Aboveground woody biomass estimation using L-band ALOS PALSAR and high resolution optical (DMC-2 and WorldView-2) and field inventory datasets in Skukuza, Kruger national Park.

Odipo¹, V. O., Hüttich¹, C., Luck², W. & Schmullius¹, C.

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Abstract

African savanna plays an important role as a carbon pool, habitat for mankind and wildlife, source of livelihood, an important tropical climate modifier, among other ecological roles. A lot of efforts have been directed towards accounting for this carbon pool, relying mainly on poorly documented point-based datasets. Remote sensing has proven to provide reliable aboveground biomass estimates, given the high spatial and temporal resolution allowing datasets to be availed in areas where ground based inventories are infeasible due to time and financial constraints. The availability of freely accessible optical remotely-sensed datasets has made this feat attainable. However, the heterogeneity of tropical savannas, the near spectral similarity between life-forms within seasons makes it difficult to extract biophysical properties of the savannas by solely using optical datasets. Microwave, especially longwave SAR data solves this problem because the data is independent of cloud cover, and backscatter intensity has been found to positively correlate to biomass. However, the amount of biomass that can be predicted by SAR is affected by saturation, the level at which increase in biomass cannot be detected by change in backscatter intensity. This study assesses the potential of SAR backscatter texture in increasing saturation level or eliminating it in predicting biomass in Skukuza Flux site in South Africa. We derive 3-D point clouds from Intergraph’s DMC-2 cameras using structure from motion (SFM) algorithm, and use to derive vegetation height model (VHM). Additionally we compute both canopy cover (CC) and canopy height (CH) from the VHM based on pixel image objects. The SAR backscatter intensity is segmented based on WorldView 2 datasets and are used to derive both spectral and grey-level co-occurrence matrix (GLCM) textural objects after Heralick. A random forest regression model is used to predict woody cover biomass for the study area. Statistical analysis, including RMSE and

¹ Department of Earth Observation, Institute for Geography, Friedrich-Schiller-Universität Jena, Löbdegraben 32, 07743 Jena, Germany
² Forest Sense, Waterkloof Glen, P. O. Box 32594 Glenstantia, 0010 Pretoria, South Africa
*victor.onyango@uni-jena.de
rRMSE and stochastic significance is used to assess the relevance of different object variables to biomass estimation. The effects of both polarimetry and seasonal variations with SAR backscatter are also assessed.