SPECTRAL CHARACTERISATION AND MAPPING OF WELWITSCHIA MIRABILIS IN NAMIBIA

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Preferred presentation method: Poster Presentation

Suggested Topic: L3: Forests and Vegetation
Special Africa Theme: none

ABSTRACT

Remote Sensing bears the potential to contribute towards identification and mapping of endemic and endangered plant species. This study assesses the spatial distribution of *Welwitschia mirabilis*, an ancient desert plant species, in its natural habitat, Africa's Namib desert. *Welwitschia Mirabilis* is one of the oldest plants in existence; some plants reach an age of almost 2000 years. Considered as a living fossil, the plant is difficult to map both due to the fragile ecosystem in which it lives, and the fact that a large part of its indigenous area is inaccessible as a result of diamond mining.

In a first step, various *Welwitschia* individuals from botanical institutions within Switzerland are spectrally characterized using an ASD FieldSpec3 spectroradiometer. These data sets are investigated to a) identify potential spectral variations within and among individuals and b) elaborate possible common spectral characteristics of the genus usable for remote sensing recognition. The results of these experiments show that the overall spectral behaviour of *Welwitschia* does not represent potential influencing factors like plant age, plant stress and environment, which makes the signal suitable for remote sensing species detection.

In a second step, mapping of individual Welwitschia plants is performed in a valley of the Namib-Naukluft Park using multispectral IKONOS satellite data of high spatial resolution. The plant species are classified using a maximum likelihood approach. It can be concluded that with the IKONOS data used, an adequate result may only be achieved under ideal conditions where *Welwitschia* individuals and additional plants (e.g., acacias, bushes) grow apart from each other on a homogeneous background consisting of bright gravel and sand. Despite the huge amount of shadow fractions within a plant pixel due to the spatial resolution of the image, the species *Welwitschia* was successfully detected by its typical spectral signal.

Spatial and spectral resolution remain a limiting factor in accurately mapping individual *Welwitschia* species and detecting them in a heterogeneously vegetated environment. Future spaceborne sensors of higher spatial and spectral resolution can further contribute towards an improved assessment of plant individuals from space and may therefore support the detection of endangered, invasive or prohibited species.