

New gravimetric tide observations in the vicinity of Lake Nasser

K.H. Zahran¹, J. Hinderer², E. Issawy¹, J.-P. Boy², S. Rosat², M. Taweel¹, M. Becker³, W. Zürn⁴
and T. Jahr⁵

1NRIAG, Geodynamics Department, Cairo, Egypt

2IPGS/EOST, University of Strasbourg/CNRS, Strasbourg, France

3 Institute of Geodesy, Technical University of Darmstadt

4 Institute of Geophysics, Karlsruhe University

5 Institut für Geowissenschaften, Friedrich-Schiller-University Jena

Lake Nasser, which is impounded by the High Dam, is the second largest man-made reservoir in the world. It extends 500 km in Southern Egypt and Northern Sudan with a capacity of 133.8 km³. Water level fluctuates during the year obeying an annual cycle of inflow and discharge. Variable loading of the water mass of the reservoir causes the equilibrium state to be broken and a time variation of the Earth's gravity field and crustal deformation is expected. On the other hand, continuous seismicity occurred after the filling of the Lake has many scientific interests on this region. Many geophysical and geodetic activities have been initiated on this region.

The D-218 of NRIAG was installed in the ground floor of the main building of the Seismological Centre at Sahari, close to lake Nasser from 2002 to 2004. The main objectives were to increase the accuracy of the geophysical and geodetic observations on this region and to shed more light on the effect of variation of the Lake level to the surrounding crust. Analysis of tidal gravity observations at Aswan tidal station shows discrepancies between the observed tidal parameters and the synthetic tidal parameters. These discrepancies may be due to variations of lake level, which are seen in the variable load of the lake and the change of underground water level. The residuals were generally quite high but show moderate correlation with the lake level variations. Amplitude spectrum shows high noise level in the diurnal band. The low quality of the data thought to be due to the poor calibration of the gravimeter and the missing atmospheric registrations. However, obtained results were encouraging for the repetition of these observations.

Within a scientific agreement between NRIAG and IPGS, ET 16 and ET 18 belonging to the Institute of Geodesy in Darmstadt and the University of Jena respectively in Germany have been installed in the vicinity of Lake Nasser during 2015. ET16 has been installed at Sahari old location and ET18 at Abu Simbel Observatory about 270 km from Aswan and very close to the lake. Both gravimeters are well calibrated against absolute and/or superconducting gravity observations. In addition, accurate monitoring of the atmospheric pressure is considered. Although it is still early for accurate data analysis, some preliminary results of these observations can be presented.