A STUDY ON EARLY-WARNING SIGNALS FOR TRANSITIONS TO DESERTIFICATION

ANNA CHERUBINI

DIPARTIMENTO DI MATEMATICA E FISICA, UNIVERSITÀ DEL SALENTO, ITALY

AND

DEPARTMENT OF MATHEMATICS, IMPERIAL COLLEGE LONDON

ABSTRACT. This study deals with the identification of early-warning signals for desertification in fragile ecosystems such as arid or semi-arid ones. Literature on this topic shows that vegetation patchiness in semi-arid ecosystems can lead to the identification of indicators for an ap-proaching transition to desertification. We numerically analysed a model for semi-arid eco-systems based on a stochastic cellular automaton (CA) depending on a number of parameters (accounting for external stresses, soil quality, interactions between plants etc.). We investi-gated the time fluctuations properties of quantities associated with the steady states of the CA and described the desertification process in term of percolation theory, which allows to follow the progressive deterioration of the ecosystem and identify a number of early indicators. Other very early warning signals can be obtained from the time fluctuations distribution of the biggest cluster size.

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