UNIVERSITI TEKNOLOGI MARA

MODELLING OF TIDES AND RIVER DISCHARGES IN AN IDEALISED MEANDERING RIVER

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ABSTRACT

Rivers debouching into the sea are subjected to tidal variation at the river mouth. Tide-river interaction can cause variations in discharge by giving an additional gradient in water level which known as a backwater effect and somehow can cause serious flood event. Hydrodynamic model was believed has the capabilities to simulate the behaviour of tide and flood coming from the river upstream. An idealised river meander geometry is constructed using the improved sine-generated curve that simplifies the river meander planform by constructing the meander path as combinations of line and arc with direct reference to practical dimensions. This an idealised meandering river model is employed to investigate the changes water depth due to backwater effect in a semi-diurnal-type estuary. Model is developed using Delft3D open-source software. A curvilinear grid is finalised with RGFGRID, a boundary fitted grid generation program. Then, the bottom depth in the model is generated using QUICKIN, a program to visualise a bathymetry. The boundary conditions included different magnitudes of river flow discharge and estuary tidal amplitude. The postprocessing process to visualise the simulation results is produced by QUICKPLOT, a user-friendly and flexible tool that has been developed using MATLAB. The idealised model demonstrates the significance of backwater effect is held up inside the meandering river. Numerical simulation of backwater effect due to riverine discharge into the open sea shows that significant backwater effect can be observed landward up to the point where the channel bed rises above the mean sea level. Tidal effect dominates in these lower reaches, whereas riverine peak discharge tends only to increase the water level in the upper reaches. Results show that backwater effect is dependent primarily on the tidal amplitude. The lower reaches of meandering river model are highly affected by the tidal amplitudes. The higher the tidal amplitude, the longer the backwater effect is held in the upland distance. The simple, idealised meandering river model reproduces the hydraulic of low land river well and generalise the effect for backwater prediction. The suitability of an idealised river model for numerical study is evaluated and will greatly facilitate related research to better understand the physics and behaviours of tidal rivers with meandering effects.

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