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TITLE: Optical Classification of the Coastal Waters of the Northern Indian Ocean

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ABSTRACT:

Coastal waters are optically diverse; studying their optical characteristics is an important application of satellite oceanography. In coastal ecosystems of the northern Indian Ocean, optical diversity has been little studied, except for the global analysis by Me´ lin and Vantrepotte (2015). This paper is a contribution towards identification and characterisation of optical classes in the coastal regions of the northern Indian Ocean. The study identified eight optical classes using the monthly climatological datasets of remote sensing reflectance for the 1998-2013 period from the Ocean Colour Climate Change Initiative (OC-CCI, www.oceancolour.org). The optical classification we adopted uses the fuzzy logic method, based on Moore et al. (2009). The seasonal variations of the eight resultant optical classes of the coastal waters of the northern Indian Ocean were explored. From the mean reflectance spectral signals obtained, it appears that classes 1 to 6 belong to Case-1 waters and classes 7 and 8 correspond to Case-2 waters. Classes 1 to 2 appear in deeper oligotrophic waters; classes 3 to 6 are present in intermediate depths; classes 7 and 8 are mostly found within inshore eutrophic regions with high chlorophyll concentrations, sediments from river plumes and land runoffs. The optical variability between seasons (the summer and winter monsoon and the intermonsoon seasons) are influenced by variations in physical forcing, such as surface winds, ocean currents, precipitation and sediment influx from rivers and land runoff. Optical diversity index ranged from around 0.3 to 1.36. High diversity indices ranging between 1 and 1.36 were found in areas dominated by classes 1 to 4, whereas low diversity indices 0.3 occurred in areas where classes 7 and 8 dominated. The variations in the dominant optical classes are shown to be related to changes in chlorophyll concentration and suspended sediment load, as indicated by remote sensing reflectance at 670 nm. On the other hand, optical diversity appears to be high in zones of transition between dominant optical classes.
Keywords: Coastal ecosystems, Satellite Ocean colour, Classification, Remote sensing reflectance, ecosystem management.

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