Fast Tidal Modelling Application Development for the Straits of Malacca

M.D.E.K. Gunathilaka[1] and M.M. Razali[2]

[1]Department of Surveying & Geodesy, Faculty of Geomatics,
Sabaragamuwa University of Sri Lanka, 70140, Belihuloya, Sri Lanka.
[2]Hydrographic Research & Training Office, Faculty of Geo information & Real Estate,
University Technology Malaysia, 81310, Skudai, Johoe Bahru, Malaysia.
erandakan@sab.ac.lk

Abstract

Conventional tidal computation techniques used many number of parameters like tidal constituents, datum, residuals in the modeling process. Because of this reason, they are inappropriate in real time onboard applications. Here, the observed tidal fields are assumed to be obeying the two-dimensional (2D) Laplace's Equation (LE) and the interpolation is computed by numerically solving the LE. The appropriate boundary conditions were tested using simulated test blocks and real data at Malacca Straits. Ceaseless Co-Tidal Chart (CCTC) and Direct Tidal Observation Spatial Interpolation Technique (DTOSIT) are two new approaches developed for fast modeling and computation of offshore tide. These two methods are significance from other existing techniques as it is not using the individual tidal constituents for the interpolation. Then, Matlab computer application was developed to provide fast, accurate and continuous tidal corrections for onboard bathymetric reduction based on the observed tides at the Malacca Straits. Results were compared against the shore stations and in offshore with the satellite altimetry sea surface heights. Furthermore, tidal datum variability over the region was also modeled. The statistical results showed a very good correlation over 0.9 with the observed and the modeled tidal values. DTOSIT tidal modeling has given slightly higher correlation than the predicted CCTC tides as it used the observed tide in the modeling. The standard deviations of the computed datum levels were around 0.1m and satisfied the International Hydrographic Organization's standards for the datum. It is clear that this approach is a fast and effective approach in modeling the tidal phenomenon.

Keywords: Tidal Modeling, Hydrology