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Optical remote sensing of mass concentration for POC based on specific absorption by phytoplankton for optically complex Case 2 waters

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Abstract

Remote sensing of mass concentration for Particulate Organic Carbon (POC) in Case 2 waters poses a greater challenge owing to spectral interferences from biogeochemical components and marginally low values of Colored Dissolved Organic Matter (CDOM) in global oceans. POC concentration plays a critical role in marine carbon cycle, determination of penetration depth for UV -B rays, estimation of primary productivity and have major implications in investigating the seasonal trend about the distribution of phytoplankton biomass for a given geometric illumination condition. The present model has been developed based on an inverse optical modelling technique for determining the mass concentration for POC wherein, the ratio of specific absorption by phytoplankton (denoted by a^*_{ph}) at blue to green ratio was used as input parameter and subsequently, match-ups for the satellite derived product was obtained using MODIS dataset. An inverse power function was developed to estimate *in-situ* mass concentration of POC following a best-regression fit for dataset covering wide range of optically complex water types (coastal and turbid productive waters). The inclusion of chlorophyll-based specific absorption coefficient, a^*_{ph} with blue-green ratio accounts for the variation in-packaging effect and community structure of chlorophyll which governs the variability in POC concentration. The bio-optical algorithm for POC concentration was developed and fine-tuned using NOMAD dataset, extracted from SEABASS. The modelled POC concentrations showed a good agreement with *in-situ* POC values with significantly low error of and correlation coefficient of nearly 0.9. Spatial structures generated for the coastal and deep waters of Arabian Sea for MODIS imagery (1 km X 1 km resolution) revealed significant increase in the levels of POC during the summer seasons due to high abundance of diatoms species and higher for waters of Arabian sea. Satellite derived POC values was also found in agreement with *in-situ* POC concentration with MRE of ±35%.

Keywords

Particulate Organic Carbon, , Remote Sensing Reflectance, Primary productivity, Chlorophyll concentration