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D O C U M E N T

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MERIS CYCLIC REPORT

CYCLE 17TH

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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)
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

The cycle #17 starts on the 02 June and ends on the 07 July 2003.
The main activity that has been performed during the cycle is the integration at stations and PACs of the new processor, IPF4.06, with the further dissemination of a new set of auxiliary files for the Level1b/ Level2 processing. The processor upgrade implies format changes for some auxiliary products and for the MERIS Level 1b product.
Two radiometric calibrations have been successfully executed on the 9th of June and 7th of July.
Information about the start and stop of the cycle can be found in the table below.

Cycle number	17
Start time	02 June 2003, 21:59:29
Stop time	07 July 2003, 21:59:29
Start orbit	6568
Stop orbit	7068

3 SOFTWARE VERSION AND PROCESSING CONFIGURATION

3.1 Software version

A new processor upgrade took place during cycle #17. The new version, IPF4.06, has been installed at stations and PACs on the 25th of June. The list of documents applied to each IPF release is given in the following:

- From 02 June 2003 until 24 June 2003:

MERIS IPF: 03.55
Prototype Version: MEGS V5.3
Applicable and Reference Documents:

1. ENVISAT Product Specification	Iss_3_Rev_G	PO-RS-MDA-GS-2009
2. MERIS Input/Output Data Definition	Iss_5_Rev_0_010914	PO-TN-MEL-Gs-0003
3. MERIS Level 1b Detailed Processing Model	Iss_5_Rev_1_020726	PO-TN-MEL-GS-0002
4. MERIS Level 1b Detailed Processing Model	Iss_5_Rev_1_020726	PO-TN-MEL-GS-0006

- From 25 June 2003 onward:

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

1. ENVISAT Product Specification Iss_3_Rev_J 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 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

New auxiliary products have been disseminated during the cycle. In the table below there is a summary of the most important changes that characterize each auxiliary file.

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	-New calibration coefficients calculated in order to remove the suspect flag always set to 1 for Level 1 products -New ADS Degradation added
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	-New tables calculated from BOMEM -Spectral shift values replaced by absolute wavelengths referring to each polynomial (759.5 to 761.5)

Cloud measurement parameters data	MER_CMP	-New resolution for surface albedo map: record size increases from 180*360 to 1800*3600; Grid vector for lat and lon increases correspondingly.
Processing Level-2 control parameters data	MER_CP2	-λ for band 11 shifted 1.25 nm toward IR. Value calculated from linear fits of the 2nd O2 campaign data. -WV and PAR scaling factors and offsets updated -Ocean aerosol climatology switched OFF -New GADS Smile Effect Correction added
Land aerosols parameters data	MER_LAP	-New flexible land/water reclassification scheme (add band index and thresholds for inland waters and island screening); band for radiometric reclassification set to 865, scaling factor set to 0.25
Land vegetation index parameters data	MER_LVI	-New TOAVI coefficients calculated from B. Pinty (JRC)
Ocean aerosols parameters data	MER_OAP	-New tables calculated from Bomem
Ocean I parameters data	MER_OC1	-Medium glint threshold set to 0.2 in order to correctly flag uncorrectable glint pixel Add new GADS thresholds: -Water vapour high glint threshold set to 0.6, value optimal for getting good WV correction over ocean with and without glint -Shallow water dept threshold set to –70m
Ocean II parameters data	MER_OC2	-Table of Chl1 corrected
Water Vapour Parameters	MER_WVP	-New values provided by FUB -Grid vectors back to angles (as must be)

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

3.2.1 LEVEL 1/LEVEL 2 CONFIGURATION AFTER IPF UPGRADE

From 02 June 2003 until 24 June 2003 the configuration used to process MERIS data is the following:

- Level 1 Configuration

Product name	**Start Validity**
MER_INS_AX VIEC20021009_091219_20020730_120000_20121008_190821	30/07/02
MER_CP1_AXVIEC20021001_093058_20020730_120000_20120920_173421	30/07/02
MER_RAC_AXVIEC20030303_144115_20021224_121445_20130226_171923	24/12/02
MER_RAC_AXVIEC20030327_143814_20030331_130000_20130213_194602	31/03/03

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_AXVIEC20020122_082016_20020101_000000_20200101_000000	01/03/02
MER_ATP_AXVIEC20021029_103226_20020301_000000_20070729_100818	01/03/02
MER_CMP_AXVIEC20021029_100951_20020301_000000_20120624_163958	01/03/02
MER_CP2_AXVIEC20021029_110653_20020301_000000_20111009_155131	01/03/02
MER_LAP_AXVIEC20020122_083900_20020101_000000_20200101_000000	01/03/02
MER_LVI_AXVIEC20021011_064004_20020301_165223_20120121_165223	01/03/02
MER_OAP_AXVIEC20021029_110409_20020301_000000_20110725_110447	01/03/02
MER_OC1_AXVIEC20021029_110104_20020301_000000_20110725_180800	01/03/02
MER_OC2_AXVIEC20021029_102705_20020301_000000_20120624_174339	01/03/02
MER_WVP_AXVIEC20021029_103021_20020301_000000_20120620_173107	01/03/02

3.2.2 LEVEL 1/LEVEL 2 CONFIGURATION AFTER IPF UPGRADE

From 25 June 2003 onward the configuration used to process MERIS data is the following:

- Level 1 Configuration

Product name	**Start Validity**
MER_INS_AXVIEC20030620_120000_20020730_120000_20121008_190821	30/07/02
MER_CP1_AXVIEC20030620_120000_20020730_120000_20120920_173421	30/07/02
MER_RAC_AXVIEC20030620_120000_20030331_130000_20130213_194602	31/03/03
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_AXVIEC20030620_120000_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

Note: The auxiliary file MER_LAP will be soon replaced by a new one where the band set for water/land reclassification is 665 instead of 865. This is necessary to minimize reclassification problems in areas affected by sun glint.

3.3 Configuration Table Interface (CTI)

No new Configuration Tables have been disseminated during cycle #17 since the Cal/Val Team has requested no spectral campaigns and no modifications to the instrument band settings have been planned.

3.4 Level 1/ Level 2 RR or FR products

The new IPF includes changes in the MERIS products format and modifications of the algorithms applied for the Level 1/ Level 2 processing from raw data. The relevant changes for each product type are listed in the following:

- MERIS Level 1 RR/FR product

1. Changed product format in order to replace the “Spectral Shift Index” with the “Detector Index”. This new parameter allows to link each pixel to the instrument detector, giving the per pixel Sun irradiances. It is used in the TOA (Top of Atmosphere) reflectance computation.
2.Added an Instrument Response Degradation Model to apply on radiometric gains

- MERIS Level 2 RR/FR product

1.Applied the Smile Correction to the TOA reflectances.
2.Added a dedicated high glint flag for the Water vapour processing
3.Applied a new XC interpolation scheme
4.Used a weighted interpolation between aerosol couples
5.Added new TOAVI science flags

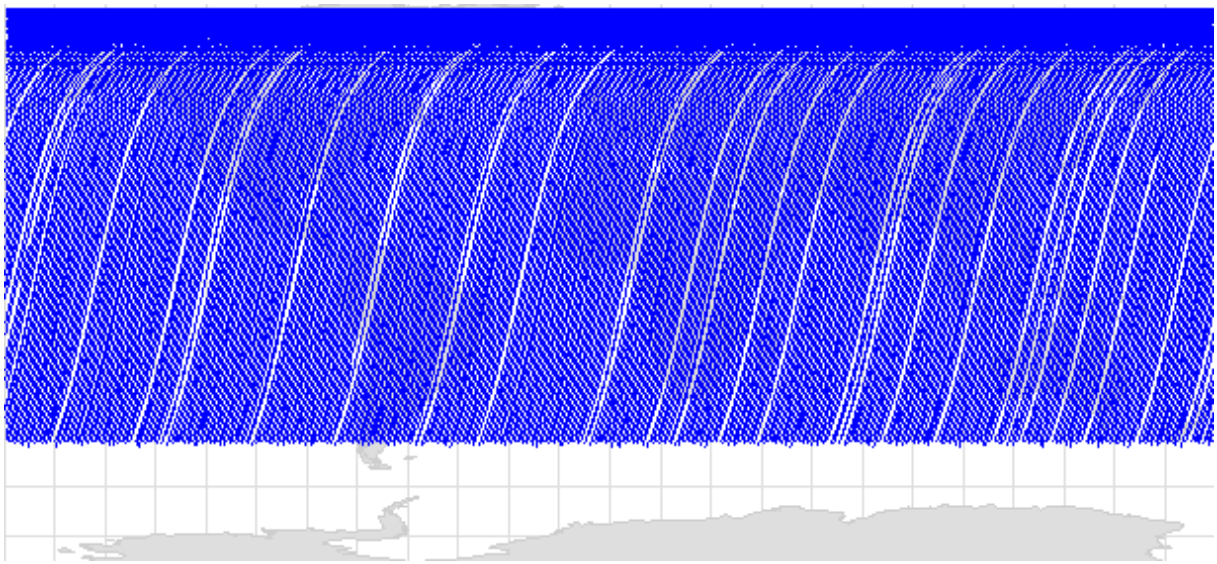
4 PDS STATUS

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.

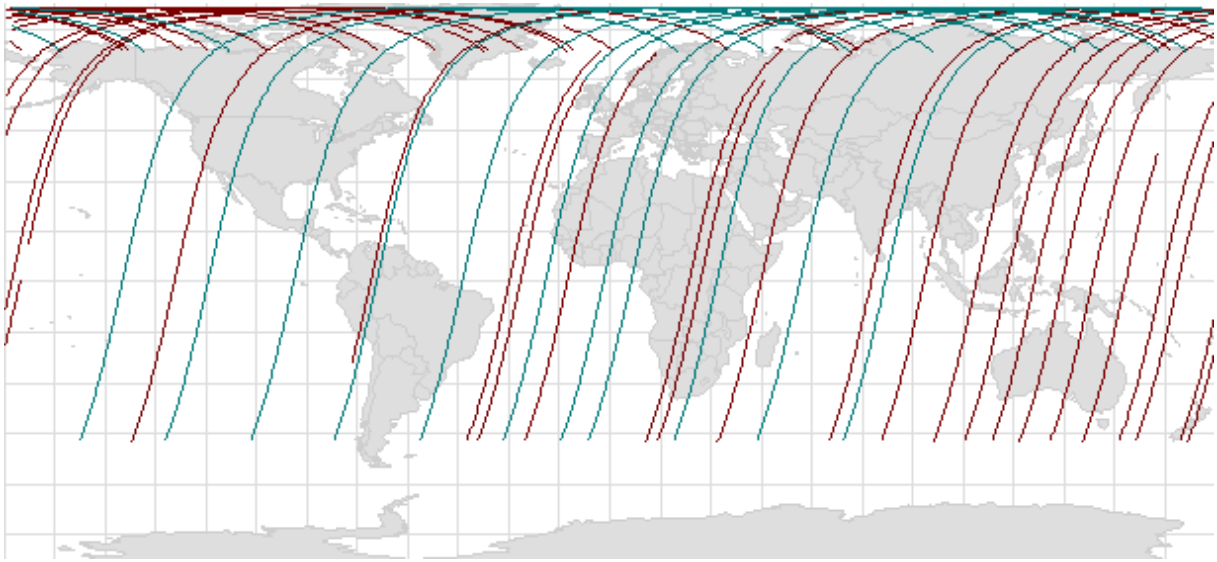
4.1 MERIS RR/FR Level 0 products

The number of RR Level 0 products acquired during the cycle is about 96% of the planned ones. Below are plotted respectively the received and the missing data by PDS for both RR and FR products.

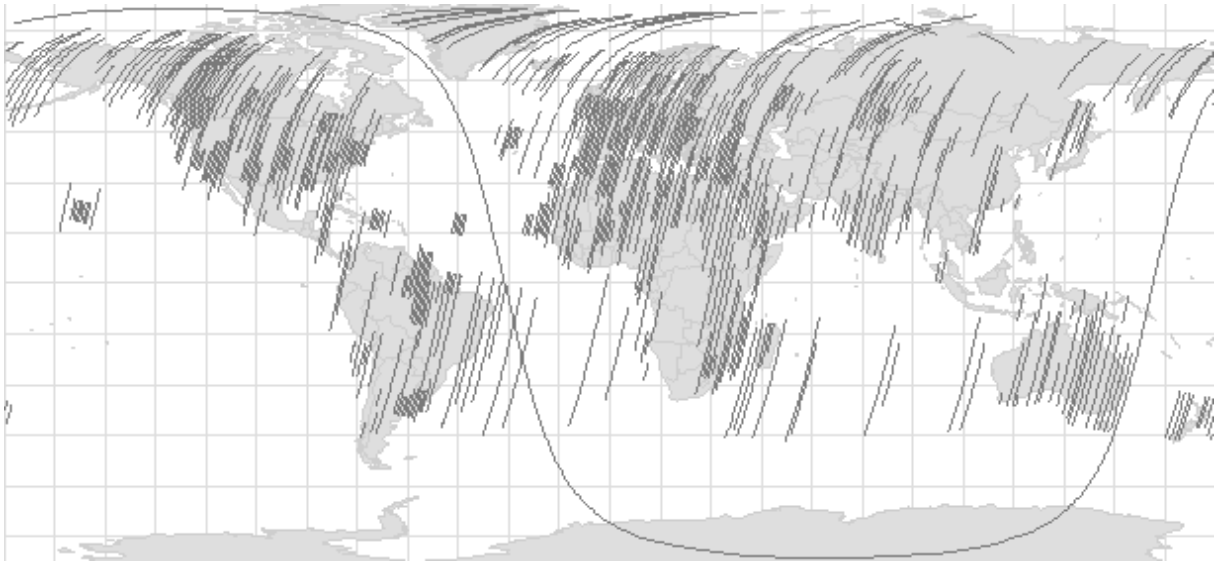
a) MER_RR__0P products received by the ground segment during cycle #17



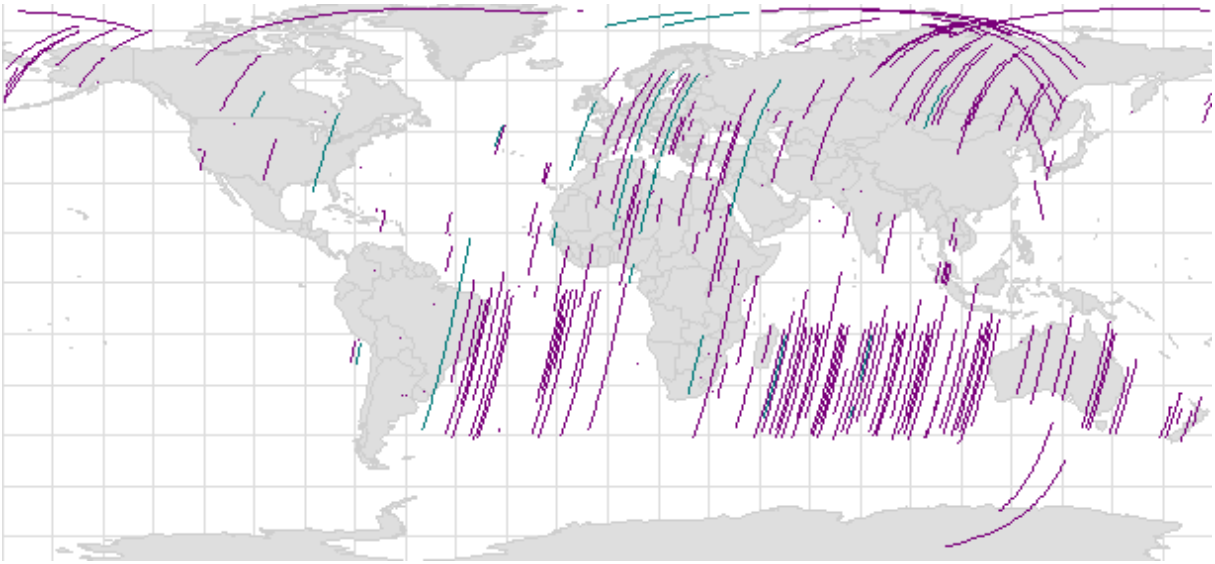
b) MER_RR__0P products missing according to DMOP for cycle #17



c) MER_FR__0P products received by the ground segment during cycle #17



d) MER_FR__0P products missing according to DMOP for cycle #17



4.2 MER_CA__0P products

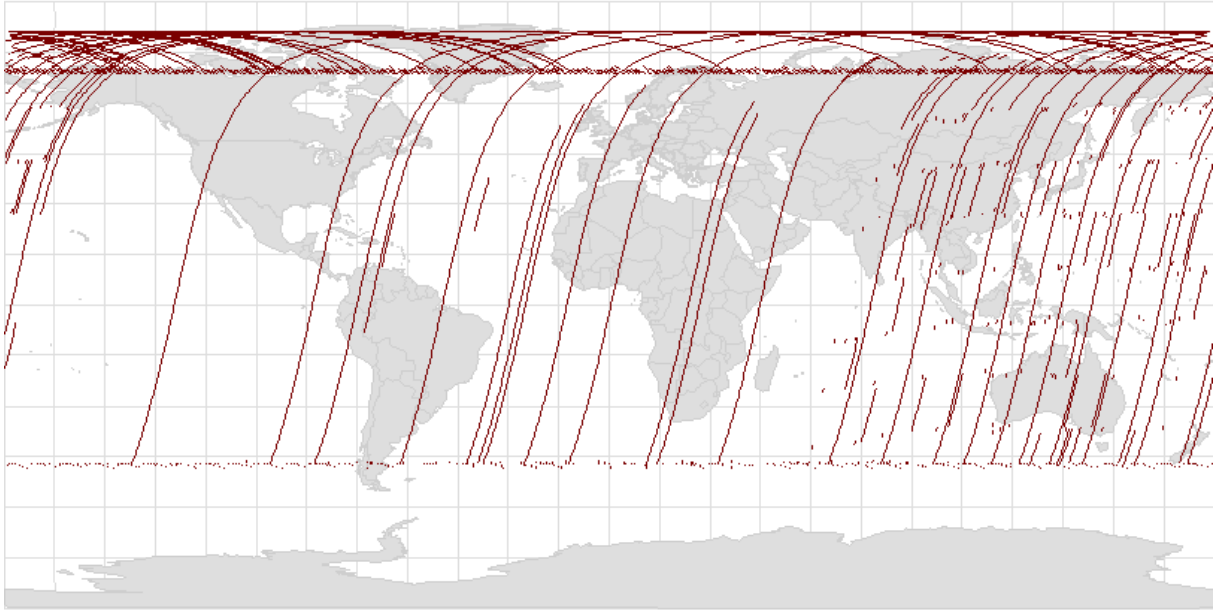
During the cycle #17 three routine radiometric calibrations with Diffuser 1were planned. The following calibrations

MER_CA__0PNPDK20030609_091931_000001782017_00093_06660_0018.N1
MER_CA__0PNPDK20030707_075905_000001782017_00493_07060_0000.N1

were successfully executed on 09th June in orbit 6660 and 07th of July in orbit 7060.
The RGC calibration with Diffuser 1 in orbit # 6860 on 23rd June 2003 could not be completed due to a re-occurrence of the expected anomaly (‘calibration critical step not reached’, covered by AR #ENV-0447), which happened at the first critical step of the calibration. As a consequence of this anomaly, neither the Dark nor the Diffuser 1 calibration frame averaging calibration coefficients were generated and downlinked to the ground.

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 #17:



5 INSTRUMENT UNAVAILABILITY

The MERIS instrument could interrupt its operations when an anomaly happens, going to Heater Mode. The summary of unavailability reports as communicated by ESOC for MERIS during cycle #17 is reported below:

Start	Stop	Reason	Reference	Planned
23 Jun2003 08:43:00	23 Jun 2003 11:29:00	MERIS went back to Heater. Measurements restarted as of orbit #6863.	EN-UNA-2003/0168	No
24 Jun2003 03:45:00	24 Jun 2003 20:35:42	Unavailable due to Operational Problems. Ref. AR92028.	EN-UNA-2003/0184	No

6 CALIBRATION AND INSTRUMENT CHARACTERIZATION

6.1 Radiometric calibration and characterization results

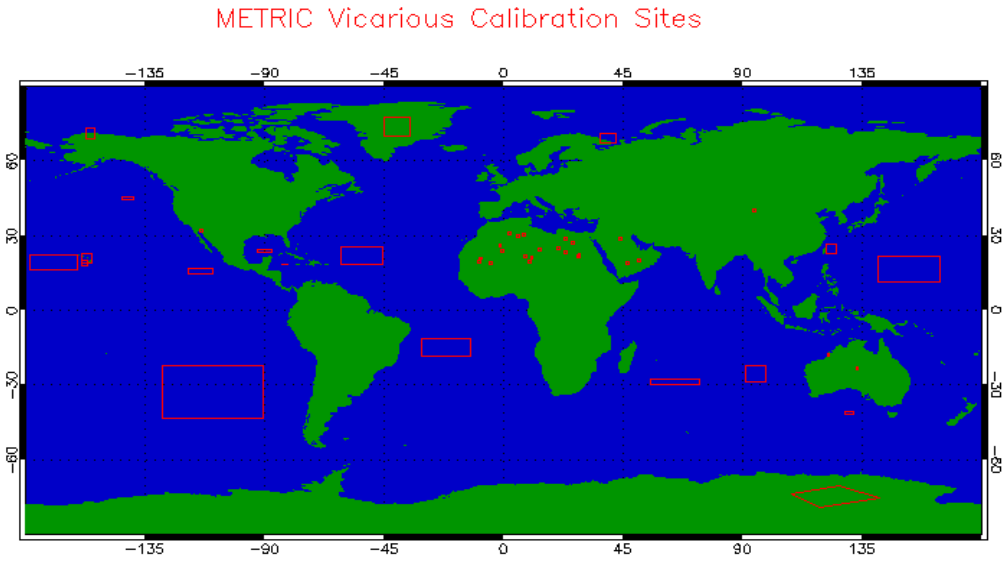
During cycle #17 two radiometric calibrations have been performed. They have been successfully executed on the 9th of June and 7th of July 2003.

6.2 Spectrometric calibration and characterization results

No spectrometric calibrations were performed during cycle #17.

6.3 Vicarious calibration results

For absolute calibration of MERIS by vicarious methods, METRIC1.3 tool 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 #17 are shown in the following picture:

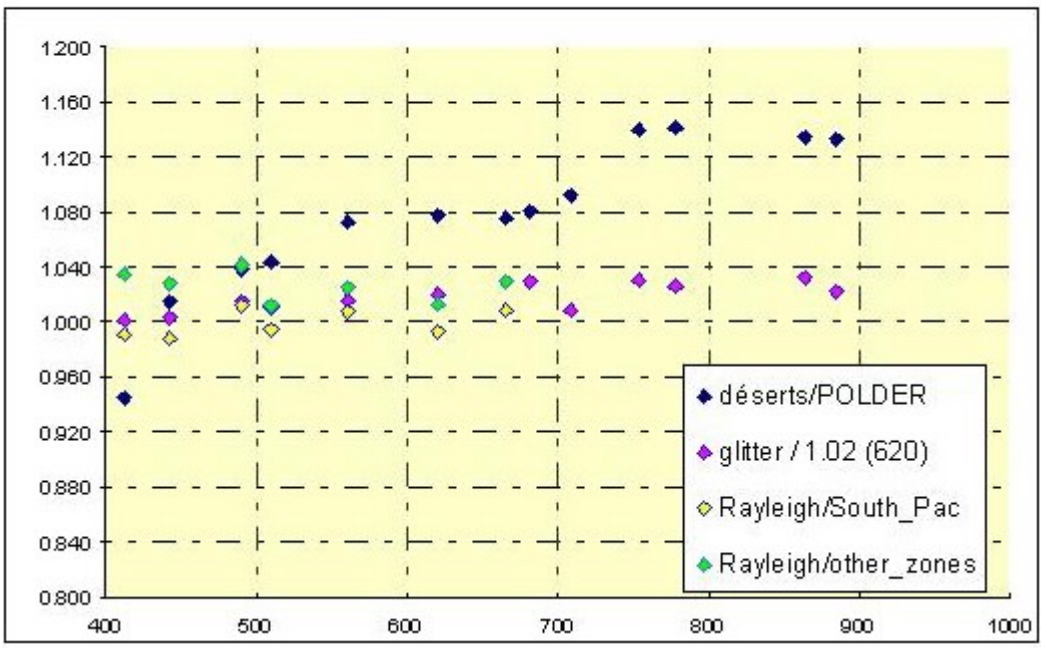


During the cycle Metric has generated for specific sites the following results:

Sites	#Products
DESERT	34
GLITTER	9
RAYLEIGH	22
SNOW	4

The image quality group of CNES analyzes the data acquired over the designated calibration sites.

The comparison between MERIS data and the natural targets performed by CNES (see figure below) has shown a very good agreement, with particularly good results for the Rayleigh method over the South Pacific Ocean site (better than 1%), while a bias of 4 up to 15% for Desert regions have been identified. This discrepancy has not been solved till today.

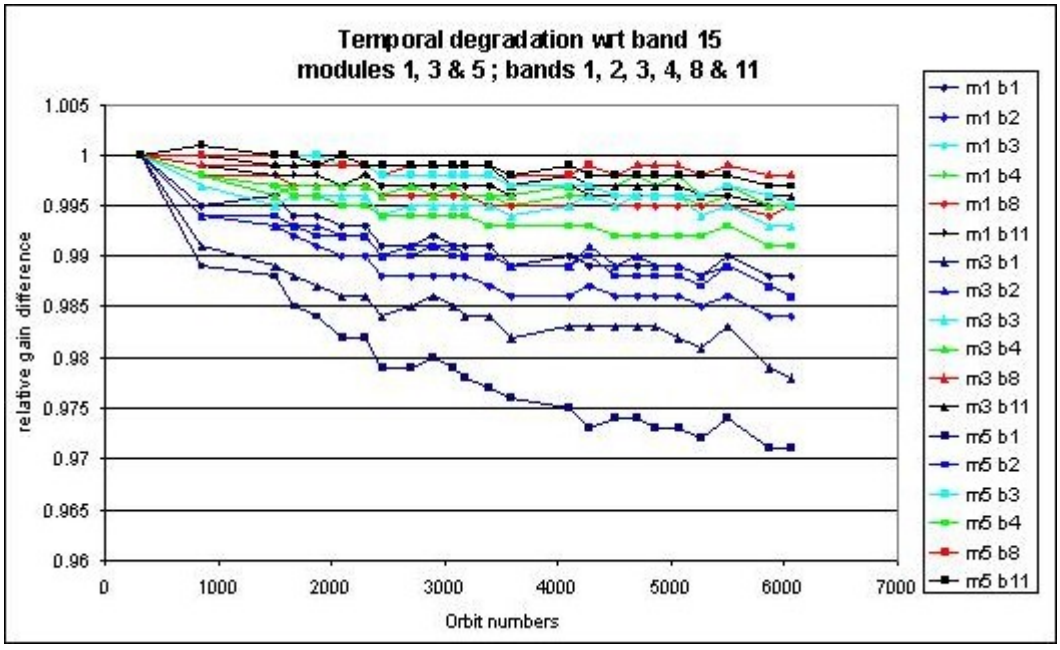


Note that a new version of METRIC will be released during the next cycle due to the format change of Level 1 products.

6.4 Instrument Characterization

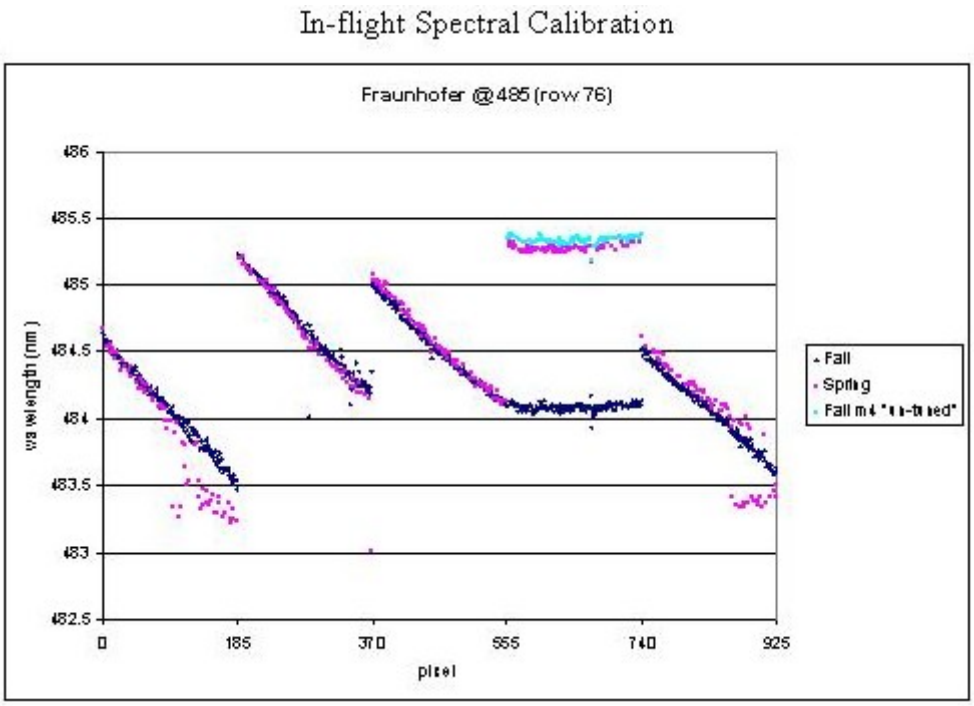
6.4.1 INSTRUMENT DEGRADATION

After more than one year of operations, the study of the evolution of the instrument response, based on diffuser 1 measurements and computed using the BRDF model based on on-ground characterization, has shown some degradation. This effect seems to affect especially the blue bands for some of the cameras (< 3%) as can be seen from the figure below (S.Delwart, L.Bourg).
A Degradation Model has been implemented in the new IPF4.06 to take into account the characterized MERIS instrument degradation.



6.4.2 SMILE EFFECT

A precise characterization of the spectral dispersion law of each of the 5 MERIS spectrometers, known as Smile effect, has been done using the spectral calibration data. With the new processor, the so-called Smile Correction has been applied to Level 2 products. In the plot below is shown the smile effect as retrieved during a Fraunhofer spectral campaign.



7 DATA QUALITY CONTROL

7.1 Anomalies

No anomalies were reported during the cycle.

7.2 Users complains

No complains were reported during the cycle.

7.3 Software Problem Reporting (SPR)

All the still open anomaly/observation reports are shown in the following:

1. 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 MER_FR_L1 products with all the records of the 15 radiometric bands set to zero. The structure and format of the products seems to be OK.

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:

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

7.4 Status of the Level 2 processing parameters

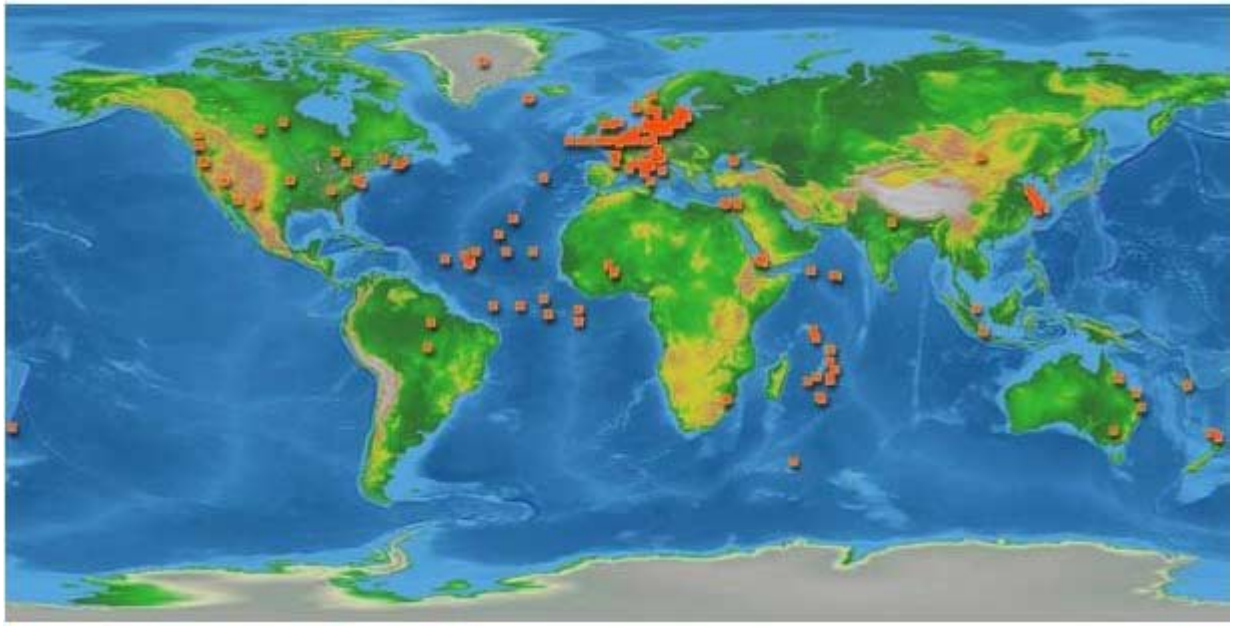
The status of quality and the goal to be achieved for the Level 2 processing parameters will be soon presented in a table, now under revision.

8 VALIDATION ACTIVITIES AND RESULTS

8.1 The Match-Ups reprocessing

A very important issue for the validation activity is the Match-Ups reprocessing. Many requests are made by PIs, covering different areas of interest spread around the world. The sites distribution is shown in the figure below:

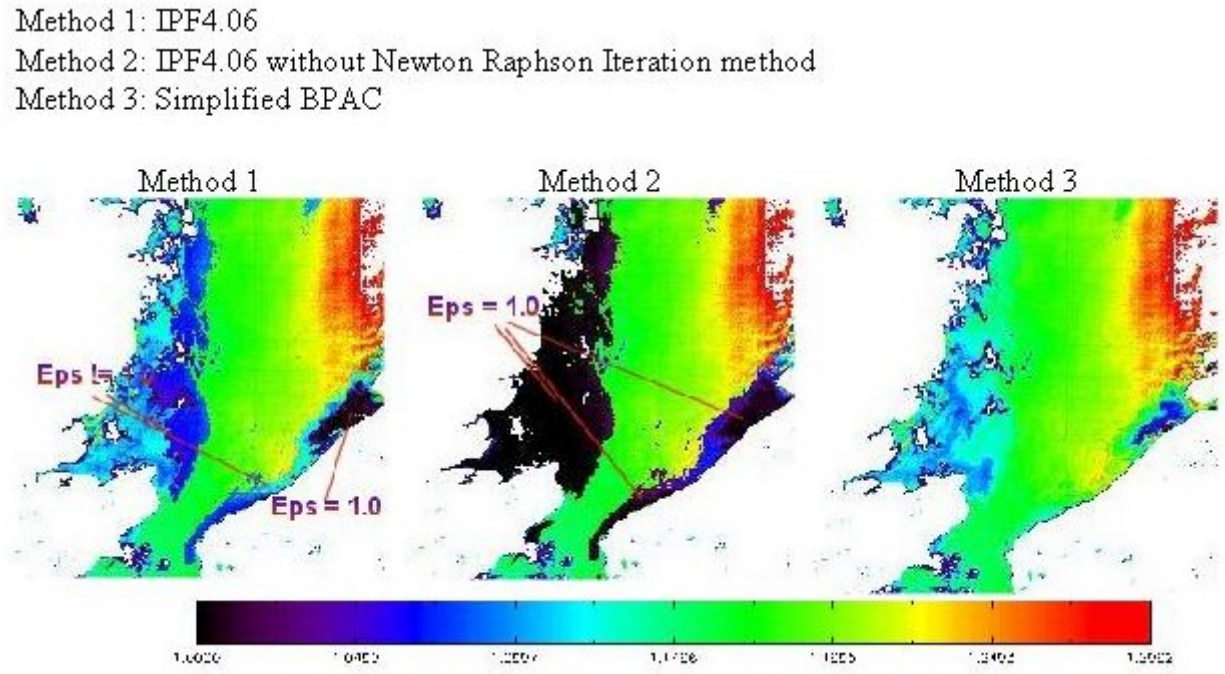
Match-Ups reprocessing: 903 requests, 24 PIs



To date, the configuration used for the Match-Ups reprocessing is slightly different from the IPF4.06 configuration, in order to test new improvements in the MERIS products quality. The products that will be soon distributed to the PIs (distribution foreseen for the end of July 2003) are equal to the IPF4.06 ones except for the following items:

a. Simplification of PCD1_13
b. Coastal flag based on bathymetry depth > -1500m
c. Aerosol climatology enabled to switch-off dust-like aerosols north of 51 degrees North
d. Simplified BPAC (Bright Pixel Atmospheric Correction)
e. Blue aerosols

In particular the simplified BPAC (Bright Pixel Atmospheric Correction) seems to show a good impact on the image. The results of the three different applied methods are compared in the figure below. However, the study on this subject is still on going.

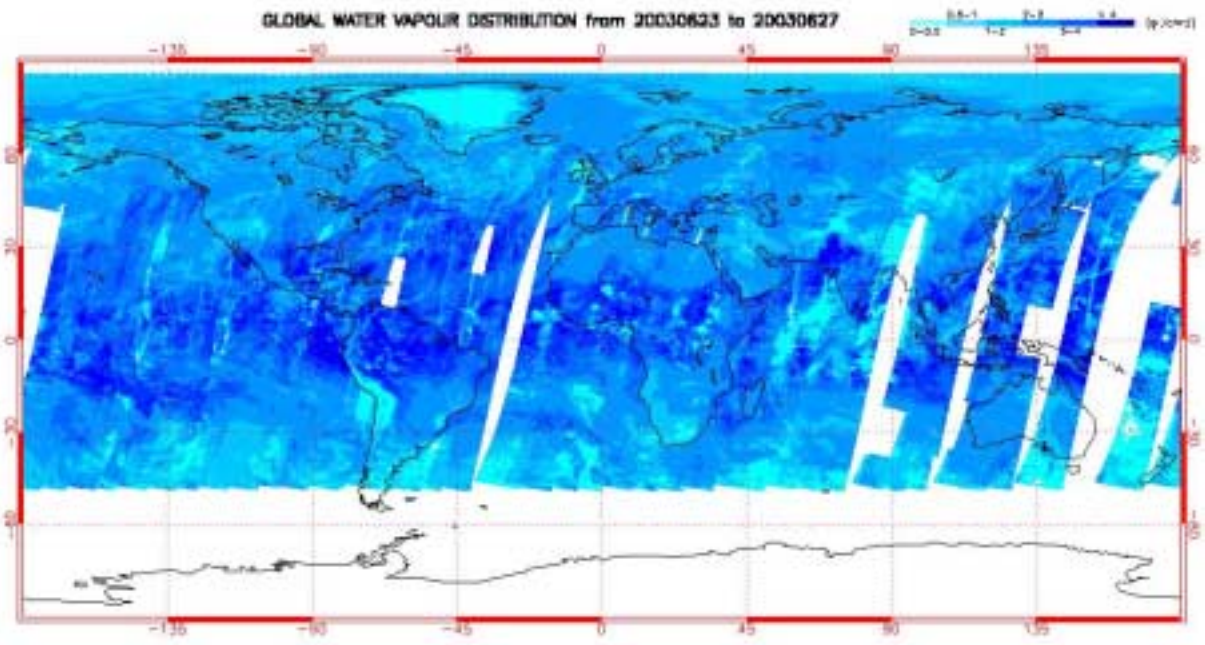


8.2 Water Vapour and Browse maps

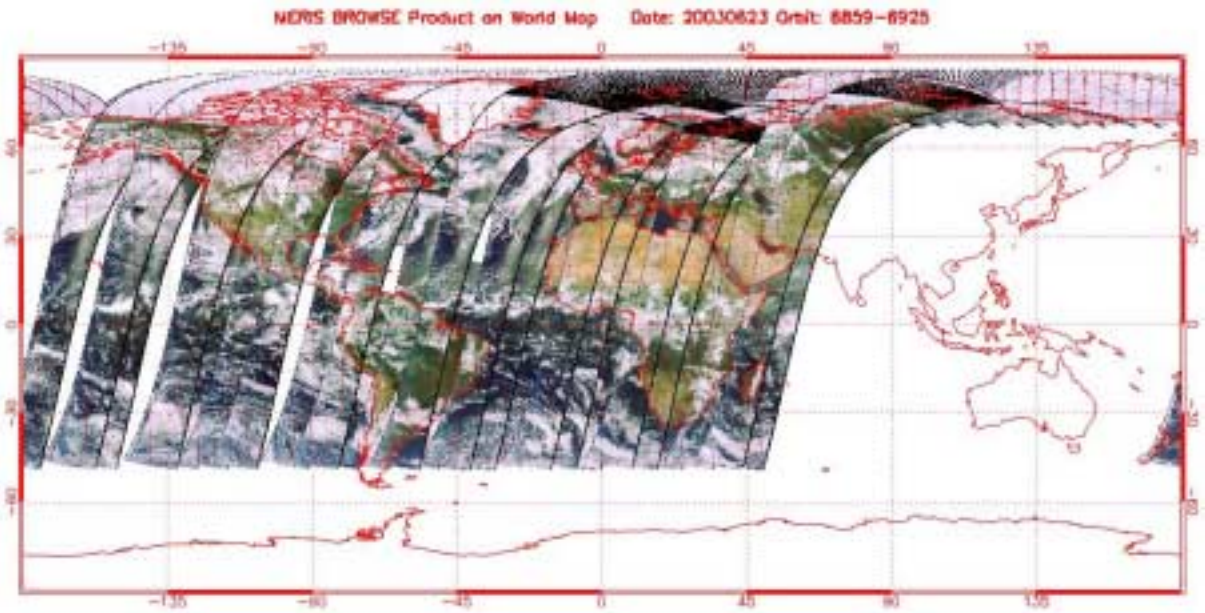
Water Vapour data, retrieved from MER_LRC_2P products, have been used to generate global maps covering the days just before and after the 25th of June 2003, date for the last processor integration at stations and PACs. The Water Vapour auxiliary product disseminated for IPF4.06 includes new tables provided by FUB.

http://earth.esa.int/pcs/envisat/meris/maps/watervapour/MERIS_WV_030623.jpeg
http://earth.esa.int/pcs/envisat/meris/maps/watervapour/MERIS_WV_030624.jpeg
http://earth.esa.int/pcs/envisat/meris/maps/watervapour/MERIS_WV_030625.jpeg
http://earth.esa.int/pcs/envisat/meris/maps/watervapour/MERIS_WV_030626.jpeg
http://earth.esa.int/pcs/envisat/meris/maps/watervapour/MERIS_WV_030627.jpeg

All the gaps visible in the maps are due to the unavailability of some MER_LRC_2P products in the PDHS-K and PDHS-E Meteo server. The global water vapour coverage for the period 23-27 June 2003 is shown below.



The MERIS coverage with Browse products for the same time period is shown in the following figure.



The map is realized using only browse products stored into PDHS-K archive, since products from PDHS-E archive are still not available. Single day maps can be found here:

http://earth.esa.int/pcs/envisat/meris/maps/browse/MERIS_BWM_030623_6859_030623_6867.jpeg
http://earth.esa.int/pcs/envisat/meris/maps/browse/MERIS_BWM_030624_6882_030624_6882.jpeg
http://earth.esa.int/pcs/envisat/meris/maps/browse/MERIS_BWM_030625_6888_030625_6894.jpeg

http://earth.esa.int/pcs/envisat/meris/maps/browse/MERIS_BWM_030626_6902_030626_6910.jpeg
http://earth.esa.int/pcs/envisat/meris/maps/browse/MERIS_BWM_030627_6916_030627_6925.jpeg

The Water Vapour and Browse Maps will be soon available for each day of the cycle.

9 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.
The MERIS QWG meeting to be held on 25/26 September 2003.