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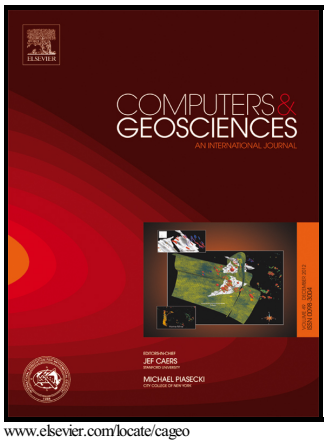

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Dynamic simulation of landslide based on thermo-poro-elastic approach

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Abstract: Catastrophic landslides often extend for surprisingly long distances, a trend consolidated by a decrease in the apparent friction coefficient with an increasing landslide volume. However, there is not yet a physical model able to predict the long distances traveled by landslides in the condition of deformation. A two-dimensional model for simulating catastrophic landslide motion is presented in this paper and is based on a lump model for thermo-poro-elastic mediums. The model can concurrently simulate landslide dynamic processes, and pore pressure and frictional heating evolution in the shear zone at the bottom of a landslide. These are based upon the shallow-seated groundwater table assumption and depth-averaged integration, as well as the thermo-poro-elastic approach. A combined computational method based on the finite volume method and Crank-Nicolson method is proposed to solve the coupled equations. Four computational experiments have been run and the numerical results indicate that frictional heating enhances pore water pressure and reduces the friction, resulting in higher mobility and longer distances traveled. The value of pore water pressure can also influence the deformation process of a landslide.

Key words: Landslide; Thermo-poro-elastic approach; Simulation; Pore pressure; Frictional heating