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Empirical computation of changes in Mean Sea Level around Sri Lanka Vertical Datum

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Tides occurs as the combined effects of the gravitational forces exerted by the moon and the sun and rotation of the Earth. Mean Sea Level (MSL) is the mean height of the surface of the sea and vertical datum of Sri Lanka is the base measurement point or set of points from which elevations are determined. Tidal constituents are the net result of multiple influences impacting tidal changes over certain time period. The aims of this study are to update the MSL of Sri Lanka, to find the eight main tidal constituents and to fit a model for variations of tidal heights. Tidal heights in every 15 minutes from 1st of January 2015 to 31st of December 2017 in Colombo, Galle, Trincomalee and Kankesanthurai coastal areas in Sri Lanka were used to analyse the behaviour of the tidal waves. For this analysis, The Mean High Water (MHW), Mean Low Water (MLW) and the average value of the heights of tides of each month in each coastal areas were calculated and graphs were plotted using MATLAB programming. These data have been used to update the MSL in each coastal areas. A Tide Analysing Tool which has been generated earlier using MATLAB programming, was used to find the main tidal constituents which are very important for national planning and naval operations. values of MSL in areas like Colombo, Galle, Trincomlee and Kankesanthurai have increased by 16.26 cm, 14.36 cm, 20.84 cm and 14.73 cm, respectively and the value of MSL in Sri Lanka has increased approximately by 16.55 cm. Values of main eight tidal constituents like Principal Lunar semi diurnal constituent (M_2) in Colombo, Galle, Trincomalee and Kankesanthurai were identified as 0.1333m, 0.0767m, 0.0882m and 0.1133m respectively. After analysing the behaviour of weekly tidal heights in January and February in 2016, their variations were fitted into the Fourier trigonometric series. This series was later used to predict weekly tidal heights in January and February in 2017. This method can also be applied for tidal analysis and predictions of any given period of time in any coastal area.

Keywords: Fourier Trigonometric Series, Mean Sea Level, Tidal constituents, Mean High Water, Mean Law Water