



## **The influence of recent change in river discharge and bathymetry on tidal wave propagation in the Modaomen estuary, China**

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Dredging and flow diversion in the Modaomen estuary in China have had a measurable impact on tidal propagation and damping. In this paper we assess the impacts of these human interventions through the use of a new analytical hydraulic model procedure. The model calculates tidal propagation and damping as a function of bathymetry and river discharge through a simple iterative procedure with explicit analytical equations. The results obtained are accurate and allow both an analysis of the historic development and a sensitivity analysis to assess the effect of possible further dredging and flow diversions. Particularly in the upper reaches of the estuary, tidal damping and wave celerity are sensitive to dredging and flow reduction. Historic analysis shows that due to these activities, since 1993, the tidal amplitude in the Modaomen estuary increased by more than 0.1 m, while the travel time of the tidal wave decreased from 20 min in the middle part of the estuary to 60 min in the upper reaches. In the future, the tidal amplitude and the wave celerity would increase even further as a result of the continuing decrease of river discharge and sand excavation. This indicates that the Modaomen estuary may experience increased risk of salt intrusion and flooding from storm surges.

Keywords: analytical model; deepening; tidal amplitude; wave celerity