The 36th International Symposium on Remote Sensing of Environment,
11 – 15 May 2015, Berlin, Germany, ISRSE36-336

REMOTE SENSING OF DRYLAND VEGETATION DYNAMICS AND DEGRADATION AT MEDIUM SPATIAL SCALE: LESSONS FROM AFRICA AND ASIA

Olena Dubovyk[a,e*], Tobias Landmann[b], Barend Erasmus[c], Alfredo Jakob[d], Gunter Menz[e], Asia Khamzina[d], Jürgen Schellberg[a,b]

[a] Institute of Crop Science and Resource Conservation (INRES), University of Bonn, Katzenburgweg 135, 53115 Bonn, Germany - odubovyk@uni-bonn.de (O. Dubovyk), j.schellberg@uni-bonn.de (J. Schellberg)
[b] Earth Observation Unit, International Center of Insect Physiology and Ecology (ICIPE), Duduville, Kasarani Road, P.O. Box 30772, 00100 Nairobi, Kenya - tlandmann@icipe.org
[c] Global Change and Sustainability Research Institute, University of the Witwatersrand, 2050 Johannesburg, South Africa - Barend.Erasmus@wits.ac.za
[d] Centre for Development Research (ZEF), University of Bonn, 53115 Bonn, Germany - ajakob@uni-bonn.de (A. Jakob), asia.khamzina@uni-bonn.de (A. Khamzina)
[e] Center for Remote Sensing of Land Surfaces (ZFL), University of Bonn, 53115 Bonn, Germany - g.menz@uni-bonn.de

THEME: Forests, biodiversity and terrestrial ecosystems (BIOD)

KEY WORDS: land surface phenology, land degradation, time-series data, trend analysis, MODIS, Africa, Central Asia.

ABSTRACT:

Monitoring vegetation dynamics in drylands is essential for a better understanding of how the Earth system responds to climatic variability and anthropogenic pressures. Frequently-acquired synoptic data from the earth observation (EO) satellites have been commonly-applied to monitor vegetation cover patterns often at coarse spatial resolution (>1km). It still should be investigated how adequately such coarse-scale datasets could capture vegetation dynamics in the heterogeneous dryland landscapes and whether such small-scale assessments could support land use and management. With the availability of medium spatial resolution (250m) MODIS time series data spanning since 2000, the advancement of vegetation assessment has become possible.

We drew on experience from current EO research in Africa and Asia based on the 250m MODIS vegetation index time series covering large spatial extents; (1) a multi-sensor approach to map human-induced vegetation productivity decline over eastern Africa, (2) a robust trend analysis approach to monitor patterns of vegetation dynamics and trends across sub-region in southern Africa, (3) an integrative multi-data approach to map land degradation trends over irrigated drylands of Central Asia. In the first example, vegetation productivity decline was effectively linked to land transformation processes in eastern Africa. By using rainfall trends from passive radar observations, climate-induced changes were largely disentangled from the human-induced change. In the second example in southern Africa, we derived a key set of phenometrics (overall greenness, peak and timing of annual greenness) and analyzed trends in these parameters. In the last example, we revealed vegetation productivity decline in the irrigated agro-ecosystems of Central Asia and explained the observed patterns in relation to environmental and socioeconomic drivers. The paper concluded on possibilities and constraints of the available data and methods used to map and monitor vegetation dynamics at medium spatial resolution in relation to evolving issues in eastern and southern Africa and Central Asia.