Status and perspective for the validation of the MERIS 3rd reprocessing Level 2 products

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Documentation status for 3rd reprocessing

MERIS level 1 and Level 2 DPMs

RMD

ATBDs (incomplete)

Where?:  Google !
Outline of strategy followed after 2d reprocessing. Phase 1:

- calibration verification and adjustment (see vicarious adjustment ATBD)

- Validation of marine reflectances not too close to the coast (= when ICOL not needed)

**Tool:** MERMAID with marine reflectance matchups
Issues encountered during Phase 1:

Necessity to realign marine reflectances provided by PI’s with MERIS level 2 definition to avoid comparing apples and oranges (implemented in MERMAID)

Necessity to perform band-shift corrections for OC-AERONET data (implemented in MERMAID)

Necessity to take polarization into account in computing the sky dome reflection for above-water radiometry to ensure consistency with MERIS reflectance definition (being implemented in MERMAID)
Other issues encountered during Phase 1:

- Absence of cheap convenient calibration facilities in Europe
- Poor tilt corrections for irradiance sensors
- Straylight issues for spectrometers
- Instability of TRIOS irradiance sensor calibration
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OC4Me
Chl = 10^{(0.405677 + (-3.6303) \rho + (5.44357) \rho^2 + (-5.48061) \rho^3 + (1.75312) \rho^4)}
From OC4Me

dAPI1/API1 = (-3.63 + 12.5r -16.5 r^2 +7r^3)\log_{10}dr

r=\log_{10}[\max(R_{443}/R_{560},R_{490}/R_{560},R_{510}/R_{560})]

0.5 < r < 20

\log_{10}dr can be estimated at about 0.01, which is compatible with MERMAID findings
In plain words there is a 98% probability that
\(0.5 \text{AP1} < \text{Chla}_\text{tot} < 2 \text{AP1},\)

To be compared to

<table>
<thead>
<tr>
<th>API1 (mg m(^{-3}))</th>
<th>dAPI1/API1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.03</td>
<td>0.5</td>
</tr>
<tr>
<td>0.2</td>
<td>0.05</td>
</tr>
<tr>
<td>20.</td>
<td>0.02</td>
</tr>
</tbody>
</table>
Stacked histogram RPD 665
MEGS 8.0 processor

Number of Matchups

Relative Error (%)
Conclusion of Phase 1

Optical measurements protocols document finalized

Vicarious adjustments for the NIR and VIS documented

Accuracy of reflectances in the visible on target (<10%)

Uncertainties in API1 definition larger than error propagation in OC4ME.

Marine reflectances at 665 nm underestimated in coastal sites. [NB define coastal 😊]
Phase 2: Sanity checks on Case2R NN Inversion.

Inversion is in terms of IOPs. According to RMD the three IOPs used in the bio-optical model are:

- Total scattering at 442 nm, assuming a ratio of backscattering to scattering of 0.02 and a slope of -0.4 + white scatterer to model whitecaps

- Total pigment absorption at 442 nm, indexing a series of 212 spectra from the North Sea and Skagerrak

- Yellow substance and bleached sediment absorption at 442 nm
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Easter Island  0.5/12/2003 AP1
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Easter island 05/12/2011 Chl2
North Sea 15/09/2003
Y=clouds, P=glint,
O=Ice_haze, Blue=case2_S
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[Image of a scatter plot with axes labeled 'total_susp [g/m^3]' and 'tsm_BPAC']

X-Band
- total_susp
- Auto min/max
- Min: 0.0
- Max: 45.0343

Y-Band
- tsm_BPAC
- Auto min/max
- Min: 0.0
- Max: 45.0

Buttons: Compute for scene, Compute for ROI, Close, Help
Phase 2: Validation strategies for concentrations (ongoing)

- Comparison of MERMAID reflectances with NN reflectances in ODESA

- Inversion of reflectances into concentrations using NN trained on local bio-optical properties and comparison with MERIS images (Davide)

- Match-up database for concentrations: MERMAID upgrades (Chla_tot, Chla, TSM, IOPs, ... Kathryn)

- Comparison with matchups from BioMap (JRC?)
First conclusions of Phase 2

Chl2 concentrations saturate at 0.04 in oligotrophic waters

No quality flags for Case2 NN activated

Case2R NN behaviour in the glint problematic

Good agreement with BPAC in case2_S waters

No attempt to solve adjacency effects in Level2
Issues encountered during phase 2

- Normalization of reflectances into match-up geometry (under evaluation in MERMAID). Easier than normalization of matchups to nadir view.

- Poor documentation of biooptical model for NN case2R

- Poor understanding of what Level 2 products are, leading to comparisons against nature.
Chla_tot measured by HPLC = Chla_tot measured by spectrophotometry
  = API1

Chla_only measured by HPLC = Chl2

Protocols => Chla_tot_HPLC_NIVA
  not equal to Chla_tot_HPLC_JRC
  (see Kai & Elisabetta)

Chla_fluorometry not acceptable for matchups