Rapid assessment of post-disturbance forest recovery using spectral and thermal information

Earth Observation for Ecosystem Management

Start Date: Anytime

Description of Project:
Understanding post-disturbance forest recovery is crucial for ecosystem management and conservation. Traditionally, field-based measurements such as regeneration density provide valuable insights into early recovery processes. One key objective of this study is to investigate how early remote sensing can detect recovery signals over larger spatial extents. This study will assess how early Sentinel-2 spectral data can detect vegetation regrowth within the first years after disturbance, using an extensive field dataset as a reference.
The project will involve creating small Sentinel-2 data cubes for locations with field observations and analyzing spectral properties to determine whether early regrowth signals are detectable. Additionally, the study will explore complementary factors that might influence spectral recovery detection, such as disturbance severity, topography, or climatic conditions. The integration of additional remote sensing data, such as Landsat-derived Land Surface Temperature (LST), will be evaluated to assess whether it improves recovery signal detection. Machine learning approaches could be used to enhance the detection of early recovery signals by integrating multiple data sources.

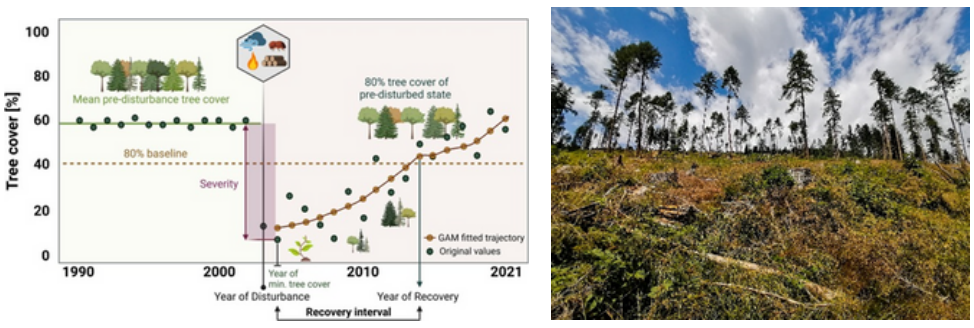
Research Question: How early can remote sensing detect post-disturbance forest recovery, and how do spectral and thermal trajectories from Sentinel-2 and Landsat, along with environmental and disturbance-related factors, influence the detectability of early recovery signals?

Key Outcomes:

- Building small Sentinel-2/Landsat data cubes for assessing early post-disturbance recovery
- Quantitative analysis of spectral signals in disturbed areas with field reference data on early recovery
- Investigation of potential drivers (e.g., disturbance severity, topography, climate) influencing spectral detectability
- Evaluation of the added value of Landsat Land Surface Temperature (LST) for early recovery detection

Suggested readings:

- Barta, K.A., Hais, M., & Heurich, M., 2022. Characterizing forest disturbance and recovery with thermal trajectories derived from Landsat time series data. *Remote Sensing of Environment, 282*, 113274, https://doi.org/10.1016/j.rse.2022.113274
- Dashti, H., Chen, M., Smith, W.K., Zhao, K., & Moore, D.J.P., 2024. Ecosystems Disturbance Recovery: What It Was or What It Could Have Been? *Geophysical Research Letters, 51*, e2024GL109219, https://doi.org/10.1029/2024GL109219
- Mandl, L., Viana-Soto, A., Seidl, R., Stritih, A., & Senf, C., 2024. Unmixing-based forest recovery indicators for predicting long-term recovery success. Remote Sensing of Environment, 308, 114194, https://doi.org/10.1016/j.rse.2024.114194



How fast can remote sensing "see" early signals of recovery?

SafeNet

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