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Prediction of salinity intrusion in the sheltered estuary of Terengganu River in Malaysia using 1-D empirical intrusion model

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Abstract

Generally one dimensional (1-D) empirical salinity intrusion model is limited to natural alluvial estuary. However, this study attempts to investigate its ability to model a sheltered alluvial estuary of the Terengganu River in Malaysia. The constructed breakwater at the mouth of the river shelters the estuary from direct influence of the open sea. The salinity density along the estuary was collected during the wet and dry seasons for scenarios before and after the constructed breakwater. Moreover, the freshwater discharges, tidal elevations and bathymetry data were also measured as model inputs. A good fit was demonstrated between simulated and observed variables, namely salinity distribution and intrusion length for both scenarios. Thus, the results show that 1-D empirical salinity model can be utilized for sheltered estuarine condition at the Terengganu Estuary, but with an appropriate determination of an initial point. Furthermore, it was observed that the salinity intrusion in the study area is largely dependent on the freshwater discharge rather than tidal elevation fluctuations. The scale of the salinity intrusion length in the study area is proportional to the river discharge of the –1/2 power. It was appeared that the two lines of the 1-D empirical salinity model and discharge power based equation fitted well to each other, with the average predicted minimum freshwater discharge of 150 m^3/s is going to be required to maintain acceptable salinity levels during high water slack (HWS) near the water intake station, which is located at 10.63 km from river mouth.

Key words: salinity intrusion, sheltered estuary, freshwater discharge, geometric characteristic, empirical model

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