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A discrete spatially - extended system approach to the seismicity of the Betic (Spain) region

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The spatio-temporal evolution of the Betic (Spain) region has been studied, using a seismic catalogue recorded from 1985 to 1999 by the Andalusian Institute of Geophysics and Seismic Disasters Prevention (IAGPDS), which contains 17311 events. Tools which include Cellular Automata and Information Theory are used, in order to find the evolution rules of the system. The catalogue is divided into time intervals, and the epicentral region into cells. For each one, the activity level is calculated by using a released energy threshold criterion. To characterize the evolution of the obtained patterns, a local interaction between cells, according to the Moore's neighborhood, is supposed; so, the state of a cell depends on the previous neighborhood state. The mutual information between the past and future states is maximized. Such a function depends on a few parameters, which are the size of the cells and the period of time in which a cell is considered seismically active. The maximum of this quantity provides the values of cells and intervals of time for the highest dependence between past and future states. Then, a stochastic Cellular Automaton is constructed so that the transition rules give the spatio-temporal characterization of the zone. By applying these rules to the latest seismic pattern, a Probabilistic Seismic Hazard Map can be constructed, where the probability of surpassing certain energy release is shown.