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The role of parameters and of hexagonal neighbourhood on the dynamics of the SCIDDICA S4c Cellular Automata model for debris flows simulation

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SCIDDICA [1] is a Cellular Automata model for the simulation of debris flows and avalanches. The latest release (S4c) better models both inertial properties, and the effects of collisions among flowing masses.
Calibration is an essential phase in the development of a model, as it allows to evaluate its ability to simulate the class of phenomena for which the model was developed. In the case of SCIDDICA S4c, the trivial comparison of the extent of real and simulated cases can be considered for a simplified, preliminary calibration, even if more articulated evaluation criteria (fitness functions) can be adopted when proper input data are available. As a result, the optimal set of values for model parameters is obtained, which allows to simulate the considered cases of study at best.
In this work, calibration has been carried out by means of Parallel Genetic Algorithms, automated search algorithms inspired by Darwinian selection and genetics, by considering real cases of study. A first Sensitivity Analysis has also been performed, in order to evaluate the behavior of the model with respect to the variation of its parameters, and to the orientation of the cellular space. Results evidenced the different weight of different parameters with respect to the overall system dynamics and the soundness of the adopted hexagonal neighbourhood.

References

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