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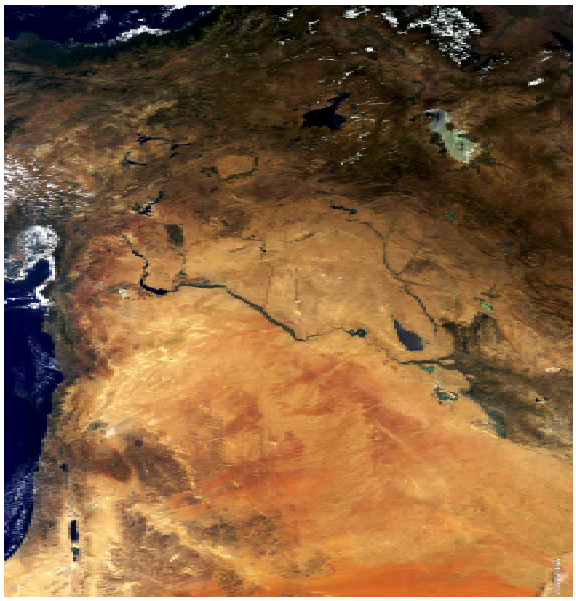
D O C U M E N T

document title/ titre du document

MERIS CYCLIC REPORT 29TH

JULY 26TH 2004 – AUGUST 30TH 2004



Mesopotamia – Asia, the area of modern Iraq and eastern Syria between the Tigris and Euphrates rivers.
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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 behaviour, data acquisition and processing, and finally the status of the calibration, validation, and quality control activities.
The Cyclic Report collects the inputs coming from different groups involved in MERIS data exploitation:

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

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

1.1 Acronyms and abbreviations

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 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
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
SPH	Specific Product Header
SQADS	Summary Quality ADS

2 SUMMARY

Cycle #29 starts on July 26th 2004 and ends on August 30th 2004.

- No auxiliary files were disseminated during the cycle.
- MERIS Spectral campaigns, with special band settings for Oxygen O_2 A band and O_2 B band and Fraunhofer have been successfully executed on 27th and 30th of August 2004.
- Three routine radiometric gain calibrations have been successfully executed. Then, five extra calibrations have been executed within the planned spectral campaigns.
- The actual status of MERIS IPF4.07 products quality is reported in details in par. 6.1 and 6.2.

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

Cycle number	**29**
Start time	26 July 2004, 21:59:29
Stop time	30 August 2004, 21:59:29
Start orbit	12580
Stop orbit	13080

3 SOFTWARE VERSION AND PROCESSING CONFIGURATION

3.1 Software version

All the documents related to the current operational processor, IPF4.07, are reported in the following:

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

3.2 Auxiliary data files

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 dataset for both Level1b and Level 2 processing from Level 0 is listed in the tables below. No new auxiliary files were disseminated during Cycle #29.

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)

MERIS Spectral Campaigns, Fraunhofer campaign with radiometric calibrations only and two O_2 Spectral campaigns (O_2 A Band and O_2 B Band) with radiometric calibrations, have been planned and successfully executed during cycle #29 (26^{th} July – 30^{th} August 2004).
The Configuration Tables, disseminated to the FOCC (ESOC), for each special acquisition followed by the return of MERIS to the nominal SciHiO2 band settings, are listed below:

O_2 A Band executed on 27^{th} of August 2004 (orbits #13025, 13027 and 13030)	**Band Setting**
CTI_OPN_MEVIEC20040722_140708_00000000_00000067_20040827_000557_20781231_235959.N1	O_2 A band
CTI_AIJ1MEVIEC20040722_141126_00000000_00000045_20040827_000618_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_141506_00000000_00000046_20040827_000621_20781231_235959.N1	

CTI_AIJ3MEVIEC20040722_141729_00000000_00000044_20040827_000624_20781231_235959.N1	
CTI_AIJ4MEVIEC20040722_141937_00000000_00000044_20040827_000627_20781231_235959.N1	
CTI_OPN_MEVIEC20040722_142638_00000000_00000068_20040827_014633_20781231_235959.N1	SciHiO2 after O_2 A band
CTI_AIJ1MEVIEC20040722_143050_00000000_00000046_20040827_014654_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_143313_00000000_00000047_20040827_014657_20781231_235959.N1	
CTI_AIJ3MEVIEC20040722_143505_00000000_00000045_20040827_014700_20781231_235959.N1	
CTI_AIJ4MEVIEC20040722_143734_00000000_00000045_20040827_014703_20781231_235959.N1	
CTI_OPN_MEVIEC20040722_144256_00000000_00000069_20040827_032709_20781231_235959.N1	O_2 A band
CTI_AIJ1MEVIEC20040722_144711_00000000_00000047_20040827_032730_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_144849_00000000_00000048_20040827_032733_20781231_235959.N1	
CTI_AIJ3MEVIEC20040722_145006_00000000_00000046_20040827_032736_20781231_235959.N1	
CTI_AIJ4MEVIEC20040722_145112_00000000_00000046_20040827_032739_20781231_235959.N1	
CTI_OPN_MEVIEC20040722_145412_00000000_00000070_20040827_050745_20781231_235959.N1	SciHiO2 after O_2 A band
CTI_AIJ1MEVIEC20040722_145609_00000000_00000048_20040827_050806_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_145751_00000000_00000049_20040827_050809_20781231_235959.N1	
CTI_AIJ3MEVIEC20040722_145914_00000000_00000047_20040827_050812_20781231_235959.N1	
CTI_AIJ4MEVIEC20040722_150040_00000000_00000047_20040827_050815_20781231_235959.N1	
CTI_OPN_MEVIEC20040722_150221_00000000_00000071_20040827_082856_20781231_235959.N1	O_2 A band
CTI_AIJ1MEVIEC20040722_150411_00000000_00000049_20040827_082917_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_150518_00000000_00000050_20040827_082920_20781231_235959.N1	
CTI_AIJ3MEVIEC20040722_150619_00000000_00000048_20040827_082923_20781231_235959.N1	
CTI_AIJ4MEVIEC20040722_150723_00000000_00000048_20040827_082926_20781231_235959.N1	
CTI_OPN_MEVIEC20040722_150857_00000000_00000072_20040827_100932_20781231_235959.N1	SciHiO2 after O_2 A band
CTI_AIJ1MEVIEC20040722_151049_00000000_00000050_20040827_100953_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_151205_00000000_00000051_20040827_100956_20781231_235959.N1	
CTI_AIJ3MEVIEC20040722_151323_00000000_00000049_20040827_100959_20781231_235959.N1	
CTI_AIJ4MEVIEC20040722_151432_00000000_00000049_20040827_101002_20781231_235959.N1	

Fraunhofer Campaign executed on 27th of August 2004	**Band Setting**

(orbits #13031, 13032 and 13033)	
CTI_OPN_MEVIEC20040722_153357_00000000_00000073_20040827_111216_20781231_235959.N1	Fraunhofer I
CTI_OPN_MEVIEC20040722_153727_00000000_00000074_20040827_115008_20781231_235959.N1	SciHiO2 after Fraunhofer I
CTI_OPN_MEVIEC20040722_154345_00000000_00000075_20040827_125253_20781231_235959.N1	Fraunhofer II
CTI_OPN_MEVIEC20040722_154531_00000000_00000076_20040827_133044_20781231_235959.N1	SciHiO2 after Fraunhofer II
CTI_OPN_MEVIEC20040722_154910_00000000_00000077_20040827_143329_20781231_235959.N1	Fraunhofer III
CTI_OPN_MEVIEC20040722_155054_00000000_00000078_20040827_151120_20781231_235959.N1	SciHiO2 after Fraunhofer III

O_2 B Band executed on 30th of August 2004 (orbits #13068, 13070 and 13073)	Band Setting
CTI_OPN_MEVIEC20040722_161419_00000000_00000079_20040830_001142_20781231_235959.N1	O_2 B band
CTI_AIJ1MEVIEC20040722_161854_00000000_00000051_20040830_001203_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_162048_00000000_00000052_20040830_001206_20781231_235959.N1	
CTI_AIJ3MEVIEC20040722_162231_00000000_00000050_20040830_001209_20781231_235959.N1	
CTI_AIJ4MEVIEC20040722_162619_00000000_00000050_20040830_001212_20781231_235959.N1	
CTI_OPN_MEVIEC20040722_162856_00000000_00000080_20040830_015218_20781231_235959.N1	SciHiO2 after O_2 B band
CTI_AIJ1MEVIEC20040722_163102_00000000_00000052_20040830_015239_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_163305_00000000_00000053_20040830_015242_20781231_235959.N1	
CTI_AIJ3MEVIEC20040722_163430_00000000_00000051_20040830_015245_20781231_235959.N1	
CTI_AIJ4MEVIEC20040722_163556_00000000_00000051_20040830_015248_20781231_235959.N1	
CTI_OPN_MEVIEC20040722_163731_00000000_00000081_20040830_033254_20781231_235959.N1	O_2 B band
CTI_AIJ1MEVIEC20040722_163926_00000000_00000053_20040830_033315_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_164036_00000000_00000054_20040830_033318_20781231_235959.N1	
CTI_AIJ3MEVIEC20040722_164151_00000000_00000052_20040830_033321_20781231_235959.N1	
CTI_AIJ4MEVIEC20040722_164246_00000000_00000052_20040830_033324_20781231_235959.N1	
CTI_OPN_MEVIEC20040722_174539_00000000_00000082_20040830_051329_20781231_235959.N1	SciHiO2 after O_2 B band
CTI_AIJ1MEVIEC20040722_174717_00000000_00000054_20040830_051350_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_174839_00000000_00000055_20040830_051353_20781231_235959.N1	
CTI_AIJ3MEVIEC20040722_174944_00000000_00000053_20040830_051356_20781231_235959.N1	
CTI_AIJ4MEVIEC20040722_175053_00000000_00000053_20040830_051359_20781231_235959.N1	

CTI_OPN_MEVIEC20040722_175236_00000000_00000083_20040830_083441_20781231_235959.N1	O_2 B band
CTI_AIJ1MEVIEC20040722_175413_00000000_00000055_20040830_083502_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_175522_00000000_00000056_20040830_083505_20781231_235959.N1	
CTI_AIJ3MEVIEC20040722_175619_00000000_00000054_20040830_083508_20781231_235959.N1	
CTI_AIJ4MEVIEC20040722_175711_00000000_00000056_20040830_083511_20781231_235959.N1	
CTI_OPN_MEVIEC20040722_175812_00000000_00000084_20040830_101517_20781231_235959.N1	SciHiO2 after O_2 B band
CTI_AIJ1MEVIEC20040722_175928_00000000_00000056_20040830_101538_20781231_235959.N1	
CTI_AIJ2MEVIEC20040722_180033_00000000_00000057_20040830_101541_20781231_235959.N1	
CTI_AIJ3MEVIEC20040722_180138_00000000_00000055_20040830_101544_20781231_235959.N1	
CTI_AIJ4MEVIEC20040727_072821_00000000_00000057_20040830_101547_20781231_235959.N1	

3.4 Level 1/ Level 2 RR or FR products

During Cycle #29 no changes regarding format or algorithms for L1b/ L2 products were applied.

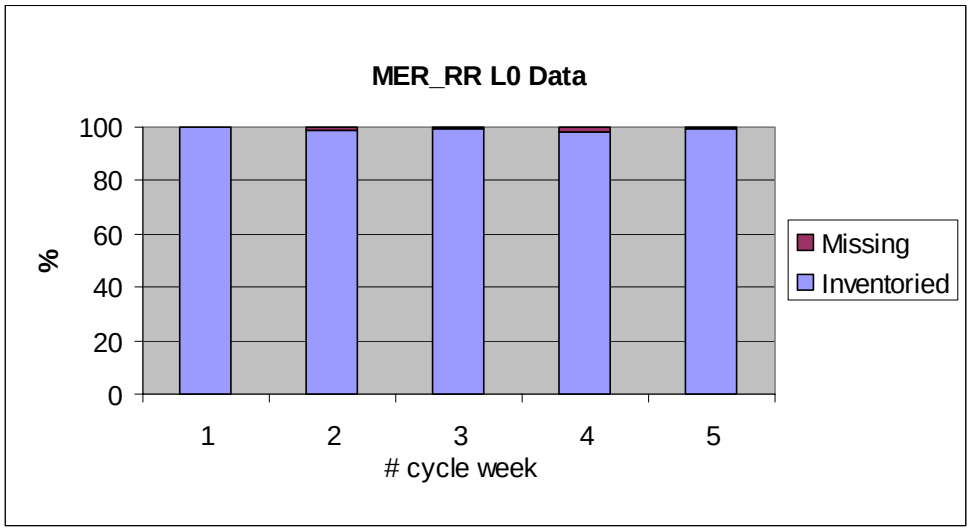
4 PDS STATUS AND INSTRUMENT UNAVAILABILITY

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 RR/FR Level 0 products

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

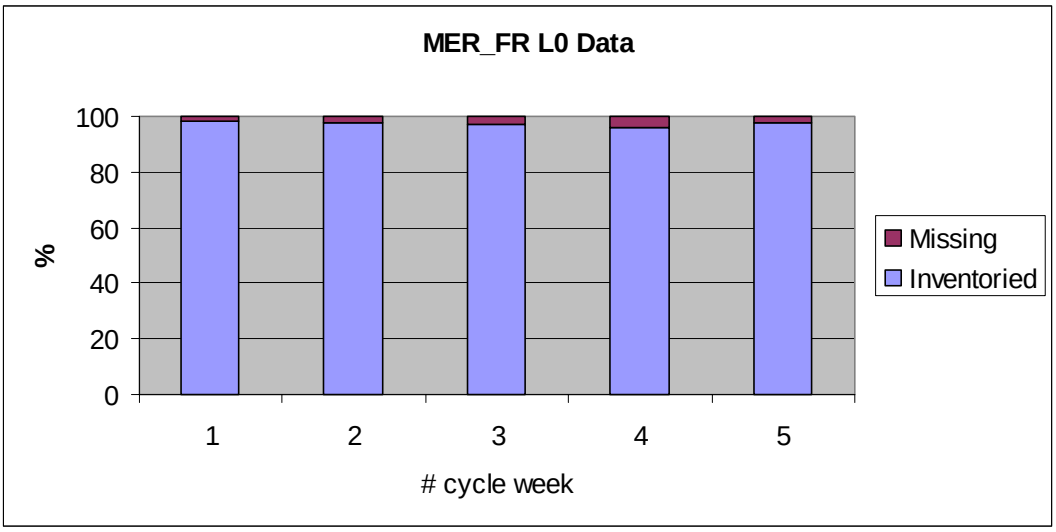
Week	MER_RR__0P	%
From 26/07 to 02/08	Inventoried	100.0
	Missing	0.0
From 02/08 to 09/08	Inventoried	98.83
	Missing	1.17
From 09/08 to 16/08	Inventoried	99.16
	Missing	0.84
From 16/08 to 23/08	Inventoried	97.94
	Missing	2.06
From 23/08 to 30/08	Inventoried	99.26
	Missing	0.74



The number of RR Level 0 products acquired during the cycle is about 99.04% of the planned ones.

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

Week	MER_FR__0P	%
From 26/07 to 02/08	Inventoried	98.45
	Missing	1.55
From 02/08 to 09/08	Inventoried	97.91
	Missing	2.09
From 09/08 to 16/08	Inventoried	97.01
	Missing	2.99
From 16/08 to 23/08	Inventoried	95.71
	Missing	4.29
From 23/08 to 30/08	Inventoried	97.85
	Missing	2.15



The number of FR Level 0 products generated during the cycle is about 97.39% of the planned ones.

The duration of acquisitions per orbit on average during the cycle and the global coverage of MERIS FR products every five days for cycle #29 are given in the figures and plots below:

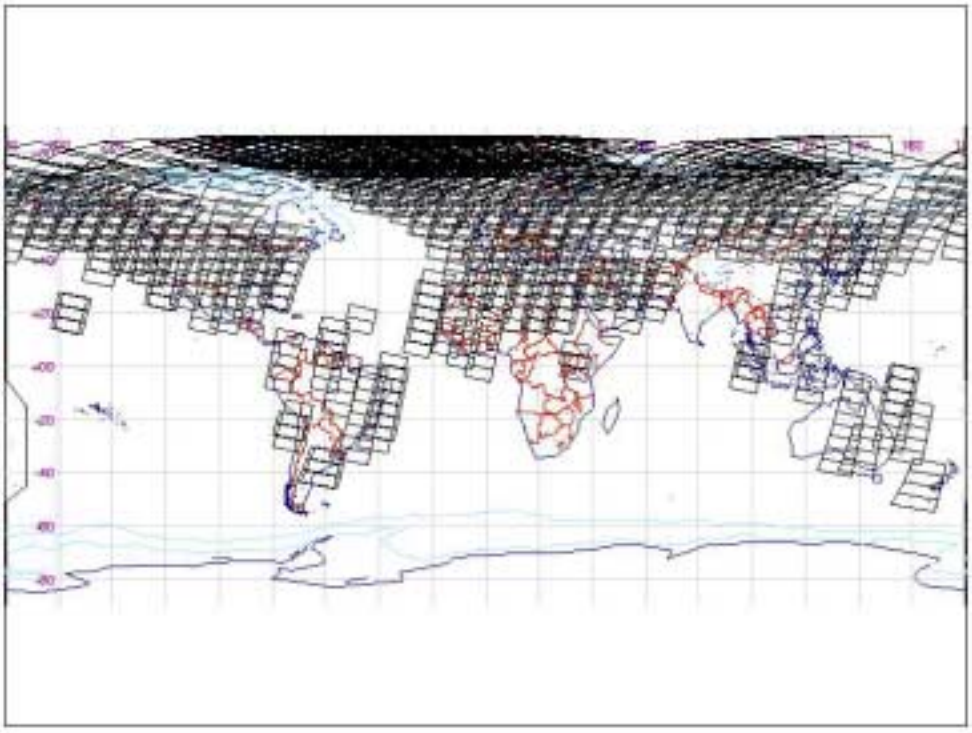
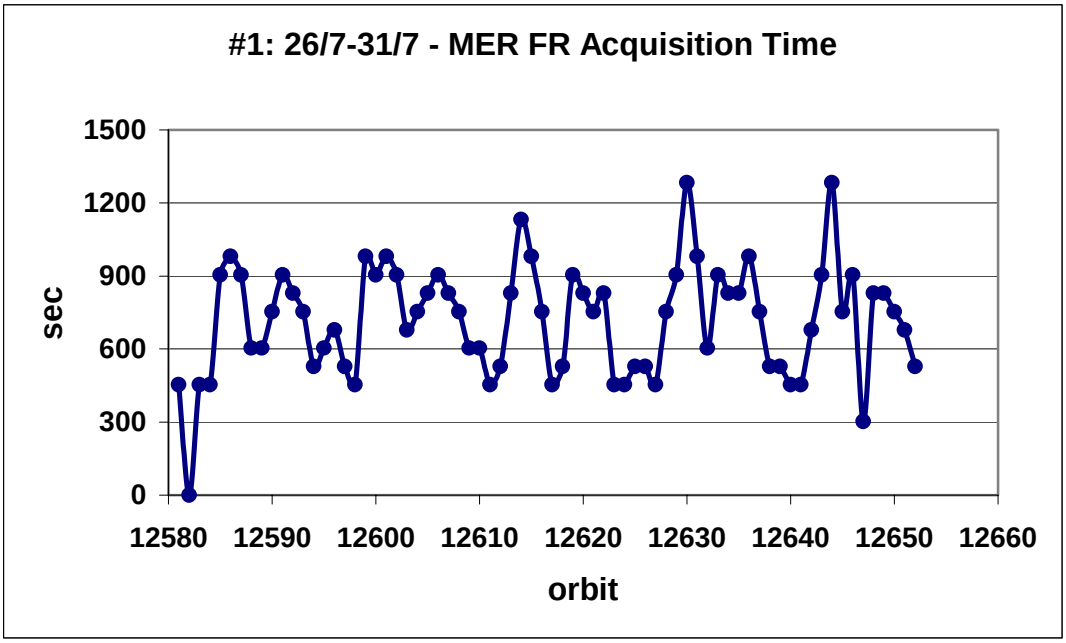


Figure 1 MER FR Global Cover for period 26/07 – 31/07



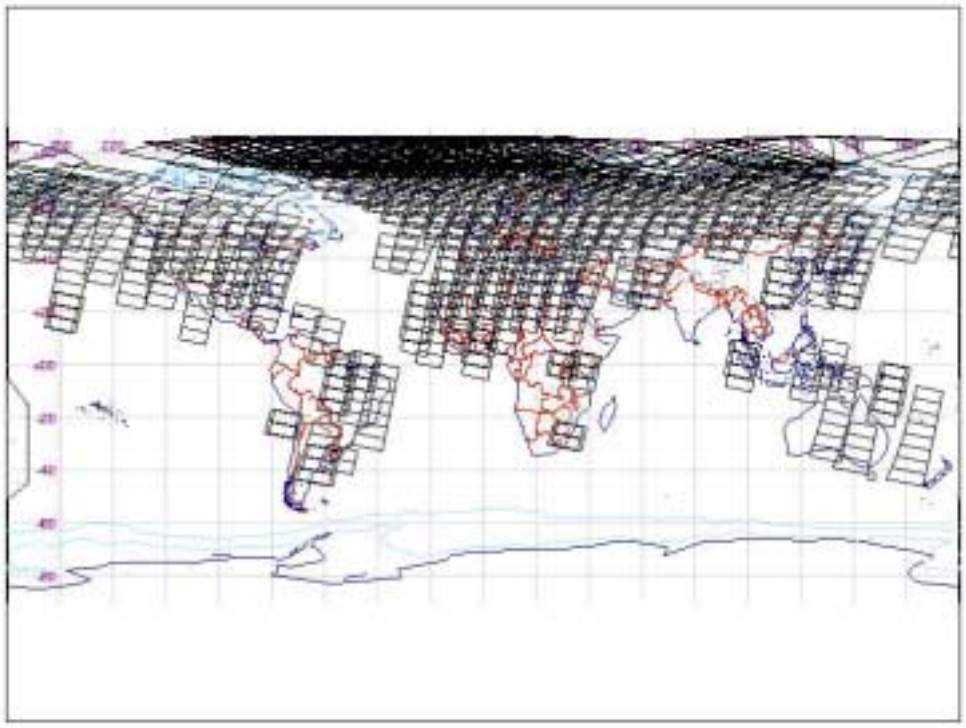
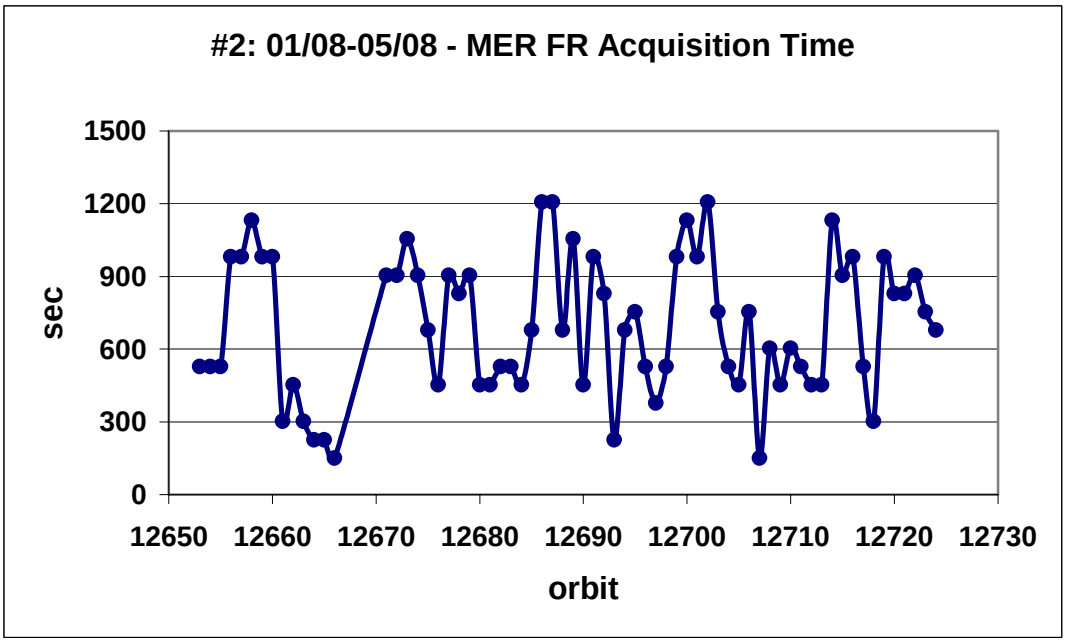


Figure 2 MER FR Global Cover for period 01/08 – 05/08



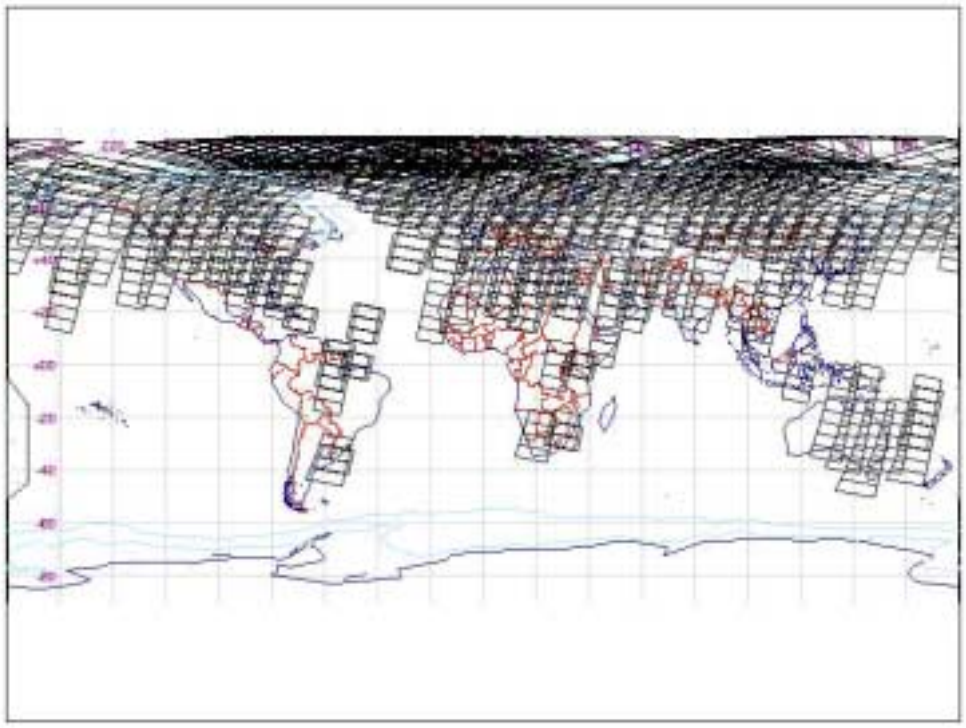
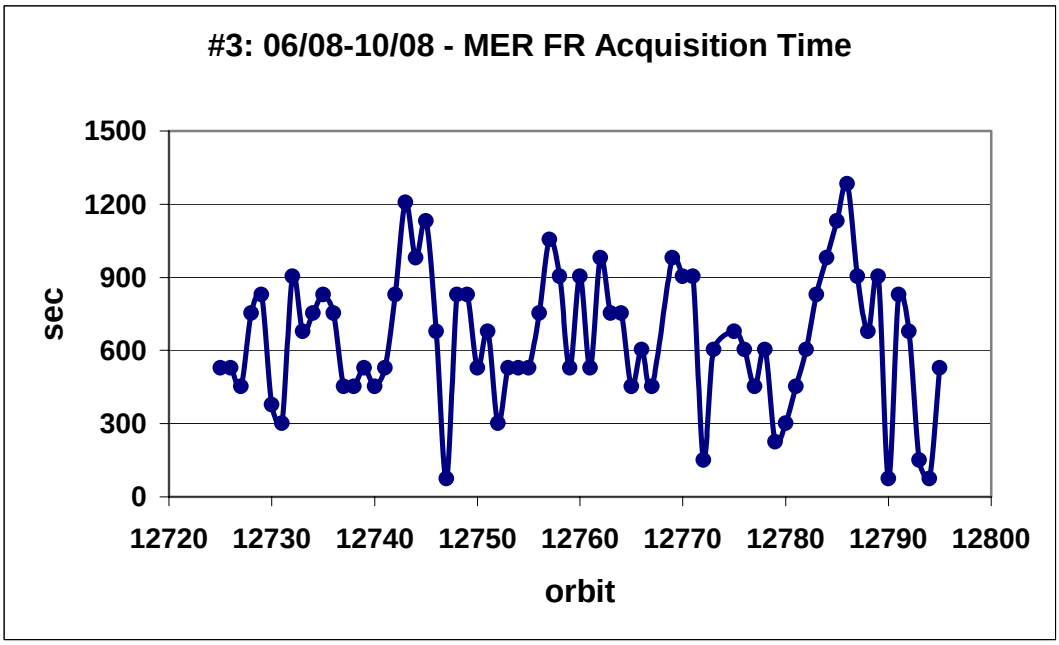


Figure 3 MER FR Global Cover for period 06/08 – 10/08



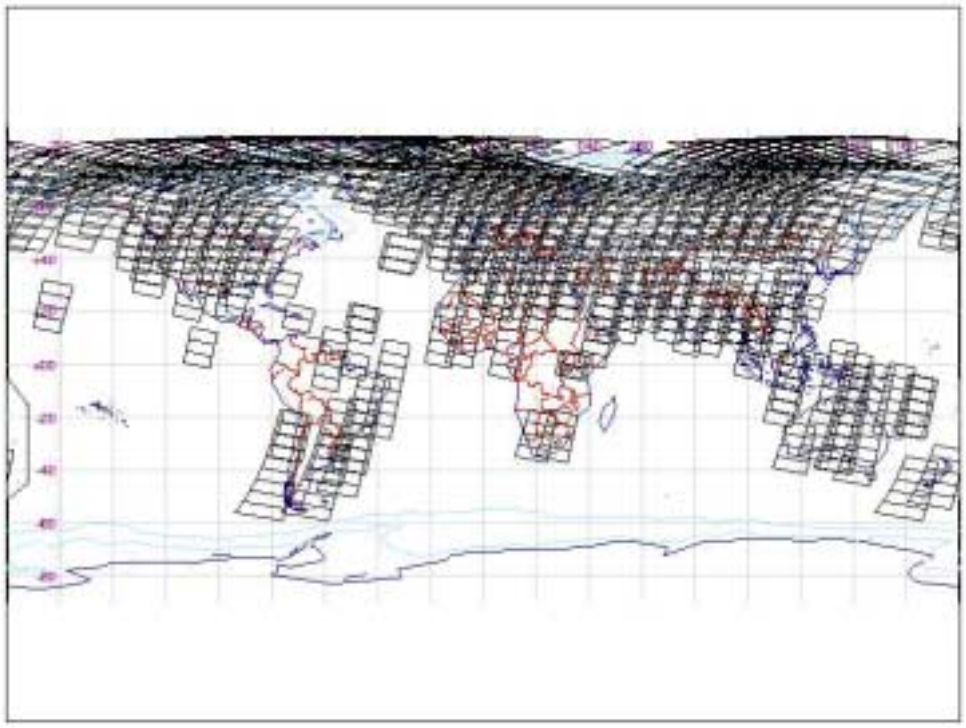
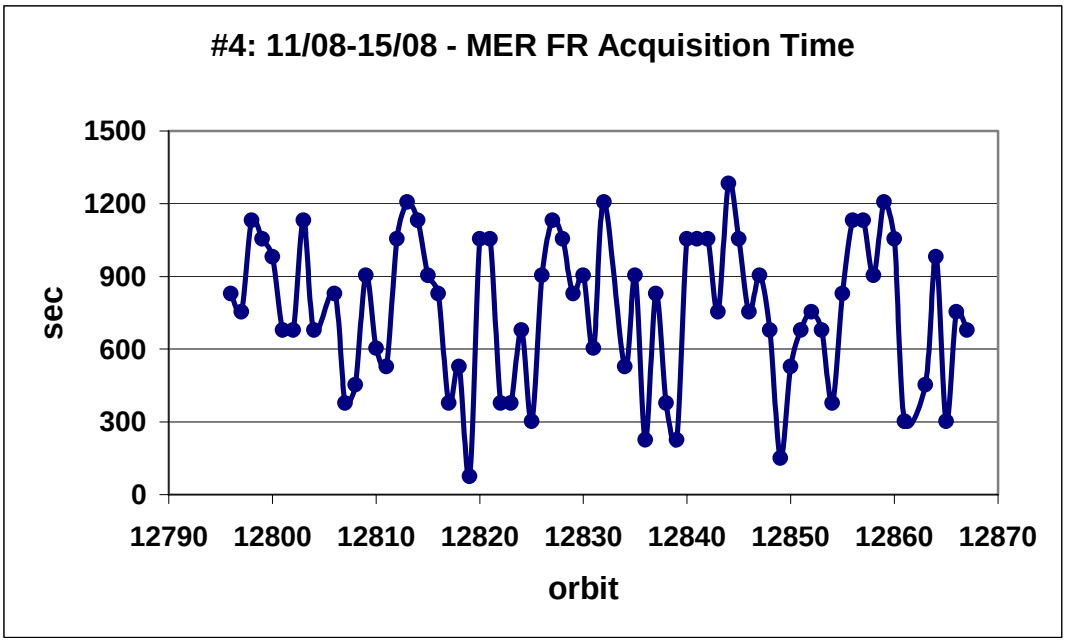


Figure 4 MER FR Global Cover for period 11/08 – 15/08



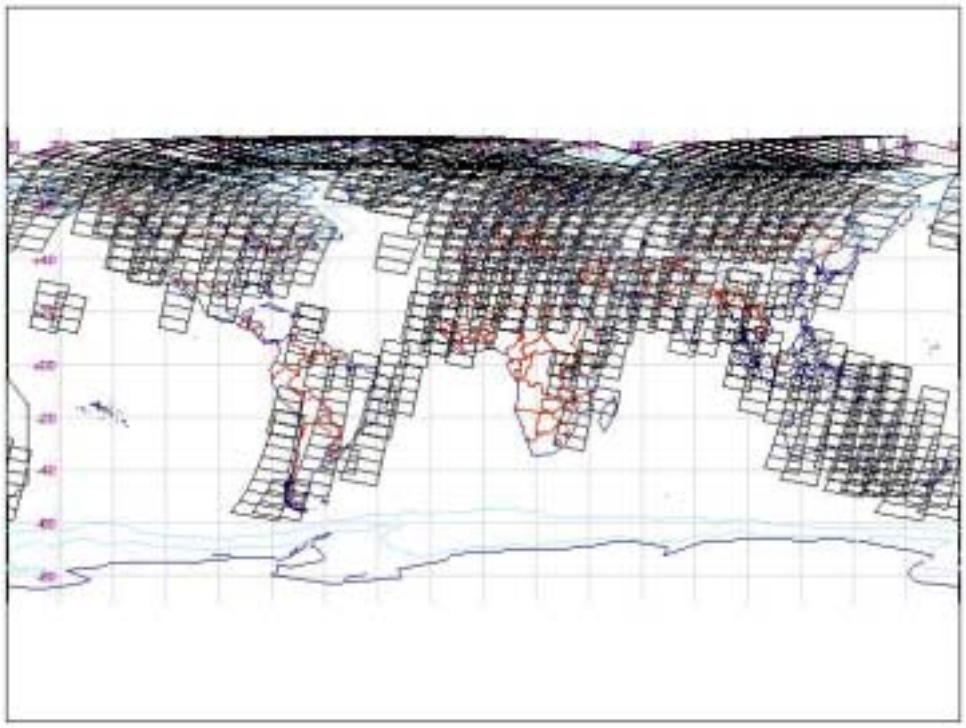
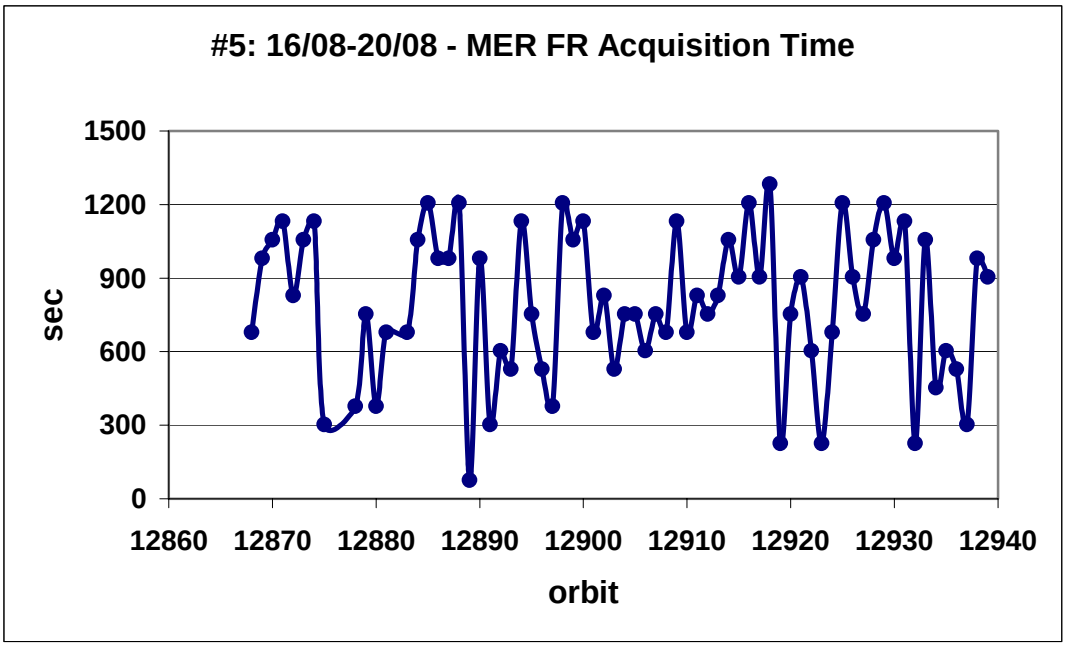


Figure 5 MER FR Global Cover for period 16/08 – 20/08



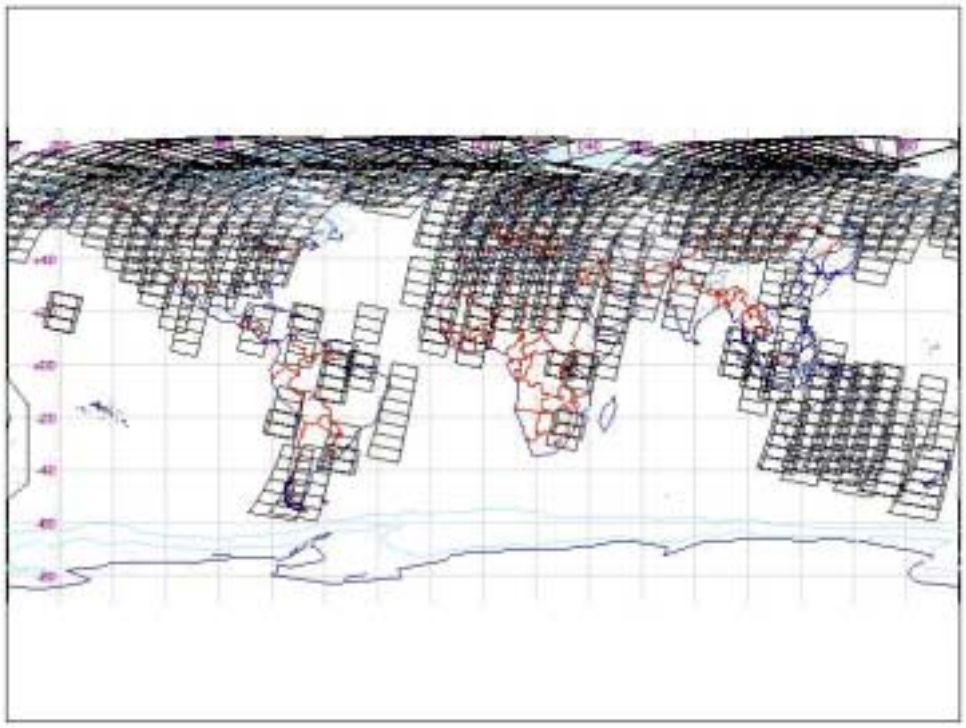
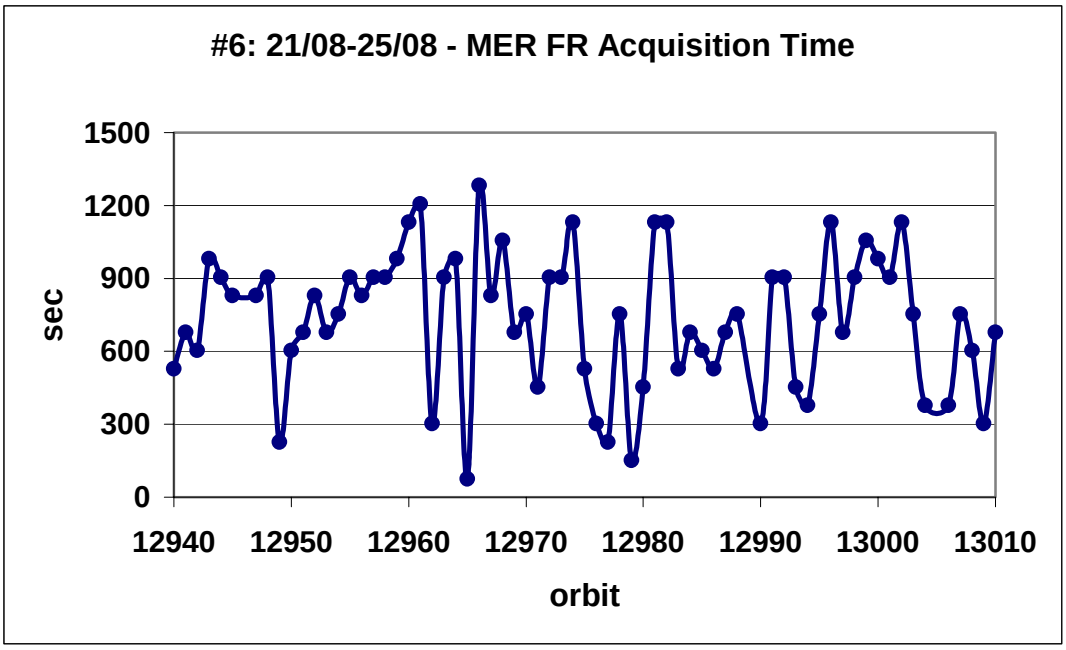


Figure 6 MER FR Global Cover for period 21/08 – 25/08



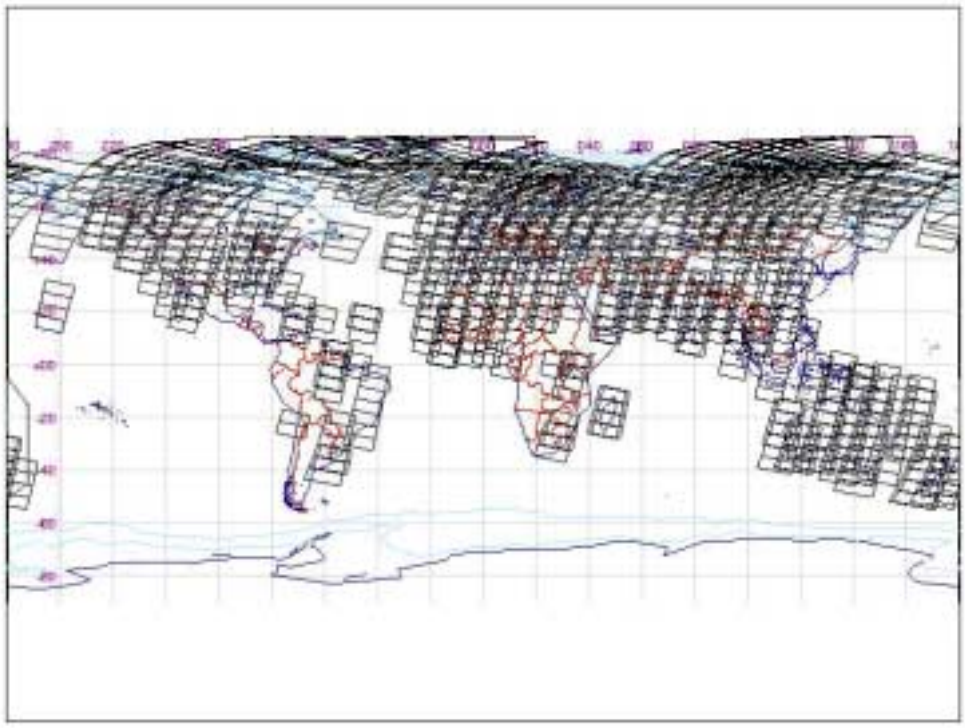
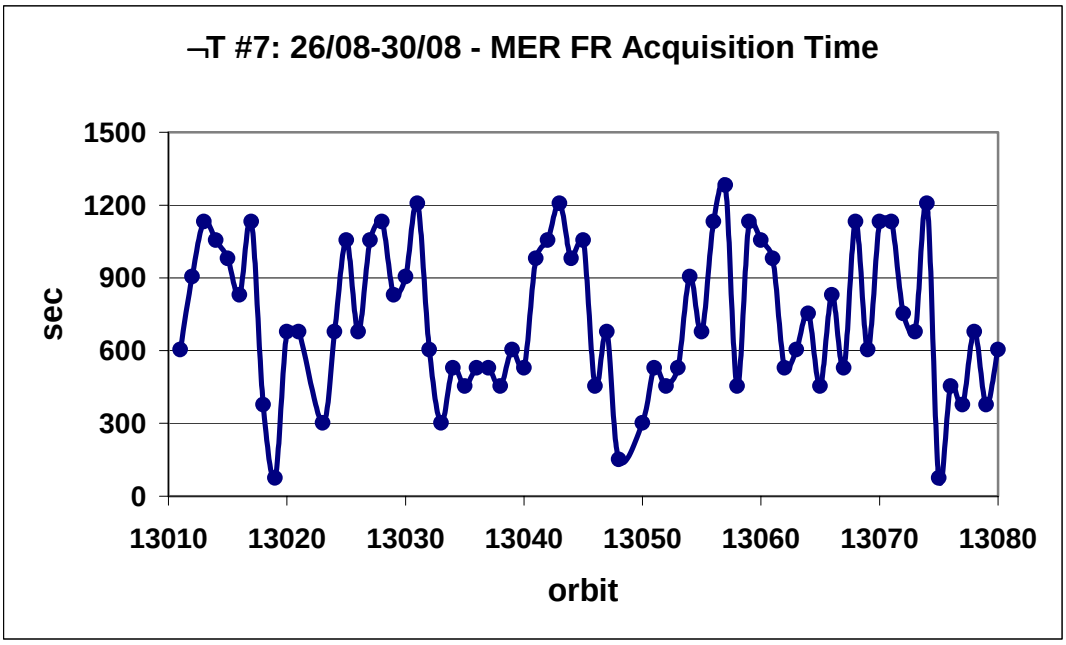


Figure 7 MER FR Global Cover for period 26/08 – 30/08



During the cycle, on average 12.15 min are acquired per orbit.

4.2 MER_CA__0P products

During Cycle #29 three routine radiometric calibrations RGC Diffuser 1 were planned. The following calibrations:

MER_CA__0PNPDK20040801_131352_000001792029_00081_12660_0016.N1 RGC
MER_CA__0PNPDK20040815_123450_000001792029_00281_12860_0018.N1 RGC
MER_CA__0PNPDK20040829_115607_000001792029_00481_13060_0038.N1 RGC

were successfully executed on the 1st, 15th and 29th of August, in orbits respectively 12660, 12860 and 13060.

All the extra calibrations corresponding to MERIS spectral campaigns, successfully executed on the 27th and 30th of August in orbits respectively 13025, 13031, 13032, 13033 and 13068, are reported below:

O_2 A band:
MER_CA__0PNPDE20040827_011452_000001792029_00446_13025_0000.N1

Fraunhofer I, II and III:
MER_CA__0PNPDK20040827_111830_000001802029_00452_13031_0023.N1
MER_CA__0PNPDK20040827_125906_000001792029_00453_13032_0024.N1
MER_CA__0PNPDK20040827_143943_000001792029_00454_13033_0025.N1

O_2 B band:
MER_CA__0PNPDE20040830_012057_000001792029_00489_13068_0007.N1

4.3 Instrument Unavailability

No instrument unavailability was communicated by ESOC during the Cycle #29.

5 CALIBRATION AND INSTRUMENT CHARACTERIZATION

5.1 Calibration

5.1.1 Radiometric calibration

During Cycle #29 three routine Radiometric Gain Calibrations, were successfully executed on the 1st, 15th and 29th of August. Furthermore, five extra RGC calibrations were executed on 28th and 30th of August. For more details see par. 4.2.

5.1.2 Spectral calibration

No Erbium calibrations were performed during Cycle #29.

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.

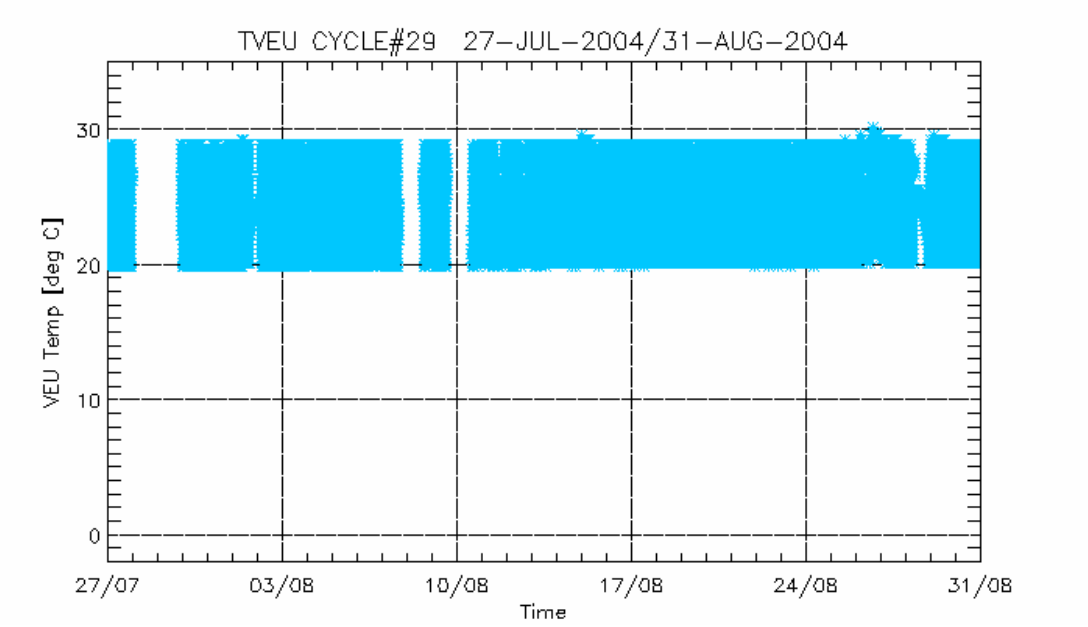
(II) The 2003 period is characterized by a degradation of the absolute geolocation accuracy where error is around ±209 meters along-track and ±295 meters across-track. For this period, the RMS absolute geolocation error stays within the range of 368.39 ± 67 m.

(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 new report made by Gael Consultant (Fr) available on the ESA website:
http://earth.esa.int/pcs/envisat/meris/reports/

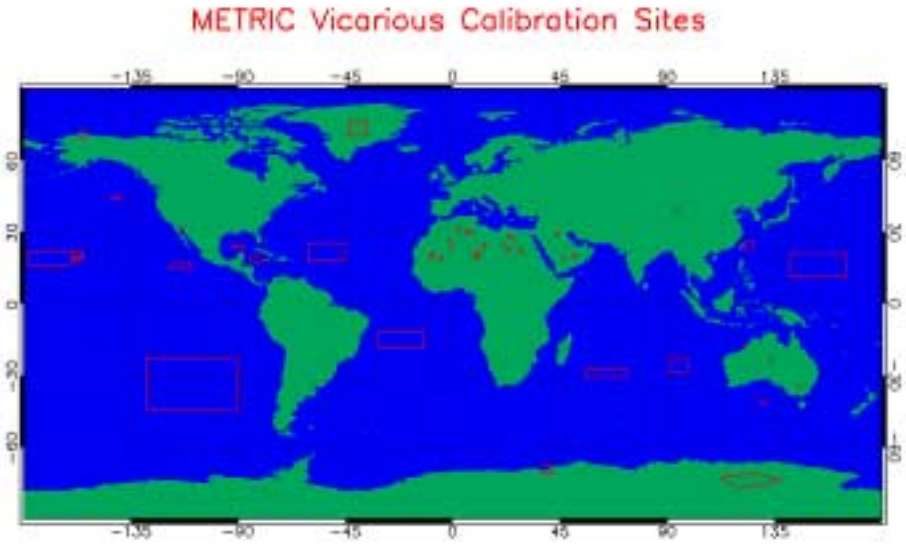
5.1.4 VEU Temperature Analysis

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 #29 the VEU temperature does not show any anomalous behavior, being into the nominal operating temperature range apart from lack of data from FOCC occurred during the cycle.



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	815
GLITTER	115
RAYLEIGH	77
SNOW	0
BUOY	20

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 the cycle. Please refer to Cycle #26.

5.2.2 Diffuser ageing

No new results to be shown for the cycle. Please refer to Cycle #26.

5.2.3 Smile Effect

No new results to be shown for the cycle. Please refer to Cycle #23.

5.2.4 Spectral evolution from erbium measurements

No new results to be shown for the cycle. Please refer to Cycle #23.

6 DATA QUALITY CONTROL

6.1 Status of the Level 1 and Level 2 products quality

The quality of the IPF4.07 products is described in the previous Cyclic Report #25.
The IPF4.07 is the current processor installed at ESA Facilities and it will be upgraded during winter 2004. At this time it will be aligned with the Prototype Processor MEGS7.0 that has been used for the MERIS Products Reprocessing. (See paragraph 8.0)

6.2 Anomalies and Software Problem Reporting (SPR)

1. Despite the processor upgrade done during cycle #22 to fix the problem, some MERIS FR L1 products still show the following anomalies: null radiance values for all the 15 bands and the 1st Tie Point of the product with latitude and longitude values out of the actual product geolocalization. The problem seem to be related to the Orbit State Vector, OSV: an OSV given at product start time and not at Ascending Node Cross, ANX, time prevent correct computation of the FR product limits that constrain all further processing including data extraction. A patch to IPF 4.07 is now under test to properly manage the geo-location step in FR L1 processing.

2. In MERIS RR L2 products the Water Vapour field is characterized by a vertical feature, which lies quite in the centre of the image and regards only water pixels. Above those pixels the water vapour content has negative value and both the HIGHGLINT and PCD_14 flags are raised. The L2 processing done with the prototype, MEGS6.2p3, does not reproduce the same anomaly, then the problem could be due to an implementation error in the processor, which is now under investigation.

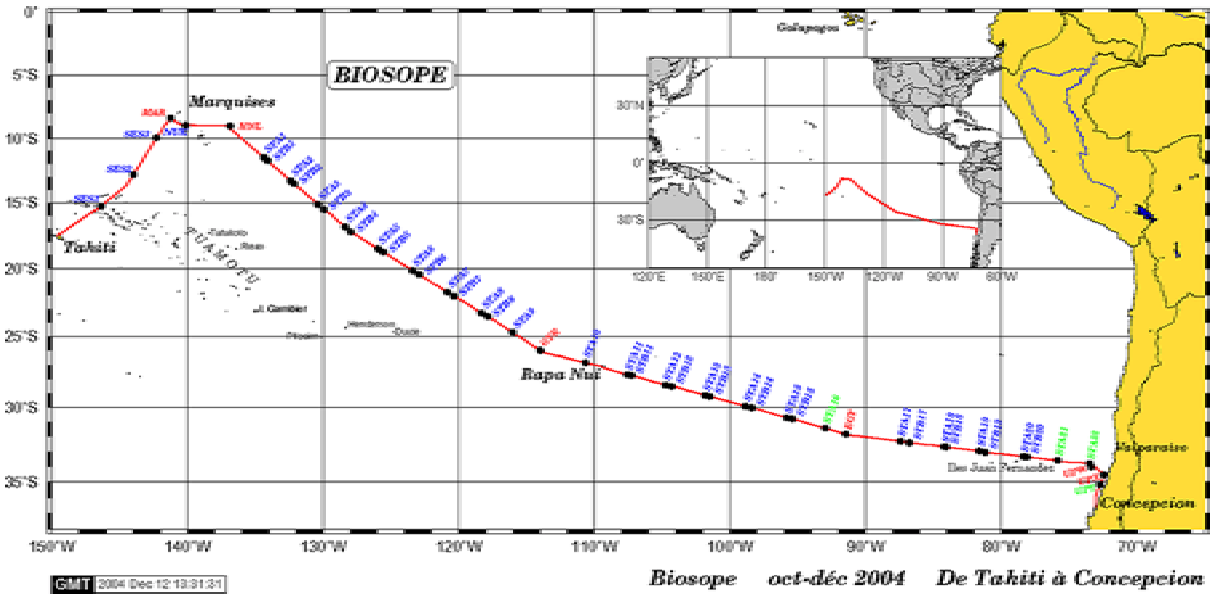
Both problems are being solved. A patch will be delivered and installed in January 2005.

7 VALIDATION ACTIVITIES AND RESULTS

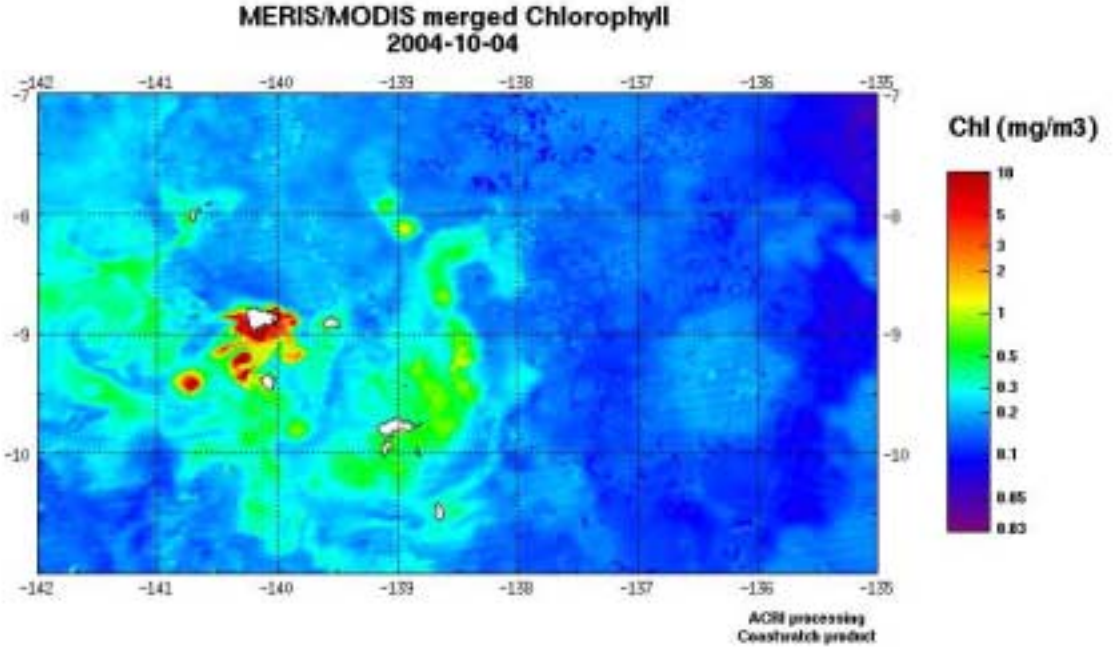
Most of the validation activities have been concentrated in the verification and validation of the new prototype processor MEGS7 (See paragraph 8). Anyway, first results from BIOSOPE project related to oceanographic studies, are shown in the chapter below.

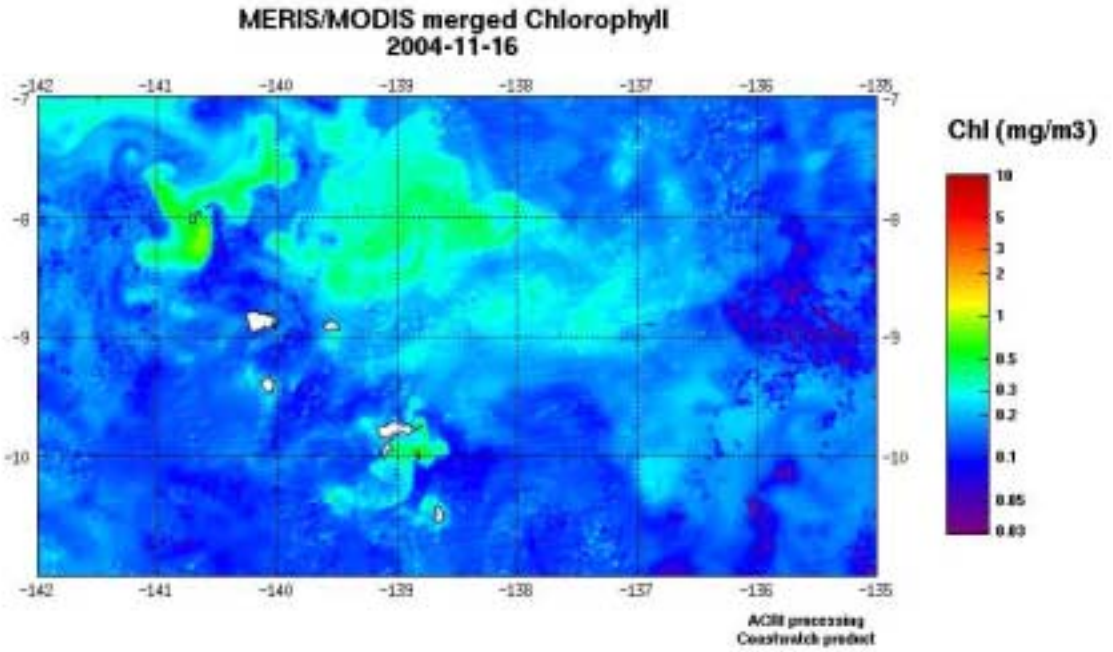
7.1 BIOSOPE project

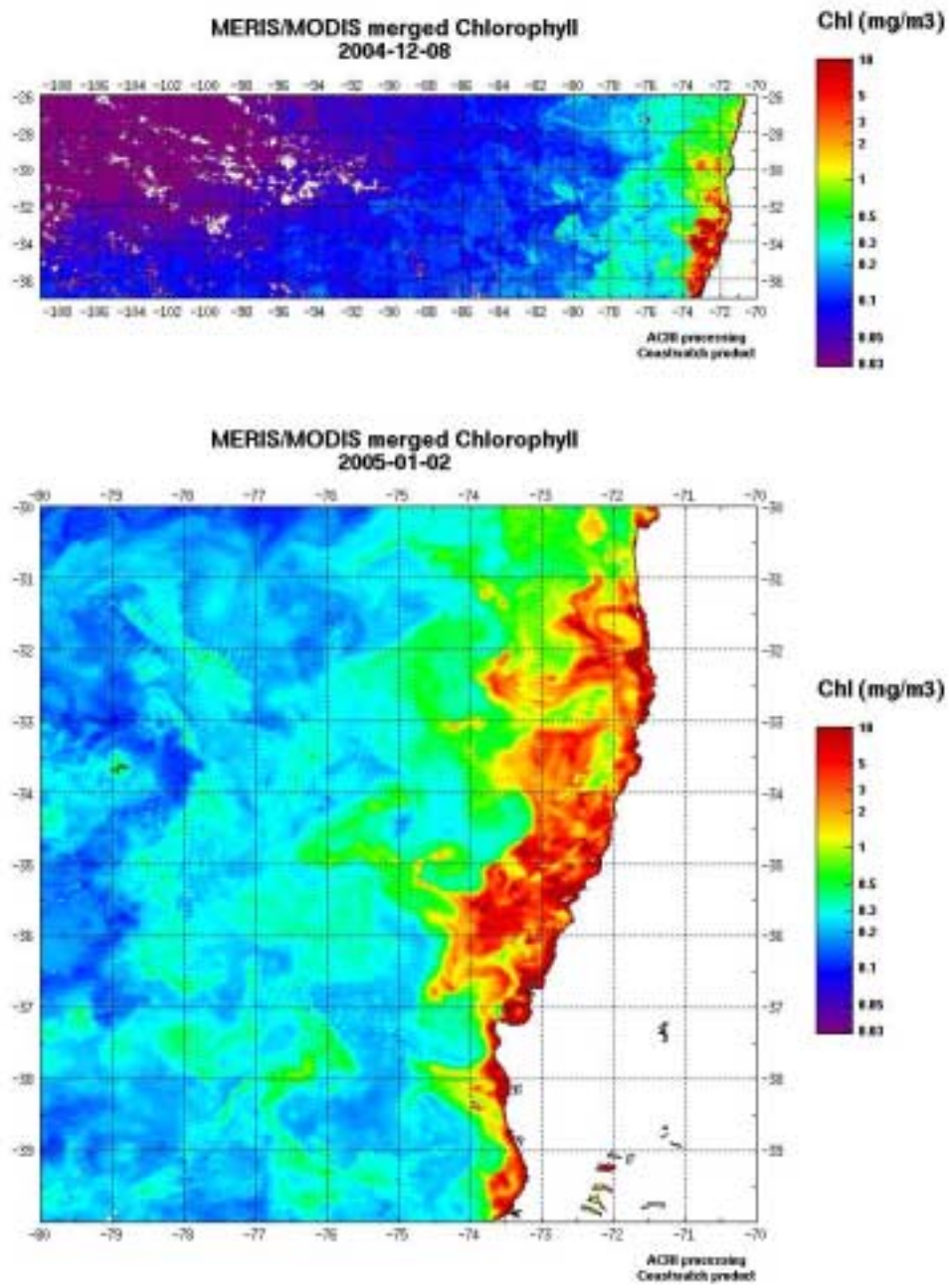
BIOSOPE (BIOgeochemistry and Optic SOuth Pacific Experiment) project, supported by the French program PROOF (Biogeochemical Processes in Ocean and Fluxes), and by SOLAS at an international level and supported also by two spatial agencies in the context of calibration activities of the ocean color sensors SeaWiFS (NASA) and MERIS (ESA), has had its first campaign in autumn 2004.
The main objective of the BIOSOPE project is to study, during austral summer the biological, biogeochemical and optical properties of different trophic regimes in the South East Pacific ocean, and especially the oligotrophic area associated to the central part of the South Pacific Gyre (SPG). This area has been one of the less studied major oceanic entities of the world ocean and presents the interesting particularity of being far away from any desert dust (iron) source. The second objective of the project, which is an important prerequisite for the success of this South Pacific cruise, is to develop or adapt methods in order to be able to quantify stocks or fluxes at levels close to detection limits, which are expected to be encountered in the highly oligotrophic conditions associated to the SPG. The project has been based on observations conducted along a 28°S line between 70°W (coastal upwelling of Chile) and 140°W, and on the Marquise island plume (140°W, 8°S). The map station of the research cruise is given below:



Examples of results in Chlorophyll concentration near the Marquise Island and along the coast of Chili using MERIS/MODIS data are reported below.







All information about BIOSOPE project, scientific aims, research plan, bibliography, data and project life can be found on websites:

http://www.enviport.org/GMES/services/coastal/index.htm

http://www.esa.int/export/esaCP/SEMDOG3AR2E_Protecting_0.html

8 PROCESSOR UPGRADE

A new operational processor upgrade is foreseen for summer 2005 including several changes in the Level 2 processing chain as suggested from the MAVT and the QWG.
Today, all changes have been implemented only into the prototype MEGS7. This prototype MEGS7 was used for the 1st MERIS data reprocessing. The reprocessed data for 2003 are available since summer 2004. Please contact the ESA EOHELP for more information.

The chapter below gives an overview of the modifications introduced in the new version of the processor MEGS7 and the Data Quality assessment:

8.1 Level 1

Radiometric quality:

The accuracy observed is better than 4% over ocean surfaces, but some discrepancies still exist with CNES method over Deserts. Since the beginning of mission, the degradation is less than 3% in the blue, and negligible in the NIR

Spectral calibration quality:

The spectral bands central wavelengths vary within the cameras field of view (< 1nm). This so-called smile effect is present in the Level 1b product where all bands are calibrated with the exact spectral characteristics of each pixel. All processing needed to minimize its impact on the geophysical products is performed in the Level 2 processing.
In order to minimize the overall spectral dispersion within the field of view, in particular in the blue, camera four was re-aligned by 1.25 nm (one pixel) toward the NIR with respect to the other cameras. This was done at orbit 846 (29-Apr-2002), after analysis of the first in-flight spectral calibration data.
In order to achieve a better accuracy for the pressure retrieval, band 11, centered on the Oxygen absorption feature (761 nm), has been shifted by one pixel towards the NIR on 24-Dec-2002.

8.2 Level 2

8.2.1 Major changes with respect to version IPF (Instrument Processing facility) 4.07

Following the recommendations from various forums (Science Advisory Group, MERIS User Workshop, MERIS AATSR Validation Team (MAVT)), the MERIS Quality Working Group has ratified a certain number of changes in the initial MERIS processing. Those changes have been implemented in the processor and associated auxiliary files. The changes being important enough, we decided to reprocess the complete archive of MERIS data (2002-2003).

The chapter below describes at high level the changes performed.

- **Classification:**
  The classification at Level 1 basis is performed using a predefined land/sea mask. At Level 2, the data are re-classified using the pixel radiometry at two wavelengths (665 and 865 nm). The re-classification is now performed for each pixel over land, and not only for which ones closed to the coastline as in the previous processor. It allows well classifying the inland waters. The reclassification of water pixel is still restricted to those close to the coastline. Anew algorithm has been introduced to better reclassify dark land surfaces, which are classified as water in Level 1b.

- **H2O absorption:**
  The smile effect within the H2O absorption correction (at 709nm) is taken into account.

- **Surface pressure:**
  The surface pressure is now retrieved through a polynomial expression of $\log(MP^2)$ instead of MP^2 as before.

- **Water Vapour:**
  The water vapour Look Up Table over water has been updated in order to include the wind speed dimension.

- **Land branch:**
  The Dark Dense Vegetation concept has been extended. The aerosol family has been extended. The cloud shadow is now screened out.

- **Water branch:**
  A High Aerosol/Ice screening was added to the medium glint sub-branch.
  An additional test at 412 nm was added to screen out the remaining bright target.

- **Atmospheric correction above bright water:**
  Based on Infra Red data, the Bright Pixel Atmospheric Correction (BPAC) is now forced for all pixels.
  The CASE_2S flag has been modified. It is raised now when the BPAC is on and when Total Suspended Matter (TSM) is above a certain threshold.

- **Case 2 water processing:**
  A new neural net has been trained with an optimised set of inherent optical properties based on MAVT measurements. The concentration range was extended to lower and higher concentration ranges. A white scatterer was introduced meet the scattering effect of Cocolithophorides. The net has been further trained to work also in cases when some reflectance measurements are below a reliable value or even negative.

- **Atmospheric Correction above clear water:**
  The aerosol database has been revised according to recent publications and MAVT findings. It includes, in addition to the well-known Maritimes Coastal and Rural families, three families of Dust-like (absorbing) aerosols (Moulin et al, JGR, 2001) and the so-called Blue family of theoretical Junge distribution aerosol with steep spectral dependency.
  The logic of atmospheric correction over ocean has been reviewed. Basically, it allows all aerosols except absorbing ones in the first pass. Absorbing aerosols are used in additional passes, over Case 1 waters only, if triggered by a test on the water leaving reflectance at 510 nm as compared to climatology of rectified marine reflectances at 510 nm.

- **Aerosol**
  The Angstrøm coefficient replaces the Epsilon coefficient.
  The Angstrøm coefficient is defined as follow:
  alpha = log(tau_a(775)/tau_a(865)) / log(lambda(865)/lambda(775))

- **Flags:**
  The check on the solar angle (> 70 deg) has been removed from all the PCD. This condition is now available as a science flag LOW_SUN.
  The flag ABSOA_CONT has been removed and is replaced by a new flag AERO_BLUE to indicate the selection of “blue” aerosol.
  The ABSOA_DUST flag is now raised only if an absorbing aerosol has been used in the atmospheric correction. In the previous processing, it indicated the potential of the existence of an absorbing aerosol. The CASE2_S flag is now indicating sediment loaded Case 2 water. It is triggered if the suspended sediment concentration is likely to be above a certain threshold.
  The meaning of the DDV flag has been extended to include less dark vegetation and now indicates that aerosol retrieval over land has been attempted.
  A new flag BPAC_ON has been introduced which indicates that the bright pixel atmospheric correction over water has been activated. In the current setting, this is the case for all water pixels (see above) so that this flag is raised everywhere.
  The flag P_Confidence has been deleted.

8.2.2 Known Problems

Despite the major improvement with respect to the IPF4.07, some problems are still present within this processor version.
The major problems are:

- Slightly negative reflectances occur at 620nm over Case-I water, especially in conditions favourable to whitecapping, probably due to the limitation in the aerosol family, but it does not seem to affect the chlorophyll products.
- Over Case-II waters the short wavelengths bands are sometimes overcorrected, leading partially to negative reflectances. This affects the quality of the Case-II water constituents Algal-2, TSM and Yellow Substance.

- In a coastal fringe approximately 10 km wide the atmospheric correction may be invalid due to adjacency effects.
- The field named “BOAVI, Bottom Of Atmosphere Vegetation Index” is currently empty. It will contain the MERIS Terrestrial Chlorophyll Index (MTCI) in a future version.
- A coding error has been identified in the PAR retrieval. It will be corrected in the next version of the processor.
- A coding error in PCD16 has been identified for water pixels. PCD17 should be used instead as they are supposed to be identical for water pixels.

The table in chapter below will detail the quality status for each parameter:

8.2.3 Detailed status

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	25.06.04	Ice, snow often detected

[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]	
			hardly detected.		as clouds.
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

Parameter	Quality				Comment
	Goal[1]	Source[2]	Status[3]	Date[4]	
					needs a statistically 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	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

Parameter	Quality				Comment
	Goal[1]	Source[2]	Status[3]	Date[4]	
			most coastlines. 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.		neighbouring effect.
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/m^3 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 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/

10 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/