

# Mapping the effects of extreme climatic events reveals differential responses across species and elevations

## Mapping heatwaves and late spring frost stress on forests using Sentinel-2 time series

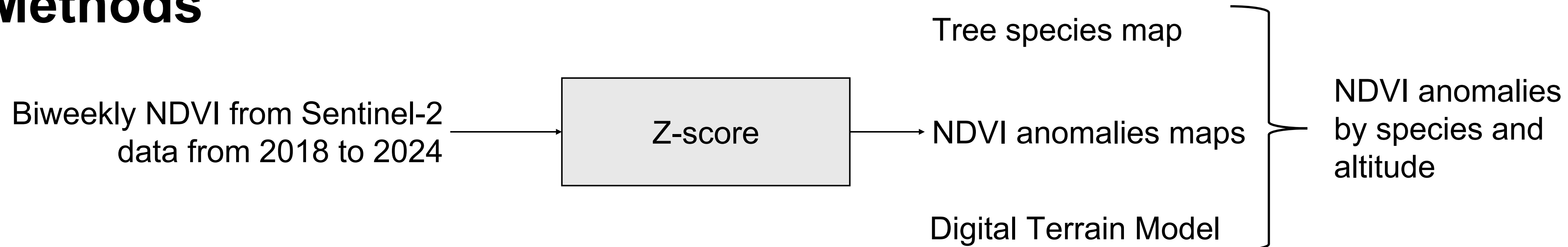
Michele Dalponte<sup>1</sup>, Jana Annika Wicklein<sup>1,2</sup>, Federico Fattorini<sup>1</sup>, Davide Andreatta<sup>1</sup>

<sup>1</sup> Research and Innovation Centre, Fondazione Edmund Mach, San Michele all'Adige, Italy  
<sup>2</sup> Department of Information Engineering and Computer Science, University of Trento, Italy  
 Email: michele.dalponte@fmach.it

### Objectives

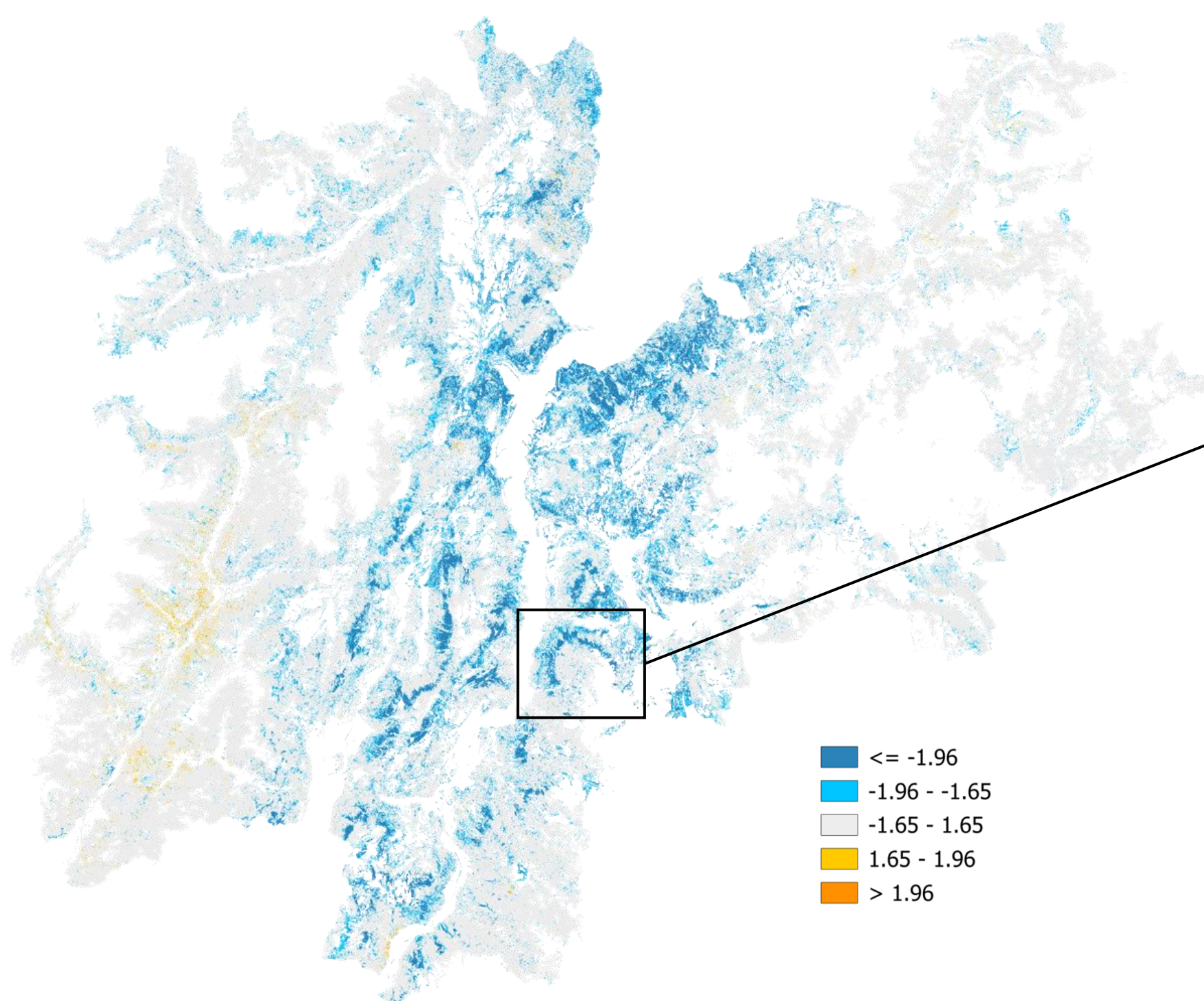
1. Map forest areas impacted by late spring frost and heatwaves.
2. Relate the stressed areas with tree species and altitude.

### Methods

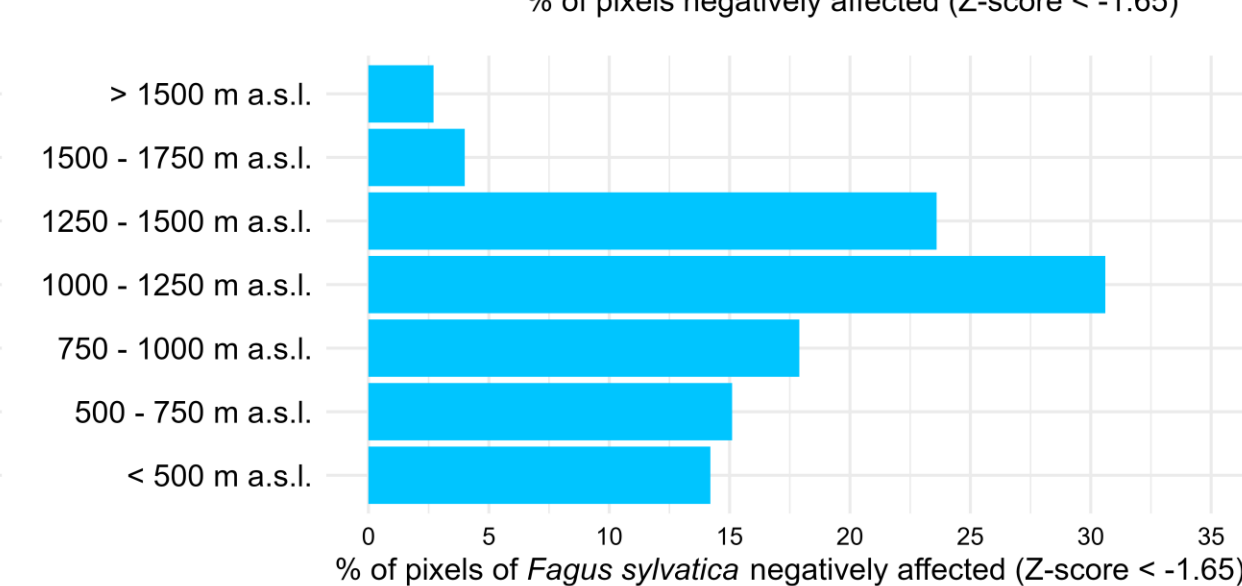
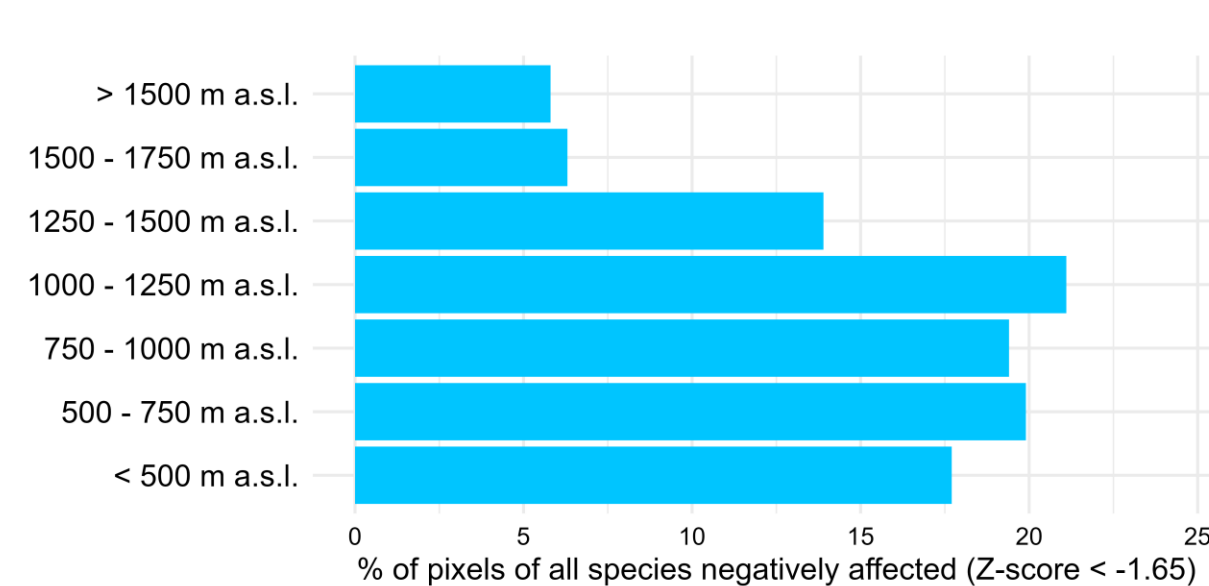
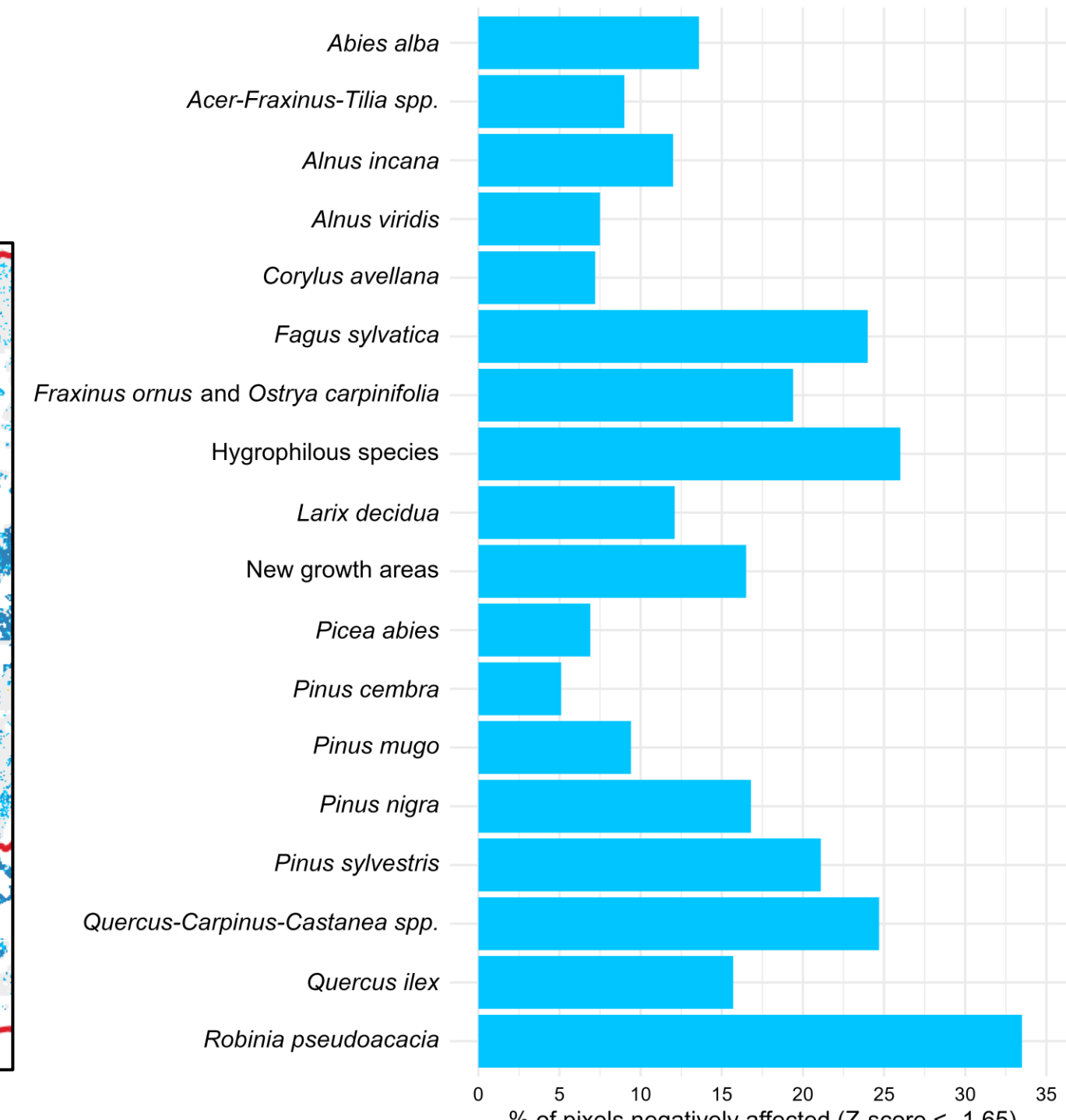
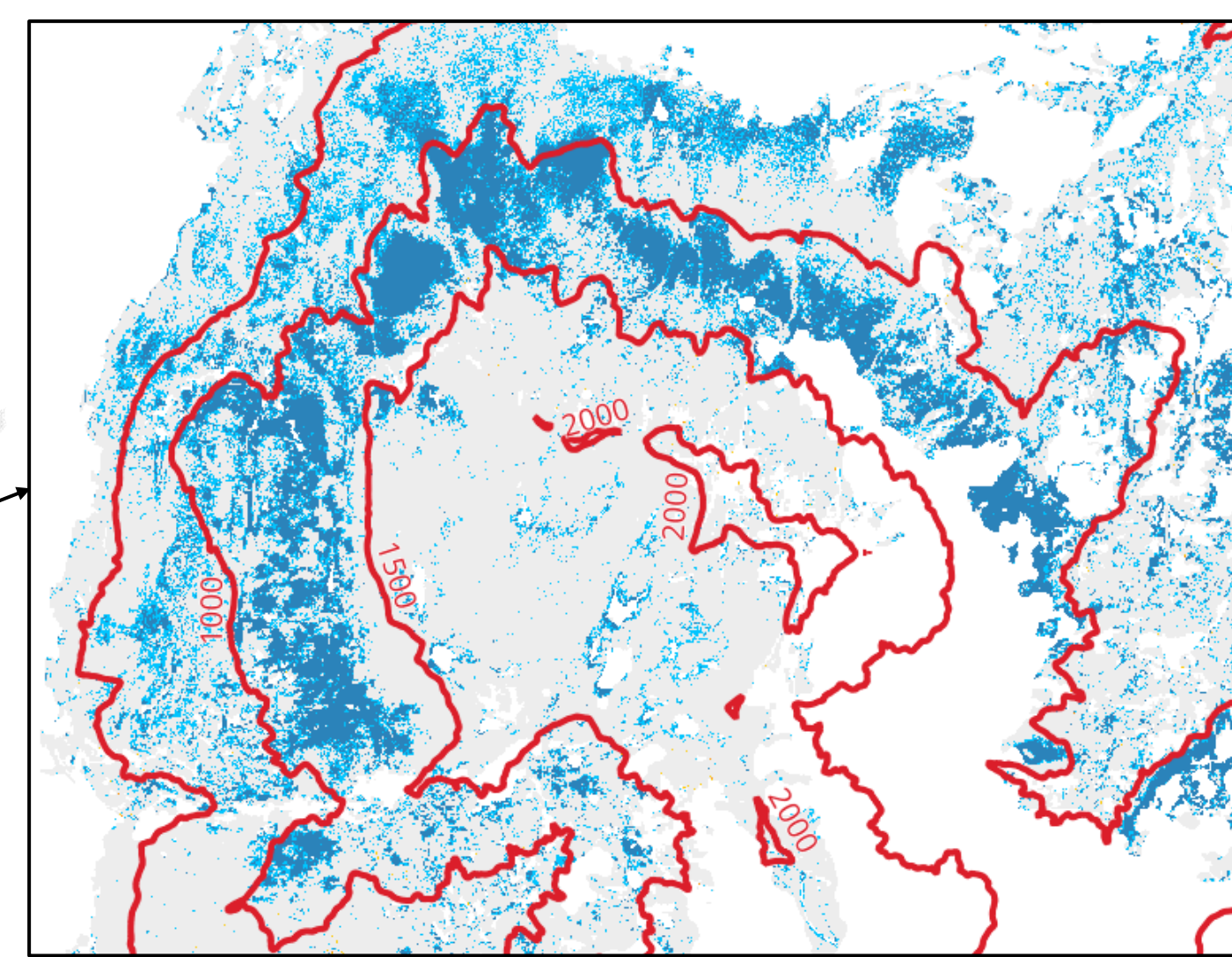


### Results

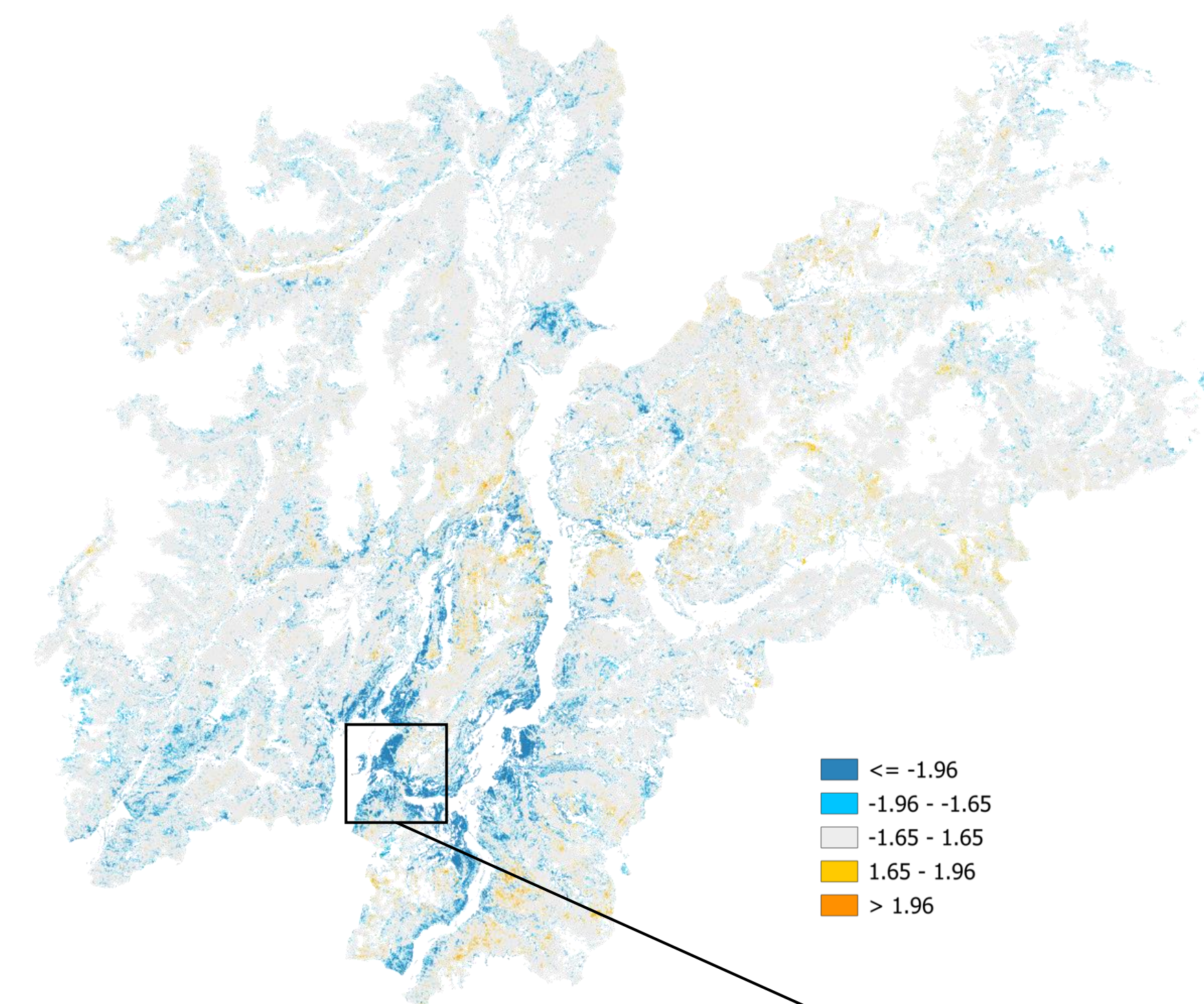
#### Late spring frost



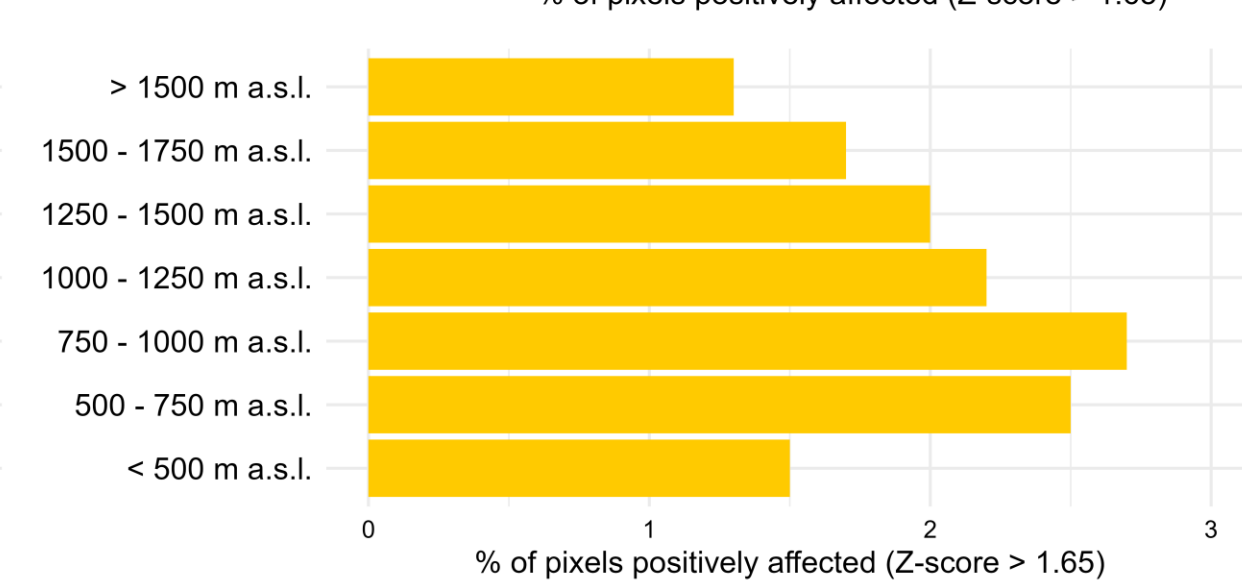
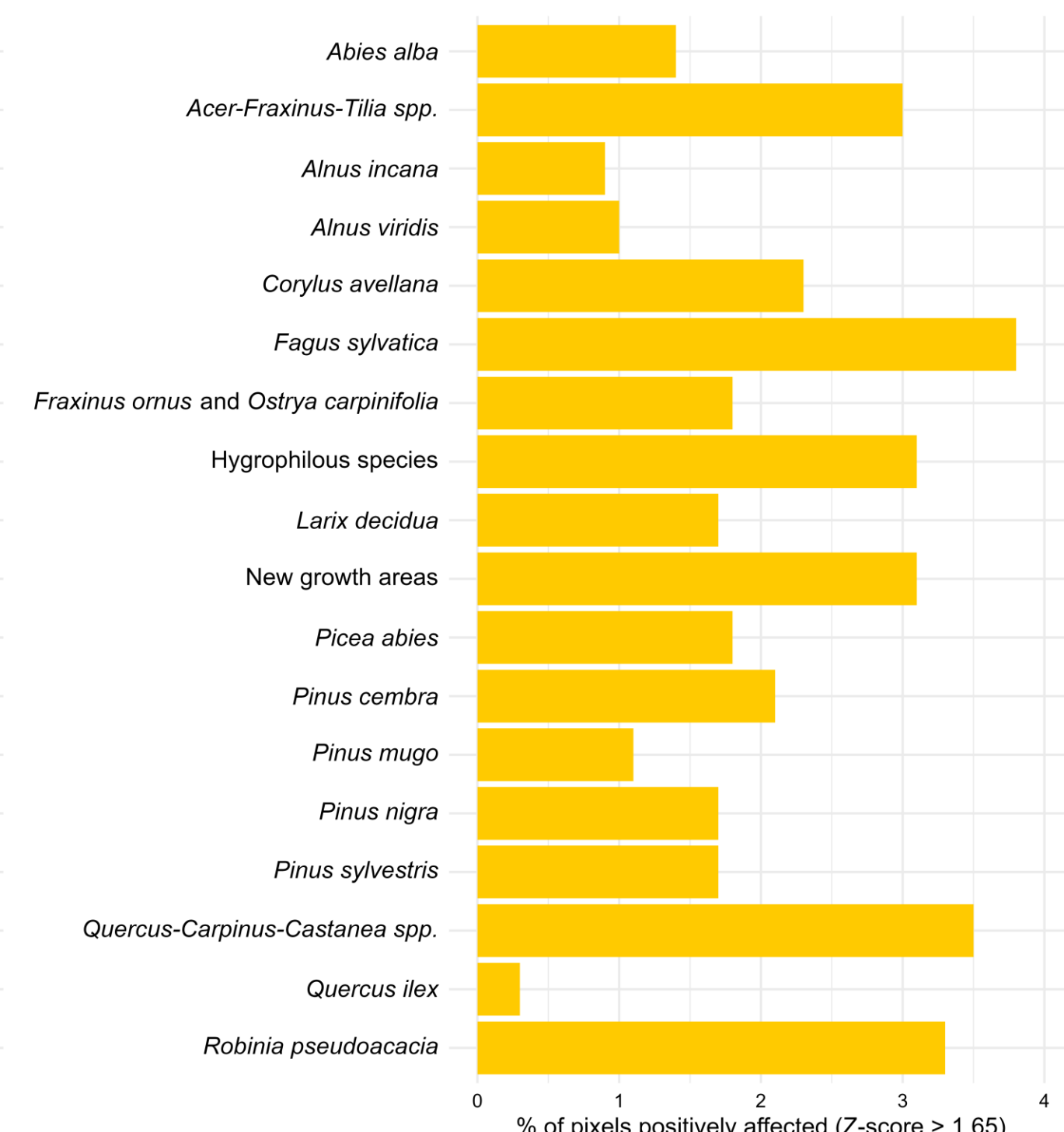
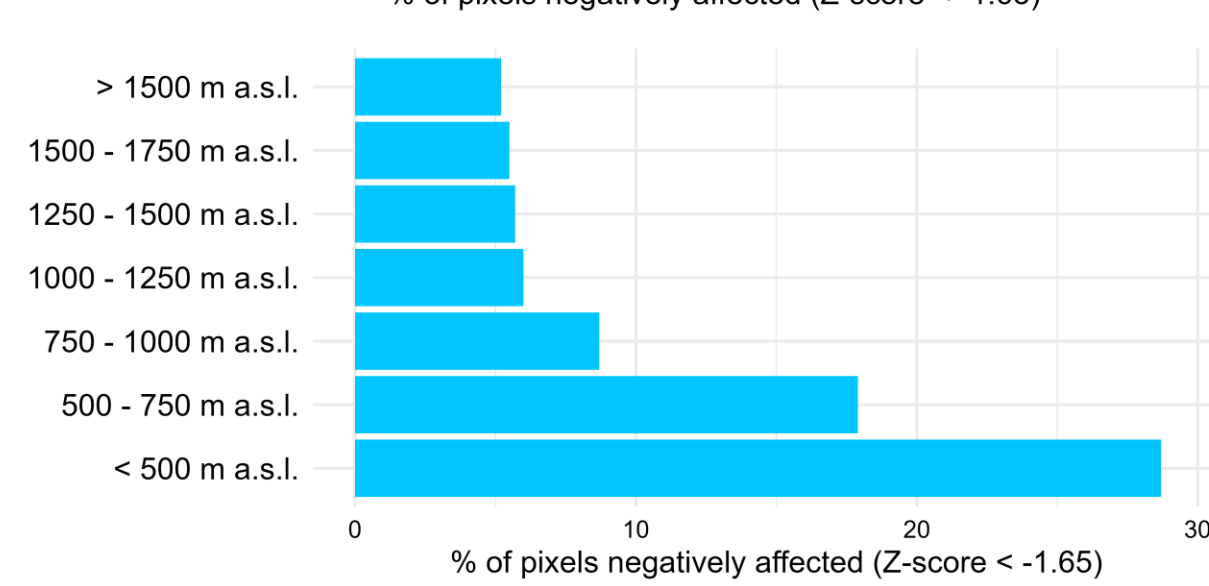
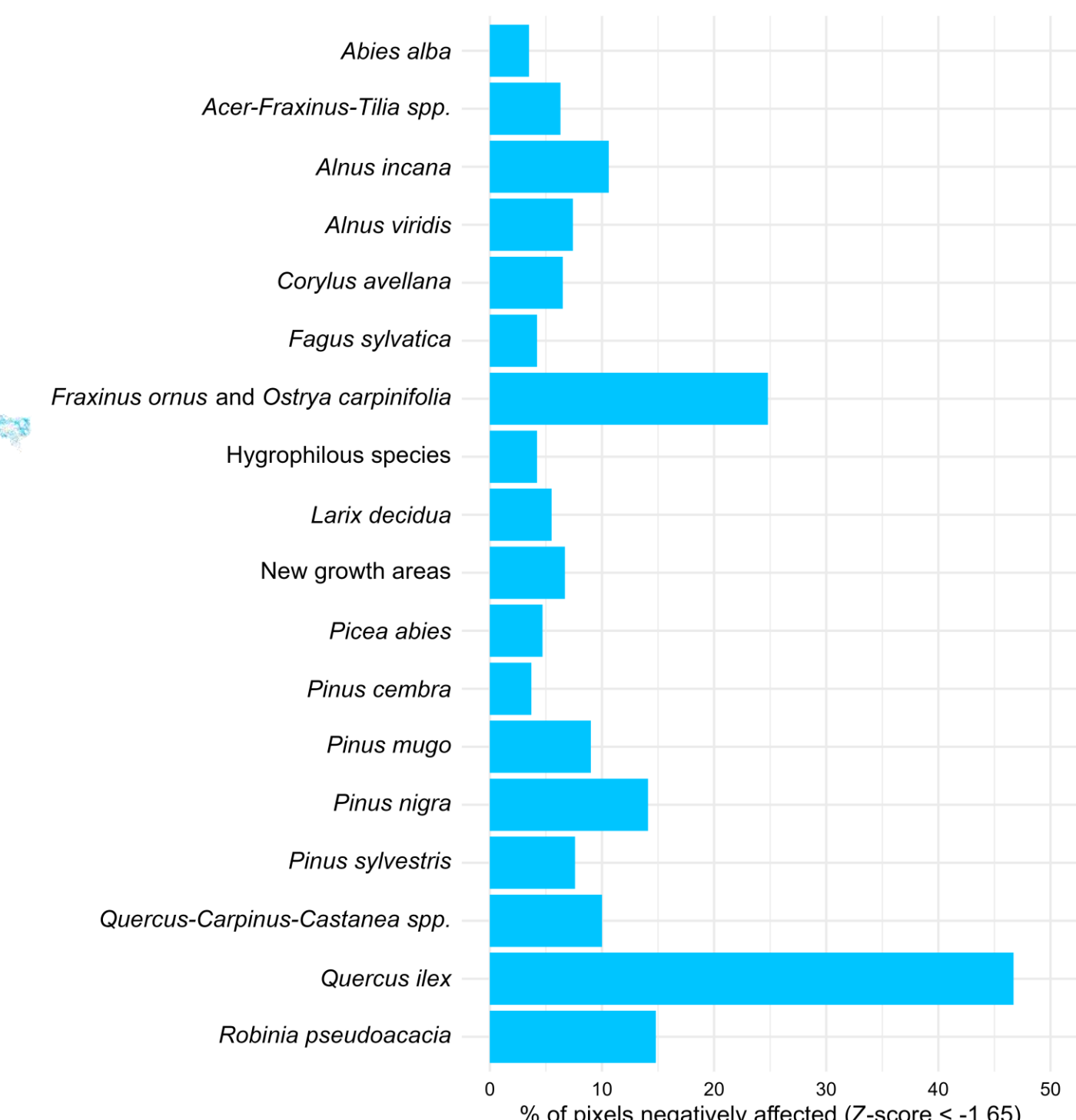
NDVI Z-score for the period 7-20 June 2019



#### Summer heatwave

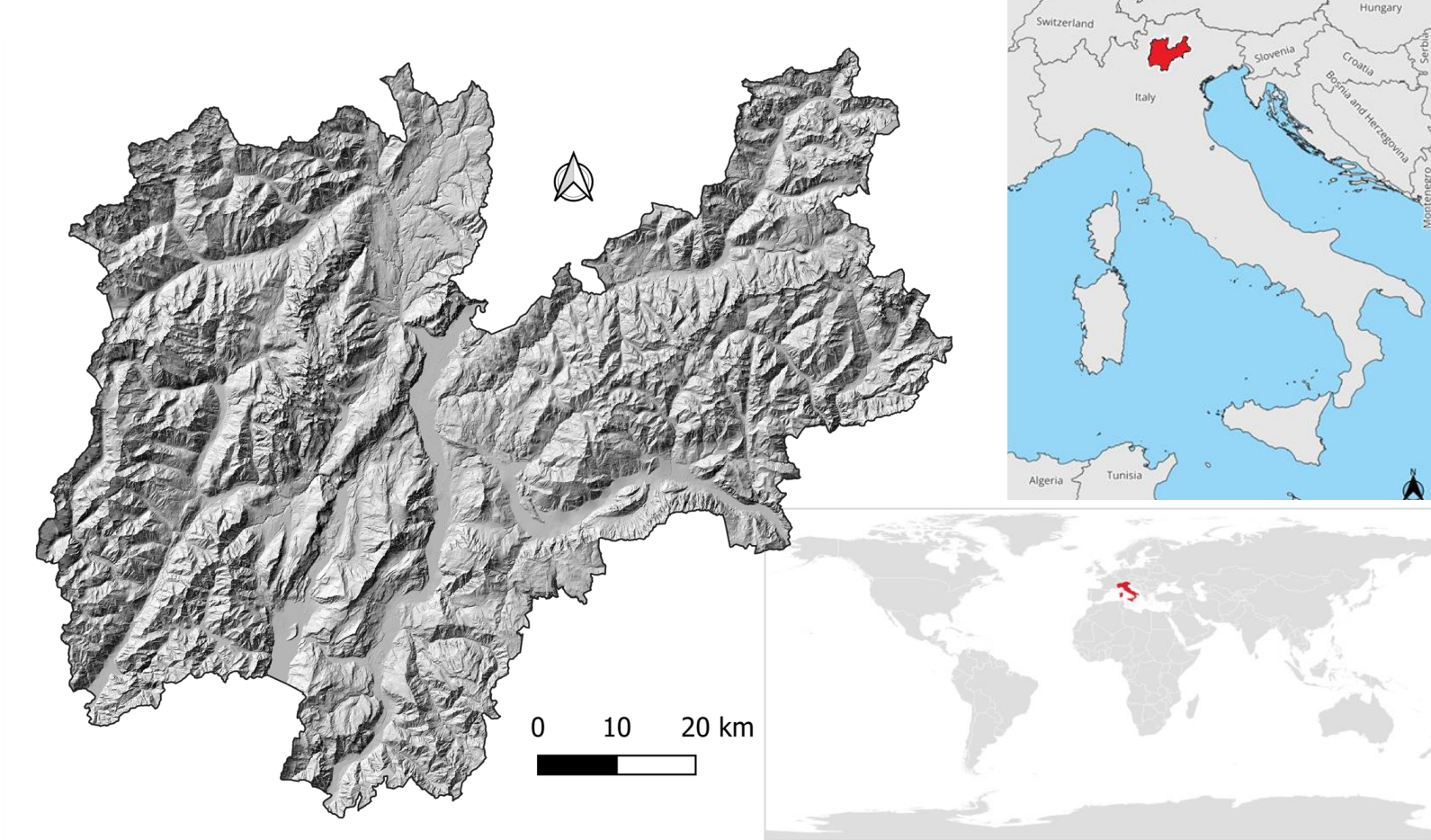


NDVI Z-score for the period 19 July - 2 August 2022



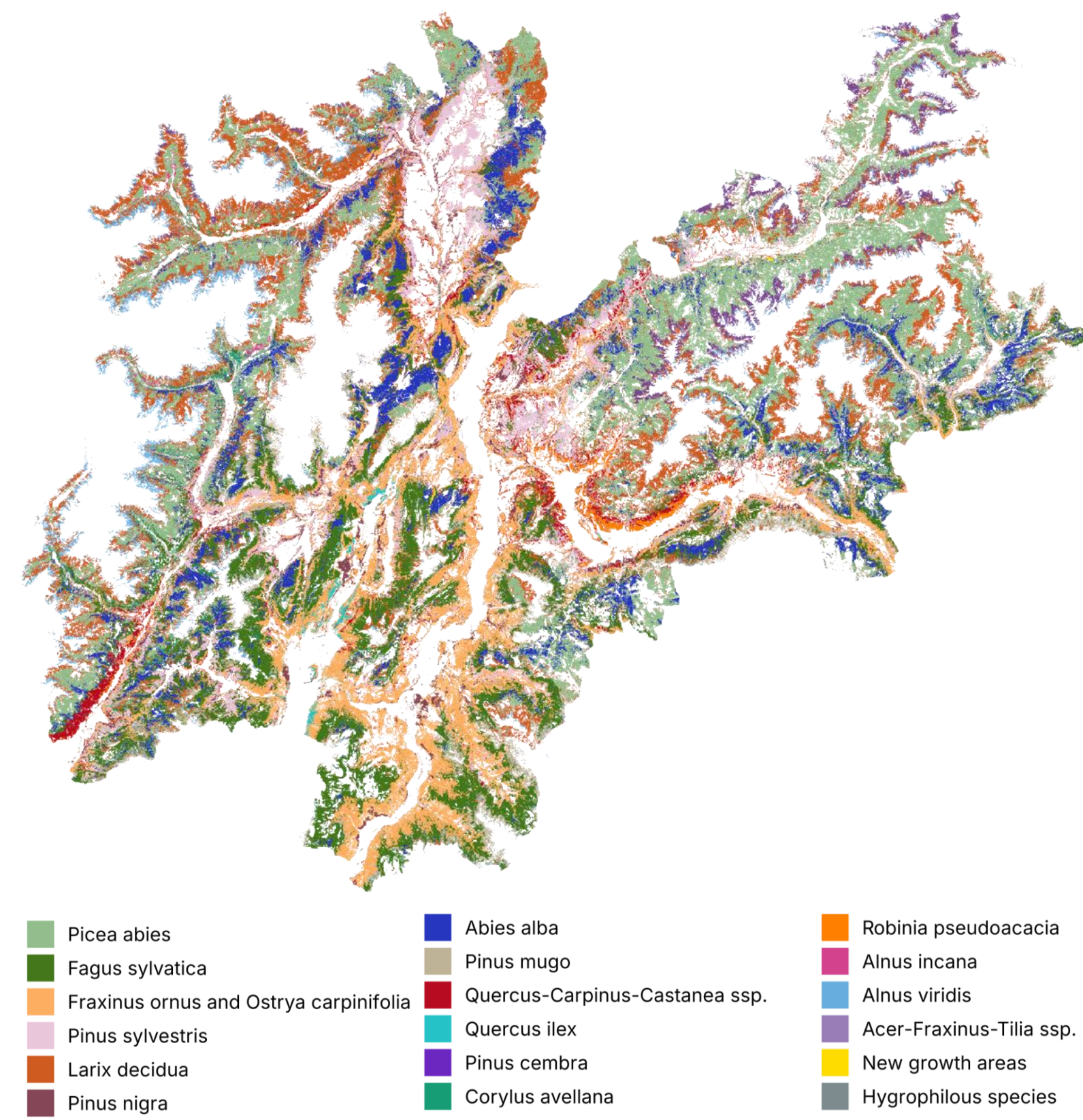
### Study area

- Autonomous Province of Trento (Italy)
- High altitudinal gradient: from 60 to 3600 m a.s.l.
- About 3900 km<sup>2</sup> of forest areas.
- Late spring frost event at the beginning of May 2019.
- Heatwave in July 2022.



### Tree species map

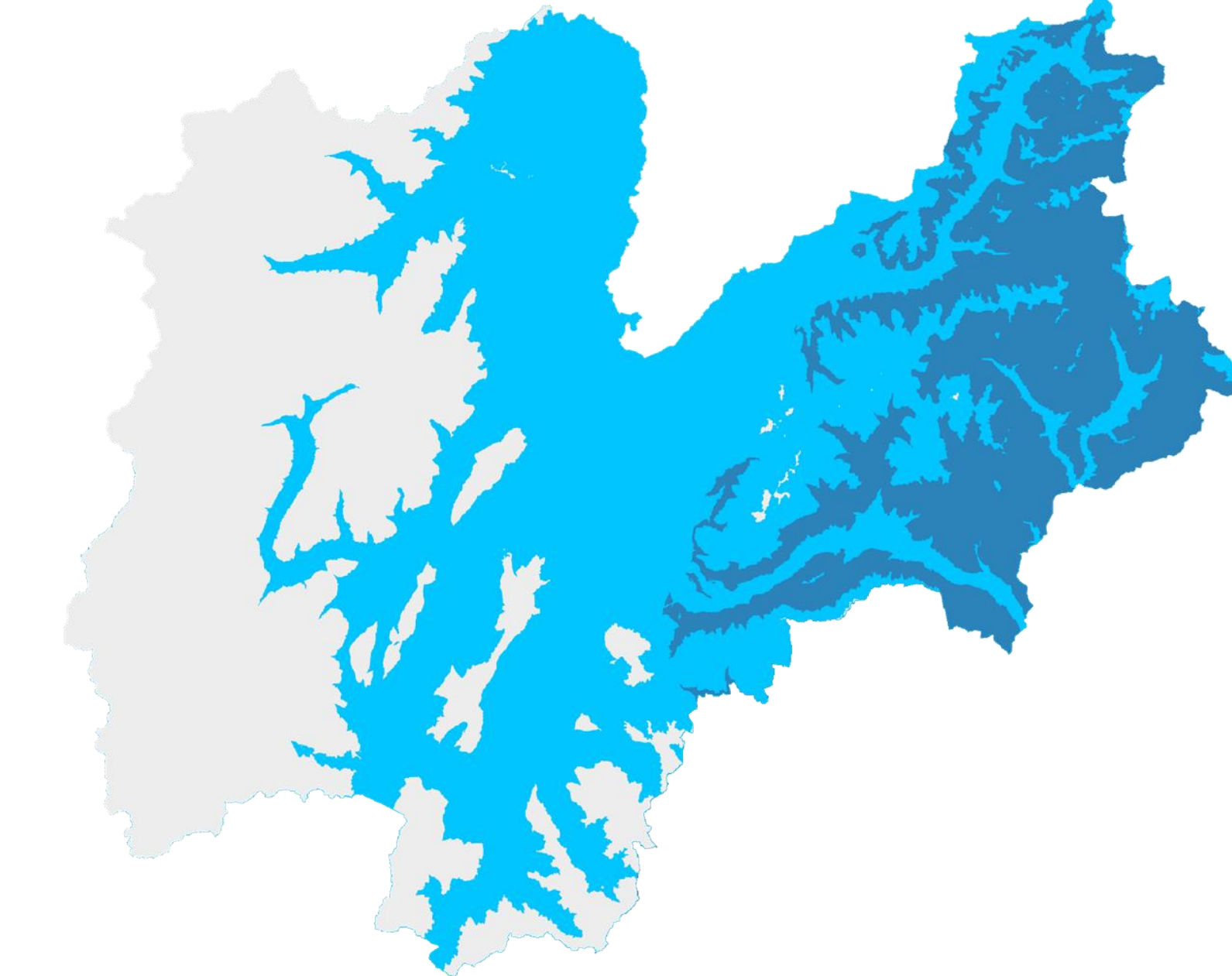
Obtained using a SVM trained with Sentinel-2 time series, topographic and climatic features.



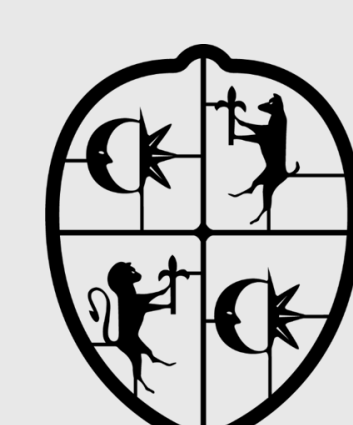
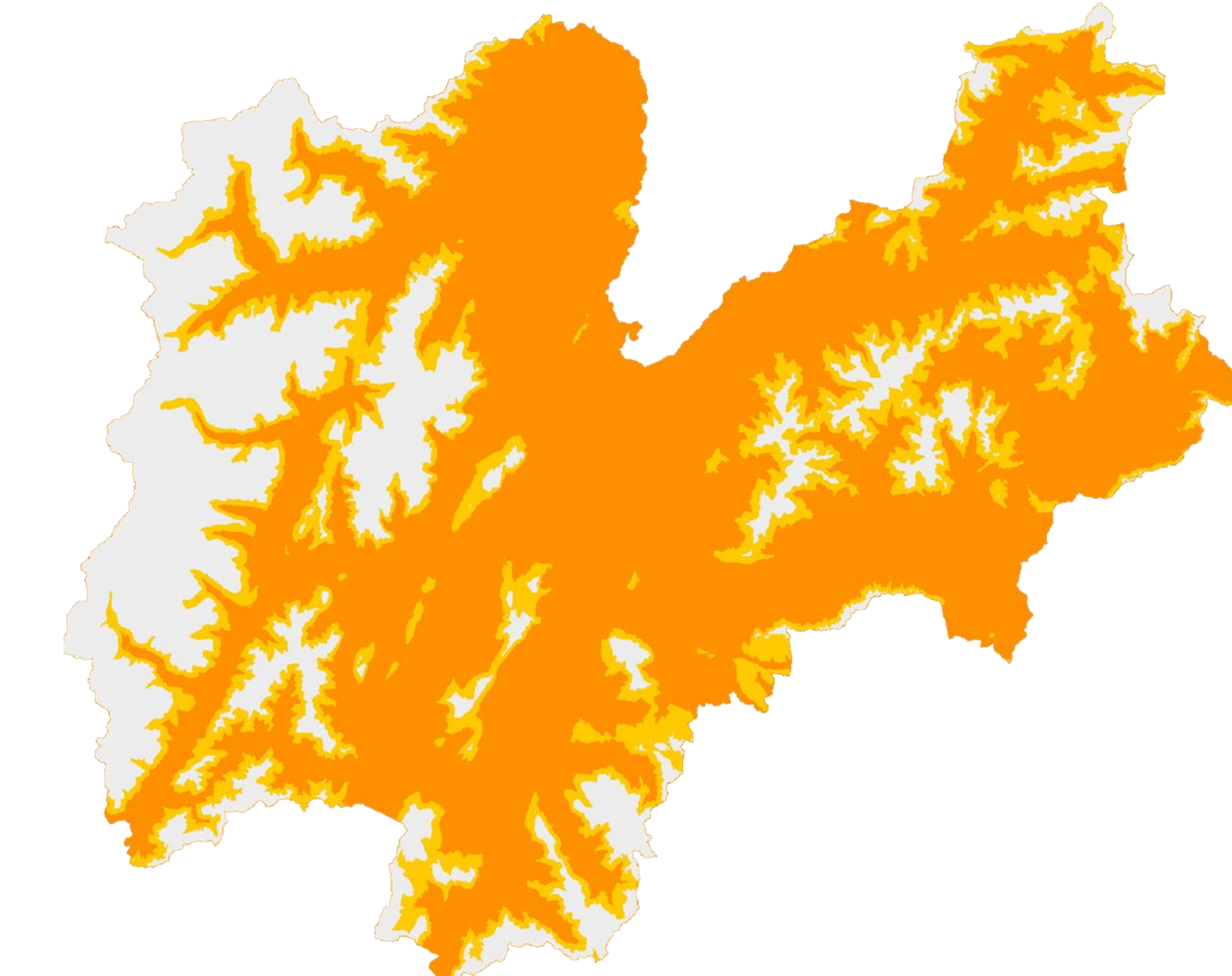
### Temperature anomalies maps

Z-score maps for mean daily temperatures of May 2019 and July 2022 obtained from 109 local weather stations.

MAY 2019



JULY 2022



FONDAZIONE  
EDMUND MACH  
dal 1874



Funded by  
the European Union