Effect of Nasser Lake on Gravity Reduction and Geoid Computation

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The determination of the gravimetric geoid is based on the magnitude of gravity observed at the topographic surface of the earth. In order to satisfy Laplace's equation, the masses between the surface of the earth and the geoid must be removed or shifted inside the geoid. Then the gravity values have to be reduced to the geoid, forming the boundary values on the boundary surface. Gravity reduction techniques usually presume that positive elevations are reserved for positive topography. In case of lake Nasser, the whole lake with its bed floor is above sea level, i.e. having positive elevation. This leads to an obvious error in the topographic reduction using, for example, TC program by assuming rock topography filling the lake instead of water. The aim of this paper is to determine the effect of Nasser lake on gravity reduction and geoid computation in Egypt, as a prototype of the effect of great lakes on gravity reduction and geoid determination. The results proved that Nasser lake, having relatively shallow depths up to 25 m, has a minor effect on both the gravity anomalies and the geoidal heights in Egypt.