Atmospheric correction for Ocean Colour: POLDER algorithm applied to MERIS “POLMER”

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POLMER atmospheric correction algorithm

Concept

Validation using SIMBADA radiometer in-situ measurements

Example of application to a MERIS scene the Mediterranean Sea
POLMER algorithm

Main concept:

the aerosol scattering correction is estimated between 865 and 670 nm for POLMER against 865 and 780 nm for MERIS

the atmospheric correction which is done by an extrapolation to shorter ocean colour wavelengths is therefore less sensitive to radiometric errors in the NIR channels
POLMER algorithm

- For the needs of the demonstration, we schematically assume that the aerosol scattering varies about linearly.

- The MERIS algorithm determines the aerosol scattering at 560 nm, \( R_{a565} \) from extrapolating the aerosol scattering observed at 780 and 865 nm; \( R_{a780} \) and \( R_{a865} \):

  \[
  R_{a560} = R_{a780} + \left( R_{a780} - R_{a865} \right) \frac{780-560}{865-780}
  = 3.21 R_{a670 \text{ nm}} - 2.21 R_{a865}
  \]

  \[\Rightarrow \text{NeDR}_{a560} = 3.9 \text{ NeDR in the NIR}\]
The POLMER algorithm determines the aerosol scattering at 560 nm, $R_{a565}$, from extrapolating the aerosol scattering observed at 670 and 865 nm; $R_{a670}$ and $R_{a865}$:

$$R_{a560} = R_{a670} + (R_{a670} - R_{a865}) \frac{(670-560)}{(865-670)}$$

$$= 1.56 \text{ Ra780 nm} - 0.56 \text{ Ra865}$$

$$\rightarrow \text{ NeDR}_{a560} = 1.66 \text{ NeDR in the R/NIR}$$

**POLMER algorithm** is about 2.5 less sensitive to radiometric errors in the NIR than the standard MERIS atmospheric correction.
POLMER algorithm

Details:

• SeaWiFS type aerosol models

• LUTs computed using SoS code with polarization

• Empirical correction of turbid marine scattering estimated from 560 nm

• Preliminary results given at 443 - 490 - 560 nm
MERIS-SIMBADA match up locations (1)
MERIS-SIMBADA match up locations (2)
Match up selection

First filter
- turbid water: in-situ Rw+560 > 0.02
- location close to the coast

2 data sets considered
- flag PCD_1_13 not activated
- flag PCD-1_13 activated at a loss of more than 1/3 of match up cases
### Statistics

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<th>POLMER</th>
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Bias: algo $^\text{S}$ in-situ
MERIS, Rw+443
POLMER, Rw+443

2003-03-04, Mediterranean Sea
MERIS, Rw+560  POLMER, Rw+560

2003-03-04, Mediterranean Sea
MERIS, Rw+560 (close-up)  POLMER, Rw+560 (close-up)

2003-03-04, Mediterranean Sea
MERIS, Rw+560

POLMER, Rw+560

2003-08-02, Bay of Biscay
MERIS, Chl (Algal1)  POLMER, Chl

2003-08-02, Bay of Biscay
POLMER algorithm
Conclusion

Preliminary results show

- less sensitivity of the POLMER algorithm than the standard MERIS algorithm to the radiometric noise and errors in the NIR

- more robustness, acceptable results even when the PCD_1_13 flag has been activated in the standard MERIS algorithm

Improvements underway to develop the algorithm and processing using all MERIS channels

More complete validation necessary with additional in-situ measurements and MERIS data is necessary