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Changing vegetation self organisation affecting eco-hydrological and geomorphological processes under invasion of blue bush in SE South Africa

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In southeastern South Africa sub-humid grasslands on abandoned soils are spontaneously being invaded by the exotic shrub Pteronia incana (Blue bush) originating from the semi-arid and arid Karoo region. This results eventually in soil loss and rill and gully erosion and consequently loss in agricultural production affecting the local rural economy.
Degradation of soils is occurring following replacement of grassland by unpalatable shrubs and altering the spatial organization of the vegetation. This in consequence is changing the eco-hydrological response of the hillslopes leading to a dramatic increase of runoff and erosion. However the reason for this spontaneous vegetation replacement is not clear. Various explanations have been proposed and discussed such as overgrazing, vegetation cover and rainfall, drought or climatic change or exposition. The study presented aims at quantifying the observed changes in the plant and bare spot patterns and which may help us unraveling vegetation self organisation processes in relation to environmental disturbances. We analyzed high resolution low altitude images of vegetation patterns in combination with high resolution digital terrain model analysis. We applied this procedure for different patterns reflecting a time series covering the observed changing patterns. These reflect changing interactions between the (re-) organization of the plant patterns during the bushy invasion and incorporated the interaction between vegetation, water redistribution and soil properties. By doing so we may be able to unravel critical processes as indicated by changes in vegetation patterns that might enable us to mitigate degradation of dryland ecosystems.