Geophysical Research Abstracts
Vol. 19, EGU2017-6165, 2017
EGU General Assembly 2017

Estimating aboveground biomass in Kalahari woodlands: inferring soil erosional and distributional processes

Vladimir Wingate

University of Basel, Physical Geography and Environmental Change, Environmental Science, Basel, Switzerland (vladimir.wingate@unibas.ch)

Estimating aboveground biomass in Kalahari woodlands: inferring soil erosional and distributional processes

Vladimir R. Wingate 1,*, Stuart R. Phinn 2,3, Nikolaus Kuhn 1 Peter Scarth3

1Physical Geography and Environmental Change, University of Basel, Klingelbergstrasse 27 Basel 4056; Nikolaus.kuhn@unibas.ch
2Remote Sensing Research Centre, School of Geography, Planning and Environmental Management, The University of Queensland, St Lucia, QLD 4072, Australia; s.phinn@uq.edu
3Joint Remote Sensing Research Program, School of Geography, Planning and Environmental Management, University of Queensland, St Lucia, QLD 4072, Australia; peter.scarth@gmail.com
* Author to whom correspondence should be addressed: Vladimir.wingate@unibas.ch;

Maps which accurately quantify vegetation carbon, or above ground biomass (AGB) and its changes, are not only essential for ecosystem monitoring, but also for understanding controls on ecosystem carbon, associated soil organic carbon (SOC) and the global carbon cycle. Throughout the rangelands of Namibia, two vegetation cover change processes are widespread, firstly, deforestation and forest degradation, and secondly, the encroachment of the herbaceous and grassy layers by woody strata. Both processes effect a range of key ecosystem services, including SOC dynamics by facilitating erosion and altering soil re-distributional processes. Yet, the spatial and temporal intensity of these vegetation change processes and hence their effect on SOC, remain poorly quantified. This study therefore aims to distinguish and map the extent of both deforestation and woody thickening and associated AGB changes, and gain an understanding of the spatial distribution of land degradation risk areas. We map AGB at two periods (2007 and 2015) for part of the Namibian Kalahari woodland savannah, by modelling forest inventory measurements as a function of a fusion of radar and optical satellite imagery. We then process a change detection and validate both individual and change maps using independent field and satellite data. Results show widespread increases and declines in both areal extent and quantity of AGB, suggesting (i) important vegetation change processes (i.e. both deforestation and woody thickening), and (ii) associated changes in soil quality. Indeed, woody thickening has been found to mask land degradation, through the replacement of herbaceous layers with hardy shrubs, leading to increases in erosional processes. These results are in agreement with previous studies, which identify both extensive greening and small-scale deforestation.
Keywords: Soil Organic Carbon, Erosion, deposition, Above Ground Biomass; Savannah; Rangeland; Carbon; Remote Sensing; Change detection