

## Sea Level Characteristics Referenced to Specific Geodetic Datum in Alexandria, Egypt

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**Abstract :** Two geo-referenced sea level datasets (September 2008 &ndash; November 2010) and (April 2012 &ndash; January 2014) were recorded at Alexandria Western Harbour (AWH). Accurate re-definition of tidal datum, referred to the latest International Terrestrial Reference Frame (ITRF-2014), was discussed and updated to improve our understanding of the old predefined tidal datum at Alexandria. Tidal and non-tidal components of sea level were separated with the use of Delft-3D hydrodynamic model-tide suit (Delft-3D, 2015). Tidal characteristics at AWH were investigated and harmonic analysis showed the most significant 34 constituents with their amplitudes and phases. Tide was identified as semi-diurnal pattern as indicated by a &ldquo;Form Factor&rdquo; of 0.24 and 0.25, respectively. Principle tidal datums related to major tidal phenomena were recalculated referred to a meaningful geodetic height datum. The portion of residual energy (surge) out of the total sea level energy was computed for each dataset and found 77% and 72%, respectively. Power spectral density (PSD) showed accurate resolvability in high band (1&ndash;6) cycle/days for the nominated independent constituents, except some neighbouring constituents, which are too close in frequency. Wind and atmospheric pressure data, during the recorded sea level time, were analysed and cross-correlated with the surge signals. Moderate association between surge and wind and atmospheric pressure data were obtained. In addition, long-term sea level rise trend at AWH was computed and showed good agreement with earlier estimated rates.

**Keywords :** Alexandria, Delft-3D, Egypt, geodetic reference, harmonic analysis, sea level

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