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Combined Effect of Moving and Open Boundary Conditions in the Simulation of Inland Inundation Due to Far Field Tsunami

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Abstract : Tsunami and inundation modelling due to far field tsunami propagation in a limited area is a very challenging numerical task because it involves many aspects such as the formation of various types of waves and the irregularities of coastal boundaries. To compute the effect of far field tsunami and extent of inland inundation due to far field tsunami along the coastal belts of west coast of Malaysia and Southern Thailand, a formulated boundary condition and a moving boundary condition are simultaneously used. In this study, a boundary fitted curvilinear grid system is used in order to incorporate the coastal and island boundaries accurately as the boundaries of the model domain are curvilinear in nature and the bending is high. The tsunami response of the event 26 December 2004 along the west open boundary of the model domain is computed to simulate the effect of far field tsunami. Based on the data of the tsunami source at the west open boundary of the model domain, a boundary condition is formulated and applied to simulate the tsunami response along the coastal and island boundaries. During the simulation process, a moving boundary condition is initiated instead of fixed vertical seaside wall. The extent of inland inundation and tsunami propagation pattern are computed. Some comparisons are carried out to test the validation of the simultaneous use of the two boundary conditions. All simulations show excellent agreement with the data of observation.

Keywords : open boundary condition, moving boundary condition, boundary-fitted curvilinear grids, far-field tsunami, shallow water equations, tsunami source, Indonesian tsunami of 2004
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