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"Bridging the gap between increasing knowledge and decreasing resources"

Contribution of Earth Observation to Emerging Environmental Challenges in Africa

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Abstract

The effects of emerging environmental problems associated with climate change and human-induced land cover change often directly impede livelihoods of the rural population in Africa. Erratic rainfalls, flooding, forest cover loss, and land degradation are causing unstable agricultural yields and incomes. Earth Observation (EO) has the potential to monitor landscape dynamics in relation to climate or human-induced environmental effects. Moreover, EO can provide seamless and integrative, that is multi-data and multi-scale, geo-spatial monitoring solutions that are of particular use within data scarce environments.

This paper illustrates examples, possibilities and future perspectives from current EO research to address emerging environmental issues in Africa. Two experimental EO examples from eastern Africa are presented; (1) a multi-sensor approach to map vegetation productivity decline over eastern Africa, and (2) an integrative (multi-data) approach to map the spatial distribution of flowering plants at a local to landscape scale. In the first example, vegetation productivity decline, mapped at a regional scale using time-series of 250-meter MODIS NDVI imagery (from 2001 to 2012), is related to very high resolution (VHR) imagery in Google Earth. The MODIS-based productivity data could be effectively linked to land transformation processes (i.e. "deforestation") using the multi-date VHR imagery. Climate-induced change could be largely disentangled from the human-induced change using rainfall trends derived from passive radar satellite observations. In the second example, the spatial distribution and abundance of flowering plants are mapped for a local site in Kenya using 0.6-meter hyperspectral data. The locations of flowering plants were verified in the field using a Smartphone geo-tagging. The up-scaling potential of the hyperspectral derived flowering map to a multi-spectral Worldview-2 image was probed. The results are instigated for the quantification of pollination effects in Africa and to sustain healthy honey bee colonies.

Multi-sensor and multi-scale monitoring of environmental effects in Africa is effectively possible given that adaptable and 'intelligent' data integration models or techniques are used.

Keywords: Africa, data assimilation, earth observation, integrative monitoring

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