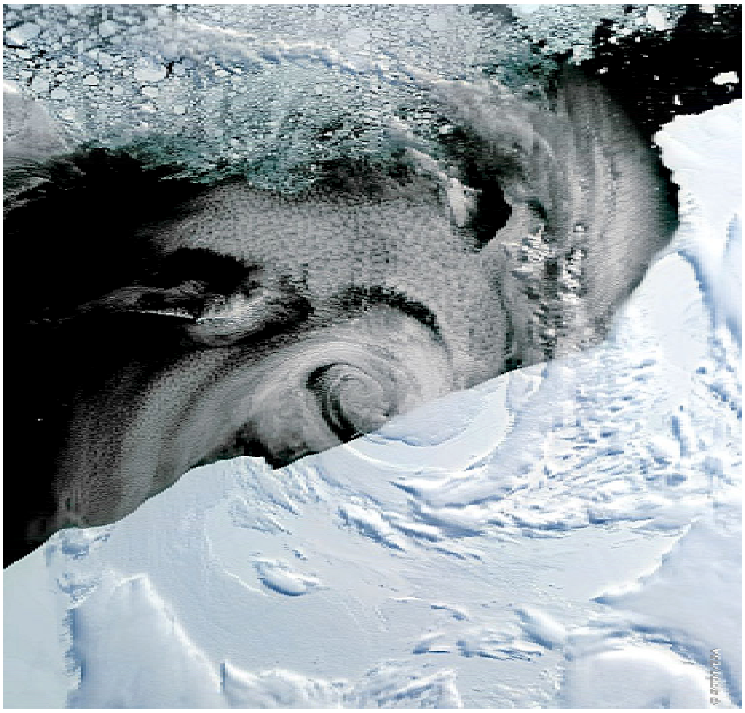
MERIS CYCLIC REPORT 33RD

DECEMBER 13TH 2004 – 17TH JANUARY 2005



On 14 December MERIS has captured wispy clouds over open water at the edge of the Ross Ice Shelf along the Shackleton Coast.

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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

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
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
QC	Quality Control
QWG	Quality Control Working Group
QUARC	Quality Analysis and Reporting Computer
RGC	Radiometric Gain Calibration
RR	Reduced Resolution
SPH	Specific Product Header
SQADS	Summary Quality ADS
WV1	Wavelength type 1 calibration
WV2	Wavelength type 2 calibration

2 SUMMARY

Cycle #33 starts on December 13th 2004 and ends on January 17th 2005.

- No auxiliary files were disseminated during the cycle.
- Three routine radiometric gain calibrations (RGC) have been successfully executed.
- According to the results of the OCL campaign executed during cycle #30, the OCL has been set to OFF starting from cycle #33 (start orbit #14584). In fact, the OCL ON seems to be the main contributor to the across-track stripping (i.e. horizontal lines visible in MERIS products), mainly present in products derived from low signal band ratios (e.g. Chlorophyll). For details refer to Cyclic Report # 32 on the ESA website: http://earth.esa.int/pcs/envisat/meris/reports/cyclic/.
- On mid January a new processor release, IPF 4.10, has been installed at stations and PACs. The new release fixes minor bugs and has low impact on MERIS products quality; for details see par. 3.1.

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

Cycle number	**33**
Start time	13 December 2004, 21:59:29
Stop time	17 January 2005, 21:59:29
Start orbit	14584
Stop orbit	15084

3 SOFTWARE VERSION AND PROCESSING CONFIGURATION

3.1 Software version

IPF 4.10 replaced IPF 4.07 at processing centers on mid January 2005. The new processor release basically corrects some minor bugs and improves the processing time. IPF 4.10 allows the FR Full Swath processing, however, the operation of the Full Swath is not yet decided (i.e. no ordering yet). The relevant changes are listed in the following:

- Full Swath (4481 pixels per line) extension for FR Level_1, Level_2 and Browse products
- Improvement of product limit calculation for FR scenes
- Level_2 performance improvement by optimizing the Turbid Water Correction algorithm

All the documents related to the operational processors, IPF 4.07 and IPF 4.10, are reported in the following:

a) MERIS IPF 04.07
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 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

b) MERIS IPF 04.10
Prototype Version: MEGS V6.2p3
Applicable and Reference Documents:

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).

3.2.1 Level 1/Level 2 Configuration (SciHiO2)

The current operational ADFs, for both Level1b and Level 2 processing starting from Level 0, are listed in the tables below. No new auxiliary files were disseminated during Cycle #33.

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

Table 1 - Level 1 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

Table 2 - Level 2 ADF Configuration

3.3 Configuration Table Interface (CTI)

No new CTI disseminated during cycle # 33.

3.4 Level 1/ Level 2 RR or FR products

During cycle #33 no format changes or algorithm modifications regarding MERIS RR and FR products were applied.
A new product type has been introduced by IPF 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 AND INSTRUMENT UNAVAILABILITY

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

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__0P	%
From 13/12 to 20/12	Inventoried	96.05
	Missing	3.95
From 20/12 to 27/12	Inventoried	99.55
	Missing	0.45
From 27/12 to 03/01	Inventoried	100.00
	Missing	0.00

From 03/01 to 10/01	Inventoried	98.60
	Missing	1.40
From 10/01 to 17/01	Inventoried	99.23
	Missing	0.77

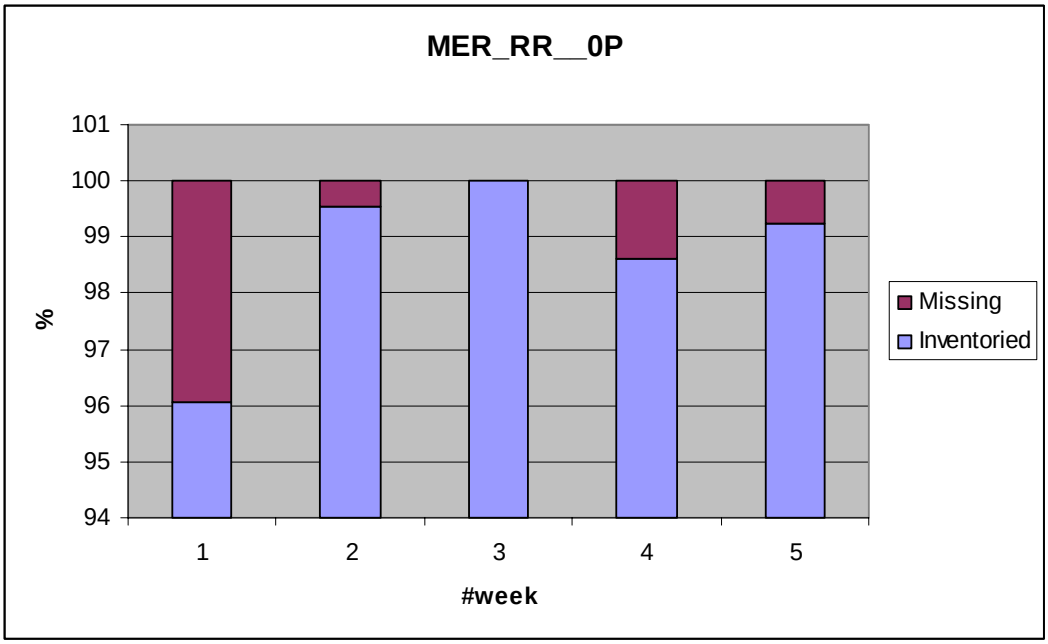


Figure 1 - MER_RR__0P generated/missing by the ground segment during cycle #33

The number of RR Level 0 products acquired during the cycle is about 98.69 % of the planned ones.

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

Week	MER_FR__0P	%
From 13/12 to 20/12	Inventoried	96.54
	Missing	3.46
From 20/12 to 27/12	Inventoried	99.35
	Missing	0.65
From 27/12 to 03/01	Inventoried	99.92
	Missing	0.08
From 03/01 to 10/01	Inventoried	99.73
	Missing	0.27
From 10/01 to 17/01	Inventoried	96.54
	Missing	3.46

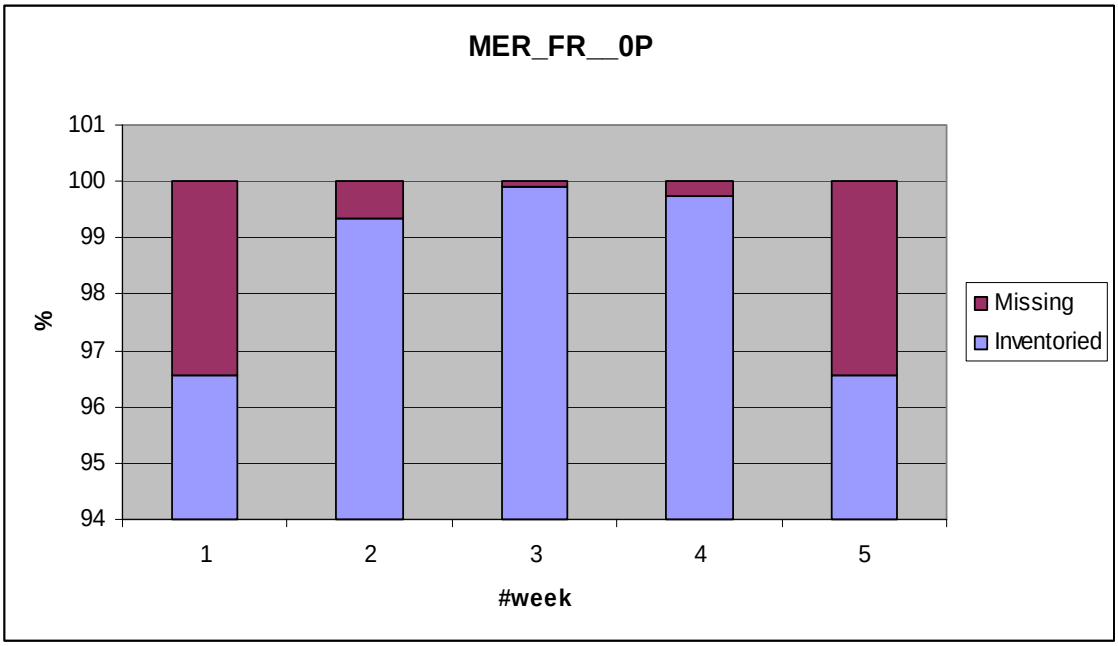


Figure 2 - MER_FR__0P generated/missing by the ground segment during cycle #33

The number of FR Level 0 products generated during the cycle is about 98.42 % of the planned ones.

4.2 MERIS FR acquisitions

The global coverage of MERIS FR products acquired during cycle #33 is shown below. For each coverage map, the acquisition time per orbit with respect to the orbit number is plotted. To optimize the visualization the FR acquisitions are plotted every five days.

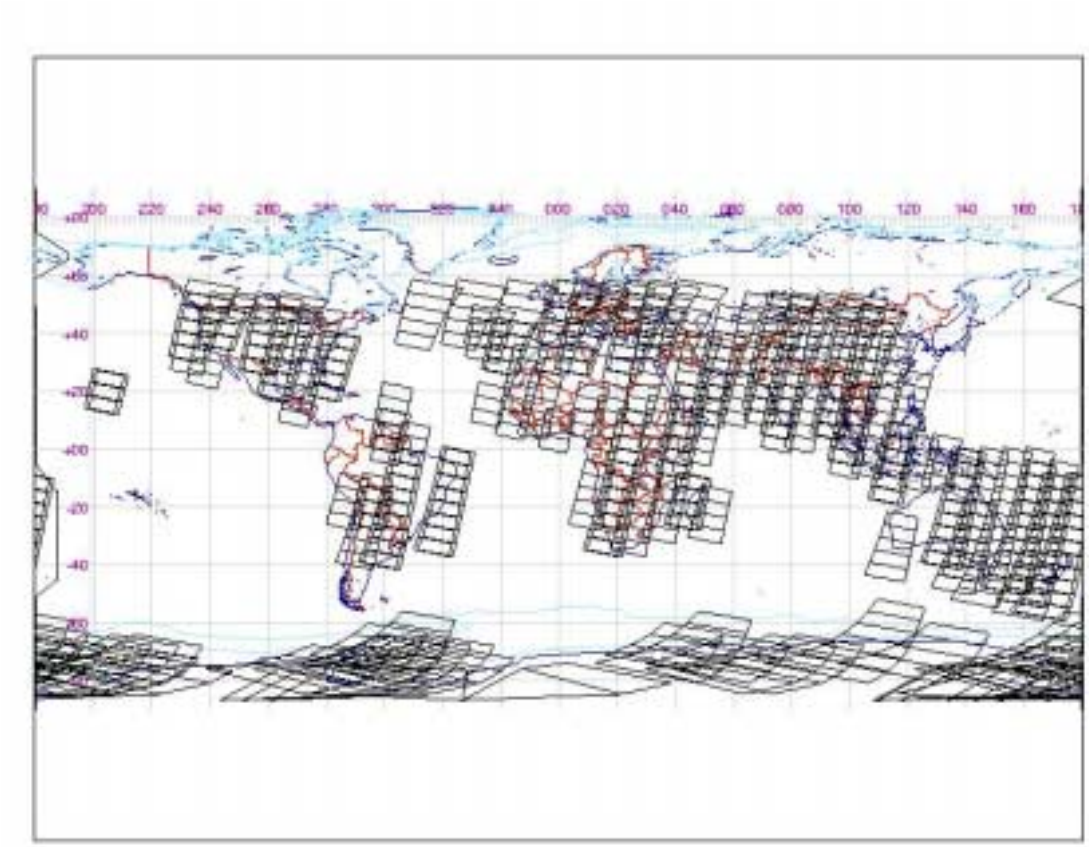
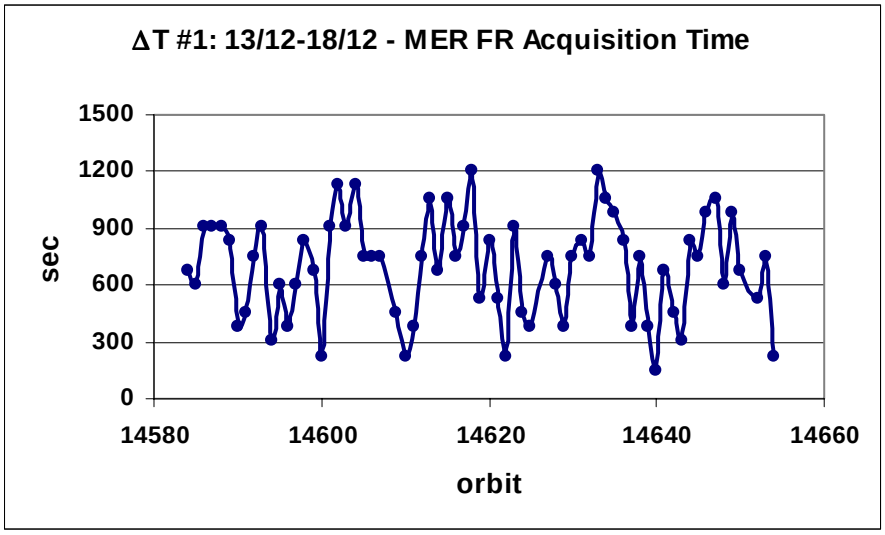


Figure 3 - MER FR Global Coverage for period 13/12 – 18/12



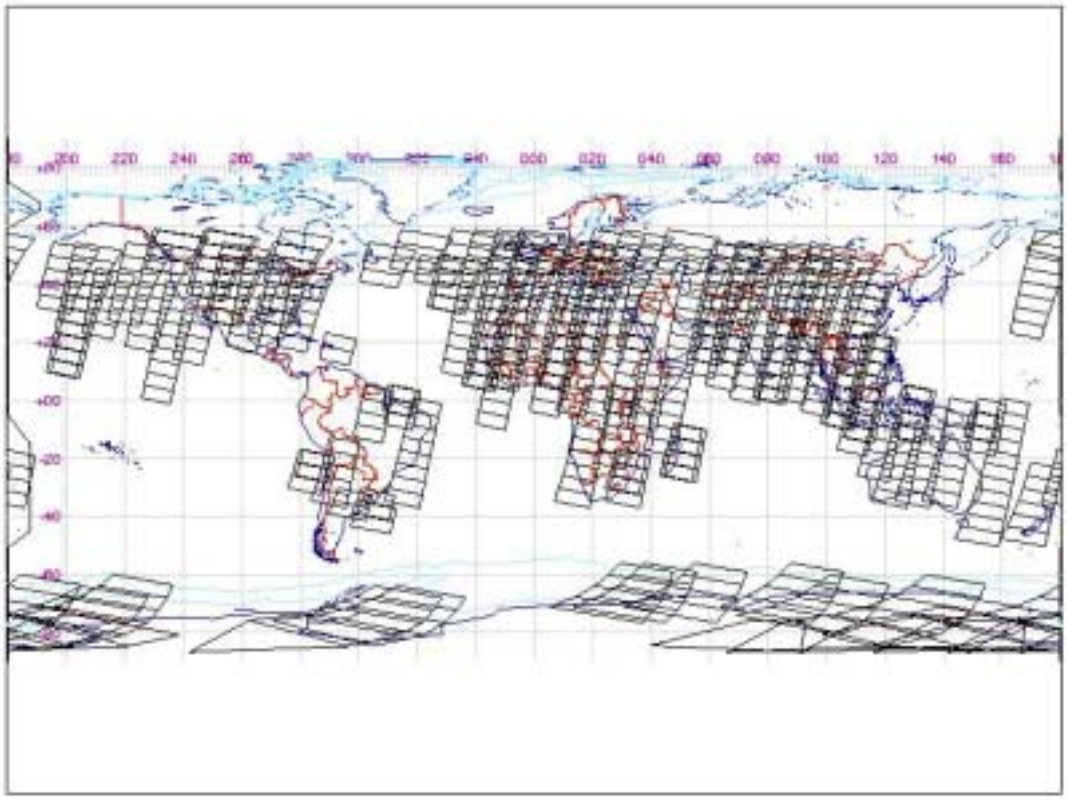
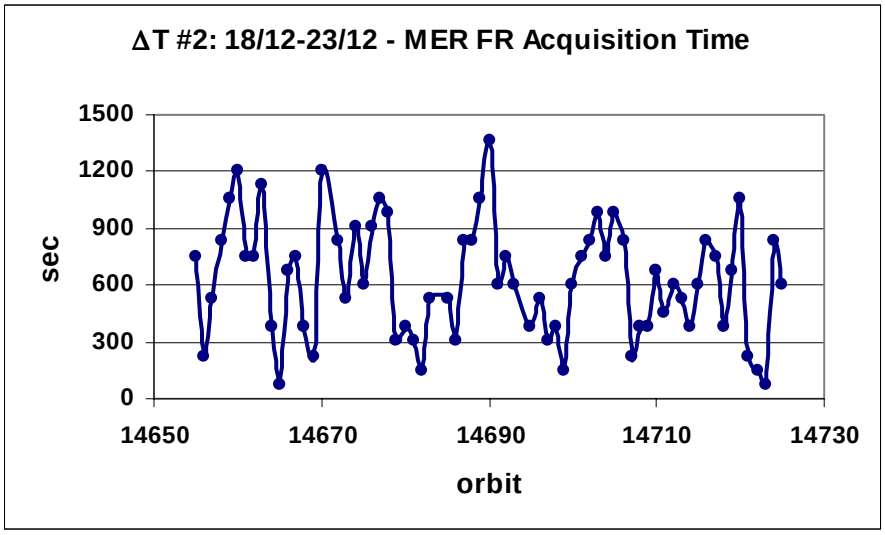


Figure 4 - MER FR Global Coverage for period 18/12 – 23/12



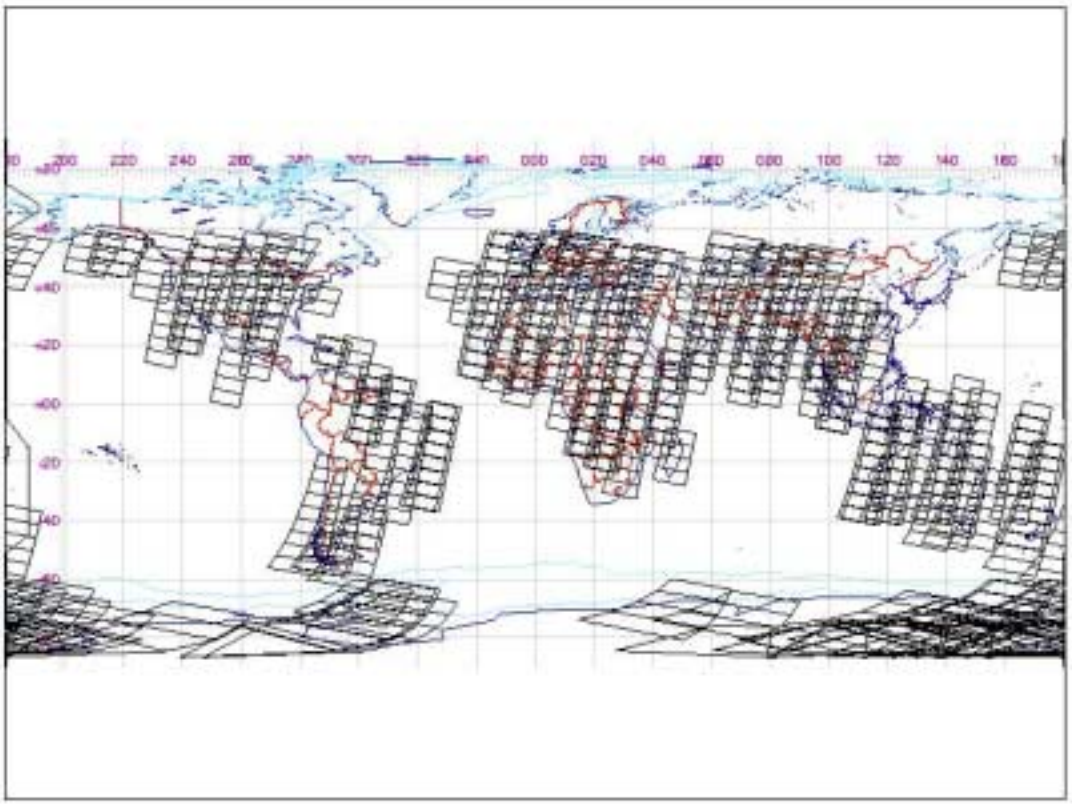
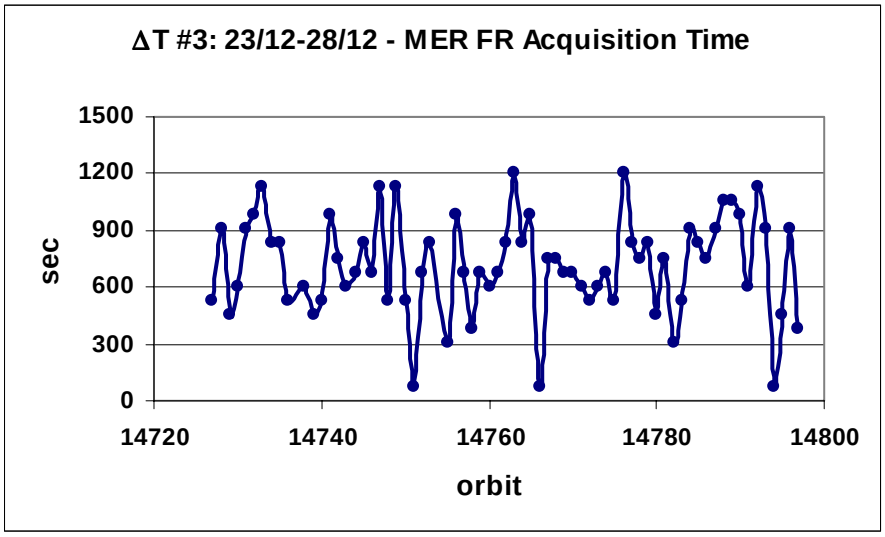


Figure 5 - MER FR Global Coverage for period 23/12 – 28/12



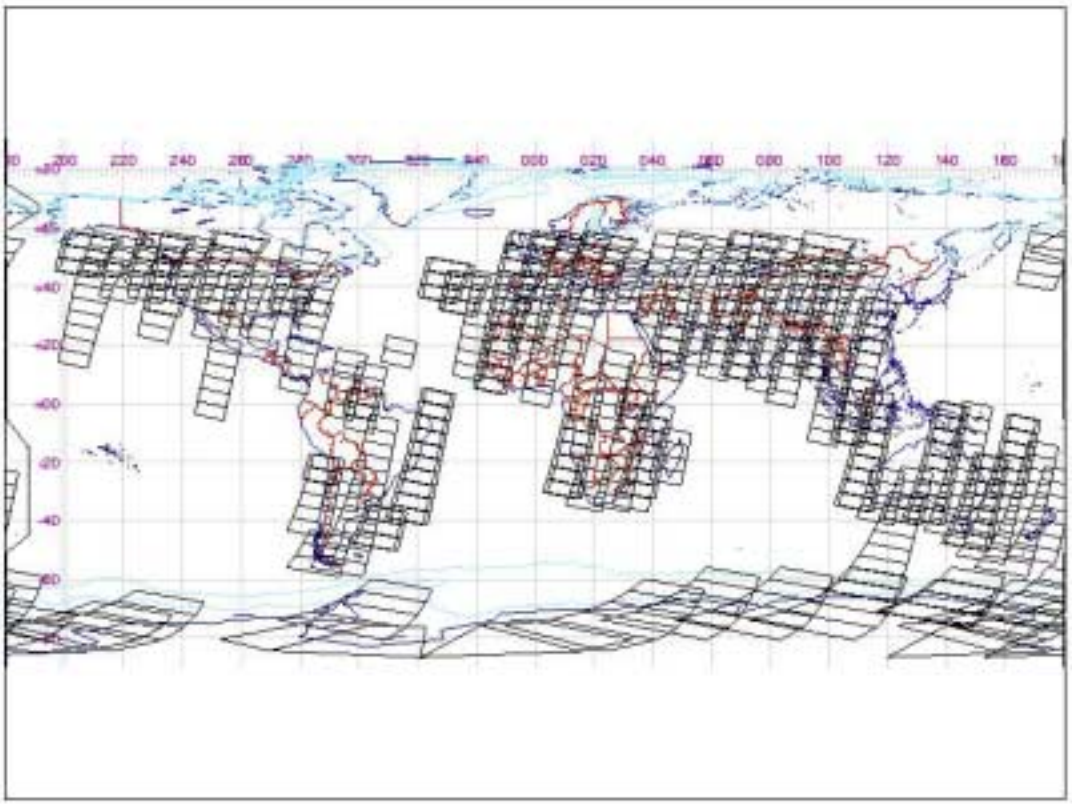
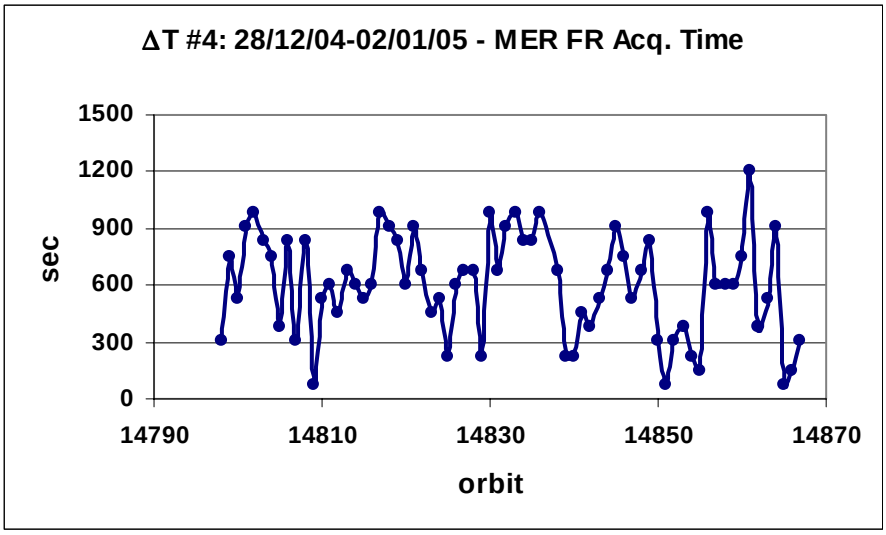


Figure 6 - MER FR Global Coverage for period 28/12/04 – 02/01/05



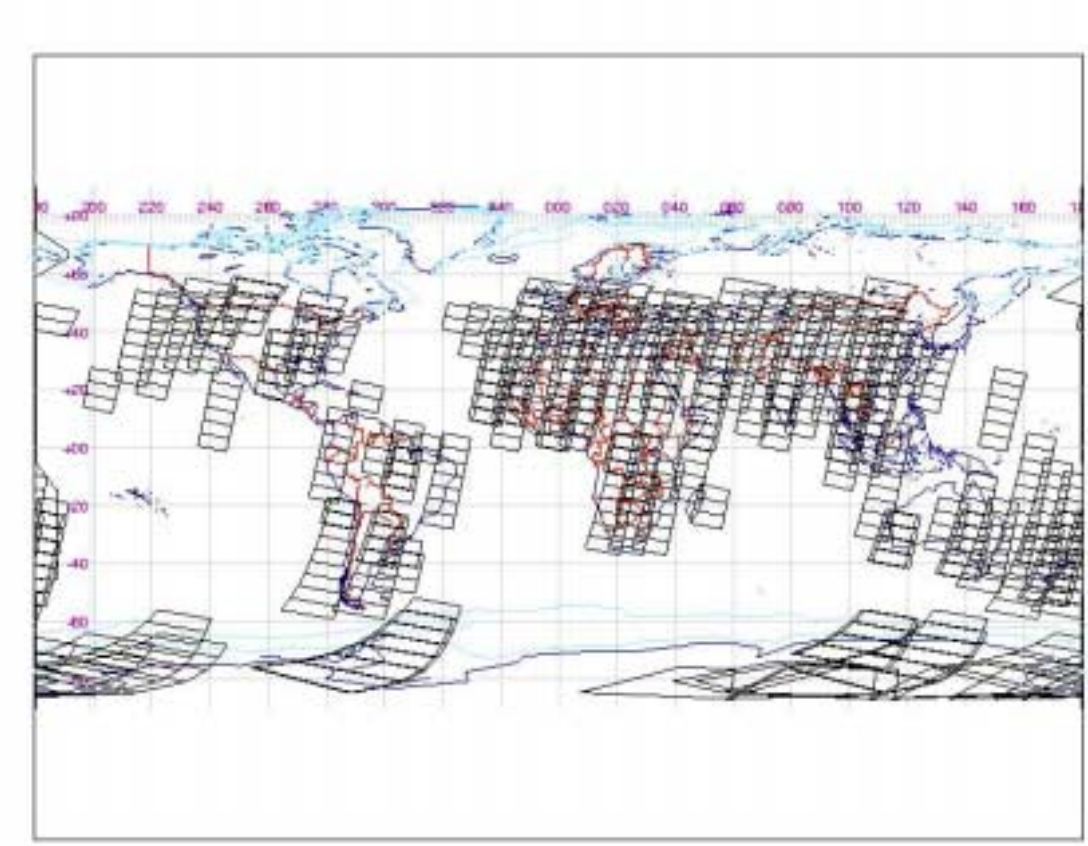
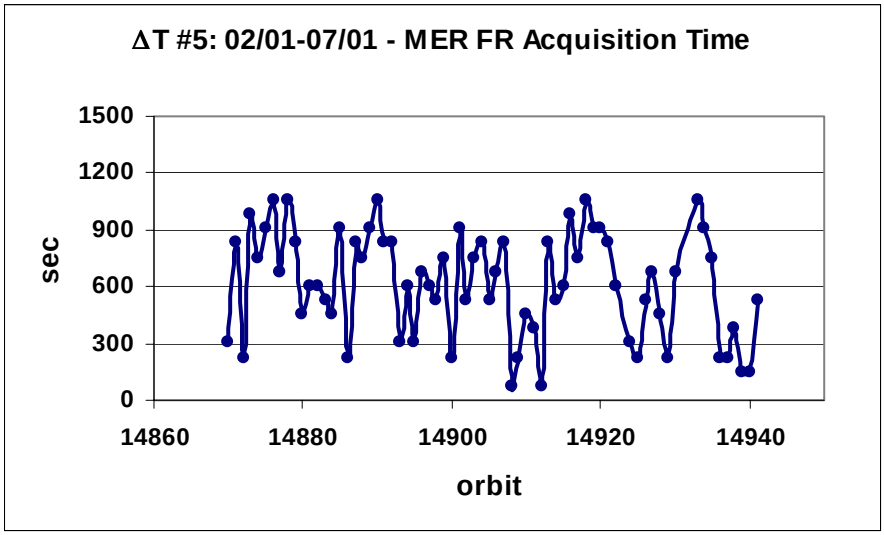


Figure 7 - MER FR Global Coverage for period 02/01 – 07/01



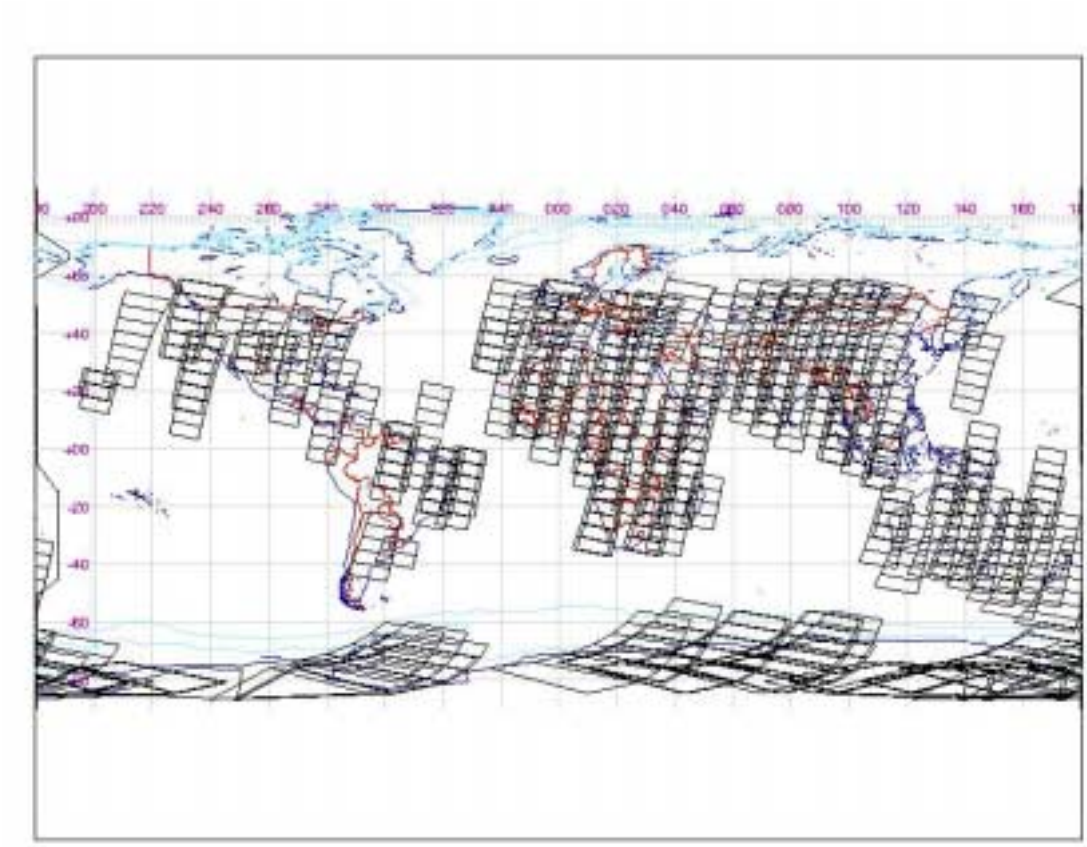
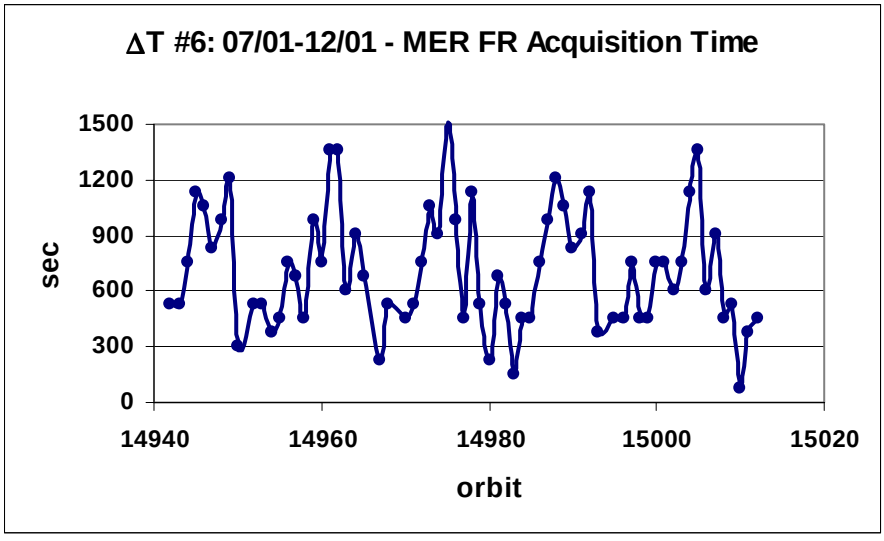


Figure 8 - MER FR Global Coverage for period 07/01 – 12/01



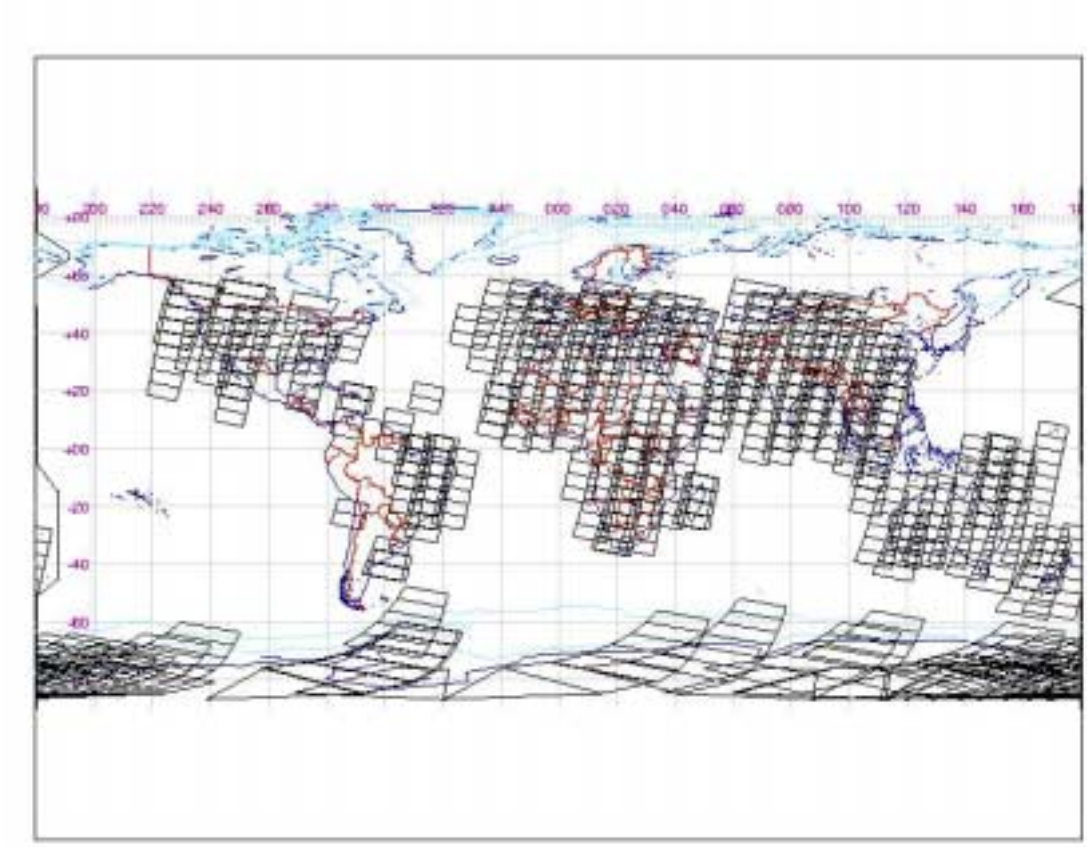
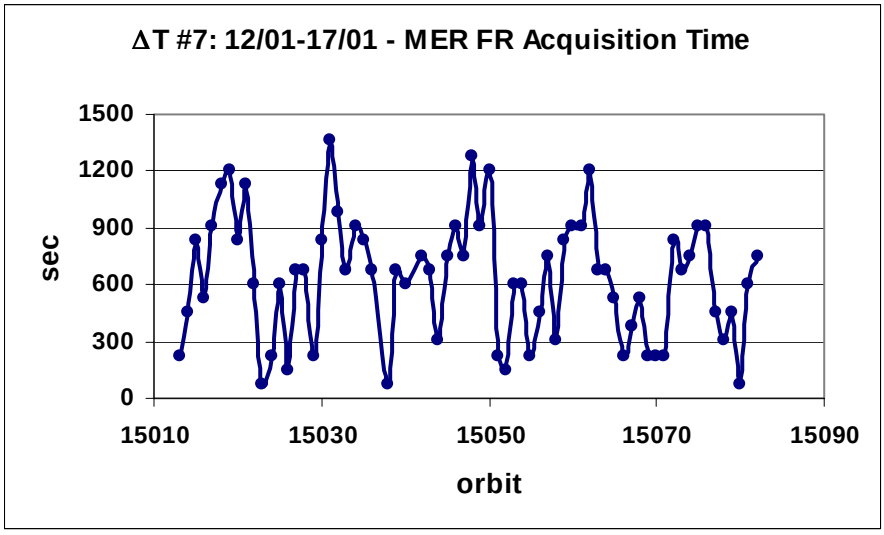


Figure 9 - MER FR Global Coverage for period 12/01 – 17/01



During cycle # 33, the mean time per orbit dedicated to FR acquisitions is 10.85 min.

4.3 MER_CA__0P Products

During cycle #33 three routine RGC radiometric gain calibrations have been planned. All the calibrations were successfully executed on the 19th of December, 02nd and 16th of January 2005, in orbits respectively 14660, 14860 and 15060.
The list of calibrations is reported below:

MER_CA__0PNPDK20041219_064436_000001792033_00077_14660_0115.N1	RGC
MER_CA__0PNPDE20050102_060411_000001792033_00277_14860_0022.N1	RGC
MER_CA__0PNPDE20050116_052319_000000022033_00477_15060_0028.N1	RGC

The last calibration executed on 16th of January was acquired with only 64 packets. An anomaly report has been opened for the identification of the cause and if possible to reprocess the data acquired in order to generate a complete source packets product.

4.4 Unavailability

4.4.1 Instrument

No instrument unavailability was communicated by ESOC during cycle #33.

4.4.2 Data

No significant data unavailability was reported by PCF MERIS Team during cycle #33.

5 CALIBRATION AND INSTRUMENT CHARACTERIZATION

5.1 Calibration

5.1.1 Radiometric calibration

During cycle #33 three routine RGC calibrations were successfully executed on the 19th of December, 02nd and 16th of January 2005. For more details see par. 4.2.

5.1.2 Spectral calibration

No spectral calibration was performed during cycle #33.

5.1.3 Geolocalization

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 consecutives 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.

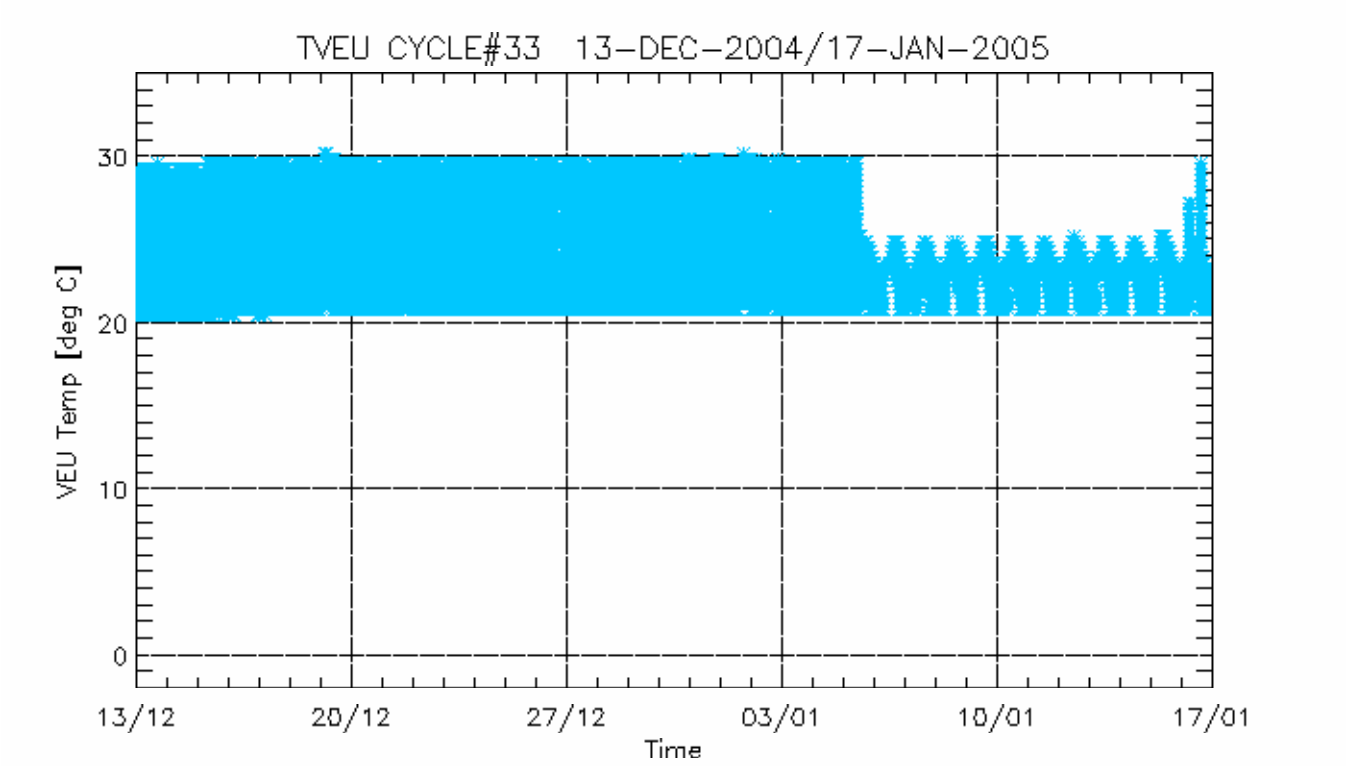
(II) The 2003 period is characterized by a degradation of the absolute geolocation accuracy where error is around ±209 meters along-track and ±295 meters across-track. For this period, the RMS absolute geolocation error stays within the range of 368.39 ± 67 m.

(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 (centred 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/

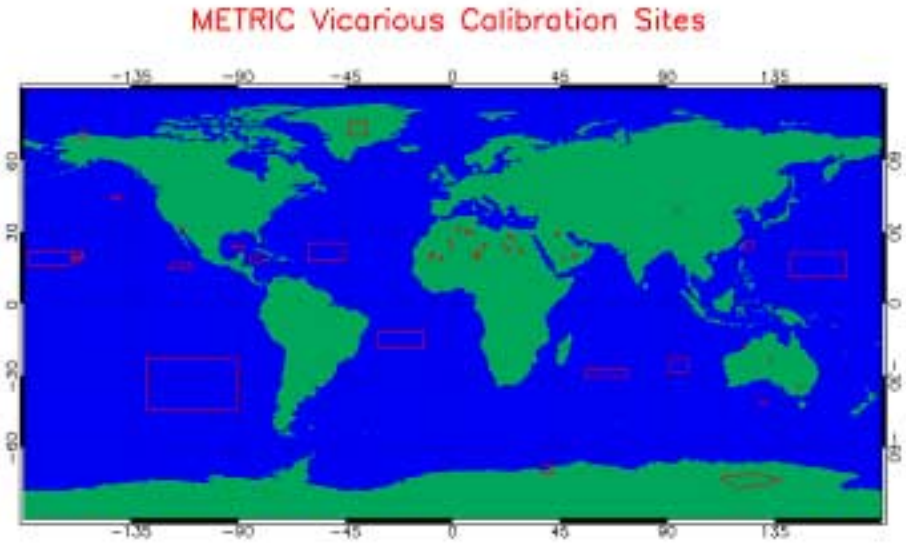
5.1.4 VEU Temperature Analysis

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°/+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 #33 the VEU temperature shows an anomalous behavior due to incomplete recorded housekeeping telemetry. Reception of recorded house keeping data (DS2) at ESRIN and KIRUNA from ENVISAT mission was interrupted on 6th January since 006.06.29.15. On 11th January, at 13.50.10 the HSIM2A HSM input module for the PMC was reset whilst in Kiruna coverage, and the HSM Routing History Table dumped for reference in the following pass at 15.29.00. Initial indications suggest that this has not resolved the problem. The HSM input module was reset again on 13th January at 17.44.15, with a longer ‘off’ duration (15.5sec instead of 5 sec), but again this failed to resolve the problem. Investigations are still ongoing to determine the cause.



5.1.5 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:



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

Sites	#Products
DESERT	360
GLITTER	9
RAYLEIGH	38
SNOW	25
BUOY	10

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/

5.2 Instrument Characterization

5.2.1 Instrument degradation

No new results to be shown for cycle #33. Please refer to Cyclic Report #26. The report can be found on the ESA website: http://earth.esa.int/pcs/envisat/meris/reports/cyclic/.

5.2.2 Diffuser ageing

No new results to be shown for cycle #33. Please refer to Cyclic Report #26. The report can be found on the ESA website: http://earth.esa.int/pcs/envisat/meris/reports/cyclic/

5.2.3 Smile Effect

No new results to be shown for cycle#33. Please refer to Cyclic Report #23. The report can be found on the ESA website: http://earth.esa.int/pcs/envisat/meris/reports/cyclic/

5.2.4 Spectral evolution from erbium measurements

No new results to be shown for cycle #33. Please refer to Cyclic Report #23. The report can be found on the ESA website: http://earth.esa.int/pcs/envisat/meris/reports/cyclic/

6 DATA QUALITY CONTROL

6.1 Status of the Level 1 and Level 2 products quality

The quality of the MERIS products generated by IPF4.07 has been accurately described in Cyclic Report #25. The report can be found on the ESA website:

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

The processor upgrade performed during cycle #33 mainly improves the Level 2 processing time and fixes some minor bugs related to the FR production and specifically to the water vapor product.
The MERIS processor will be completely renewed during summer 2005 for a significant improvement of the Level 2 products quality. At that time the processor installed at processing centers and the prototype, that has been properly configured for the MERIS Products Reprocessing of 2002, 2003, 2004 and part of 2005 data archive, will be perfectly aligned. See paragraph 8 for information regarding the format changes and algorithm modifications foreseen for the new MERIS IPF release.

6.2 Anomalies and Software Problem Reporting (SPR)

No product anomalies identified during cycle #33.

7 VALIDATION ACTIVITIES AND RESULTS

In the following paragraphs are presented the more recent results regarding the validation of MERIS atmospheric products shown by FUB during the QWG held on December 2004.

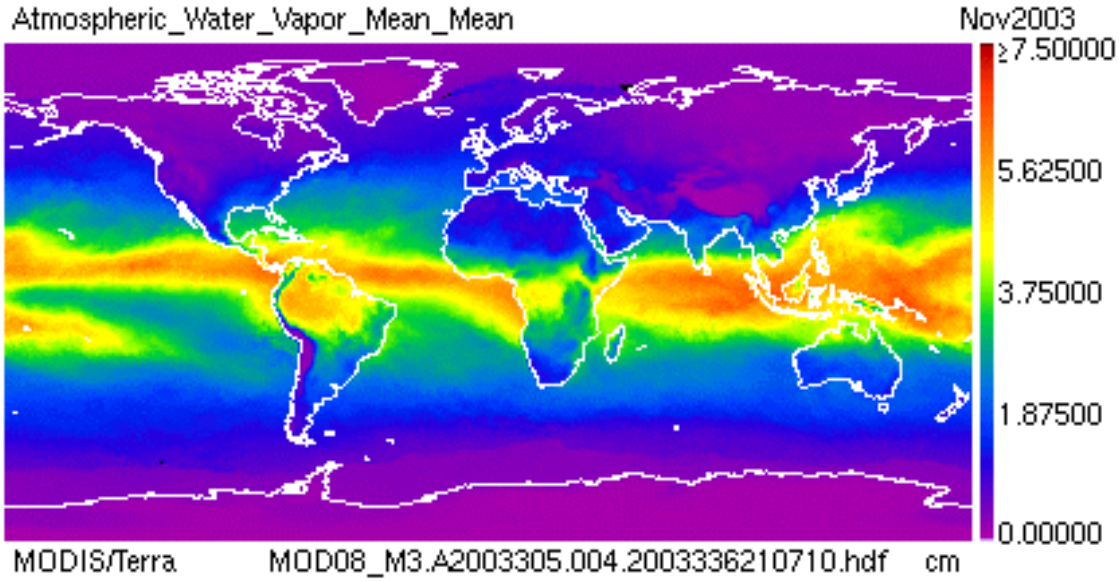
7.1 7.1 Validation of MERIS Water Vapour

The procedure applied for the validation of MERIS Water Vapour is the following:

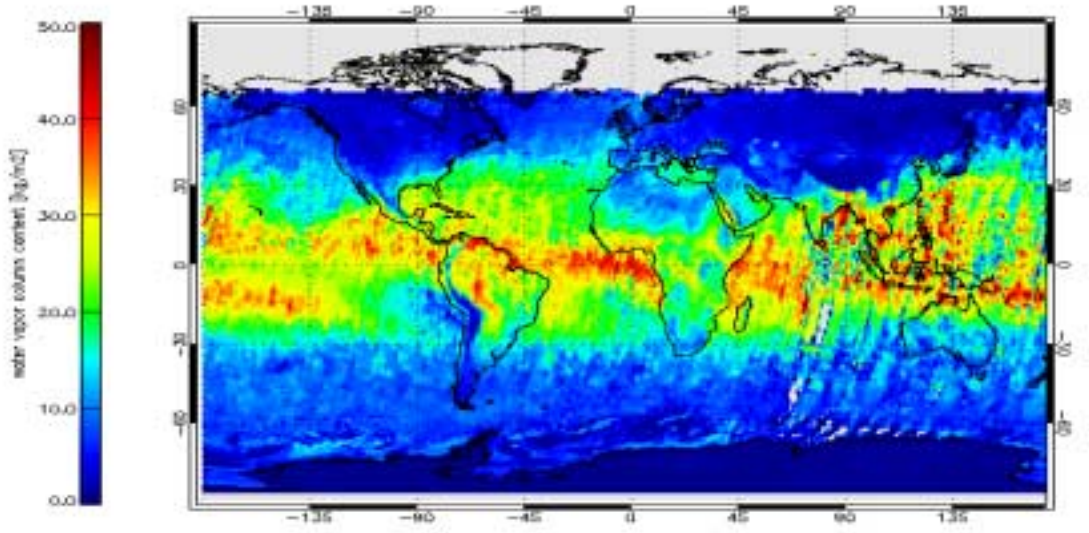
- Data extracted from the MERIS Meteo products received from ESRIN and KIRUNA
- Consider only cloud-free pixels detected using the cloud mask included in the MERIS products.
- Average of pixel values over a map of resolution 1° x 1°.

7.1.1 Validation of Water vapour above land

The comparison of MERIS data with MODIS (Terra) and MSG (SEVIRI) shows that above land the MERIS water vapour content is underestimated; see plots below.



Water Vapour map by MODIS averaged on Nov 2003

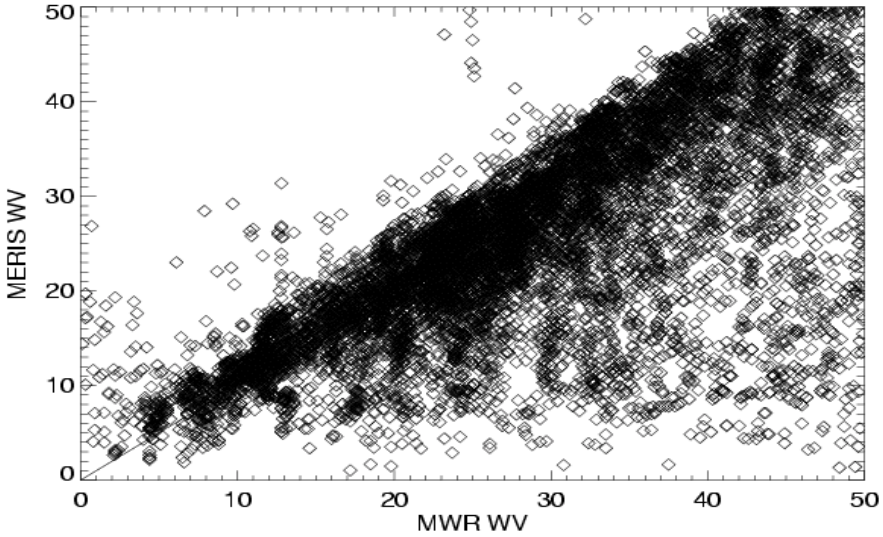


Water Vapour map by MERIS averaged on Nov. 2003

The analysis of camera dependencies for MERIS data shows that no systematic camera effect is visible.

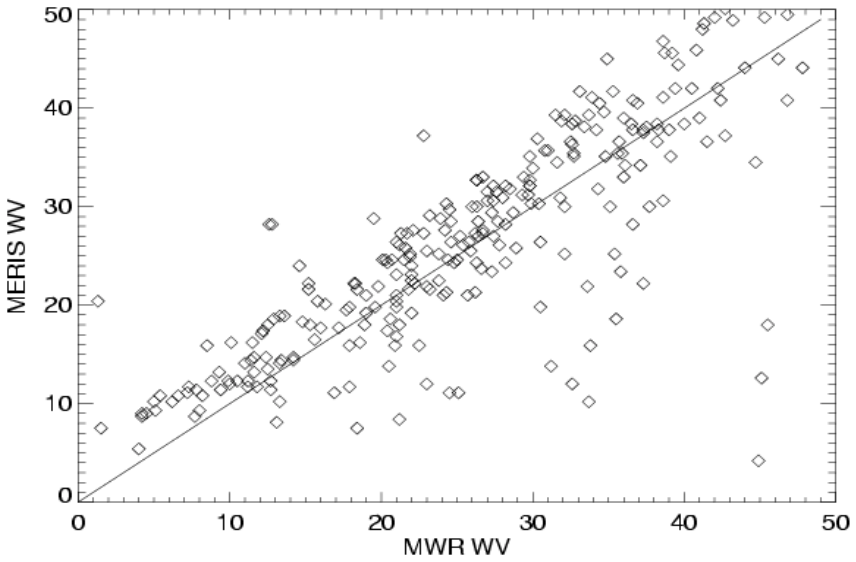
7.1.2 Validation of MERIS Water Vapour above ocean

The comparison of MERIS water vapour data and the complete archive of measurements collected with the Microwave Radiometer (MWR) is shown below:



Note that 19 MERIS pixels (resolution of 1 Km) are included in 1 MWR pixel (resolution of 20 Km).

Then, considering only those cases for which at least 16 MERIS pixels are cloud-free the plot above becomes:



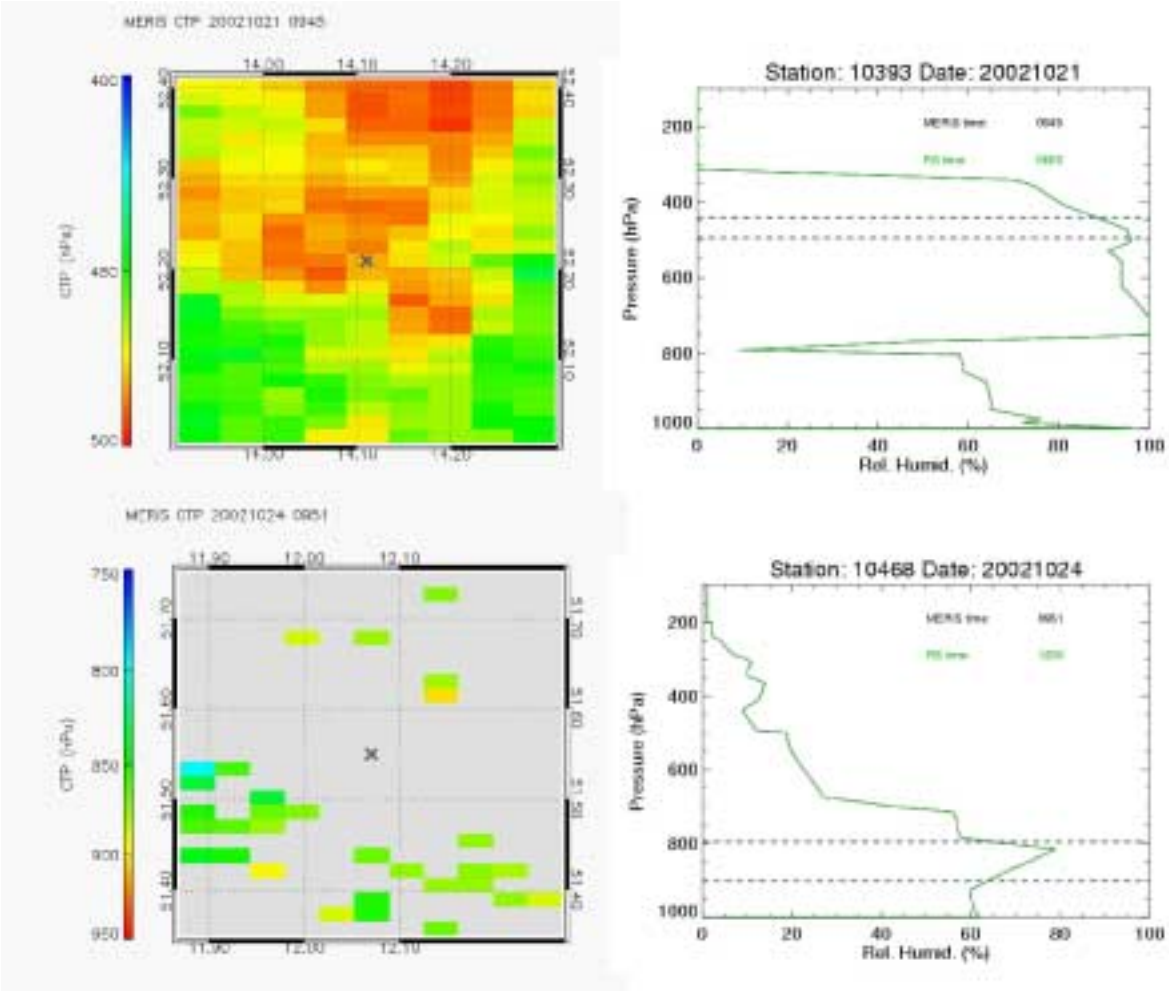
In the graph above: rms: 6.5 Kg/m^2; bias: 1.8 Kg/m^2

In conclusion, the comparison between the MERIS Water Vapour and the measurements of the microwave radiometer shows that above ocean there is a moderate agreement.

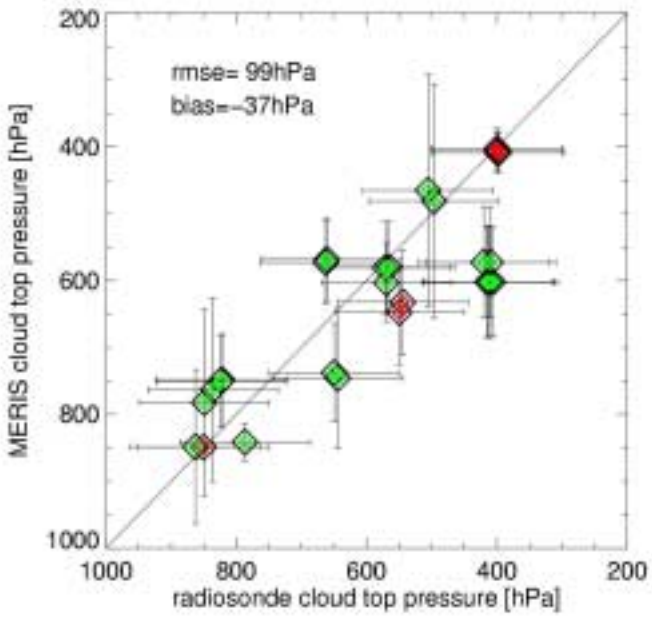
7.2 Validation of MERIS Cloud Top Pressure

7.2.1 Validation with Radiosondes

The comparison between the measurements from Radiosondes and the MERIS Cloud Top Pressure (CTP) data at Radiosondes overpass time is shown in the plot below: are visible the MERIS cloud top pressure and the profile of relative humidity for a high level cloud (upper; 21.10. 2002 above Lindenberg, Germany) and for a low level cloud (lower; 24.10. 2002 above Oppin, Germany).



For the scatter diagram of all the retrieved cloud heights, see plot below. The median cloud top in the 0.5° square around the radiosondes launch point is taken as the MERIS cloud top height, the error-bar is the standard deviation within this area.

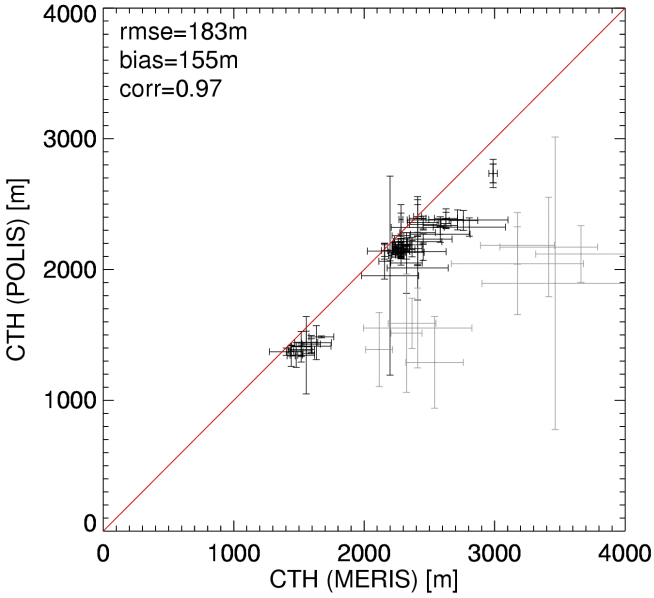


7.2.2 Validation with aircraft campaign

An aircraft campaign for CTP validation has been done, with POLIS (Portable Lidar System) on board having the following properties:

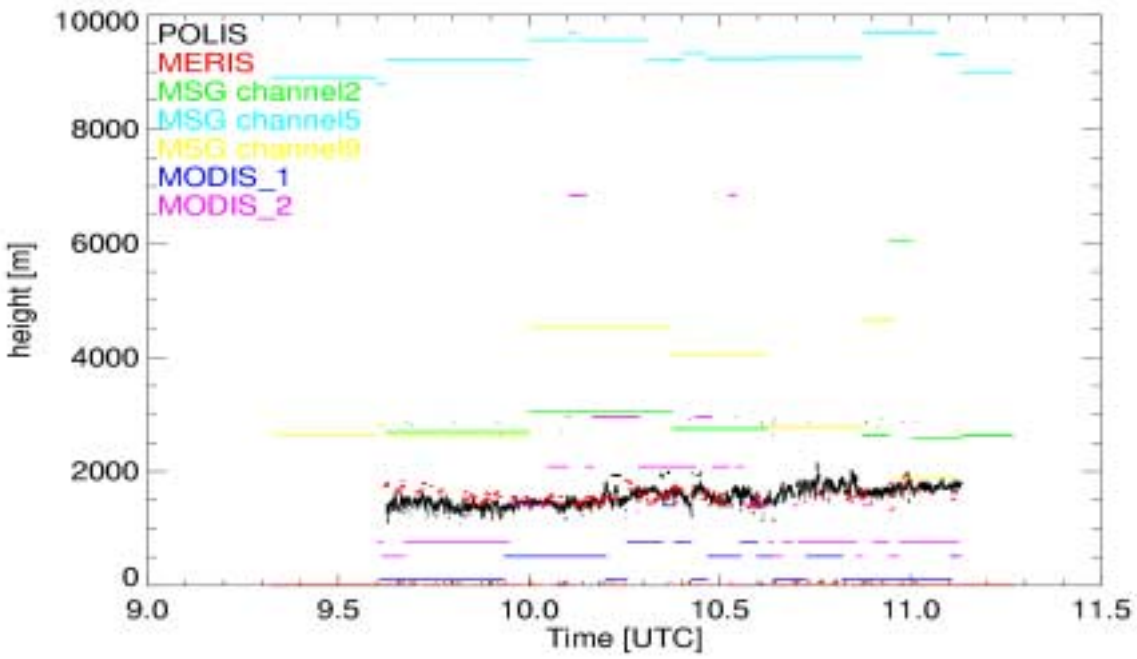
- Wavelength: 355nm
- Repetition rate: 5Hz.
- Vertical resolution: 7.5m.
- Horizontal resolution: ~10m (vaircraft = 50 m/s).

The comparison between POLIS measurements and MERIS CTP data is shown in the plot below:



Legend: grey with cirrus; black without cirrus

The comparison with other instruments is shown in the following plot:



In conclusion, the accuracy achieved for the MERIS cloud top height is ~ 180m (rmse, that corresponds to ~ 17 hPa at 2000m; bias: 155m) in case of low clouds without cirrus. This result shows that MERIS is more accurate than expected (30 hPa). On the contrary, some problems have been identified in MERIS data in presence of Cirrus and scattered Cumuli.

8 FIRST 2003 MERIS DATA ARCHIVE REPROCESSING

For details about the 1st reprocessing of the 2003 MERIS data archive, in terms of applied algorithms and associated auxiliary parameters, please refer to the on–line document:

Fisrt_2003_MERIS_Reprocessing.pdf

The document explains also how to access the reprocessed data.

8.1.1 Detailed status

The table below shows the quality status achieved for each parameter in the reprocessed dataset.

Parameter	Quality				Comment
	Goal[1]	Source[2]	Status[3]	Date[4]	
Pixel Classification					
Land flag	Reclassification of uncharted inland waters and islands, tidal flats and correction of map inaccuracies	ATBD 2.17 Iss. 4 Dec. 1997	The reclassification is now performed over each land pixel using the radiometry. The inland waters are now well classified. There is no distortion by high glint.	25.06.04	The reclassification is based on the Level 2radiometry that is corrected from Rayleigh and gaseous absorption. Over land, at high altitude, this correction may be wrong introducing wrong classification (ex: Top of Hawaii mountain classified as water).
Water flag	As land flag		As land flag	25.06.04	
Cloud flag (over ocean)	Detection of clouds		Thin clouds are hardly detected.	25.06.04	Separation of ice from clouds works well. The purpose of this flag is to identify clouds, which are useful for the cloud processing. In order to dismiss any cloudy pixel this flag should be used in complement with the ICE/HAZE flag that detects the thin clouds.
Cloud flag (over land)			Thin clouds are hardly detected.	25.06.04	Ice, snow often detected as clouds.

[1] The accuracy that shall be achieved.
[2] The origin of the quality goal.
[3] Present status of quality
[4] Date of the present status

Parameter	Quality				Comment
	Goal[1]	Source[2]	Status[3]	Date[4]	
Pixel classification science flags					
Pressure confidence			no longer available in the product It has been reused for LOW_SUN	25.06.04	Removed from the product.
Low pressure			OK	25.06.04	It is raised mainly over clouds pixel.
Cloud parameters					
Surface reflectance 1-13	See L1b radiometry	QWG 25.9.03	over clouds simple conversion into TOA reflectances works well. Saturation in bands 779 and 865 can be observed – correctly flagged.	25.06.04	An analysis of the statistics of saturated pixels.
PCD_1_13			OK	25.06.04	
Cloud top pressure (CTP)	20 hPa	ATBD 2.3, Iss. 4.1 Feb 2000	Goal is reached over stratocumulus clouds in the Passat region (30°-40°N). Elsewhere needs further validation. At low clouds camera transitions, with a step ~40 hPa, are observed.	25.06.04	Validation campaign, e.g. with Lidar, is still required. The problem of camera interfaces still needs to be further investigated.
PCD_15			Ok	25.06.04	
Cloud albedo	accuracy of 0.01 albedo	ATBD 2.1, Iss. 4.1 Feb 2000	Ok		The accuracy of the products is determined by the radiometric accuracy.
PCD_18			OK	25.06.04	
Cloud optical thickness	accuracy of 0.1 – 5.0 (worse with increasing OT)	ATBD 2.2, Iss. 4.2 Feb 2000	OK	25.06.04	In situ measurements validation is on going (aircraft campaign).
Cloud type			OK	25.06.04	Verification ongoing. It needs a statistically

Parameter	Quality				Comment
	Goal[1]	Source[2]	Status[3]	Date[4]	
					significant number of products.
PCD_19 (cloud opt. th. and type)			OK	25.06.04	
Water Vapour parameter					
Water vapour content (ocean)	Less than 20% rel. to WV over glint: 10%	ATBD 2.4, Iss. 4.0 Dec. 1997	OK	25.06.04	
PCD_14 (ocean)			Ok but strange setting on the transition to glint	25.06.04	
Water vapour content (land)	10% relative. to WV amount		OK	25.06.04	The water vapour products show a good agreement when comparing with GPS, radio sounding data, Microwave radiometers or MODIS data.
PCD_14 (land)			OK	25.06.04	
Water vapour content (cloud)	Not specified in ATBD		OK	25.06.04	
PCD_14 (cloud)			OK	25.06.04	
PCD_19 (cloud opt. th. and type)			OK	25.06.04	
Ocean parameter					
Surface reflectance 1-13	Case1: accuracy 0.002 marine reflectance in the blue. Case2: accuracy 5%	ATBD 2.7 Iss. 4.1 Feb 2000 ATBD 2.6 Iss. 4.1 Feb 2000	Negative reflectances occur at 620 nm over case I water probably due to the limitation in the aerosol family, but it does not seem to affect the chlorophyll products. Overcorrection of the first 3 bands in Case-II water occurs sometimes. A fringe of negative reflectances exists around most coastlines.	25.06.04	The atmospheric correction above bright water in the Infra Red works well, however the extrapolation seems to overestimate sometimes the path radiance with decreasing wavelengths leading even to negative reflectances under some atmospheric conditions. The retrieval of water constituent in the water, which is dark in the blue, is limited by the accuracy of the atmospheric correction. The negative reflectances in the pixels next to the coast are probably due to neighbouring effect.

Parameter	Quality				Comment
	Goal[1]	Source[2]	Status[3]	Date[4]	
			Reflectance at 681 is not corrected for smile and may be affected diversely depending on the fluorescence activity. Reflectance at 709 is corrected for smile, however gaseous absorption correction does not account for smile, which may lead to erroneous values at low reflectance levels.		
PCD_1_13			OK	25.06.04	The PCD_1_13 is raised in most cases for good reasons: high sun glint or thin clouds (ICE_HAZE flag) are the cause in ~ 80% of the cases when PCD_1_13 is raised. In the coastal area due PCD_1_13 could be raised due to environmental effect.
Aerosol optical thickness	Accuracy 15% or 0.02 for moderate values (~0.1 – 0.2)	ATBD 2.7 Iss. 4.1 Feb 2000	OK	25.06.04	
Aerosol Angström coefficient (alpha)	Not specified in ATBD	ATBD 2.6 and 2.7 Iss. 4.1 Feb 2000	OK	25.06.04	
PCD_19 (aer. opt. thk. and epsilon)			OK	25.06.04	
Algal pigment index 1	Accuracy 10 classes per decade (~13%), covered range: 0.01 – 30 mg/m³ over Case1 waters	ATBD 2.9 Iss. 4.2 Feb 2000	OK	25.06.04	Quantitative error accuracy assessment is on going.

Parameter	Quality				Comment
	Goal[1]	Source[2]	Status[3]	Date[4]	
PCD_15			OK	25.06.04	PCD15 is raised (among other reasons) if any of the reflectances used in the Chlorophyll 1 retrieval is out of range (e.g. negative), which makes it less restrictive than PCD1_13.
Yellow substance	Depends on combination of YS, SPM and chlorophyll. See ATBD for details.	ATBD 2.12 Iss. 4.0 Dec 1997	Values are in the expected range. Quantitative error assessment not completed	25.06.04	Case2 algorithm uses band 1-7 and 9, which makes it more sensitive to PCD1_13. It is very important not to use the products when PCD17 is raised! PCD17 is raised almost everywhere in Case1 waters, which is in agreement with the definition range for the algorithm. Presently the range of the yellow substance absorption is linearly scaled over the available 8 bit in the data product. Instead of this the log of the absorption should be used (as it is the case for all other water constituents). This would provide much more detail in particular in case 1 water where the yellow substance values are now fixed to the minimum threshold of the 8 bit range (i.e. 0.0196). By this we simply throw away very valuable information. The corresponding loss of resolution at higher concentrations is no problem.
Total suspended matter			OK	25.06.04	
PCD_16 (YS and TSM)			A coding error in PCD16 has been identified. PCD17 should be used instead.		
Algal pigment index II			OK	25.06.04	
PCD_17			OK	25.06.04	
PAR	Accuracy +/- 3%	ATBD 2.18 Iss. 4.0 Dec 1997	A coding error has been identified in the PAR retrieval. It will be corrected	25.06.04	

Parameter	Quality				Comment
	Goal[1]	Source[2]	Status[3]	Date[4]	
			in the next version of the processor.		
PCD_18			See above.	25.06.04	
Ocean Science Flags					
Blue aerosol			OK	25.06.04	
Dust aerosol	.		OK	25.06.04	Investigation in progress. The dust aerosol flag is now raised when an absorbing aerosol has been selected for the atmospheric correction
Case2_S			Ok.	25.06.04	The Case2S flag is now indicating that a sediment loaded water is present. It does no longer indicate that the turbid water (=bright pixel) atmospheric correction is activated. This is now indicated by the BPAC_ON flag.
Case2_anom			OK	25.06.04	Visually inspected.
Case2_Y			Not activated	25.06.04	
Ice and haze			OK	25.06.04	This flag has been redefined and is now also triggered in case of thin clouds, which are not correctable by the atmospheric correction. First verification results are very promising.
Medium glint	Indicate atmospheric correction could still be possible.	QWG 25.9.03	OK	25.06.04	Large portions of the images over water surfaces are affected by sun glint.
High glint	Indicate that atmospheric correction cannot be performed with the claimed accuracy.	QWG 25.9.03	OK	25.06.04	Threshold for glint is based on simulated data. Users should use the products with EXTREME CAUTION under medium glint conditions. The accuracy of the results in the medium glint is not validated. Users should NOT use Level 2 data when the high glint flag is raised
BPAC_ON	Indicate that the		OK	07.04	

Parameter	Quality				Comment
	Goal[1]	Source[2]	Status[3]	Date[4]	
	Bright Pixel Atmosphere Correction was enabled				
Land Parameter					
Surface reflectance 1-13			OK	25.06.04	Correction includes Rayleigh but not aerosol correction.
PCD_1_13			OK	25.06.04	Cloud shadows are not included in PCD1_13 but in TOAVI_WS
Aerosol optical thickness			OK (see comment)	25.06.04	When the PCDs are raised, the Optical Thickness that is given at 865 nm is wrong, but its propagation at 443 nm, using the Angström coefficient given in the product is valid. However, in this case the Angström coefficient is invalid.
Aerosol Angström coefficient (alpha).			OK (see comment)	25.06.04	
PCD_19 (aer. opt. thk. and esp.)			OK	25.06.04	
TOAVI (MGVI)	Not specified in ATBD	ATBD 2.10 Iss. 4.1 Feb 2000	OK	25.06.04	
PCD_15			OK	25.06.04	
BOAVI	Not specified	No ATBD for BOAVI available	This field is currently not available	25.06.04	This field will provide with the MERIS Terrestrial Chlorophyll Index (MTCI) in the next version of the processor.
PCD_17			OK	25.06.04	
Rectified reflectances			OK	25.06.04	
PCD_16			OK	25.06.04	
Surface pressure			Generally ok, but camera interfaces and striping visible	25.06.04	The problem of camera interfaces is further investigated.
PCD_18			Ok	25.06.04	Could be more “sharp”: only P_surf>1047 are flagged by the out-of-range criterion, but 1030 < P < 1047 is also quite high and can be found not rarely in images. TBC

Parameter	Quality				Comment
	Goal[1]	Source[2]	Status[3]	Date[4]	
Land Science Flags					
DDV (keep DDV)			OK	25.06.04	The concept of DDV has been extended to less dark vegetation in order to increase the temporal and spatial extend, so that aerosol properties is retrieved over more pixel. In that sense the term DDV is abusive. This flag will be renamed to LARS = Land Aerosol Remote Sensing On in future releases.
TOAVI_Bright			OK	25.06.04	
TOAVI_Bad			OK	25.06.04	
TOAVI_CSI			OK	25.06.04	
TOAVI_WS			OK	25.06.04	
TOAVI_Invalid_Rec			OK	25.06.04	
Additional Flags					
Coastline			OK	25.06.04	Coastline is taken from a static map and not reclassified using radiometry. The accuracy of the current database is not optimum. It should not be used to precisely characterise the geolocation accuracy, which is known to be better than 400m irrespective of the coastline flag information.
Cosmetic			OK	25.06.04	
Suspect			OK	25.06.04	
LOW_SUN			OK	25.06.04	Should be available on all surfaces, but is not set for cloud pixel.

9 MERIS INSTRUMENT PROCESSING FACILITY (IPF) EVOLUTION

For details about the evolution of the MERIS IPF since March 2002, in terms of data format changes and algorithm modifications please refer to the on–line document:

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

10 HOW TO GET MERIS DATA

For details about the different ways to access the MERIS data please refer to the on–line document:

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

11 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/

12 GENERAL INFORMATION

1. The 2004 ENVISAT Symposium has been held in Salzburg (Austria) from 6 to 10 September 2004. For detailed information see the ESA's official page: http://earth.esa.int/salzburg04/

2. The European Space Agency is organizing a joint MERIS and (A)ATSR workshop that will be held at ESRIN, Frascati, Italy from **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/