

An optimized Chlorophyll *a* switching algorithm for MERIS and OLCI in phytoplankton-dominated waters

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ABSTRACT:

Productive upwelling zones such as the southern Benguela can exhibit phytoplankton biomass variability over several orders of magnitude, from near oligotrophic offshore waters to hypertrophic inshore blooms of $>100 \text{ mg m}^{-3}$. This introduces complexity for ocean colour applications such as Harmful Algal Bloom (HAB) monitoring. As low and high biomass algorithmic approaches for ocean colour differ, no single algorithm can optimally retrieve accurate Chl *a* over such a wide range of biomass. We propose a novel technique to apply and blend two different Chl *a* algorithms — an empirical blue-green algorithm for low to moderate biomass and a red-NIR band-ratio algorithm for moderate to high biomass. The blending method is based on the 708 and 665 nm reflectance wavelength ratio, where the blue-green algorithm is applied when the $\rho_w(708)/\rho_w(665)$ ratio is <0.75 , the red-NIR algorithm is applied >1.15 , whilst the two are blended using a weighted approach in between these values. When applied to *in situ* and satellite match-up data this method provides a median absolute relative difference (MARD) of 37.9 and 45.7%, respectively, and a RMSD of 0.27 and 0.35 respectively, over Chl *a* concentrations spanning three orders of magnitude. Application is demonstrated for both MERIS and OLCI sensors, providing a smooth transition between different biomass levels and algorithm Chl *a* returns.