Development and implementation of remote sensing techniques for long-term monitoring of Biological Soil Crusts (BSCs)

Weber, B.*, Deutschewitz, K.*, Schultz, C.** and Büdel, B.*

* Department of Biology, Plant Ecology and Systematics, University of Kaiserslautern
** Department of Geography, Remote Sensing, University of Würzburg, German Remote Sensing Data Center

Presentation

- **Introduction**
  - BIOTA Africa
  - Biological Soil Crusts (BSCs)
- **Geographic Areas of Interest**
  - Rehoboth, Namibia
  - Soebatsfontein, South Africa
  - Namib Desert, Namibia
- **Planned Data Analysis and Interpretation**
Objectives

1) Assessment of Biodiversity State + Natural Dynamics in Space & Time

2) Monitoring & Understanding (Processes of) Biodiversity Change

3) Monitoring Human Use in Space & Time

4) Create Input for spatio-temporal Modelling of Change/Scenarios
Biological soil crusts result from an intimate association between soil particles and microorganisms (algae, cyanobacteria, fungi, lichens) present immediately on top of, or just below, the surface of soil.

Adapted from: Nap and Lange, 2001
Chlorophyll content of BSCs along the Transect

Rehoboth

Nareis: extensive grazing

Duruchaus: intensive grazing
Rehoboth

Soebatsfontein

Study area from northeastern corner

Study area from southwestern corner
Biodiversity Monitoring Transect Analysis in Africa

Flight area for the acquisition of hyperspectral data

Legend
- Flight area
- GPS points along the road
- Ground Control Points (GCPs)
- Observatory

BIOTA S05
Biological Soil Crusts compiled by Dr. B. Weber
January 2005

---

Spectra of Biological Soil Crusts

Soebatsfontein

Reflection [%] vs. Wavelength [nm]

Reflection [%] vs. Wavelength [nm]

Reflection [%] vs. Wavelength [nm]
Spectra of Phanerogameous Plants

Soebatsfontein

Biodiversity Monitoring Transect Analysis in Africa
Namib Desert
Planned Data Analysis and Interpretation

- Analysis of characteristic wavelengths
- Creation of channel ratios
- Creation of normalized channel differences
- Red-edge
  - Red-edge slope (RESL)
  - Red-edge step (REST)
  - Red-edge maximum slope wavelength (REMS)
- Normalized Difference Vegetation Index (NDVI)

- Spectral analysis
  - on the pixel level
  - on the area level
Thank you!