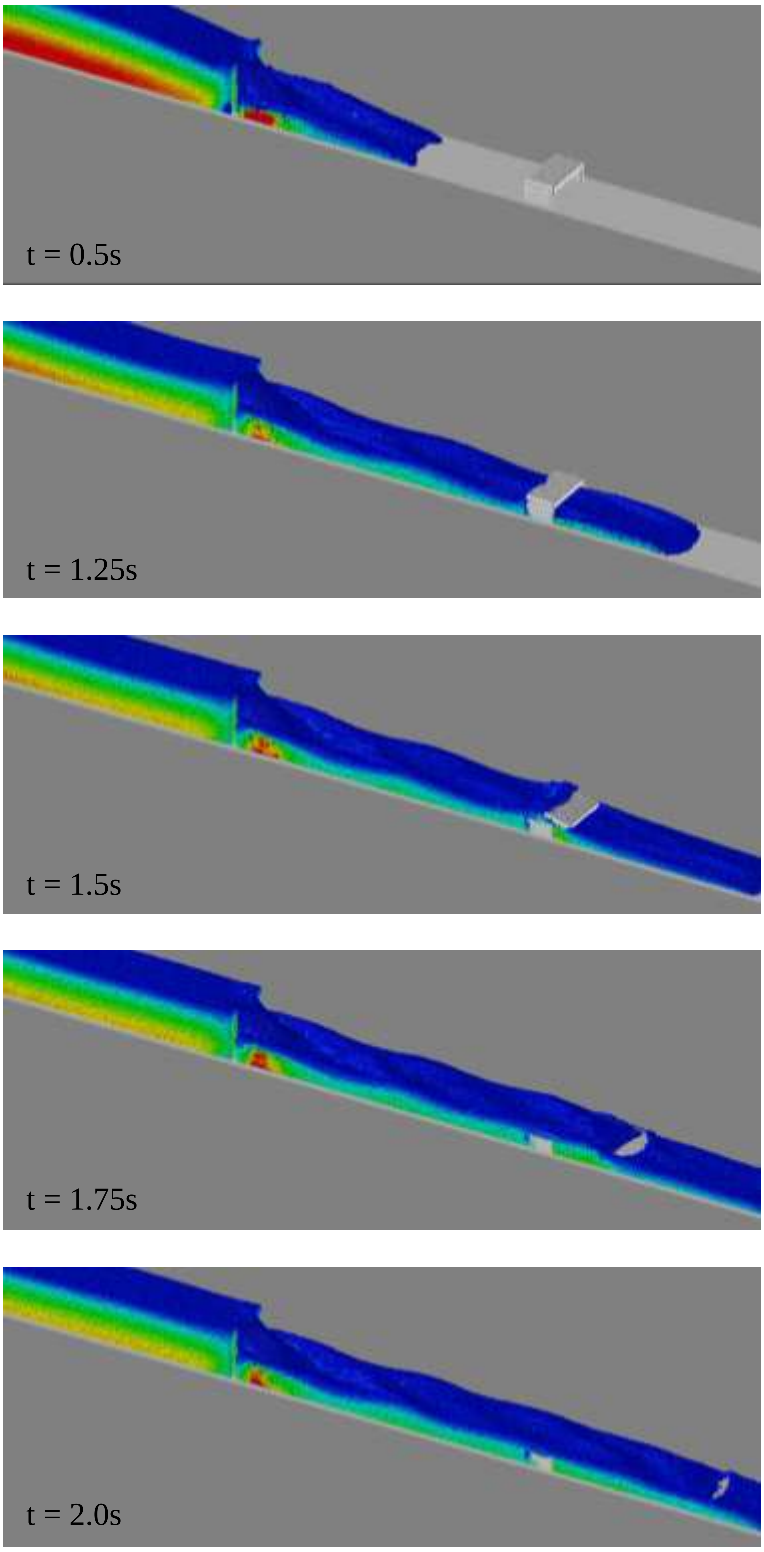

Fig. 7 Time sequence of bridge wash-out simulation by the stabilized ISPH method for initial water height 250mm

From the above figures, it can be clearly observed that our analysis results show a very good agreement with the experimental data, simulating the movement and rotation of girder from positive angle to negative angle. Even though the experimental results obtained from the motion capturing systems are quite noisy and sometimes there are some data missing due to the perturbation caused by strong turbulence and rapid flow, we can still clearly see fairly good tendencies of rigid body motion along the horizontal and vertical axis, those which are similarly shown by our numerical results. From these comparisons, we believe that our proposed method can evaluate the fluid-rigid interaction motion during wash-out in a small scale experiment.

5. CONCLUSION AND FUTURE WORKS

In this study, the verification and validation tests of fluid-structure interaction formulation were conducted after introducing rigid body dynamics algorithm considering decomposed penalty contact forces and spatial variables into ISPH. In our experimental validations, the rigid body motion shows a very good agreement compared to the experiment; particularly can be seen from the comparison of the rigid body center and rotational angle after wash-out. In the future works, consideration of the rigid body impact formulation will be studied and implemented before conducting a real scale simulation of a particular bridge structure. Moreover, further research should be conducted to improve the numerical simulation in consideration of the detailed multibody systems of rigid and deformable bearings and aseismic connectors between the bridge upper and lower structures. In order to achieve a better result of FSI simulation, an SPH–FEM coupled model can be a very effective alternative to investigate and predict the bridge wash-out phenomena during tsunami.

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