Feasibility of Using Sentinel-3 in Estimating Lake Nasser Water Depths

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Abstract   After the construction of the Grand Ethiopian Renaissance Dam (GERD), Nasser Lake (NL)became one of the most challenging hot spots at both local and global level. It is one of the biggest manmade reservoirs in the world and the most important in Egypt. It is created in the southern part of the Nile River in Upper Egypt after the construction of Aswan High Dam (AHD). The water level in NL might fluctuate between 160 to 182 m above the mean sea level. Monitoring NL water depth is an expensive and time-consuming activity. This work investigates the possibility to use information from the Sentinel missions to estimate the depth of NL as an inland water body, in the frame of estimating storage variations from satellite measurements. In this preliminary study, we investigated the relationship between the radiance /reflectance of optical imagery from two instruments SLSTR and OLCI instruments hosted by the Sentinel-3A platform and in situ water depth data using the Lyzenga equation. The results indictaed that there was a reasonable correlation between Sentinel-3 optical data and in situ water depth data. Also, Heron's formula was used to estimate water storage variations of NL with limited in situ data. In addition, equations governing the relationship between water level and both surface area and water volume were worked out. This study is in the framework of a bilateral project between ASRT of Egypt and CNR of Italy which is still running.

Keywords: Sentinel, SLSTR, OLCI, Inland water body, Nasser Lake, Egypt, Water Depth, GERD, AHD, Egypt