #18 two routine radiometric calibrations with Diffuser 1 (1 orbit), one Wavelength Type 2 calibration (4 orbits) and one Diffuser Ageing Calibration (2 orbits) were planned. The following calibrations

MER_CA_0PNPDK20030707_075905_000001782017_00493_07060_0000.N1	RGC
MER_CA0PNPDK20030721_035815_000001782018_00190_07258_0000.N1	DAC
MER_CA_0PNPDK20030721_053852_000001782018_00191_07259_0003.N1	DAC
MER_CA_0PNPDK20030721_071927_000001782018_00192_07260_0004.N1	WV2
MER_CA_0PNPDK20030721_090003_000001792018_00193_07261_0005.N1	WV2
MER_CA_0PNPDK20030721_104039_000001792018_00194_07262_0006.N1	WV2
MER_CA_0PNPDK20030721_122115_000001782018_00195_07263_0007.N1	WV2

were successfully executed on the 07<sup>th</sup> of June in orbit 7060 and on the 21<sup>st</sup> of July in orbits 7258, 7259, 7260, 7261, 7262, 7263.

The MERIS routine radiometric calibration using Diffuser 1, planned in orbit 7460 on the 04 of August 2003, was aborted due to a failure in the second critical calibration step. The Diffuser1 frame averaging coefficients were not downlinked to the ground, but the anomaly did not cause a switch-down of the instrument and the nominal observation could continue.

### 4.3 MERIS RR Level 1 products

A PDS failure could be responsible of the lost of some MER\_RR\_\_1P products. Just below are plotted the missing MER\_RR\_\_1P scenes against the inventoried MER\_RR\_\_0P products during cycle #18:



# **5** CALIBRATION AND INSTRUMENT CHARACTERIZATION

#### 5.1 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 stabilize 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  $-10^{\circ}/+50^{\circ}$  in order to meet the image quality requirements. The VEU temperature should be maximum  $+/-10^{\circ}$ C different from the last radiometric calibration for optimum performance. During Cycle #18 the VEU temperature does not show any anomalous behavior, being into the nominal operating temperature range.

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#### 5.2 Radiometric calibration and characterization results

All the radiometric calibrations performed since the beginning of the MERIS life are collected in the figure below, where is shown the evolution of the sun azimuth angle value for the acquired calibrations.



During cycle #18 one Radiometric Gain Calibration, two Diffuser Ageing Calibrations and four Wavelength type 2 Calibrations have been successfully executed on the 7<sup>th</sup> of June and 21<sup>st</sup> of July 2003. For more details see par. 4.2.

### 5.3 Spectrometric calibration and characterization results

No spectrometric calibrations were performed during cycle #18.

#### 5.4 Vicarious calibration results

For absolute calibration of MERIS by vicarious methods, METRIC2.0 tools is 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 where are stored 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.

The sites location provided to Metric for cycle #18 has been modified introducing new sites with smaller size as required by the Cal/Val team. The new site map is shown in the following picture:



METRIC Vicarious Calibration Sites

During the cycle Metric has generated for specific sites the following results:

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Sites	<b>#Products</b>
DESERT	67
GLITTER	24
RAYLEIGH	32
SNOW	9

For a comparison between MERIS data and in situ measurements of natural targets, performed by CNES, refer to Cyclic Report #17.

Note that METRIC 2.0 has been delivered during present cycle in order to take care of the L1b format changes (reference document: Metric\_STD.2.0.pdf).

#### 5.5 Instrument Characterization

#### 5.5.1 INSTRUMENT DEGRADATION

The evolution of the instrument response based on diffuser 1 measurement shows some degradation. This effect seems to affect especially the blue bands for some of the cameras. In particular, as can be seen in the figure below, the degradation is always below 1.5% but for band 1 of cameras 3 and 5 is around 2.5%. Moreover cameras 1 and 4 degrade more at 442 and 490 than at 412 nm. Note that the graph shows the gain evolution for each module as computed w.r.t orbit 846.

A Degradation Model has been implemented in IPF4.06 in order to take into account the instrument degradation. This is modeled with an exponential behavior that is fitted to the calibration data shown below. The degradation LUTs will be available for the 1<sup>st</sup> MERIS reprocessing foreseen early 2004.





### 5.5.2 DIFFUSER AGEING

The comparison between radiometric measurements performed during orbit #1859 with those done during orbit #7259 (current cycle) makes visible the Diffuser 1 browning that will be taken into account in the processing. See plot below.



#### 5.5.3 SMILE EFFECT

A precise characterization of the spectral dispersion law of each of the 5 MERIS spectrometers, known as Smile effect, is performed with spectral calibration data. The latest spectral calibrations show a good stability increasing with time as visible from the figure below (ACRI):



The Smile Correction has been implemented in IPF4.06.

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# 6 DATA QUALITY CONTROL

#### 6.1 Anomalies

Some MERIS FR L1 products have been identified with null radiance values for all the 15 bands. When this problem occurs the 1<sup>st</sup> Tie Point inside the product is always corrupted since the 1<sup>st</sup> record contains latitude and longitude values out of the product geolocalization.

The anomaly has been investigated and fixed: a bad variable type definition in the processor, IPF 4.06, causes the 1<sup>st</sup> record of the 1<sup>st</sup> Tie Point to have wrong latitude/longitude values depending on the center of the requested FR scene. This is the reason why the problem is affecting not all the FR L1 products. A patch for the processor is now under test.

#### 6.2 Software Problem Reporting (SPR)

Open anomaly/observation reports:

- MER\_FR\_L1 products: all radiometric data set to zero. Received 5 CDs from E-PAC (production date 15/7/2003) and 1 CD from UK-PAC (production date 11/08/2003) containing some MER\_FR\_L1 products with all the records of the 15 radiometric bands set to zero. The structure and format of the products seem to be OK. For more details refer to par. 7.1.
- 2. MERIS Child products: problem in number of frames. Some MERIS Child products have an incomplete granule at the end (last tie frame corresponds to frame Nf-16 if Nf is the total number of frames). The missing last tie point leads an interpolation problem.
- 3. MERIS Child Level 1 products: GADS scaling factor variable. The number of records for the GADS "scaling factor" of some MERIS Child products is variable, 1 or 2! . We assume that the number of records is always 1, as it should be according to specifications we have. Note that the DSR size and offsets seem to be correct with respect to the number of records.
- 4. MERIS FR Level 0 product: no temporal continuity between valid sequences. The FR L0 product contains 4 valid sequences (0,2,4,6) that are alternated with 4 invalid sequences (1,3,5,7). The comparison of the Start and Stop OBT of two consecutive valid sequences shows that they are partially overlapped. This means that there are events of TEMPORAL INVERSION in the complete valid dataset of the FR Level 0 product!
- 5. MERIS Child Product: various problems SPH:

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Out of range values of latitude and longitude: from FIRST\_FIRST\_LAT to LAST\_LAST\_LONG Wrong DS\_SIZE in each DSD and consequently wrong DS\_OFFSET Tie Points ADS not attached - MDS: Wrong dsr\_time in all the records of each MDS: not corresponding to the acquisition time in MPH - Summary Quality ADS Wrong dsr\_time and strange values in ADS record # 10 - GADS Scaling factor 2 records instead of 1 record, as from the products specifications Scaling factors values different from the expected ones in each record

#### 6.3 Status of the Level 2 processing parameters

The quality status for the Level 2 processing parameters will be soon presented in a table, now under revision.

# 7 VALIDATION ACTIVITIES AND RESULTS

### 7.1 The Match-Ups reprocessing

For the last news about the match-ups reprocessing see the Cyclic Report #17.

### 7.2 Early results from three oceanic sites: Benguela, BOUSSOLE, MOBY

The first MERIS validation results above oceanic Case 1 water have been presented by D.Antoine, A. Morel et all. during IGARSS - International Geoscience And Remote Sensing Symposium – held at Toulouse, on July 21-25, 2003.

The in situ measurements have been collected for three different oceanic sites: the Benguela current with the BENCAL cruise, the BOUSSOLE site (buoy) and the MOBY site (buoy).

During the BENCAL cruise, held in October 2002, only three matchups with MERIS overpasses were possible. The agreement between the in situ and the MERIS measurements is satisfactory as can be seen from the plots below (MERIS in red, in situ in blue).





For the BOUSSOLE site only 4 matchups could be used. The results are presented in the following.



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For the MOBY site, about 40 MERIS overpasses were available for good matchups after discarding clouds and glint.



pw(X), MOBY

The agreement between in situ data and MERIS data shows that the validation of water leaving reflectance does not have major problems over oceanic Case 1 water. However the glint correction must be improved as far as possible because glint is affecting large portions of MERIS images.

### 7.3 Early results for the MERIS atmospheric products

The validation results presented by J. Fischer during IGARSS confirm that MERIS cloud top pressure processor is working and producing results within expected accuracy (~30 hPa) and that the agreement with radiosoundes and MODIS measurements is within expected range.

Regarding Water Vapour above land, the processor is producing good results as well (accuracy within 0.2 gr/cm<sup>2</sup>), as visible in the plot below built using data from October 2002 to February 2003 (118 MERIS overpasses above Central Europe).



Good accuracy is achieved also for Water Vapour above clouds. Water Vapour above ocean needs further investigations since the algorithm shows promising results but also a strong variability due to the aerosols/ocean reflectivity.

#### 7.4 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 will be soon 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 will be soon available on the ESA website:

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

# 8 GENERAL INFORMATION

The "MERIS Validation Workshop" to be held at ESA-ESRIN from 20 to 24 October 2003. The "ENVISAT MERIS Workshop" to be held at ESA-ESRIN from 11 to 14 November 2003.