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The colour of the Mediterranean Sea: global versus regional bio-optical algorithms evaluation and implication for satellite chlorophyll estimates

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Uncertainties in the retrieval of satellite surface chlorophyll concentrations in the Mediterranean Sea have been evaluated using both regional and global ocean colour algorithms. The rationale for this effort was to define the most suitable ocean colour algorithm for the Mediterranean region where standard algorithms were demonstrated to be inappropriate. Using a large dataset of coincident *in situ* chlorophyll and optical measurements, covering most of the trophic regimes of the basin, we validated two existing regional algorithms (Bricaud *et al.*, 2002 and D'Ortenzio *et al.*, 2002) and the global algorithm OC4v4 used for standard NASA SeaWiFS products. The results of our analysis confirmed that the OC4v4 performs worse than the two existing regional algorithms. Nonetheless, these two regional algorithms do show uncertainties dependent to chlorophyll values. Then, we introduced a better tuned algorithm, the MedOC4. Using an independent set of *in situ* chlorophyll data, we quantified the uncertainties in SeaWiFS chlorophyll estimates using the existing and new regional algorithms. The results confirmed that MedOC4 is the best algorithm matching the requirement of unbiased satellite chlorophyll estimates and improving the percentage of the satellite uncertainty, and that the NASA standard chlorophyll products are affected by an uncertainty of the order of 100 %. Moreover, the analysis suggests that the poor quality of the SeaWiFS chlorophyll in the Mediterranean is not due to the atmospheric correction term but to peculiarities in the optical properties of the water

column. Finally the observed discrepancy between the global and the regional bio-optical algorithms has been discussed analysing the differences between the two *in situ* datasets used for tuning the algorithms (SeaBASS versus ours). The main results are that methodological differences in the two datasets cannot play a major role and the inherent bio-optical properties of the basin can explain the observed discrepancy. In particular the oligotrophic water of the Mediterranean Sea is less blue (30 %) and greener (15 %) than the global ocean.