Application of Sentinel Platforms in assessing chlorophyll-a distribution in Algoa Bay.

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Abstract.

Eutrophication is the enrichment of water by nutrients causing accelerated growth of algae and higher levels of plant life. It is a natural process but is highly influenced by human activities. Eutrophication causes disturbances in the balance of organisms present in water leading to reduced biodiversity. The degradation of South African oceans is an ongoing accelerating process; therefore, there is an urgent need for conservation measures for ocean ecosystems by means of monitoring eutrophication. The Ocean Land Cover Instrument (OLCI) on Sentinel 3A coupled with CHL_NN and CHL_OC4me algorithms were employed to assess the distribution of chlorophyll-a in Algoa Bay for the period June 2017 to April 2018. Accuracy assessment was used to check the agreement between the in situ measurements of chlorophyll-a and the final processed satellite products. The OC4me model produced results that are almost similar to in situ with slight underestimates (bias_log 0.9) whereas OCNN model showed much poorer performance (bias_log 0.180 for the waters of Algoa Bay. The connection found between river flow and chlorophyll-a concentration in the bay was that high river flow resulted in high chlorophyll-a concentration in some cases. However, it was a challenge to separate the influence of river systems connected to the coastline and to quantify the amount of chlorophyll-a concentration they bring into the oceans. Other variations such as Sea Surface Temperature (SST) and the Agulhas current indicated the upwelling which influences the occurrence of phytoplankton in the bay. The chlorophyll-a measured through this investigation suggests an environmental shift that threatens biodiversity. Remote sensing techniques integrated in the study have substantiated beyond doubt its capabilities in detection of spatio-temporal dynamics of nutrient flow and long term environmental monitoring of the coastal environment. Limitation of this study is that the Red-NIR band ratio were not assessed during this study, which would have been able to resolve some of the very high (>30mg/m^3) chlorophyll-a concentration that may have been flagged out in some of the OC4me images. The study strongly recommends that for future studies, it will be much ideal to use data with much higher resolution such as Sentinel 2 MSI with relatively higher resolution of 10m.

KEYWORDS

Chlorophyll-a, SST, OC4me, OCNN, OLCI.