

MERIS CYCLIC REPORT 40TH

15TH AUGUST – 19TH SEPTEMBER 2005



31 August 2005 – The image acquired by MERIS shows the West part of the Java Island.

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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 Universität 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
DS	Data Server
DSD	Data Set Descriptor
EDAC	Error Detection And Correction
FR	Full Resolution
FUB	Freie Universität 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 #40 starts on the 15th of August 2005 and stops on the 19th of September 2005.

- No auxiliary files were disseminated during the cycle.
- Three type of calibrations have been successfully executed, two RGC radiometric gain, one DAC diffuser ageing and one WV1 wavelength type 1.
- Two Data unavailability have occurred during the reporting period.

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

Cycle number	40
Start time	15 August 2005, 21:59:29
Stop time	19 September 2005, 21:59:29
Start orbit	18091
Stop orbit	18591

3 PROCESSOR VERSION AND PROCESSING CONFIGURATION

3.1 MERIS Processor Release

IPF version 4.10 is the operational processor at the MERIS processing centers (stations and PACs). The reference documents for the operational processor are listed below:

- | | | |
|---|---------------------|-------------------|
| 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 |

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

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 Vapor Parameters	MER_WVP	No changes

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 #36.

- Level 1 ADF 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 ADF 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_AXVIEC20031120_104149_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_120001_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

3.4 Configuration Table Interface (CTI)

No new CTI disseminated during cycle # 40.

3.5 Level 1/ Level 2 RR or FR products

During cycle #40 no format changes or algorithm modifications regarding MERIS RR and FR products were implemented into the operational processor.

A new product type has been introduced with IPF version 4.10: the Full Swath product (4481 pixels per line). The Full Swath format includes new FR Level 1b, Level 2 and Browse products; however the ordering is not yet possible since the Full Swath operations are not yet defined.

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 sections.

4.1 MERIS Level 0 products availability

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

Week	MER_RR_OP %	
	Inventoried	Missing
From 15/08 to 22/08	98.96	1.04
From 22/08 to 29/08	97.12	2.88
From 29/08 to 05/09	99.00	1.00
From 05/09 to 12/09	97.04	2.96
From 12/09 to 19/02	97.35	2.65

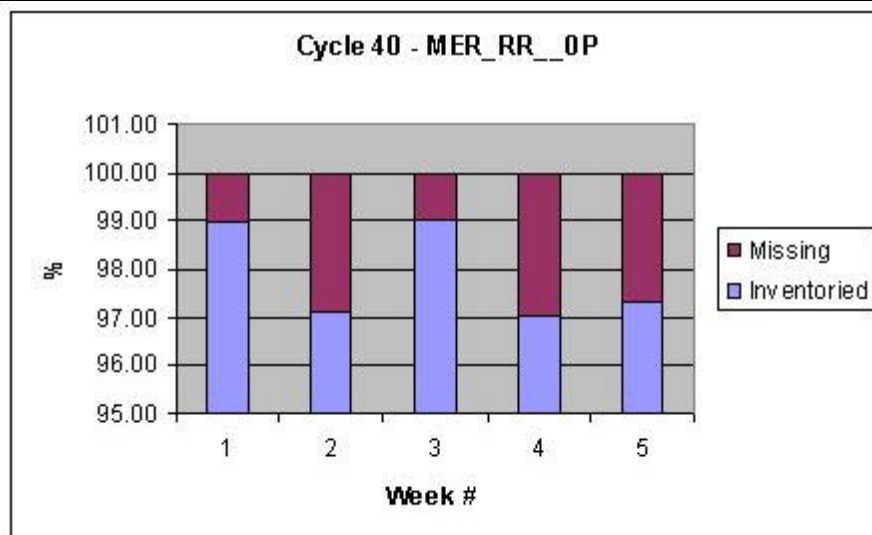


Figure 1 - MER_RR_OP generated/missing by the ground segment during cycle #40

The number of RR Level 0 products acquired during the cycle is about 97.89 % of the planned ones.

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

Week	MER_FR__OP %	
	Inventoried	Missing
From 15/08 to 22/08	99.48	0.52
From 22/08 to 29/08	97.99	2.01
From 29/08 to 05/09	99.10	0.90
From 05/09 to 12/09	93.87	6.13
From 12/09 to 19/02	99.22	0.78

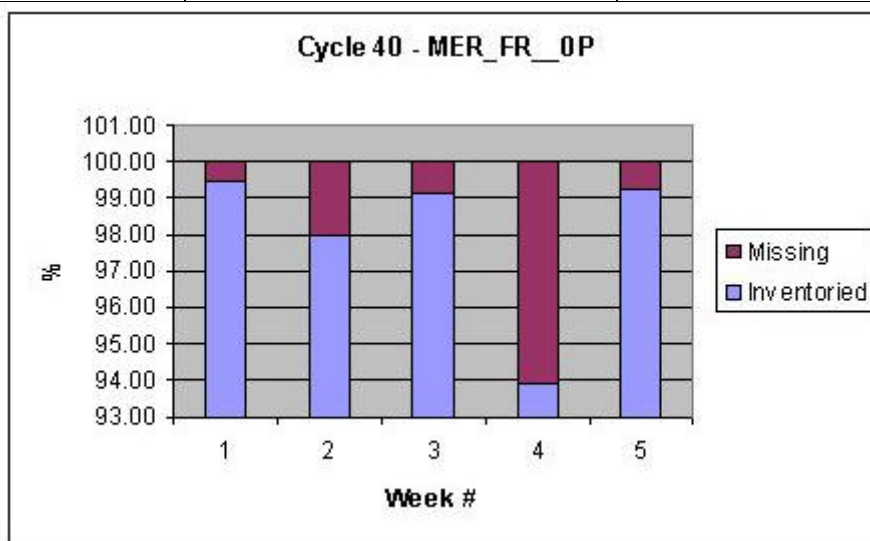


Figure 2 - MER_FR__OP generated/missing by the ground segment during cycle #40

The number of FR Level 0 products generated during the cycle is about 97.93 % of the planned ones.

4.2 MERIS FR acquisitions

Due to Technical issues, no information on the Full Resolution Level 0 spatial and temporal distribution is available for the reporting period.

4.3 MER_CA__OP Products

During Cycle #40 one type of routine radiometric calibrations has been planned; two RGC radiometric gain (one orbit each) were successfully executed on the 27th of August and 10th of September, in orbits respectively 18260, 18460.

The list of calibration files produced is reported below:

MER_CA__OPNPK20050827_182938_000001792040_00170_18260_0014.N1	RGC
MER_CA__OPNPK20050910_175103_000001792040_00370_18460_0019.N1	RGC

5 INSTRUMENT/DATA UNAVAILABILITY

5.1 Instrument Unavailability

No instrument unavailability was communicated by ESOC during cycle #40. In the reporting period, 49 EDAC-corrected SEU occurred.

5.2 Data Unavailability

Two data unavailability were communicated for cycle #40.

- On 25th of August 2005, the second processor of MERIS (SDPSS) spuriously switched to PAUSE mode due to a SEU starting from 20.33.01z until 21.12.29z, end of the normal acquisition in DIR&AVG mode. Approximately 40 minutes of data have been lost during this unexpected event.
- On 15th of September 2005, the second processor of MERIS (SDPSS) spuriously switched to PAUSE mode due to a SEU starting from 19.44.13z until 20.14.37z, end of the normal acquisition in DIR&AVG mode. Approximately 30 minutes of data have been lost during this unexpected event.

6 CALIBRATION AND INSTRUMENT CHARACTERIZATION

6.1 Calibration

6.1.1 Radiometric calibration

During Cycle #40 one routine calibration (RGC type) was successfully executed on the 27th of August and 10th of September. For more details see section 4.3.

6.1.2 Spectral calibration

No Erbium calibration was performed during Cycle #40.

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 on the order of ± 135 m along-track and ± 207 meters across-track. The RMS absolute geolocation error stays within the range of **251.24 ± 81** m.
- (II) The 2003 period is characterized by a degradation of the absolute geolocation accuracy where error is around ± 209 meters along-track and ± 295 meters 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 (centered results), for 2004 period the RMS absolute geolocation error stays within the range of **166 ± 18** m. Products collection 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:

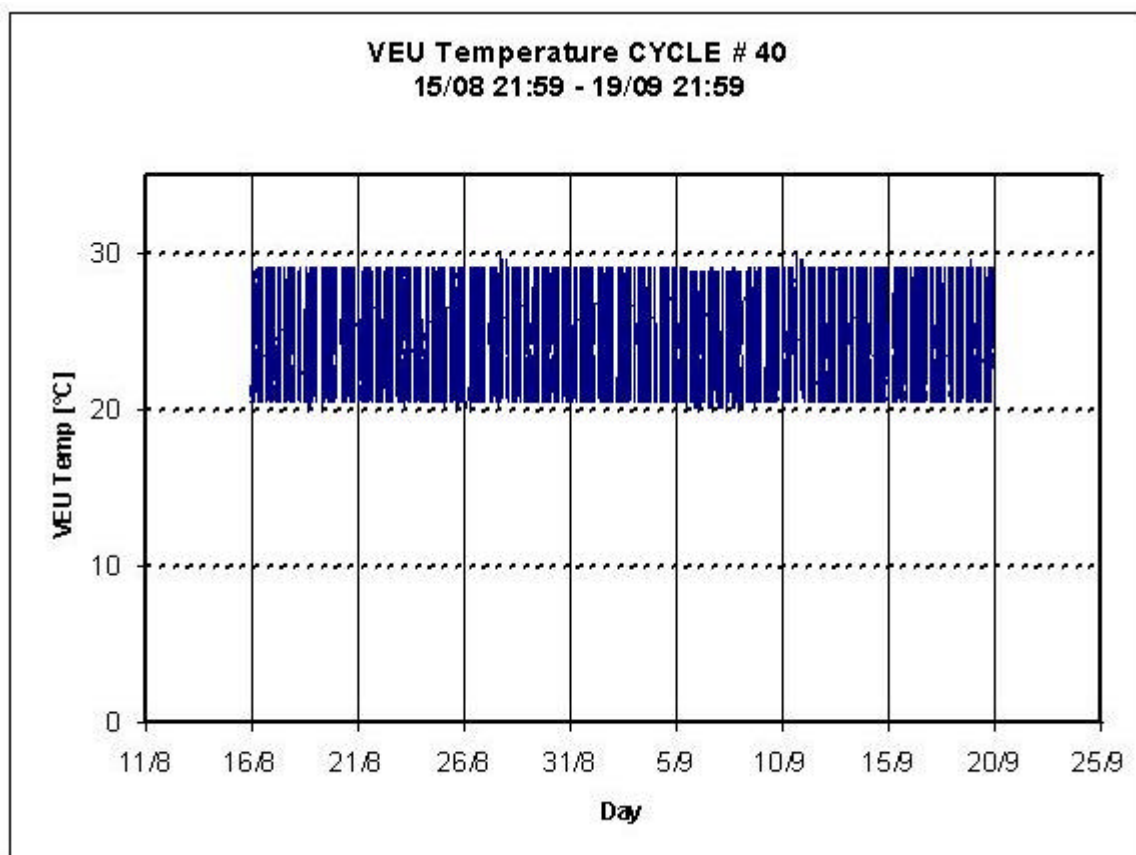
<http://earth.esa.int/pcs/envisat/meris/reports/>

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 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 $\pm 10^{\circ}\text{C}$ different from the last radiometric calibration for optimum performance.

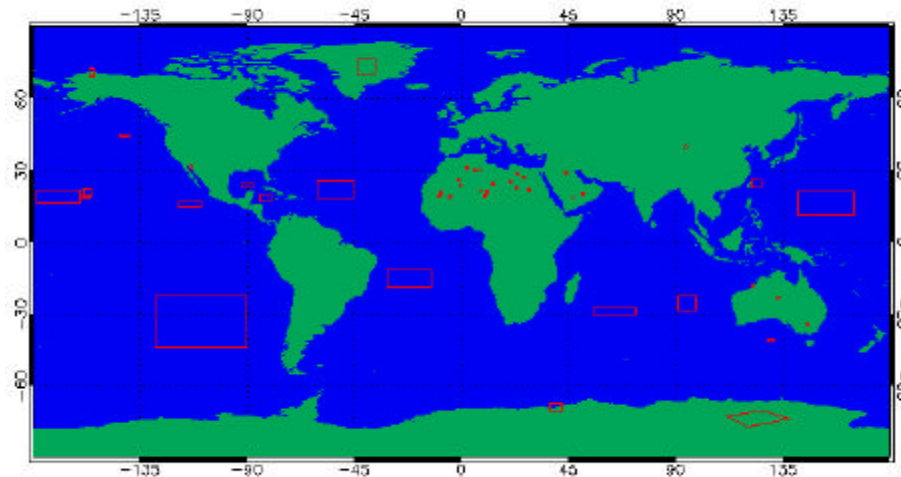
During cycle #40 the VEU temperature does not show any anomalous behavior, being into the nominal operating temperature range.



6.1.5 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. 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:

METRIC Vicarious Calibration Sites



For a comparison between MERIS data and in situ measurements of natural targets, performed by CNES, refer to Cyclic Report #17. The report can be found on the ESA website:

<http://earth.esa.int/pcs/envisat/meris/reports/cyclic/>

6.2 Instrument Characterization

6.2.1 Instrument degradation

No new results to be shown for cycle #40. For the last updates, refer to Cyclic Report #26 that can be found on the MERIS website:

<http://earth.esa.int/pcs/envisat/meris/reports/cyclic/>

6.2.2 Diffuser ageing

No new results to be shown for cycle #40. For the last updates, refer to Cyclic Report #39 that can be found on the above-mentioned MERIS website.

6.2.3 Smile Effect

No new results to be shown for cycle #40. 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 #40. Please refer to Cyclic Report #23 that can be found on the above-mentioned MERIS webpage.

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 vapor 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 of the MERIS processing resulted in the version 7.4 of the off-line processor MEGS. It is currently being used for a complete re-processing 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

In the following paragraphs are presented the discussions and the recommendations resulting from the Quality Working Group (QWG) meeting held on June 2006 in LOV (Laboratoire d'Océanologie de Villefranche) premises, Villefranche-sur-mer, France.

The main goal of the meeting was to review the modifications implemented in the last version of the MERIS prototype (MEGS v7.4) – currently in use for the 2005 Reprocessing of MERIS data (See section 9 for more details)- and to discuss of new improvements in the processing parameters if needed.

11.1 Level 1b configuration for 2005 reprocessing

Three auxiliary data files configurations are in use for the 2005 reprocessing, depending on data acquisition time:

- The SciHi version for data acquired between 05/2002 and 12/2002.
- The SciHiO2 version for data acquired between 01/2003 and 12/2004 included. The modification concerns the band 11 (761 nm - O2 absorption band) that has been shifted by 1 pixel toward the NIR to reduce sensitivity to the Smile Effect (variations of the spectral band's central wavelengths within the MERIS cameras field of view).
- The SciHiO2 OCL OFF version for data acquired since 12/2004. In this configuration, the Offset Control Loop (automatic on-board dark current correction) has been switched off to avoid small oscillations.

The common features of the new configuration are as follows

- New SRDF (stray light correction kernels)
- New degradation model (accounting for diffuser ageing)
- Latest spectral model used(2004, parabolic fit from Fraunhofer spectral calibrations)
- Gain & Response Look Up Tables where updated from 3 calibration campaigns at 27.5 deg Sun Azimuth Angle.
- Dark Current Look Up Tables updated from all OCL on calibrations

11.2 Level 2 configuration for 2005 reprocessing

The changes in the L2 configuration with respect to 2004 reprocessing are presented below:

- AER (Aerosol climatology): no changes
- ATP (Atmosphere parameter): minor changes to surface pressure retrieval parameters
- CMP (Cloud Measurements Parameters): no changes
- CP2 (Processing Level-2 Control Parameters): wavelengths and E_0 from 2004 model, smile correction switched on for MTCI bands, Pressure range in [450,1100], Chlorophyll 1 product coding range in [-2, 2] log10 scale instead of [-3,3], modification of the criteria of identification of absorbing aerosols over water.
- LAP (Land Aerosols parameters): latest LARS (Land Aerosol Remote Sensing) LUTs.
- LVI (Land Vegetation Index Parameters): upgraded MTCI pixel filtering parameters
- OAP (Ocean Aerosols Parameters): the blue aerosol with $a=1.5$ removed, Maritime 99%RH-with aerosol-free troposphere re-introduced. The former was justified as its range of angstrom exponent is already covered by another aerosol model while the latter extends the range of spectral dependency..
- OC1 (Ocean 1 Parameters): new Chlorophyll1 algorithm data & validity range, white caps threshold decreased to 10 ms^{-1} (previously 14), Chlorophyll 1 product validity range set to [0.01,30] mg.m^{-3} .
- OC2 (Ocean 2 Parameters): implementation of a new Neural Network model, and updated Chlorophyll 2 conversion factors
- WVP (Water Vapor Parameters): no changes

For more detailed description please follow the link below:

<http://earth.esa.int/pcs/envisat/meris/documentation/MERISRRsecondreprocessing-V2.pdf>

11.3 Level 3 products

Simultaneously to the 2005 second reprocessing of the MERIS data archive, new Level 3 products will be generated as listed below:

- Algal 1 product (Chlorophyll in Case 1 waters)
- Aerosol optical thickness (at 865nm over Oceans)
- Aerosol Angstrom coefficient (at 865nm)
- Total water vapor column over clear sky
- Fully normalised water leaving radiances (including bi-directionality correction) at 412, 443, 490, 510, 560 nm

These products will be available by the end of Year 2005. Please refer to the link given in the section 13 for further information.

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. Next Data Quality Working Group (QWG) meeting will take place on 15/16 November in the ACRI-ST premises, Sophia Antipolis, France.
2. The European Space Agency is organizing a joint MERIS and (A)ATSR workshop that will be held at ESRIN, Frascati, Italy, **26-30 September 2005**. All information about the participation and objectives of the workshop can be found on the ESA's official page:

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