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:EXTEMIT-K

Vegetation index monitoring of bark beetle attack in Norway spruce forests of Central Europe using Planet Multispectral Imagery

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Bark beetle attacks in Norway spruce forests are one of the critical problems in Central Europe. Quick monitoring help to identify the green attack phase and allow it not to spread quickly. It is hard to identify green attacks with the human eye, but having satellite remote sensing data with at least one near-infrared band, we can calculate Vegetation Indices (VI) that could track changes in extensive areas.

Research Objectives

1) Estimation of RS imagery of Norway spruce (*Picea abies*) stands affected by acute and chronic stress.
2) Estimation of the use of RS imagery in order to assess predisposition of Norway spruce (*Picea abies*) to *Ips typographus* attack.
3) To develop the methods for using RS imagery to estimate Norway spruce (*Picea abies*) health characteristic related to *Ips typographus* attack

Hypotheses:

Hypothesis #1 – There are **significant differences** in Vegetation Indices **between healthy forests and forest on the early stage of attack (green attack)**
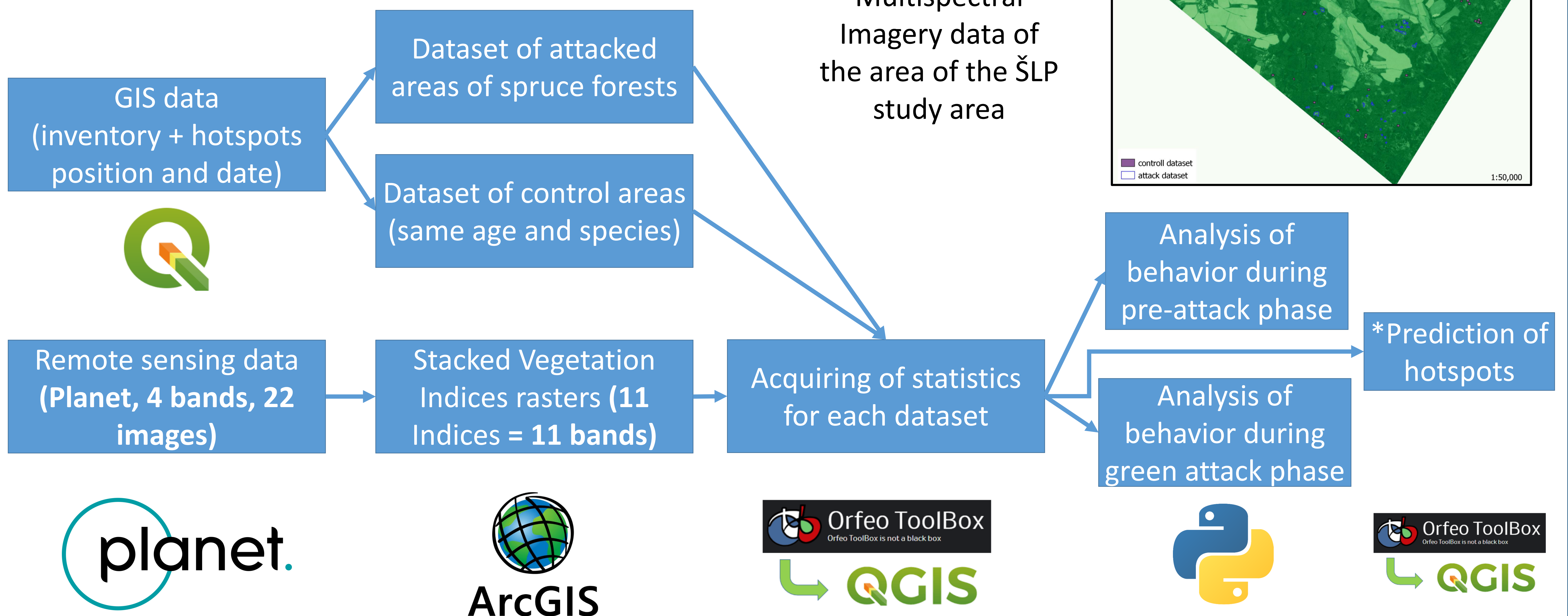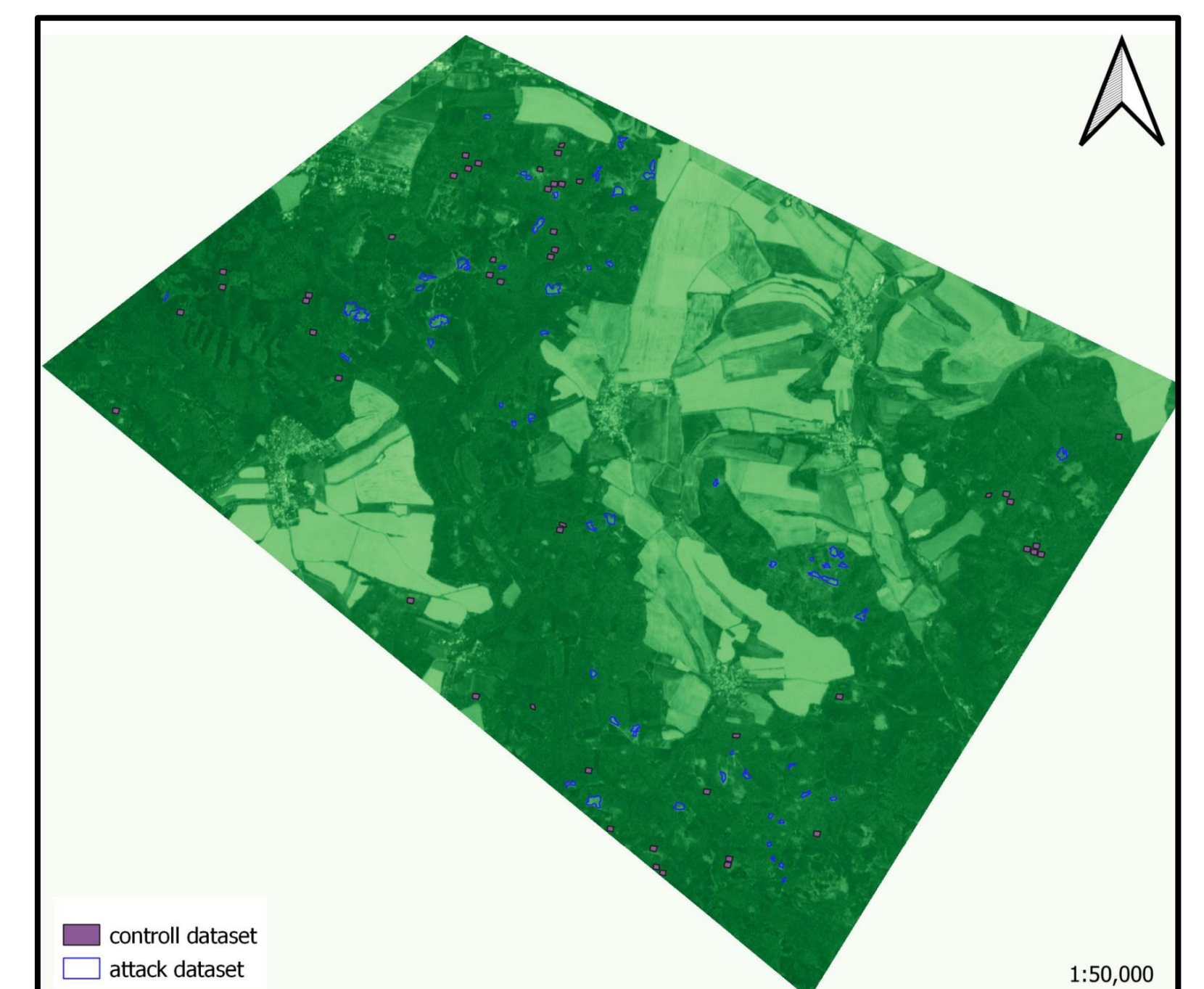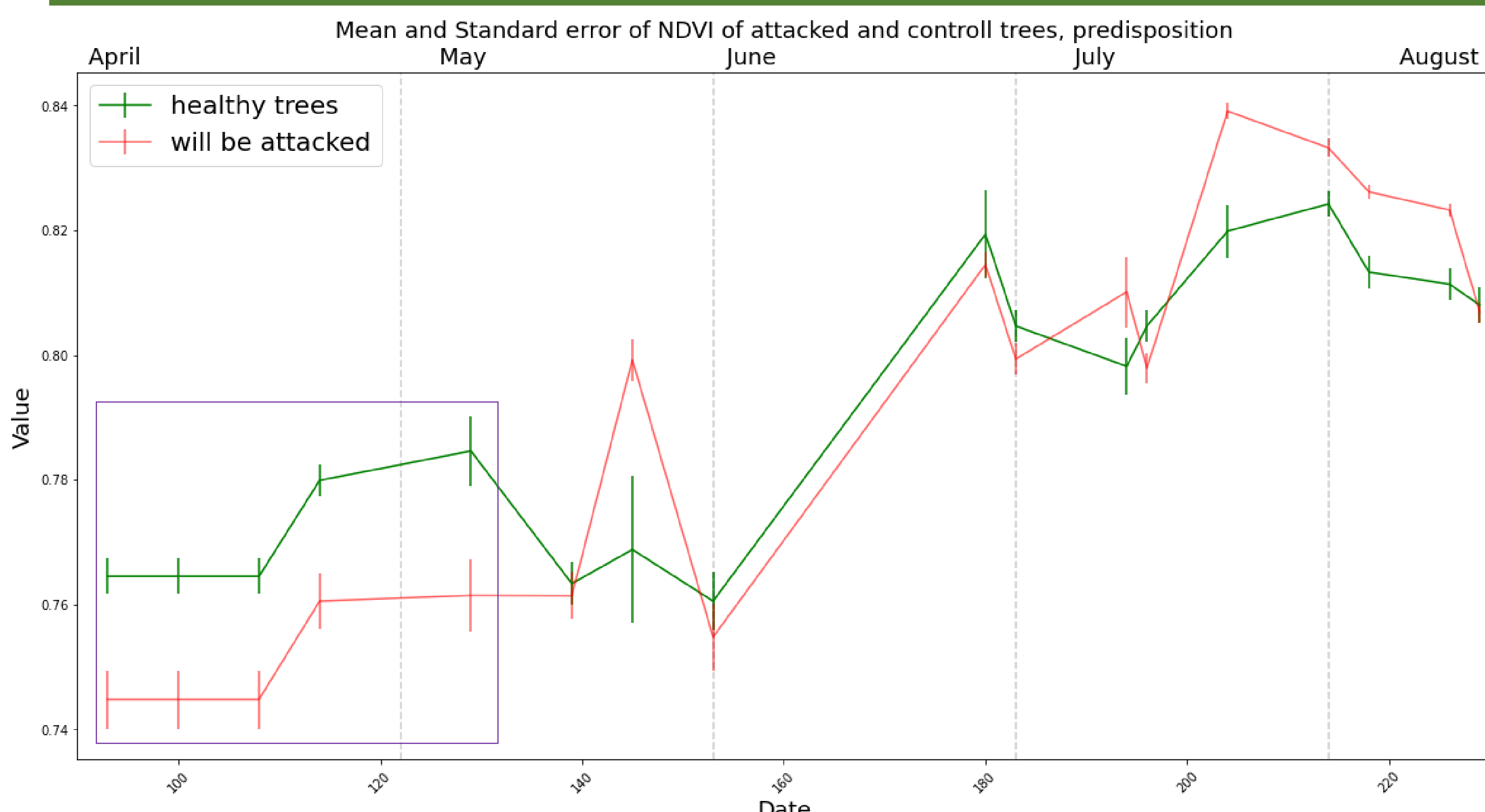**Hypothesis #2** – A forest attacked during the growing season **had a predisposition for it**.

Fig.1: NDVI based on Planet Multispectral Imagery data of the area of the ŠLP study area

controll dataset
attack dataset
1:50,000

Methodology:

GIS data (inventory + hotspots position and date)
→ Dataset of attacked areas of spruce forests
→ Dataset of control areas (same age and species)

Remote sensing data **(Planet, 4 bands, 22 images)**
→ Stacked Vegetation Indices rasters **(11 Indices = 11 bands)**
→ Acquiring of statistics for each dataset
→ Analysis of behavior during pre-attack phase
→ Analysis of behavior during green attack phase
→ *Prediction of hotspots

planet.
ArcGIS
Orfeo ToolBox (Orfeo ToolBox is not a black box) → QGIS
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Expecting results:

Mean and Standard error of NDVI of attacked and controll trees, predisposition

April May June July August

- healthy trees
- will be attacked

Value
Date

The overall results are aiming on improvement of detection tree characteristics which will indicate predisposition of Norway spruce (*Picea abies*) to *Ips typographus* attack.
Also, improvement of RS methods of Norway spruce (*Picea abies*) to *Ips typographus* green attack detection is implied.

Fig.2: Mean and Standard Error NDVI values of the time series dataset. Predisposition phase.