



## **Bistable dryland ecosystems subject to rainfall interannual variability**

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Positive feedbacks between dryland vegetation and soil moisture are frequently associated with the emergence of bistable vegetation dynamics, i.e., with two alternative stable states, corresponding to bare and completely vegetated soil. These feedbacks may be due either to the existence of higher infiltration capacity in subcanopy soils than in bare plots, or to the lower evaporation losses occurring in vegetated areas (mulching and shading effects). Because dryland ecosystems are also prone to relatively strong interannual rainfall fluctuations, an analytical model is developed to investigate the effect of random climate variability on the bistable dynamics of vegetation.

It is found that random rainfall fluctuations may induce an ordered state in the dynamics by turning the bistable deterministic dynamics into a stochastic system with only one statistically stable state. This effect is enhanced when the noise intensity is increased, whereas the stochastic dynamics become bistable (i.e. the noise-induced ordered state disappears) when the noise intensity decreases below a critical (non-null) value. This effect of noise-induced stability is found in association with an enhancement of ecosystem resilience, indicating that the likelihood of catastrophic shifts to the desert state decreases as the noise intensity increases.