

## **Using ground- and satellite-based measurements and models to quantify response to multiple disturbances and climate change in South African semi-arid ecosystems**

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Sub-Saharan Africa currently experiences significant changes in shrubland, savanna and mixed woodland ecosystems driving degradation, affecting fire frequency and water availability, and eventually fueling climate change. The project 'Adaptive Resilience of Southern African Ecosystems' (ARS AfricaE) conducts research and develops scenarios of ecosystem development under climate change, for management support in conservation or for planning rural area development. For a network of research clusters along an aridity gradient in South Africa, we measure greenhouse gas exchange, ecosystem structure and eco-physiological properties as affected by land use change at paired sites with natural and altered vegetation. We set up dynamic vegetation models and individual-based models to predict ecosystem dynamics under (post) disturbance managements. We monitor vegetation amount and heterogeneity using remotely sensed images and aerial photography over several decades to examine time series of land cover change. Finally, we investigate livelihood strategies with focus on carbon balance components to develop sustainable management strategies for disturbed ecosystems and land use change. Emphasis is given on validation of estimates obtained from eddy covariance, model approaches and satellite derivations. We envision our methodological approach on a network of research clusters a valuable means to investigate potential linkages to concepts of adaptive resilience.