Improvement of Hydro-debris2D&3D model and It's application to Mountain Hazards and Sediment Disaster Prediction

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Hydro-debris2D model has been developed and improved for predicting occurrence of debris flow throughout hydrological regime changes. The model contains three components: (1) Shallow-water based surface flow modules, in order to calculate mountain zone torrential flow regimes, (2) rapid subsurface/interflow in weathered rock, and (3) debris flow components. The model has been applied into Izu Oshima Island's debris flow event in 2013 and to Hiroshima's debris flow disaster in 2014. As rainfall was input, we made a comprehensive comparison between observed rainfall station datasets from AMeDAS and High-resolution NHM calculation results. In the case of Izu Oshima, heavy rainfall and extensive surface flow occurred in the western part of the island, together with extreme interflow which may have caused the start of debris flow in the wall. In Hiroshima's case, observed rainfall reproduced occurrences of debris flow with better agreement of the disaster due to the slight changes in heavy-rainfall zone. Prediction using ensemble rainfall results may be needed in order to increase the accuracy of the occurrence.
Hydro-debris 3D has been developed in order to simulate flow-particle interaction in the debris flow using Euler-lagrangean coupling numerical simulation. By precisely routing particle segregation, the mechanism of "Inverse grading" in debris flow observed in steep slope channel experiment in large eddies of debris flow is being reproduced by the model.

Keywords: Hydro-debris2D, Debris Flow, Heavy Rain, Euler-lagrangean coupling model

