Dynamically Adaptive Tree Grids Modeling of Flood Inundation Based on Shallow Water Equation

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Abstract: Flooding has very often occurred in the world. They caused many related problems such as flooding, landslide, disease and other problems. The problems have necessitated researchers to do numerical modeling of flood inundation which is an important tool for a risk assessment, preparation, evacuation planning and real-time forecasting of flood warning. This leads to a development of computational efficiencies of two-dimension numerical models for large-scale flood simulation. The purpose of this paper is a computational scheme for shallow water equation solving on adaptive tree grids for modeling, simulation and visualization of flood inundation. For the computational scheme, we applied the finite volume method to solve the shallow water equation, and we designed the grids adaptivity method based on general rectangular tree grids. In order to test a potential of the model in terms of computational costs, the model is applied to simulate the flood inundation in Thailand. The model results are compared with the small-scale simulation on uniform grids. The comparison shows that the model can reduce number of grids cells and computational time without losing much accuracy in the results. The software written in Delphi programming and OpenGL library is useful for the preliminary water resources management and disaster prevention from water flooding. The software can be used to simulate flooding for any region based on ETOPO data.

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