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A three dimensional numerical method for landslide run out analysis

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Flow-like movements of rocks can be identified among the most dangerous and damaging of all landslide phenomena. Since it often proves impossible to mitigate the destructive potential of this type of landslide, by stabilising the area of origin, risk analyses, including predictions of run out, have to be performed. With these predictions losses can be reduced, as they provide means to define the hazardous areas, estimate the intensity of the hazard and work out the parameters for the identification of appropriate protective measures.

Following a continuum mechanics approach [1], a three dimensional numerical model devoted to run analyses of propagation on a complex topography is here proposed. It is based on the classical finite volume approach for solving hyperbolic systems. The equations are discretized on general triangular grids (Figure 1) with a finite element data structure using a particular control volume which is the median based dual cell (C_i). To solve the Saint Venant equations a kinetic solver is followed. It consists in using a fictitious description of the microscopic behaviour of the system to define numerical fluxes at the interface (Γ_i) of an unstructured mesh [2].

The numerical code is tested through back analysis of two case histories of rock avalanches: Frank Slide (Canada) and Six des Eaux Froides (Switzerland).

Keywords: Continuum mechanics, Back analysis, Landslide run out

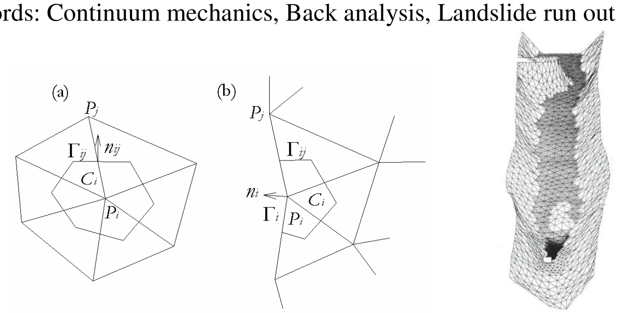

Figure 1. Triangular finite element mesh for (a) dual inner cell C_i and (b) dual boundary cell C_i

References

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