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Estimation of Chlorophyll-a in eutrophic inland waters using Sentinel 3 Ocean and Land Color Instrument

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The quality of South African freshwater systems has become of great concern as the prevalence of eutrophication and potentially toxic algal blooms have increased due to a growing population and a changing climate. The highly successful Medium Resolution Imaging Spectrometer (MERIS) provided unprecedented capabilities for the monitoring of inland water trophic status and toxic algal species identification until its unfortunate termination in 2012. The European Space Agency hopes to continue that success with the recently launched Ocean and Land Color Instrument (OLCI) aboard the Sentinel 3 satellite. The success of the mission will depend on extensive validation efforts for the development of accurate and robust in-water algorithms. One of the biggest hurdles to algorithm validation for inland water bodies is the difficulty of performing an accurate atmospheric correction. High turbidity and close proximity to land pixels make traditional correction schemes unsuitable for inland waters. The objective of this study is to assess the potential of OLCI for the monitoring of trophic status of three small inland water bodies within South Africa. Radiometric errors associated with OLCI Top of Atmosphere (TOA) radiances will be assessed by validating with in-situ measurements of water color radiometry modelled to Top of Atmosphere. A selection of various atmospheric correction procedures based on the method of aerosol retrieval and ease of implementation will be evaluated with in situ water color radiometry measured simultaneously with imagery acquired from OLCI. The uncertainties and limitations of using a full or partial atmospheric correction procedure will be evaluated in terms of their radiometric accuracy and comparison of resulting chl-a concentrations from a paired bio-optical model with in situ bio-geophysical measurements. Initial results illustrate the difficulty of performing a successful full atmospheric correction over small inland water targets.