A Real Space Cellular Automaton Laboratory (ReSCAL) to analyze complex geophysical systems

O. Rozier and C. Narteau

Institut de Physique du Globe de Paris, Sorbonne Paris Cité, Univ Paris Diderot, UMR 7154 CNRS, PARIS, France.

The Real Space Cellular Automaton Laboratory (ReSCAL) is a generator of 3D multiphysics, markovian and stochastic cellular automata with continuous time. The objective of this new software released under a GNU licence is to develop interdisciplinary research collaboration to investigate the dynamics of complex geophysical systems.

In a vast majority of cases, a numerical model is a set of physical variables (temperature, pressure, velocity, etc...) that are recalculated over time according to some predetermined rules or equations. Then, any point in space is entirely characterized by a local set of parameters. This is not the case in ReSCAL where the only local variable is a state-parameter that represent the different phases involved in the problem. An elementary cell represent a given volume of real-space. Pairs of nearest neighbour cells are called doublet. For each individual physical process that we take into account, there is a set of doublet transitions. Using this approach we can model a wide range of physical-chemical or anthropological processes.

Here, we present different ingredients of ReSCAL using published applications in geosciences (Narteau et al. 2001 and 2009). We also show how ReSCAL can be developped and used across many disciplines in geophysics and physical geography.

Supplementary informations:

Sources files of ReSCAL can be download on


References :
