Two-Dimensional Flood Inundation Model Based on Mixed Triangular and Quadrilateral Cells

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Flood inundation due to dam and levee breach can be occurred everywhere in the world. Such an extreme event may cause serious loss of life and property. The numerical model can be used to predict flood wave propagation and provide the information about the area to be flooded, wave front arrival time and water depth and so on.

The objective of this study is to develop the 2D finite volume model that is capable of using triangular mesh, quadrilateral mesh and combination of those for flexible treatment of topography including main channel and floodplain. To do so, the unsplit method is effective. The unsplit method takes into account the variations of the flow variables in all direction of space simultaneously. Accordingly, an algorithm is developed to find adjacent meshes for application of the unsplit method.

The model developed in this study is suitable to handle complex topography to simulate subcritical and supercritical flow and steady or unsteady flow. The model is also able to handle wetting or drying of floodplains and gives reliable solutions for both smooth and discontinuous problems.

The suggested model solves the conservative form of the two-dimensional shallow water equations using finite volume method and HLLC approximate Riemann solvers to compute the intercell fluxes.

Validation of the proposed model is provided by comparing the simulated results with analytical solutions, experimental data. The numerical simulation results are in good agreement with the analytical solutions and experimental data.

Keyword **:** mixed mesh, unsplit method, HLLC, FVM

References

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