MERIS 2nd reprocessing: Changes Description

By the Meris Quality Working Group

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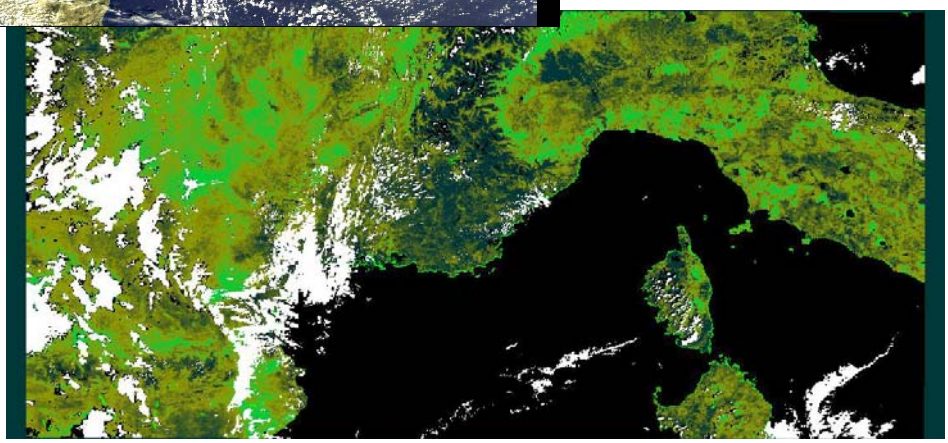
RGB – Level 1
2nd reprocessing



MTCI – Level 2 2nd reprocessing

1. Introduction

This document describes at high level the changes performed from the 1st reprocessing configuration (Megs 7.0) to the 2nd reprocessing (Megs7.4). The operational real time processor (IPF 5.0) shall be aligned with Megs7.4 during spring 2006.

The 1st reprocessing configuration can be found at:
http://earth.esa.int/pcs/envisat/meris/documentation/First_2003_MERIS_Reprocessing.pdf

The history of the operational processor changes can be found at:
http://earth.esa.int/pcs/envisat/meris/documentation/MERIS_IPF_evolution.pdf

The present document will be revised shortly in order to include a report on the evaluation of the quality of the products issued from the 2nd reprocessing.

2. List of changes

Meris QWG 6 has decided the following data changes:

1. Chl1 polynomial from LOV
2. Chl1 validity range set to [0.01,30.], no PCD raise when out of range
3. Troposphere-free MAR99 replaces BLUE-α=1.5 (from previous Bomem runs)
4. Gothic R LUT from LOV
5. Chl2 conversion factors from GKSS (revised with latest NN delivery)
6. YS coding offset and scaling factor (linear to log scale, same range)
7. Chl coding range ([-2,2] in log10 scale instead of [-3,3] previously)
8. Whitecaps threshold set to 10 $m.s^{-1}$
9. New Case 2 NN from GKSS (with and without linear reflectances as input)
10. White scatterer threshold set to 4.8
11. MTCI threshold on B13-B8 difference set to 0.05, on B10-B8 to 1e-6 (numerical purpose only), ceiling for B8 set to 0.3, floor for B9 to 0.1
12. Preliminary version of LARS LUTs from Hygeos

3. Changes description

3.1. MTCI (Meris Terrestrial Chlorophyll Index) pixel filtering

MTCI is computed only for pixels satisfying:

$\rho_{865} > \text{min\_}\rho_{865}$ (nir2)

$\rho_{681} < \text{max\_}\rho_{681}$ (red)

$\rho_{709}-\rho_{681} > \text{min\_}\rho\text{\_diff1}$ (nir1 - red)$\rho_{865}-\rho_{681} > \text{min\_}\rho\text{\_diff2}$ (nir1 - red)

3.2. New Chl1 algorithm

The current 3 steps algorithm is replaced by a single step algorithm:

The water leaving reflectances are fully normalised for the 4 following wavelengths: 442, 490, 510, 590 (bands 2-5):

$$bb\_over\_a(\lambda) = \frac{\rho'_w(\lambda, j, f)}{f\_over\_q1\_value(\lambda)}$$

3 ratios are derived:

$$r1 = \frac{bb\_over\_a(442)}{bb\_over\_a(560)}$$

$$r2 = \frac{bb\_over\_a(490)}{bb\_over\_a(560)}$$

$$r3 = \frac{bb\_over\_a(510)}{bb\_over\_a(560)}$$

and the max taken:

r_{max} = MAX(r1,r2,r3)

and finally :

$$LChl1 = \sum_{p=0}^{N_{A1}} log10coeff\_LUT(p, b442)\left[\log_{10}(r_{max})\right]^p$$

with Coeffs={0.4245, -3.4479, 5.2272, -5.857, 2.2136} and N_{A1}=4

$Chl1 = 10^{LChl1}$

If Chl1< min_chl1 then Chl1= min_chl1 *// do not raise PCD! //*

If Chl1 > max_chl1 then Chl1= max_chl1 *// do not raise PCD! //*

3.3. Re-introduction of the tropo-free MAR 99 aerosol model

The Ocean Aerosol LUTs is updated to re-introduce the troposphere free Maritime 99 model (former model 0 in MEGS versions lower than 7) and the first blue aerosol (α=1.5) is deleted to make room for the MAR99-trop-free. It was decided to remove the first blue aerosol (α=1.5) as its range of angstrom exponent is already covered by a generic aerosol.

3.4. Update of the Gothic R LUT

The whole Gothic R LUT has been filled with new values provided by LOV.

3.5. Update of the absorption to Chl2 conversion law

Instead of :

Chl2(j,f) = InvAbs_Chl2[1].**exp** (NN_output(2) * InvAbs_Chl2[2])

With InvAbs_Chl2 = {24, 1}

A new formulation is:

Chl2(j,f) = (InvAbs_Chl2[1].+ InvAbs_Chl2[2]* NN_output(2)) * **exp** (InvAbs_Chl2[3] + InvAbs_Chl2[4] * NN_output(2)).

With InvAbs_Chl2 = {23, 0, 0, 1.2}

3.6. Update of the YS product coding

It has been recommended by GKSS to use a log-scale coding of the YS absorption instead of a linear one. The L2 product count becomes:

```
X(16,f,j)(0) = int((log10(ODOC(j,f)) - ODOC_offset)/
                    ODOC_scale)];
```

(2.10.10-1)

Instead of:

```
X(16,f,j)(0) = int((ODOC(j,f) - ODOC_offset)/
                   ODOC_scale)];                    (2.10.10-1)
```

.

3.7. White scatterer flag from Case 2 NN

Based on Rayleigh corrected reflectance :

$$\frac{\rho_{rc}(620)\cdot a_w(620) \,/\, T_R(620)}{\rho_{rc}(709)\cdot a_w(709) \,/\, T_R(709)} = \left(620/709\right)^{\alpha}$$

$$\alpha = \frac{\ln\left(\dfrac{\rho_{rc}(620)\cdot a_w(620) \,/\, T_R(620)}{\rho_{rc}(709)\cdot a_w(709) \,/\, T_R(709)}\right)}{\ln\left(620/709\right)}$$

→ use α to detect (white) scatterer WITHIN water!:

White_Scatterer = α < α_thresh

This flag shall is used to cancel the ICE_HAZE science flag (when set). This flag is reported in the L2 product in place of the LOW_PRESSURE one for water pixels.
The threshold is added to the OC2 or CP2 ADF.

3.8. Switchable log scaling of reflectance at case 2 NN input

GKSS suggested to use the linear reflectance as input to the NN. This required a modification in the use of the NN and a new NN. A way to keep a backup solution and hence avoid any schedule risk was to introduce a switch allowing to select between linear and log inputs (in the case2 ADF) to keep compatibility with existing NN.

3.9. Restrictions on the use of absorbing aerosols within AC1

The absorbing aerosol families is NOT used when the MEGLINT, UNCGLINT, WHITE_WATERS (see change 2.8) or the ICE_HIGHAERO flags are set. This is possible since all those flags are set upstream and the use of absorbing aerosols is triggered by a specific test that can be ignored or modified to account for this condition.

3.10. Upgrade of Extended DDV LARS LUTs

LUTs of ARVI range, reflectance correction terms are now function of pixel location (lat, lon grid at 1 degree resolution) instead of DDV model; their temporal dependency and resolution (month) remain unchanged.

3.11. AOT over Land product given at 443 nm

To preserve best AOT quality even in case of poor alpha retrieval it has been decide to deliver AOT(443) as L2 product, as it is the wavelength at which it is best determined.

3.12. Replace BLUE_AERO science flag by OADB

The BLUE_AERO science flag is replaced by OADB (Out of Aerosol DataBase) as more useful.