# Monitoring forest response using Sentinel-2 observations to climatic factors along the Carpathian mountains

## Ecophysiological, morphological and growth response of fir and beech along geographical gradient – basis for predicting future development trends

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→ **8 research locations**
→ two seasons of **field measurements** (light intensity, ecophysiological, dendrochronological analyses)
→ **Satellite image time series**
- MODIS 2000-2022
- Sentinel-2 2017-2022

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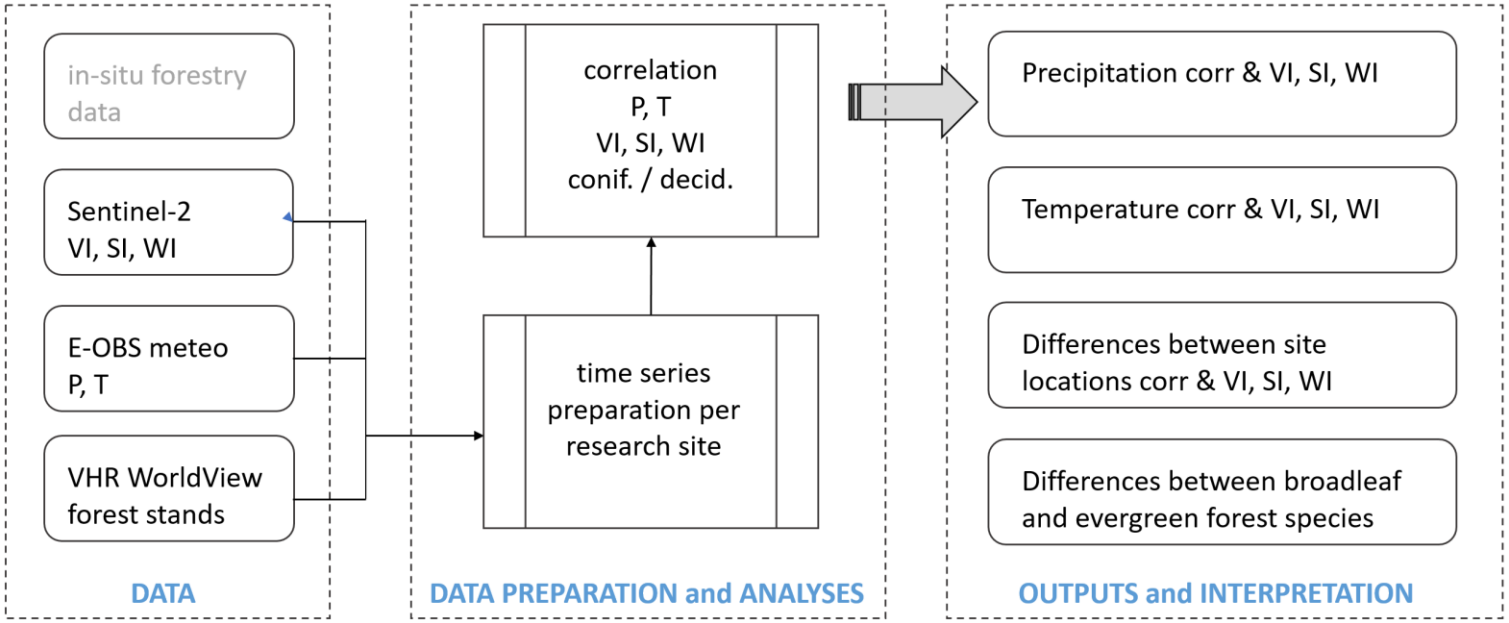
# Motivation

- ecophysiological and morphological traits / responses analysed
- **growth responses** is explored and paralleled **with different indices obtained from satellite images**
  - MODIS longterm phenological metrics + meteo parameters (**CR**)
  - Sentinel-2 spectral indices + meteo parameters (**SI**)




- provide **new insight into the processes affecting the future existence of complex European forests** in a new, comprehensive way

- 8 research sites: developed managed beech and fir adult forest stands, located at elevations above 800 m
- P-VIs correlations insignificat
- T-VIs correlations slighty stronger

**→ time lagging in vegetation response further explored**

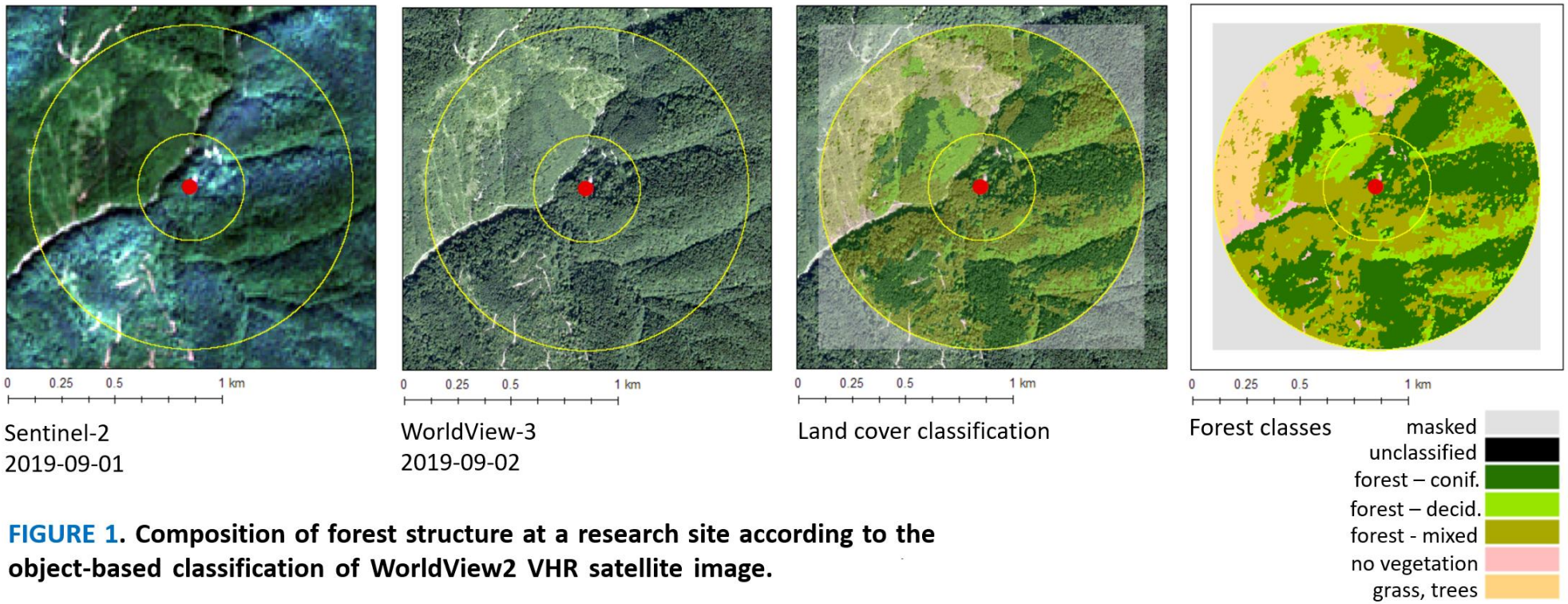



**FIGURE 1. Composition of forest structure at a research site according to the object-based classification of WorldView2 VHR satellite image.**

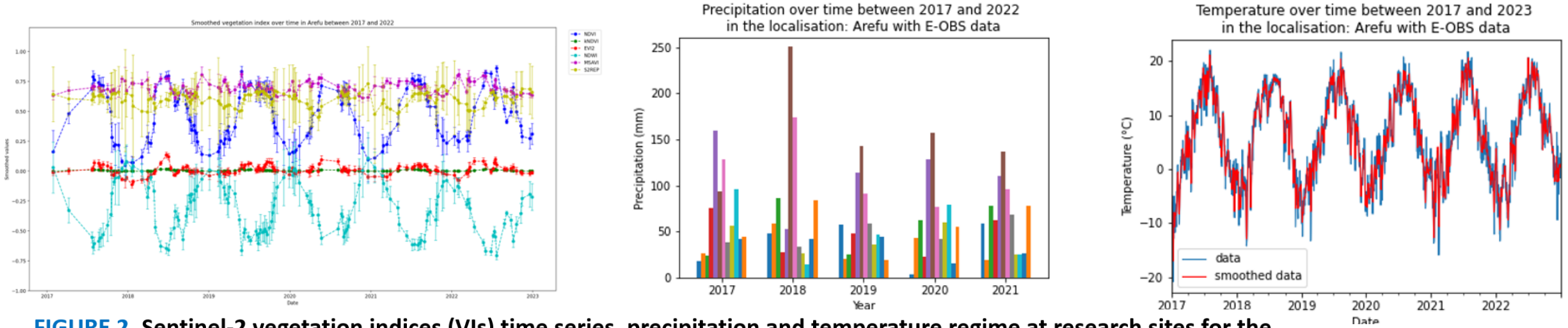
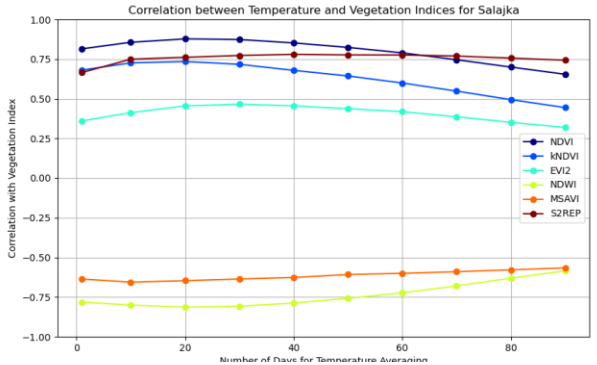
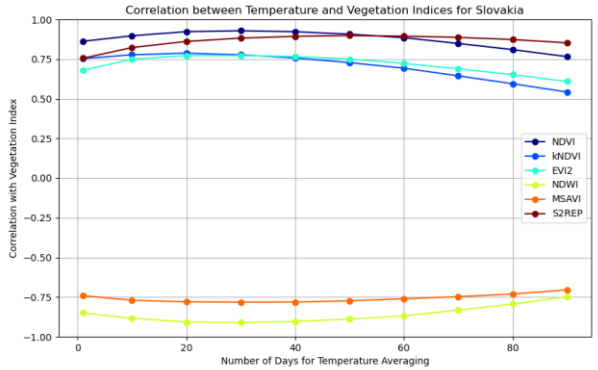


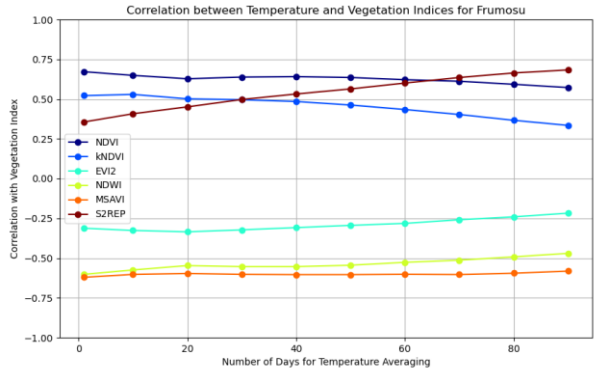

**FIGURE 2. Sentinel-2 vegetation indices (VIs) time series, precipitation and temperature regime at research sites for the period 2017 – 2022 obtained with Copernicus E-OBS meteorological data.**

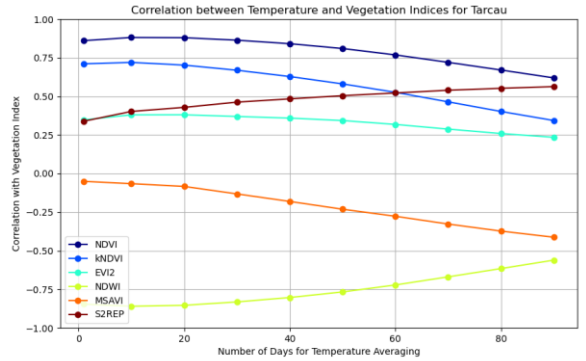
# Exploring Lagged Effects in Time Series*:

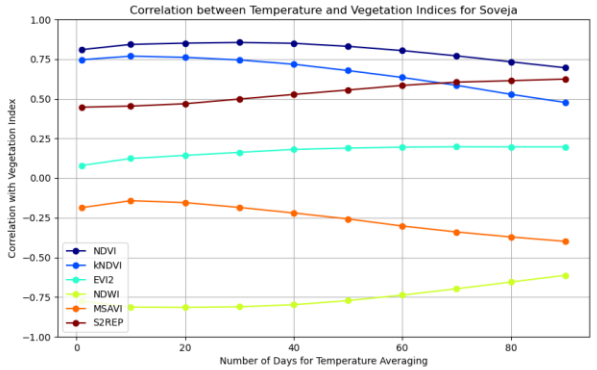
Correlation between temperature and Vis in relation to different T averaging period

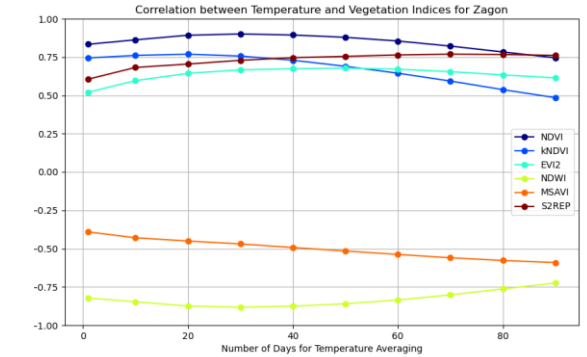


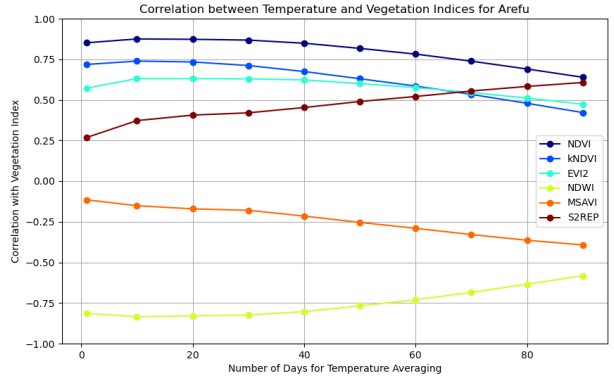



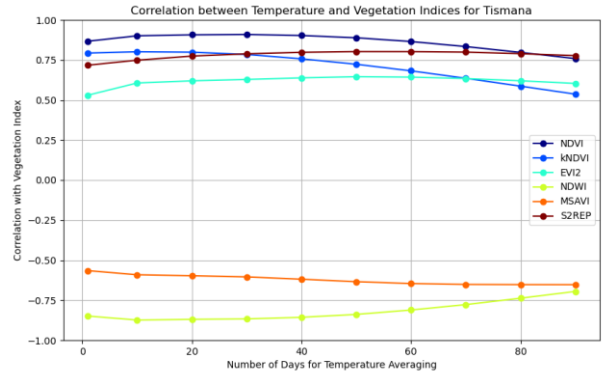




* Time-lagged effects occur when an event at one point in time impacts dependent variables at a later point in time.

Precipitation to follow…

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The project led by the Slovenian Forest Institute, ZRC SAZU (Slovenia) is collaborating with CzechGlobe (Czech Republic) to monitor forest responses using Earth observation data to obtain remote sensing-based indicators of beech and fir forest condition.

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