Remote sensing based comprehensive monitoring of land cover change in protected areas

Luisa Gedon[1], Ruth Sonnenschein[2], Ariane Walz[1]

[1] Institute of Earth- and Environmental Science, Research group Landscape Management, University of Potsdam
[2] Institute for Earth Observation, EURAC Research

Keywords

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Summary

Land cover changes - due to climate or land use change – are a common challenge for the management of protected areas. Over the last decades, large parts of the European Alps have experienced forest expansion and shrub encroachment as a consequence of land abandonment. Also the Gran Paradiso National Park experiences such vegetation successional processes, which might be a threat to some local habitats and species. Remote sensing is in general a unique tool to map rates and spatial pattern of land cover change even for remote areas that are hard to monitor. In this study, hence, we aim to explore the potential for identifying hotspots of land cover change over the entire area of park based on remote sensing data.

Land cover changes for the entire Gran Paradiso National Park are explored from 1984 to 2016 based on all available Landsat TM, ETM+ and OLI images at a spatial resolution of 30 by 30 m. To map forest expansion and shrub encroachment we combined bi-temporal and time-series change detection methods and validated our results using orthophotos.
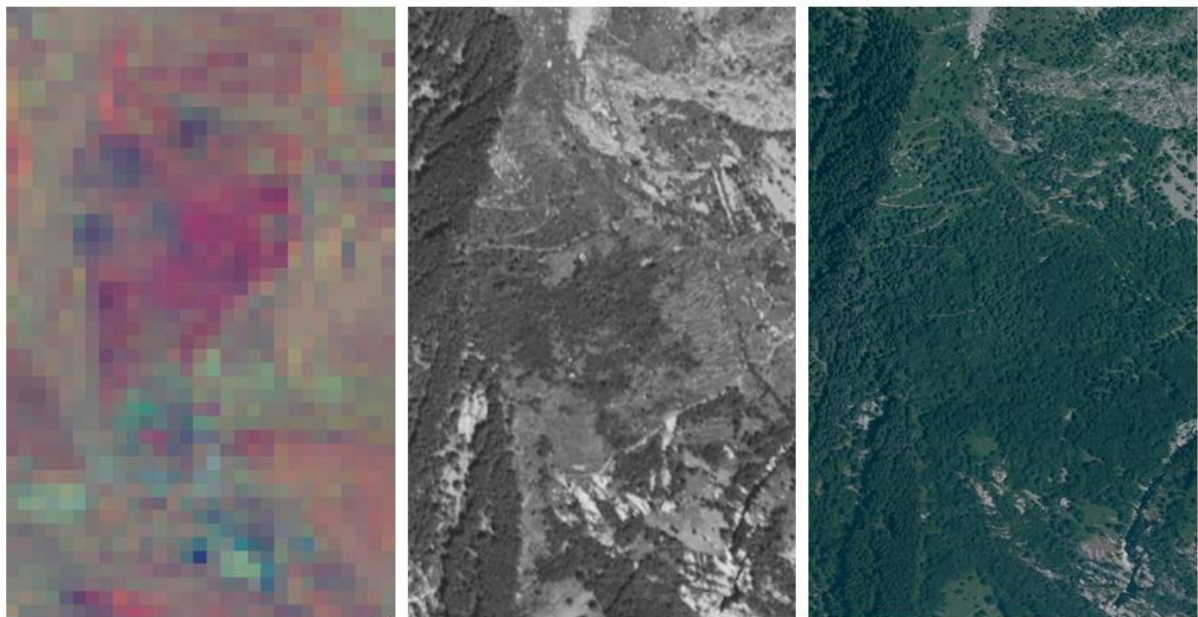
Figure 1: NDVI-Difference-Image (1988:2015) and Orthophotos from 1988/89 and 2012 show expansion of vegetation

First results show that both forest ingrowth and upward shift can be detected in several parts of the National Park (Fig. 1 with one example). Moreover, vegetation trends suggest that grasslands have been modified by shrub encroachment. They further indicate the overall diversity of change processes occurring in the park, including also changes due to disturbances (mainly avalanche tracks, see Fig. 2) and the expansion of settlement infrastructure close to the borders of the National Park.
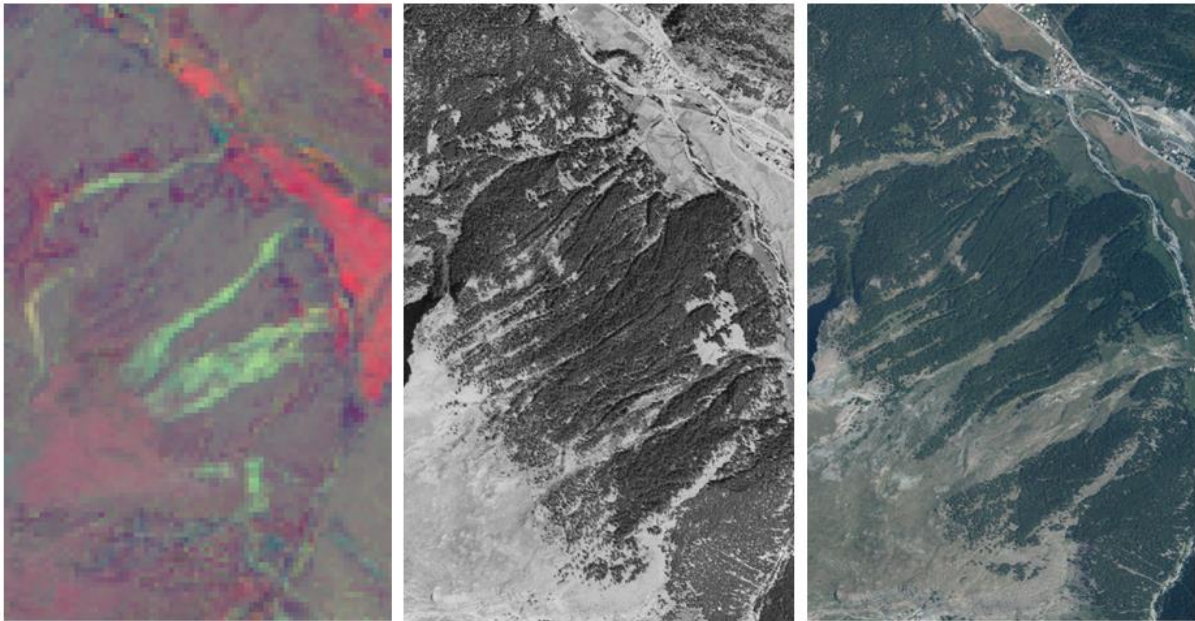
Figure 2: NDVI-Difference-Image (1988:2015) and Orthophotos from 1988/89 and 2012 show decrease of vegetation

Improving and adaptation of future management can influence such processes. Future studies have to discuss whether this is desirable.

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Contact

Luisa Gedon
gedon@uni-potsdam.de
University of Potsdam
Institute of Earth- and Environmental Science
Research group Landscape Management
Karl-Liebknecht-Str. 24-25
14476 Potsdam-Golm
Germany