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A synthesis of recent variations of soil moisture and water resources in Africa

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Water availability is an essential factor for both ecosystems and human population in water scarce areas such as Africa. African ecoregions are particularly vulnerable to climate change as seen in the recent drought in 2011, which affected the entire East African region and forced severe food crises causing the death of thousands of people. Various climate change scenarios associated with the expected population growth revealed an additional pressure on water availability, water accessibility and water demand in Africa in the future. In order to prevent, adapt and to mitigate climate change impacts (e.g. increasing water scarcity in the future) on soil moisture variability and water resources synthesis of its recent variations are of great importance. Unfortunately, there is currently no synthesis that highlights recent variations of soil moisture and fresh water resources in Africa. The aim of the study is to identify regions with large inter annual variability as well as decadal scale variability (trend, trend changes) of soil moisture and water resources. Hence, especially patterns of soil moisture and water resources variability will be demonstrated and implications in terms of vulnerability will be further discussed. The synthesis consists of a combination of three different data sources: point measurements, earth observational datasets and modelling results. Soil moisture observations from passive microwave radiometry (TRMM, AMSRE-E) and total water storage information from the GRACE satellite were applied to locate areas with a large inter annual variability. Additionally, lake level data from SAR altimetry (LEGOS/GOHS, ENVISAT) and in-situ runoff observations (SA FRIEND) provided by the Global Runoff Data Centre were used to confirm the encountered patterns of soil moisture and water resources variability. The spatial map of inter annual variability was subsequently overlaid by population density and land use data to assess the vulnerability of the African population to climate change. In order to put the findings of the synthesis in an historical perspective and to analyse the decadal scale variability and trends, runoff observations and modelling runs were used.