

Monitoring African savanna water use and water stress from local to regional scale: supporting rangeland management (pilot experience in Kruger National Park, South Africa).

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Drought periods and erratic rainfall patterns across large parts of Africa result in water-limited environments like savannas, highly sensitive to land management practices and changes in climate. Over the Southern part of the continent, savannas are key productive landscapes supporting livestock, crops and rural livelihoods. Monitoring water use and the natural vegetation stress over these semi-arid complex ecosystems can support rangeland management, to maintain long-term productivity. However, the precision/resolution/accuracy of the information required for management will differ at each scale: farm-local (e.g. evaluating the effect of management practices, livestock densities, crop production and grazing), to watershed (e.g. evaluating the effect of fire, detection of vulnerable areas) and regional (e.g. early prediction of drought). To overcome these constraints, TIGER project 401 combines two approaches that take advantage of different conceptual and operational capabilities of Earth Observation data sources. Sentinel 2 high spatial (10 m) and temporal (~5 days) resolution VIS/NIR images are used for a continuous monitoring of vegetation cover and unstressed evapotranspiration (ET - using Kc-FAO56 method). This methodology will provide the required resolution for farm-local scales, tracking separately the seasonal variations of each canopy layer growth (grass and trees). Meanwhile, lower spatial resolution (1 km) MODIS thermal data allow to determine a regional water stress index (ratio between actual ET, estimated using Two Source Energy Balance-TSEB, and potential ET), supporting the detection of vulnerable areas. The model framework was tested and validated over savanna-type experimental areas (Skukuza & Malopeni), and later applied over the whole Kruger National Park during 2015-2016.