Derivation of Seawater Depth from Atmospheric Pressure in the Near-Shore Zone of Barrier-Lagoon Complex, Lagos State, Nigeria

Oladunni Opatoyinbo, Ifeanyi Onuigbo, Ahmed Musa and Yusuf Opaluwa (Nigeria)

Key words: Coastal Zone Management

SUMMARY

Generally, water depth measurement, otherwise known as bathymetric survey is usually done using the classical bathymetry such as the use of calibrated sounding rod or the use of acoustic sounding systems (echo sounder, side scan sonar, etc). However, due to inaccessibility of some water body and unsuitability of some very shallow water for sounding boat to sail through, alternative bathymetric methods such as Satellite Derived Bathymetry (SDB) and Pressure Derived Bathymetry (PDB) have been developed. Relying on the fact that pressure is a function of depth, several algorithms for deriving depth from pressure have been developed but little efforts have been made towards depth generated from pressure data. This would have been of immense advantage for countries like Nigeria where cost of bathymetric survey has limited availability and accessibility of depth information on some sections of Nigerian waters. Therefore, the aim of this study is to evaluate the performance of three algorithms for derivation of seawater depth from pressure in decibar. Fifty (50) years (1969 -2018) of atmospheric pressure data over the barrier-lagoon complex in Lagos State, Nigeria was acquired at 5 years intervals and variation in Latitude position between 60 10'N, and 60 27'N at five minutes (5') intervals. The atmospheric pressure was converted to hydrostatic pressure. Two algorithms including theory of equivalent observed pressure to depth and hydrostatic equation were evaluated for PDB. Depth generated from the UNESCO 1983 formulation was used as a standard for validation of the results. The results showed that the varied Latitude position did not show appreciable difference in the derived depth within the years of study. The derived seawater depth as compared to the standard UNESCO 1983 formulation showed approximate difference of 0.04m with equivalent observed pressure to depth in decibars and 0.125m with hydrostatic basic equation in decibar. It is recommended that these new PDB equations which are substantial improvement on the previous ones, should be put to use for quick results over a wide area of coverage.
