Investigation of landslide tsunami using BASEMENT software

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Abstract: Landslide tsunami is one kind of natural disaster induced by the mass sliding on the seafloor, which could cause an impact on coastal structures and human beings. On tank experiment conducted by Sue et al. (2006) studying the sliding block acceralation effect on the tsunami wave propogation and one scaled physic model studing the 1993 Monai tsunami happened in Japan were both investigated through numerical simulation using BASEMENT software. The event-driven simulation was conducted to reproduce the Sue's experimental results, in which the water level stored in BASEMENT's hotstart CGNS file was modified using CGNSVIEW tool. The event-driven simulation can reflect the production, propogation and decay processes of the landslide tsunami. In the modeling of Monai tsunami experiment, we have discussed the effects of mesh resolution, calculation time step, friction coefficient on the wave amplitude, inundation area and flowing velocity. Meanwhile, the suspended sediment and bedload transport were also calculated to study the tsunami wave affecting the seafloor topography, in which the effect of sediment diameter, porosity and sediment concentration on the seafloor changes was discussed. The modeling results showed that BASEMENT software can reproduce the landslide tsunami wave propogation in the accepted accurancy after the careful parameters tuning, and the simulation efficiency and robustness can be achieved though OpenMP parallelisation. The simulated results can also reflect the temporal and spatial evolution processes of the hydrodynamic factors and seafloor topography. So we belive that BASEMENT software can be used to study the real-world problem such as flooding inundation and tsunami wave propogation.

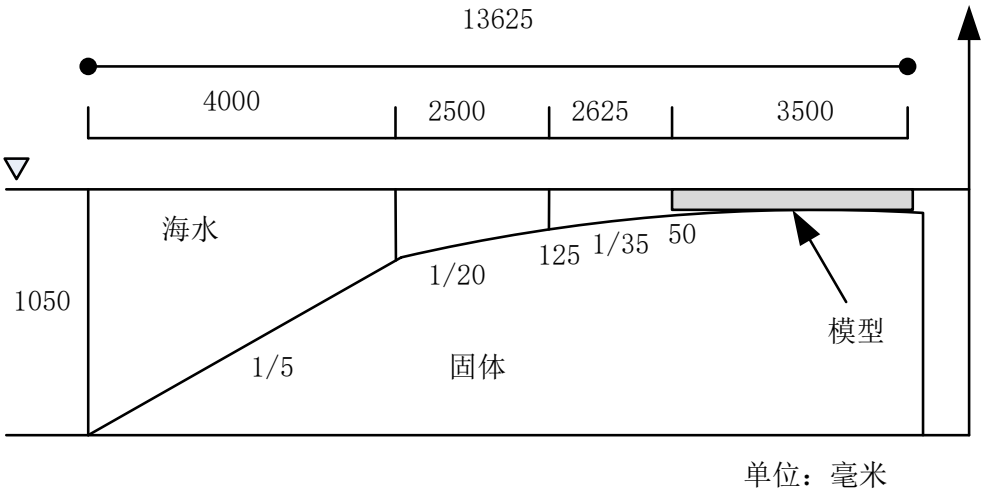

Figure 1 The physical setup of Monai tsunami experiment

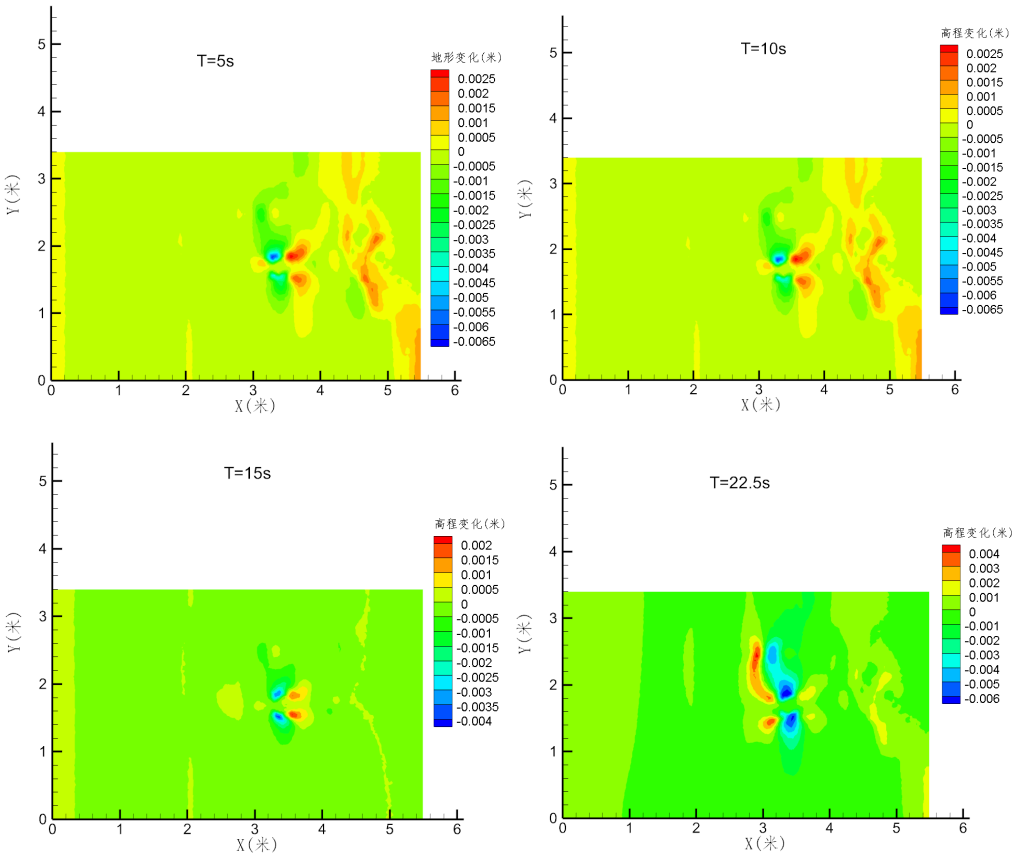

Figure 2 The searfloor topography changes at different time modelled by BASEMENT