B3

IMPETUS MOROCCO

Functional Relations between Vegetation Dynamics, Water Cycle and Human Influence

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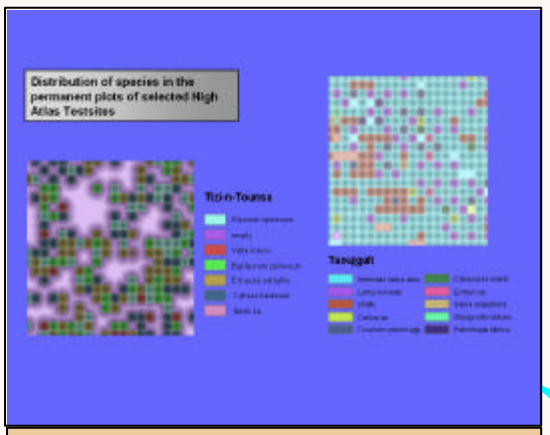
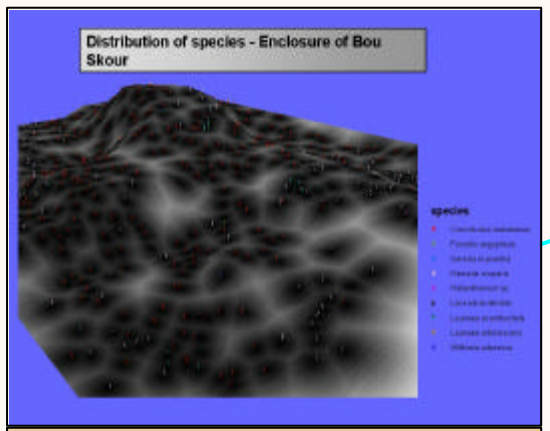
Abstract:
Subproject B3 deals with vegetation controlled regulating mechanisms which determine the regional water balance. The selected approach is based on a spatio-temporal pattern analysis, combining remote sensing techniques with ground based vegetation assessments.
Identified vegetation patterns at the local, subregional and regional scale can serve as a spatial basis for the assessment of the regional transpiration rates, to finally upscale local transpiration measurements to larger areas.

Key words: remote sensing, land cover classification, vegetation dynamics, permanent monitoring plots, spatial related transpiration.

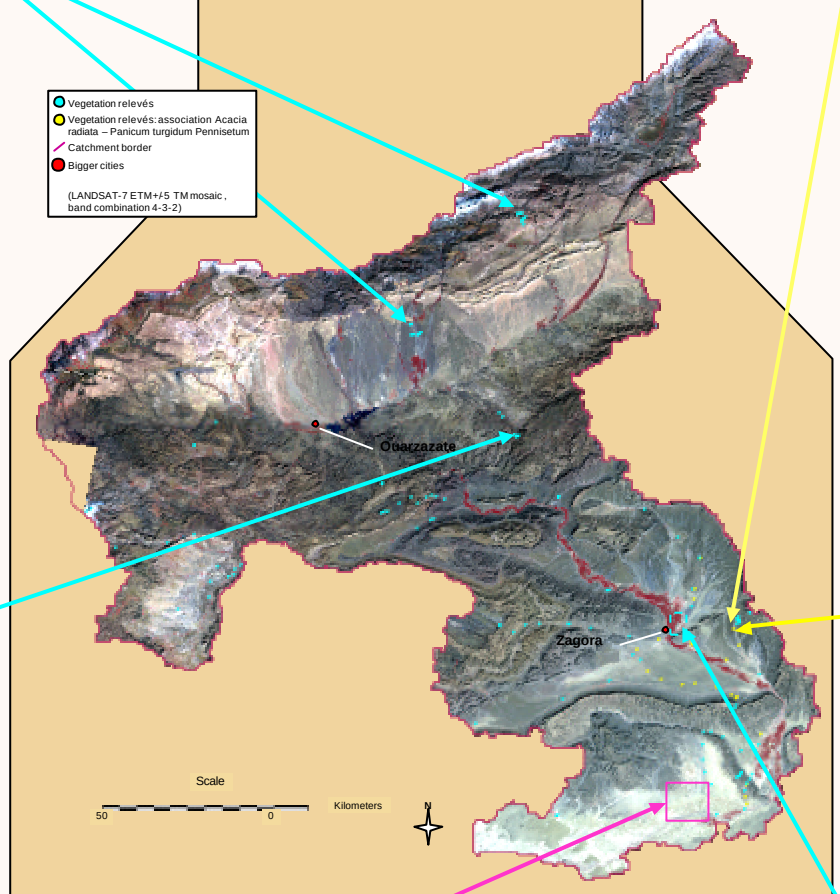
BOTANY



Along the IMPETUS-Transect ten enclosure experiments with 34 permanent monitoring plots (PP) in- and outside the fences have been established. Each PP covers 100 m². The census units are ¼ m². Monitoring is carried out twice a year. Parameters recorded for each individual plant inside the PP comprise: increase in biomass, frequencies of flowering and fruiting, as well as germination and mortality. This offers the opportunity to detect hardly noticeable long-term changes, either due to varying physical conditions, or due to different grazing intensities in the ten selected ecosystems of southern Morocco.



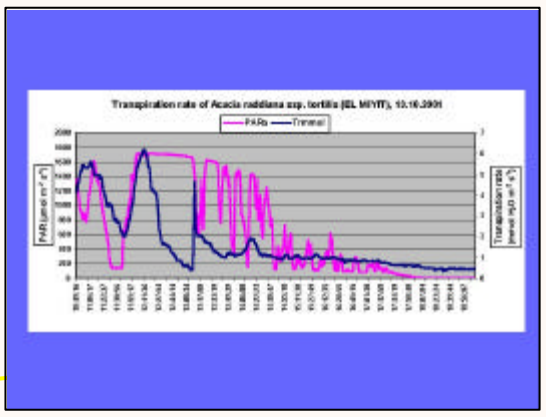
At several test sites, the vegetation of areas up to 0.3 ha was mapped at an individual level with a differential GPS. The spatial distribution of different species, with regard to their ecological affinities, can be analysed underlying a high resolution DEM. This enables the transfer of insights that are obtained from the analysis of vegetation dynamics at the permanent plots to the landscape level.

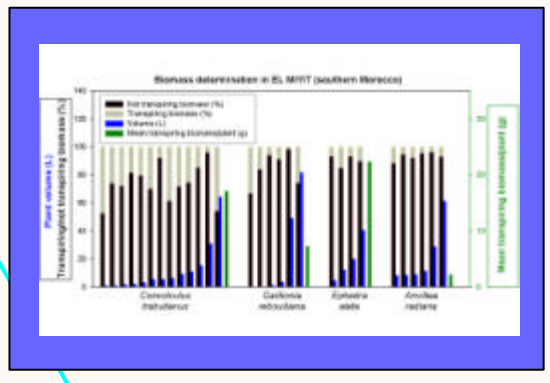


To develop and validate a vegetation map of the upper and middle Drâa-Catchment, a detailed ground check is necessary. In the ongoing intensive field campaign, up to now approximately 250 vegetation relevés were done. Each plot is geo-referenced and linked to a GIS of the study area. The preliminary classification results are used to define the landcover classes for the remote sensing data interpretation.

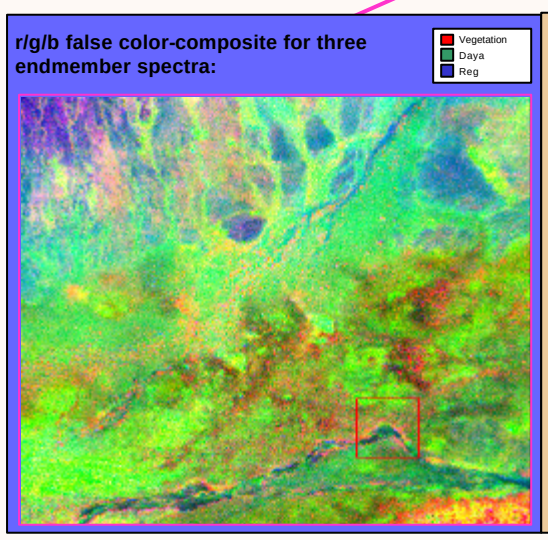
ECOPHYSIOLOGY

Absolute transpiration rates are attained by a porometer (LICOR). Together with leaf wetness sensors (RESI) the diurnal transpiration dynamics of a species can be recorded. Finally, the biomass of dominant plant species is determined in order to extrapolate the transpiration rates (gathered from single leaves) to the individual plant. Estimation of vegetation composition, density and biomass allows the upscaling to the landscape level.

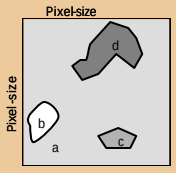




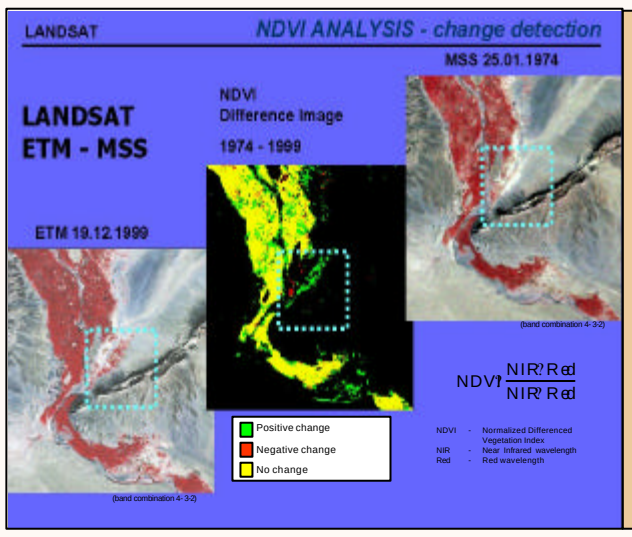
REMOTE SENSING



The spatial distribution of different land cover classes in this example west of M´hamid were interpreted from LANDSAT-ETM data, by means of supervised classification techniques. Especially in the scanty vegetated areas in the southern catchment sub-pixel classifiers as Linear Spectral Unmixing provide best surface representations (figure on the right). The theory is, that a single image pixel is a mixture of different surface components called "endmember". In the unmixing process the abundances of each endmember are estimated for each pixel.



Endmember	Area [%]
a	65
b	8
c	7
d	20



A change detection result for a time period of 25 years from a LANDSAT-MSS (1974) and LANDSAT-ETM (1999) image is shown in the figure above. Marked is an example of an agricultural extension on a former river-bank in the irrigated areas north-west of Zagora.

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