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Vegetation changes under gradients of precipitation and fire using a simple ecohydrologic model

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Predicting ecosystems responses under changing environment conditions is one of the major challenges of modern ecology.
This issue is more important when the vegetation changes imply changes in plant functional types. The study is rendered more difficult by the complex of actions and feedbacks in ecosystem dynamics and by the presence of catastrophic and abrupt transitions.

Here vegetation changes are investigated using a minimal ecohydrologic model (Accatino et al 2010) for the coupled dynamics of tree and grass in competition for space and soil water and disturbed by fire and herbivores.
The possible steady states of the model are bare soil, grassland, forest, and savanna. To each of them is associated a stability domain in the parameter space.

Stability map will allow to identify the existence domains of each vegetation type, and show the changes in vegetation structure/composition along grandients of rainfall, fire and herbivores pressure.
Interpretation of stability maps will shade light on the some vegetation abrupt transitions (e.g., forest collapse and bush encroachment). An application of the theoretical results to 15 african savannas sites is presented and discussed.