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Abstract

SIMULATION OF THE IMPACTS OF  
TOPOGRAPHY CHANGE ON FLOW AND  
SEDIMENT TRANSPORT IN SURROUNDING  
WATERS OF MACAO BY NUMERICAL MODEL

by

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The impacts of topography changes on flow and sediment transport since 1985 in surrounding waters of Macao are simulated by a two-dimensional numerical model based on Finite Volume Method (FVM).

Four tidal types representing a lunation, two types of runoff discharge representing flood and dry seasons are introduced in models, in which three types of topography in 1985, 1997 and 2001, represent the topography during different periods.

*In Macao Waterway and around airport runway*

The topography changes in Hongwan Waterway affects significantly on flows in Macao Waterway in flood season. It shifts flow path to north, which coincide with the orientation of deep channel, and enhances the upstream runoff until to confluence area, so that the carried sediment is brought farther, and settles down around the outlet of waterway.

In waterway outlet, the presenting of airport runway reduces flood flow fed into waterway and changes flow path, its impact on ebb flow is not significant, but significant on flood flow.

For the area between runway and Taipa-Coloane Island, the impact of raising of seabed elevation in this area on flood flow is not significant but significant on ebb flow. Although slight erosion occurs inside runway, severe deposition is found in north and south flow entrances, which will block the flow in this area.

*In Shizimen Waterway*

The quantities of ebb flow fed into waterway are reduced significantly due to, (1) narrowing of Hongwan Waterway, which increase the distance between Hongwan Waterway and Shizimen Waterway, and (2) the new navigation channel connecting Macao Waterway and Shizimen Waterway, which is NE direction, perpendicular with ebb flow.

The reclamation beside waterway reduced flow capacity remarkable. Raising of seabed elevation outside of south outlet also reduces flood flow fed from main tidal current.

In waterway, the deposition trend becomes more severe, especially in north and south flow entrances. Hence, if such waterway entrances are not regularly dredged, the flow fed into waterway will reduce further, finally the waterway will be blocked naturally.

*In other areas*

In Wanzai Waterway and Macao Outport, the water is stagnant, which is unfavorable for dispersion of pollutant.

In Hac-Sa Bay, the deposition presents in all seasons, which coincides with the changes of isobaths in Map 2001 and Map 1997. Although severe erosion had occurred during Winter, it is due to the impact of wind in NE direction, which is ignored in this simulation.