Properties of a Finite Stochastic Cellular Automaton Toy Model of Earthquakes

Mariusz BIAŁECKI

Institute of Geophysics, Polish Academy of Sciences, Warszawa, Poland
e-mail: bialecki@igf.edu.pl

A b s t r a c t

Finite version of Random Domino Automaton – a recently proposed toy model of earthquakes – is investigated in detail. Respective set of equations describing stationary state of the FRDA is derived and compared with infinite case. It is shown that for a system of large size, these equations are coincident with RDA equations. We demonstrate a non-existence of exact equations for size $N \geq 5$ and propose appropriate approximations, the quality of which is studied in examples obtained within the framework of Markov chains.

We derive several exact formulas describing properties of the automaton, including time aspects. In particular, a way to achieve a quasi-periodic like behaviour of RDA is presented. Thus, based on the same microscopic rule – which produces exponential and inverse-power like distributions – we extend applicability of the model to quasi-periodic phenomena.

Key words: stochastic cellular automaton, avalanches, cellular automata – exact solutions, toy model of earthquakes, Markov chains.