Master Thesis: Transferability of spectral unmixing models across European bioregions

Earth Observation for Ecosystem Management

Start Date: Anytime, but preferably spring 2025

Description of Project: Spectral unmixing is a widely used technique in remote sensing that helps estimate the proportion of different land cover types within a single pixel. This allows for detailed ecosystem monitoring, even at a fine scale. However, it is still unclear whether spectral unmixing models work equally well in different environmental conditions or if they need to be adapted to specific regions. This thesis will explore how well a single spectral unmixing model performs across diverse European landscapes, including boreal, temperate, and Mediterranean regions. The goal is to determine whether one model can be applied universally or if region-specific models are necessary for accurate results. The study will evaluate model accuracy, potential limitations, and key environmental factors that influence transferability.

Research Question: How well can spectral unmixing models be transferred across European bioregions, and do they require regional adaptation for accurate results?

Key Outcomes:

- *Build small, representative Landsat data cubes for different European bioregions*
- *Apply synthetic spectral unmixing to each study site and assess model performance through validation for each bioregion*
- *Identify key biophysical and climatic factors that influence the transferability of spectral unmixing models*
- *Provide recommendations for best practices in applying spectral unmixing across diverse landscapes*

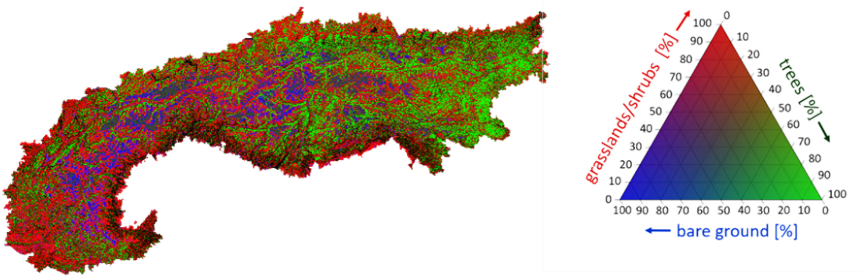
Suggested readings:

- *Schug, F., Pfoch, K., …, Radeloff, V. (2024): Land cover fraction mapping across global biomes with Landsat data, spatially generalized regression models and spectral-temporal metrics, Remote Sensing of Environment, https://doi.org/10.1016/j.rse.2024.114260*
- *Pham, V-D., Thiel, F., …, van der Linden, S. (2024): Learning the variations in annual spectral-temporal metrics to enhance the transferability of regression models for land cover fraction monitoring, Remote Sensing of Environment, https://doi.org/10.1016/j.rse.2024.114206*

Additional Information:

SafeNet

Contact:
Lisa Mandl
lisa.mandl@tum.de



Fractional land cover map based on spectral unmixing for the Alps. The map represents the proportions of tree cover, grasslands/shrubs, and bare ground, as indicated by the ternary color legend. This approach will be applied across different European bioregions in this study to assess the transferability of spectral unmixing models.