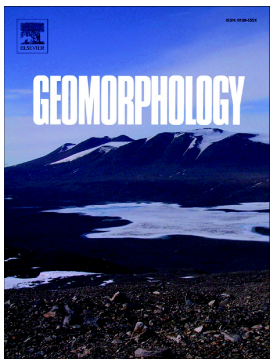

Numerical investigation of debris materials prior to debris flow hazards using satellite images

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Numerical investigation of debris materials prior to debris flow hazards using satellite images

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Abstract: The volume of debris flows occurred in mountainous areas is mainly affected by the volume of debris materials deposited at the valley bottom. Quantitative evaluation of debris materials prior to debris flow hazards is important to predict and prevent hazards. At midnight on 7th August 2010, two catastrophic debris flows were triggered by the torrential rain from two valleys in the northern part of Zhouqu City, NW China, resulting in 1765 fatalities and huge economic losses. In the present study, a depth-integrated particle method is adopted to simulate the debris materials, based on 2.5 m resolution satellite images. In the simulation scheme, the materials are modeled as dry granular solids, and they travel down from the slopes and are deposited at the valley bottom. The spatial distributions of the debris materials are investigated in terms of location, volume and thickness. Simulation results show good agreement with post-disaster satellite images and field observation data. Additionally, the effect of the spatial distributions of the debris materials on subsequent debris flows is also evaluated. It is found that the spatial distributions of the debris materials strongly influence affected area, runout distance and flow discharge. This study might be useful in hazard assessments prior to debris flow hazards by investigating diverse scenarios in which the debris materials are unknown.