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An improved CA-model for simulating flow-type landslides

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S4d is a new hexagonal release of the Cellular Automata model SCIDDICA for the simulation of flow-type landslides. It is able to simulate the erosion of the regolith along the flow-path, as well as branching/re-joining events of the flow masses. Dissipative effects are modelled in terms of not-exclusive velocity-dependent mechanisms, which allow to simulate even complex rheological behaviours. Moreover, it is able to manage the peculiar characteristics of rapid flows, and the effects of mass collisions, by guaranteeing mass conservation. Finally, in case of no dissipation, conservation of energy and of momentum are also assured. With respect to previous releases, computation of debris distribution among the cells is improved: it is in fact carried out by explicitly considering the centres of mass. The debris is described in terms of "blocks", individuated by their barycentre co-ordinates, and by velocities. This type of approach differs from classical cellular-automata models for fluid-dynamical phenomena (e.g. lattice-gas and lattice-Boltzmann models). Block specifications permit to obtain a better physical description of the phenomenon, and a more accurate control of its development. Model calibration is presently being carried out through parallel Genetic Algorithms, by considering real cases occurred in Campania (Southern Italy) in May 1998 and in December 1999. A sensitivity analysis is also being performed, aiming at evaluating the role of a subset of model parameters, of the size of the cell, and of the orientation of the cellular space. Preliminary results of calibration confirmed the reliability of the model in reproducing the considered cases of study. Moreover, first analyses of sensitivity pointed out the robustness of the model with respect to the considered factors.