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Exploring and processing big earth observation data with EODIE

Arttu Kivimäki, Samantha Wittke, Eetu Puttonen

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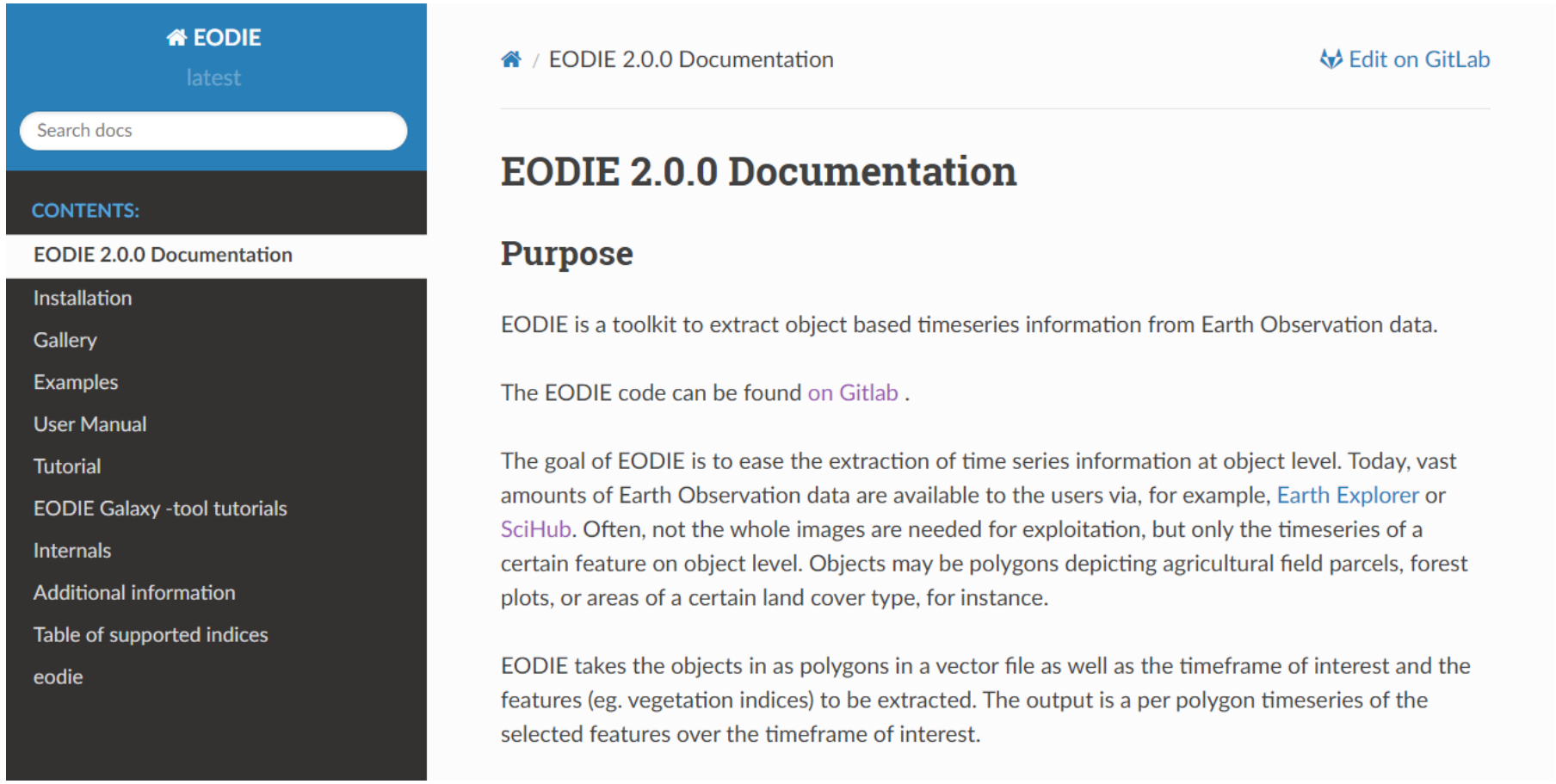
What is EODIE?

- **E**arth **O**bservation **D**ata **I**nformation **E**xtractor
  - *https://eodie.readthedocs.io/*
- A stand-alone Python software for processing geospatial raster and vector data
- Natively supported raster formats:
  - Sentinel-2
  - Landsat 8
  - Generic GeoTIFF
- Dependencies on commonly used geospatial libraries
  - rasterio, geopandas, rasterstats…

Documentation

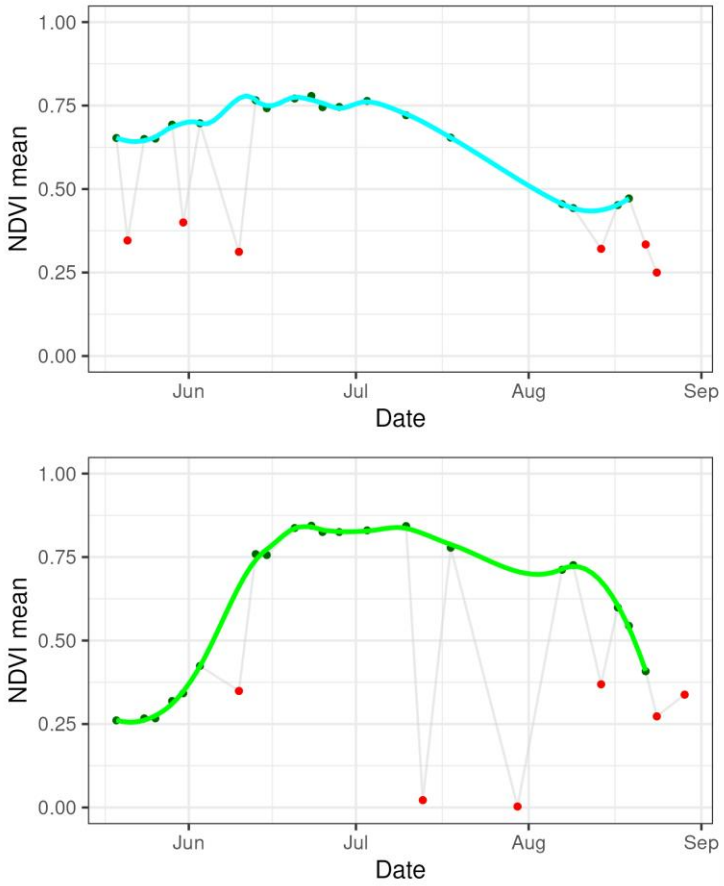


What does it do?

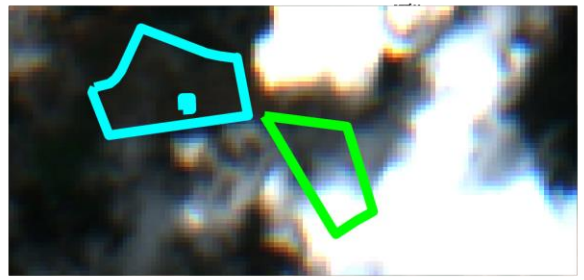
- Find relevant raster data based on vector data
  - Filtering by timeframe, location, cloud cover
- Calculate several remote sensing indices (NDVI, NBR, Tasseled-Cap, etc.)
- Extract index/raster values per vector feature (polygon/point)
- Output options:
  - Statistics as csv-files or SQLite3 database
  - Raster values as GeoTIFFs or NumPy arrays
- Works on Linux and Windows
- Open source: can be adapted to users' needs

Example on agricultural growth parcels

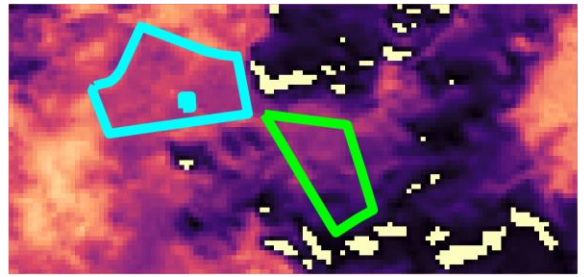
- Sentinel-2 data
- SCL-based cloud-masking

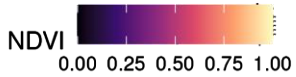


RGB

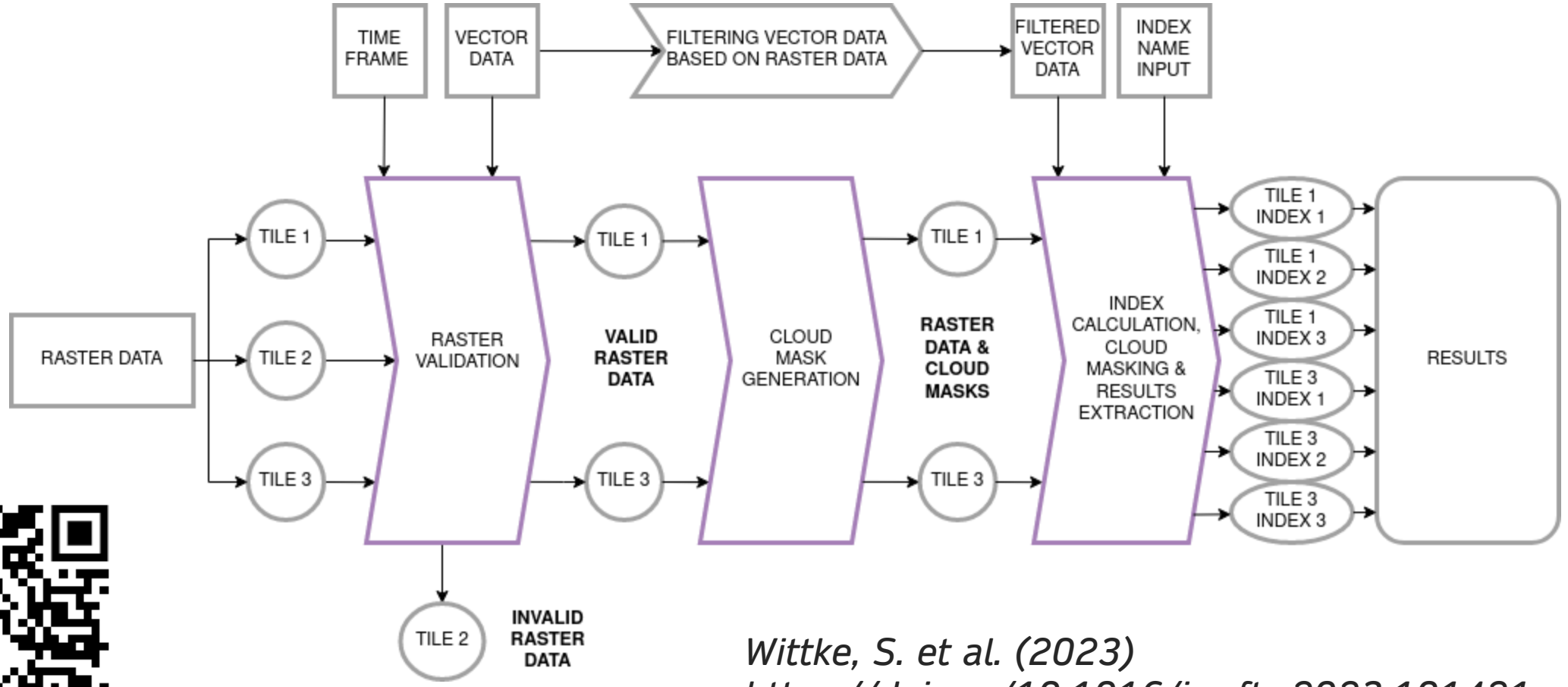


NDVI





How does it do it? Sentinel-2 example



Wittke, S. et al. (2023)
https://doi.org/10.1016/j.softx.2023.101421

Why EODIE?

vs.

- Data sensitivity or privacy
  - Data cannot be uploaded to cloud platforms for computations (GDPR)
- Offline use possible after installation
- Straightforward workflow
  - Easy to utilize for people not familiar with remote sensing data
  - No need to build own workflows in other platforms
- Stand-alone, open source software
  - Scalability without licensing issues
  - Doesn’t require other software to function
- Downloading Earth Observation data is still popular

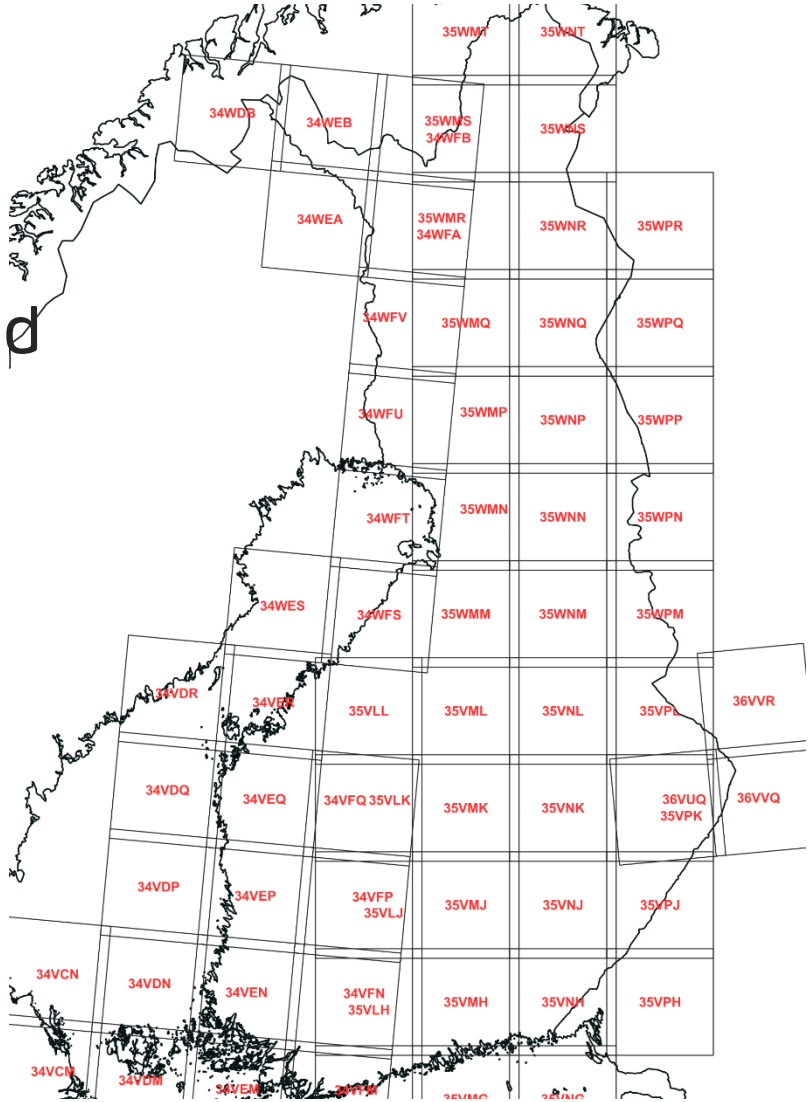
Case 1: Field parcel growth monitoring

Finnish growth season (May – September) time series from agricultural field parcels of Finland

- Platform: CSC supercomputer *Puhti*
- Scalable – computationally effective information extraction
- Simultaneous processing of several (vegetation) indices

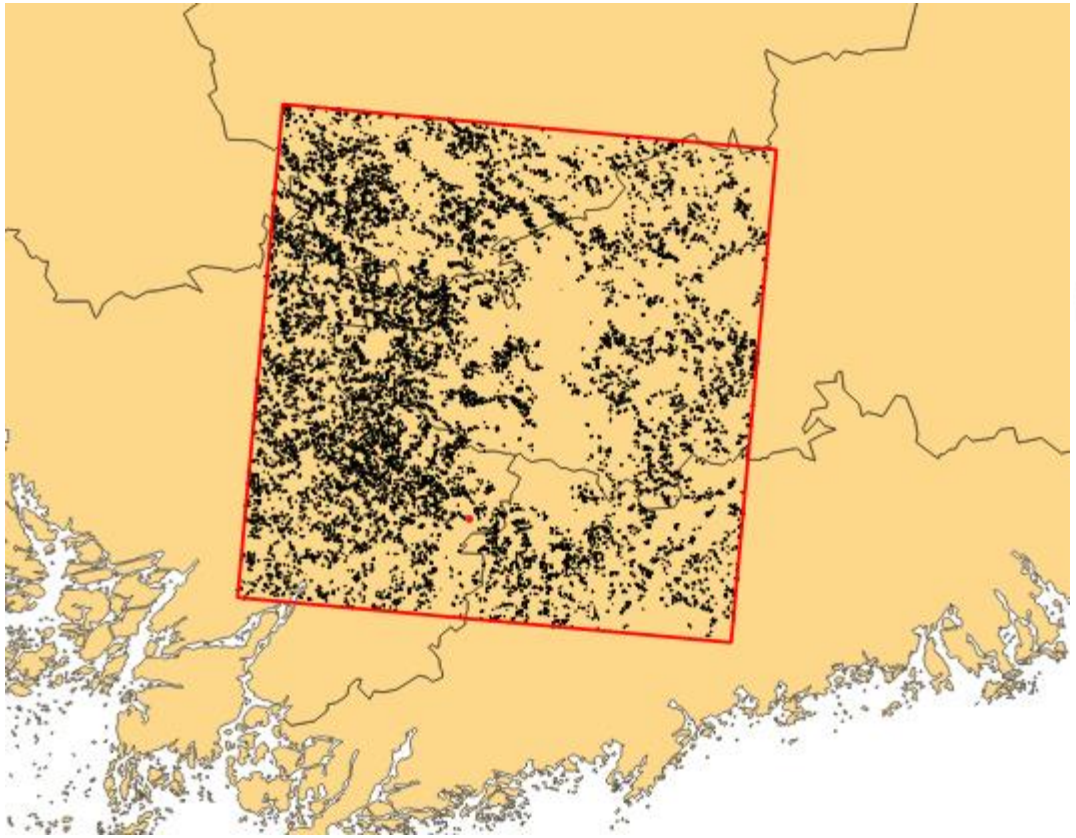
- Big data:
  - Over one million field parcels
  - Up to 20 requested indices/bands by default

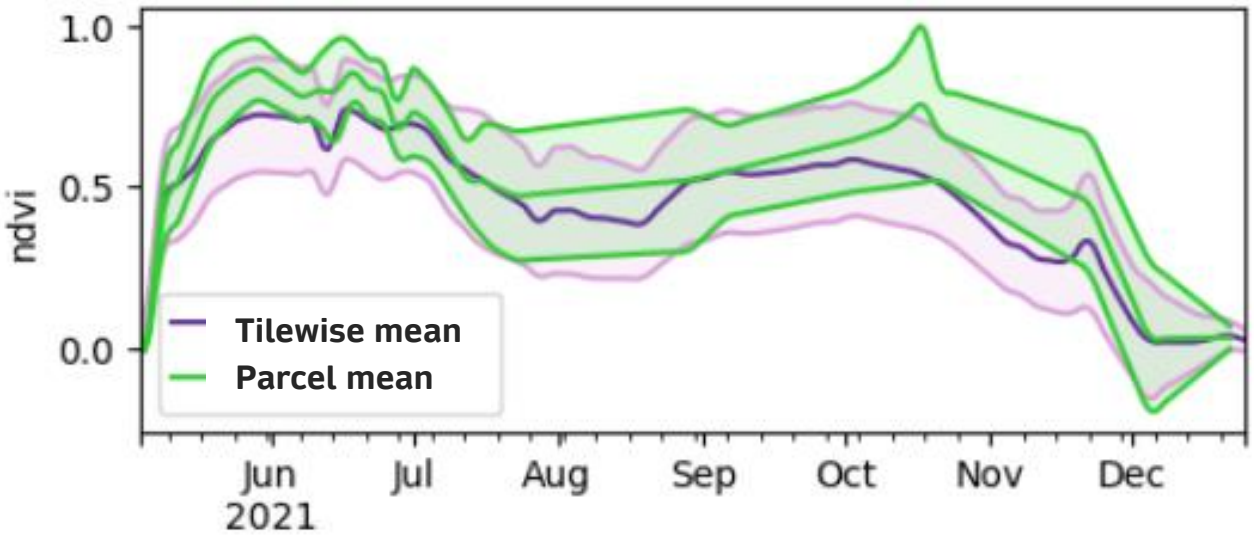
- Estimated processing time:
  - Less than one week per growth season



Case 1: Field parcel growth monitoring

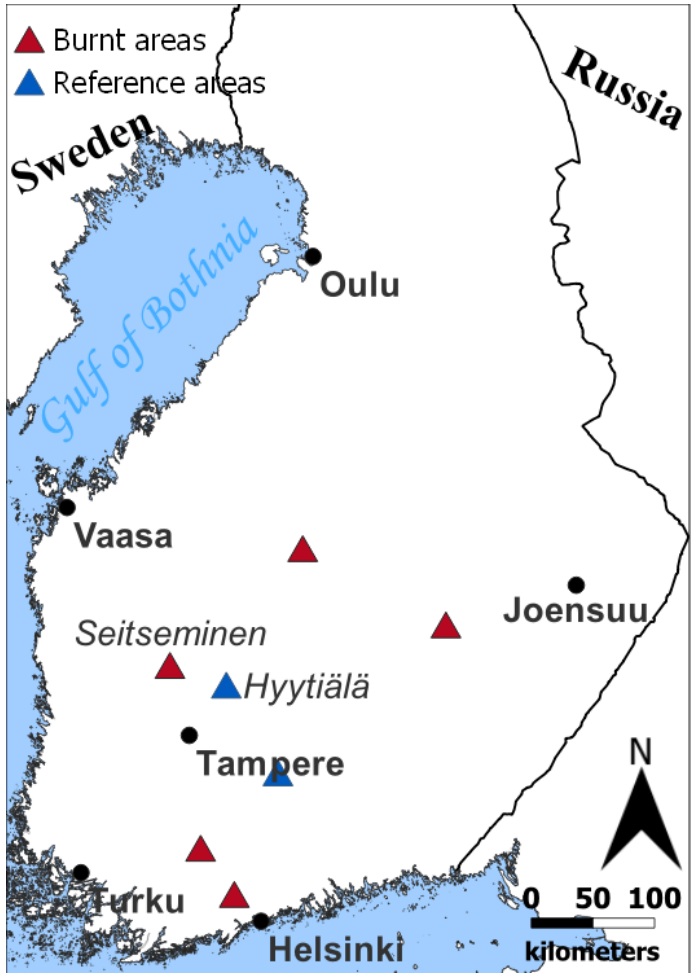
NDVI mean of parcels in a single Sentinel-2 tile

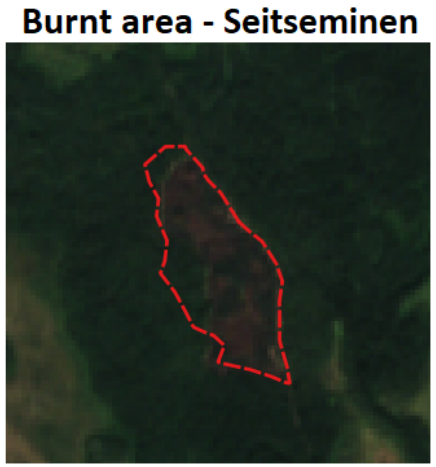


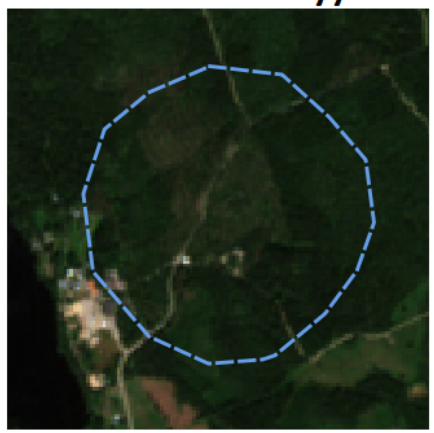


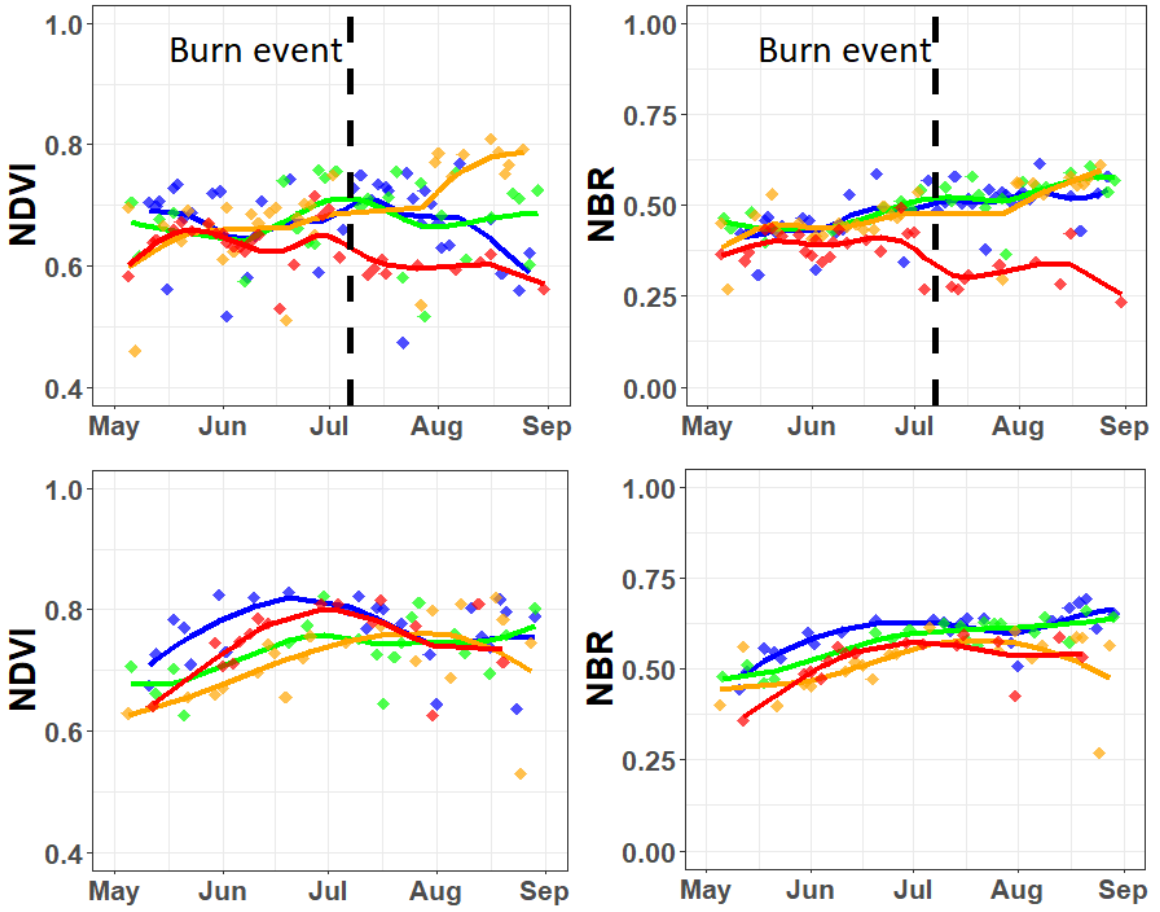
Figures by Maiju Karhu

Case 2:
Forest fire severity & recovery monitoring









Projects and acknowledgments

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  - IKIVIHREÄ
  - NC-GRASS
- Other agricultural research projects
  - DIGITALIS
  - PELTOPISTE
- Research projects funded by Academy of Finland
  - LS-HYDRO
- And yours…?

Advancing together

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