Use the Earth Observation (EO) to investigate the water quality of lake Manzala.

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Abstract

This paper aims at utilize Earth Observation (EO) technology to achieve the spatial and temporal up-scaling of water quality parameters in Lakes. In Egypt, there is an acute need for reliable and accurate information on Lake water quality. The extraction of water quality information from satellite imagery will make use of the existing in-situ monitoring network for data calibration and validation. In Egypt, the National Water Quality Monitoring Network relies on monthly measurements of water quality taken in drainage channels leading into northern Lakes and Sea. However, this program provides insufficient information on the spatial and temporal development of pollutants across the northern lakes. This paper would close this knowledge gap by providing a set of comprehensive water quality products derived from EO data. Lake Manzalah is a large, shallow lake, located in the northeastern Nile Delta. Recent years have seen a sharp decline in water quality due to the inflow of contaminated runoff from agricultural areas, pollution from domestic and industrial sources, overgrowth of water hyacinths and loss of area due to land reclamation. The water quality products would be Turbidity (TUR), Concentration of chlorophyll-a (CHL). The primary data source for turbidity and chlorophyll-a is MERIS and/or MODIS imagery. Software environments to be used include both commercial and custom-developed packages. Two principal approaches are taken to generate water quality products. Generating water constituent products requires the integration of EO and in-situ measurements to formulate empirical models linking the relative brightness variations observed in the EO data to physical ground measurements. Validation was carried out for turbidity and chlorophyll concentration using the primary reference dataset (in-situ water quality data) collected prior to and during the research.

Boundaries of preliminary five water quality zones were distinguished for Lake Manzalah derived from a time series of 11 MERIS. First zone impacted by salt water, high TDS, high turbidity, low chlorophyll; open deep water (max. depths) and little use of aquaculture. Second zone is smaller sections of open water, high concentrations of chlorophyll, high turbidity and low-medium TDS (less impacted by salt water). The third zone is low TDS (less impacted by saltwater); water is clear and floating/submerged vegetation. Fourth zone is very high concentrations of chlorophyll (likely from agricultural runoff). Finally, the fifth zone is effectively separated from main water bodies through international road, permanent aquaculture installations and intensive aquaculture.

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