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## **Modeling of the Biogeochemical cycle and Dispersion of Nitrogen off Lake Idku Outlet, Abu Qir Bay, Egypt.**

The Egyptian Mediterranean coast hosts five lakes namely the (Northern Lakes). These lakes receive their water mainly from agricultural drainage systems. One of these lakes is Idku Lake, which was suffered from a significant increase of nitrogen levels over the last few decades, and in turn could affect adversely on the water quality of Abu Qir bay that is connected directly to the lake through an outlet.

The objective of the present study, is to investigate the fate of nitrogen forms which are driven from the lake into the bay, as well as the biogeochemical cycle of nitrogen.

A coupled highly resolved hydrodynamic - biogeochemical model was developed on the basis of Delft3D over the period from November 2015 to May 2016. The model comprised most of the nitrogen cycle processes and factors, as well as the hydrodynamics in the study area.

This model showed, the temporal and spatial distribution of nitrogen levels in the bay have varied depending on the nitrogen levels concentrations inside the lake as well as the physical parameters that regulate the hydrodynamics of the lake water dispersion into the bay.

Regarding the cycle, the Dissolved oxygen levels have played a key role in regulating the cycle processes. As the study area was shallow coastal area, the water column was turbulent oxygenated column, resulting in increasing the rate of nitrification as well as inhibiting the process of denitrification.

Furthermore, phytoplankton has had a major role in the cycle. After assimilation of nitrogen, algal mortality has existed significantly, as most of algal species have brackish water characteristics, and due to the significant increase in salinity, algal mortality was observed. Thereafter, detrital nitrogen in algal cells was transferred to sediments by settling. Also, the sedimentary nitrogen mineralization process had a pivotal function in releasing more nitrogen fluxes back to water column.

Moreover, the nitrogen budget over the simulation period has shown that, most of nitrogen forms that derived from Idku lake outlet, were dissipated and transported over the open boundaries of the model domain, due to the high interaction between the water masses inside the model domain and those from the area beyond the open boundaries. In addition, the model has observed that the residence time of water masses was very low over the simulation time, decreasing the rate of retention of nitrogen fluxes over the study area.

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