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Suspended Sediment Concentration and Water Quality Monitoring Along Aswan High Dam Reservoir Using Remote Sensing

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Abstract : Field data collecting is considered one of the most difficult work due to the difficulty of accessing large zones such as large lakes. Also, it is well known that the cost of obtaining field data is very expensive. Remotely monitoring of lake water quality (WQ) provides an economically feasible approach comparing to field data collection. Researchers have shown that lake WQ can be properly monitored via Remote sensing (RS) analyses. Using satellite images as a method of WQ detection provides a realistic technique to measure quality parameters across huge areas. Landsat (LS) data provides full free access to often occurring and repeating satellite photos. This enables researchers to undertake large-scale temporal comparisons of parameters related to lake WQ. Satellite measurements have been extensively utilized to develop algorithms for predicting critical water quality parameters (WQPs). The goal of this paper is to use RS to derive WQ indicators in Aswan High Dam Reservoir (AHDR), which is considered Egypt's primary and strategic reservoir of freshwater. This study focuses on using Landsat8 (L-8) band surface reflectance (SR) observations to predict water-quality characteristics which are limited to Turbidity (TUR), total suspended solids (TSS), and chlorophyll-a (Chl-a). ArcGIS pro is used to retrieve L-8 SR data for the study region. Multiple linear regression analysis was used to derive new correlations between observed optical water-quality indicators in April and L-8 SR which were atmospherically corrected by values of various bands, band ratios, and or combinations. Field measurements taken in the month of May were used to validate WQP obtained from SR data of L-8 Operational Land Imager (OLI) satellite. The findings demonstrate a strong correlation between indicators of WQ and L-8 .For TUR, the best validation correlation with OLI SR bands blue, green, and red, were derived with high values of Coefficient of correlation (R2) and Root Mean Square Error (RMSE) equal 0.96 and 3.1 NTU, respectively. For TSS, Two equations were strongly correlated and verified with band ratios and combinations. A logarithm of the ratio of blue and green SR was determined to be the best performing model with values of R2 and RMSE equal to 0.9861 and 1.84 mg/l, respectively. For Chl-a, eight methods were presented for calculating its value within the study area. A mix of blue, red, shortwave infrared 1(SWR1) and panchromatic SR yielded the greatest validation results with values of R2 and RMSE equal 0.98 and 1.4 mg/l, respectively.

Keywords : remote sensing, landsat 8, nasser lake, water quality
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