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Spatial Extrapolation of Biomass Measurements in Savannah Ecosystems by Means of Remote Sensing

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Abstract

Information on biomass is crucial for different stakeholder communities, e.g. farmers, scientists, politicians, etc. This is especially valid for the vast semiarid savannah ecosystems on the African continent, but data is often not available and / or not spatially explicit. We present a study on the estimation of grass and shrub biomass of Namibian savannah ecosystems using a non-destructive life-form specific sampling approach. In 2006 a biomass survey in two savannah ecosystems in central Namibia was performed, a dwarf shrub and a thornbush savannah. After species-specific regression equations were generated, grass biomass was measured using a Disc-Pasture Meter; shrub biomass was estimated by applying volume calculations on simple in-situ measured shrub parameters such as diameter and height. Afterwards, information on cover was used to scale species-specific biomass up on the level of vegetation relevés. In-situ gathered biomass data were then related to multi- and hyperspectral remote sensing data information in order to achieve a spatial map of grass and shrub biomass. This information consisted of different vegetation indices, such as the normalised differentiated vegetation index (NDVI) and soil adjusted versions of this index (SAVI, TSAVI, MSAVI, etc.). Furthermore, biophysical indices representing cellulose and lignin content of the vegetation canopy were derived from hyperspectral data. We are confident that this workflow offers a way for the combination of simple field measurements, that are relatively easy repeatable, with the power of different satellite systems. The difference between the two sensor systems, the multispectral system Landsat and two hyperspectral sensors (HyMap, CHRIS-Proba) will be highlighted during the discussion.

Keywords: Hyperspectral, Landsat, NDVI, remote sensing, savannah, sensor types