Climate Digital Twin (DE340)

Wildfire risk and damages, now and in the future – A set of Destination Earth use cases

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INTRODUCTION

In many terrestrial ecosystems (from tropics to Arctic), wildfires are one of the main disturbances affecting also human life and societies. Globally wildfires are expected to increase with higher global warming levels. Wildfire weather has become more widespread, long-lasting, and intense in some regions (e.g. in Mediterranean). As Finland has high forest fraction and excellent forest and geospatial data, application tests will be conducted there. These applications are the FWI, WISE and SPITFIRE, used for fire danger estimations now and in the future and fire spread modelling. These are used to assess vulnerabilities and help in choosing the best adaptation options with climate and policy scenarios.

Key users:

- The Finnish forestry management project HIILIPOLKU
- North Karelian-Rescue Services

IMPLEMENTATION IN THE WORKFLOW

Hourly temperature, dewpoint temperature, wind v&u components and precipitation data are requested from the GSV and 24-h precipitation sum and average temperature from the One-pass layer for the applications over Europe. Climate data is read and processed using a Python/Fortran wrapper, which is then used to run the wildfire application (FWI/SPITFIRE/WISE). Auxiliary data consists of fuel, land cover, topography, ground flash density climatology and population density projections data.

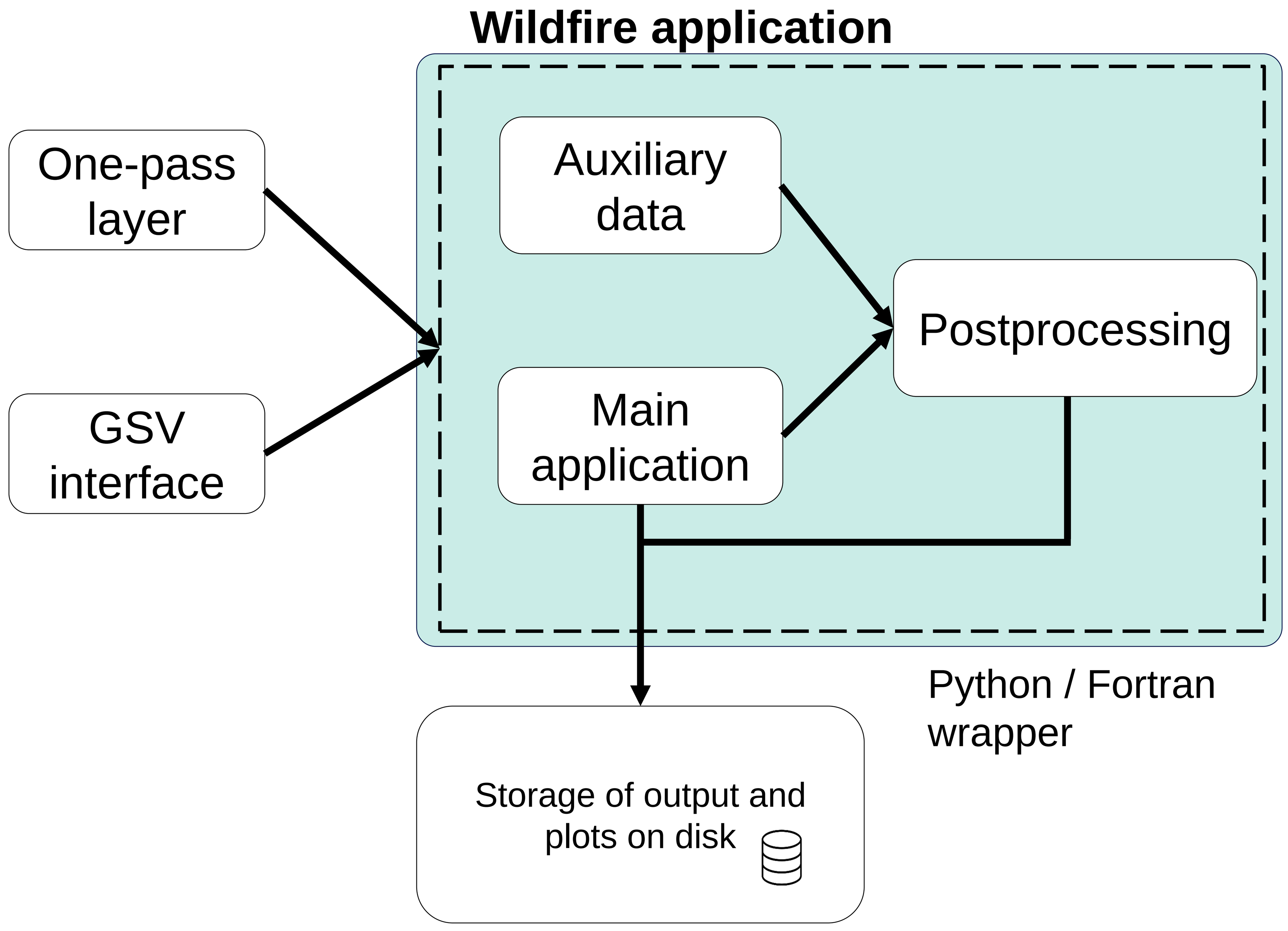

Figure 1: Preliminary architecture of the Wildfire applications and their implementation to the DestinE workflow.

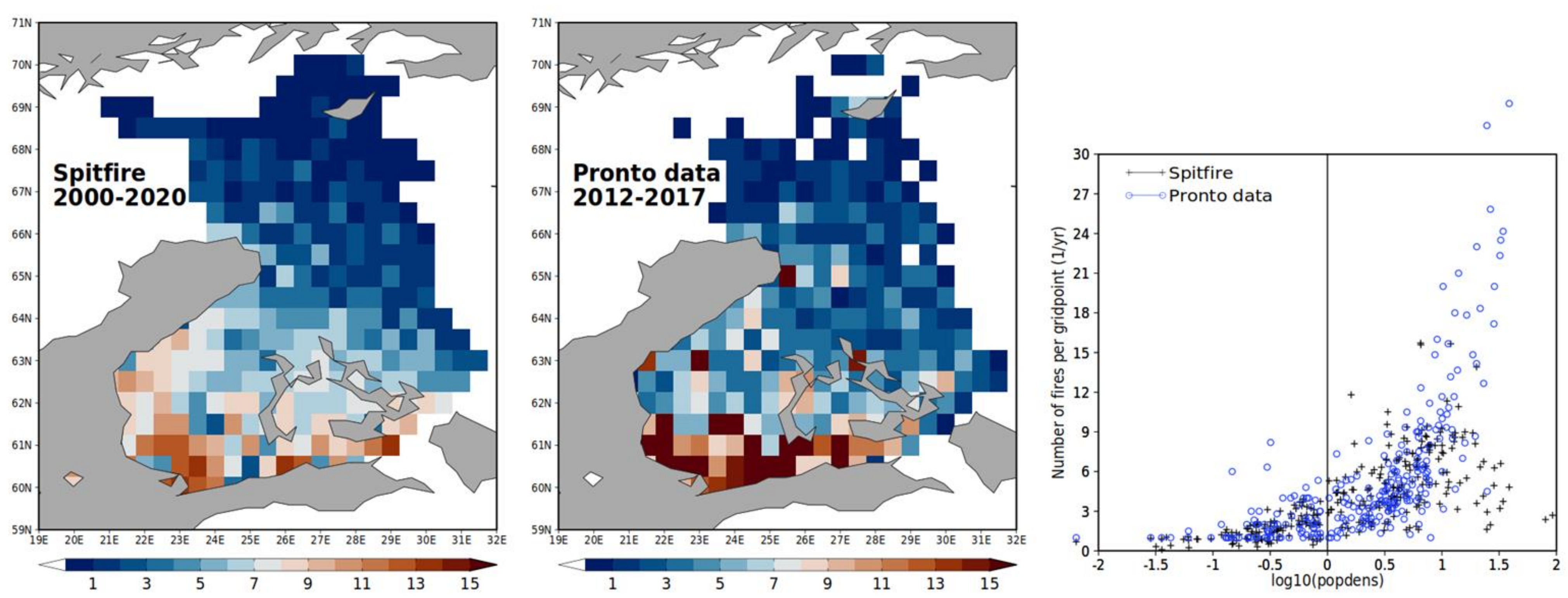

Figure 3: Spitfire: Preliminary validation of the number of fires simulated by the Spitfire app against Pronto data (geolocated data from Finnish Rescue Services). The agreement with observations is good, but the fire suppression in highly populated arrears is too strong in the simulation.

How can the initiative help to improve the state of the art methods in this sector?

For this we can identify the user needs and requirements that the ClimateDT will be able to address:

Needs	Requirements
How will fire spread change in the future under different climate scenarios?	Model the fire spread in different boreal forest environments and compare results between different climate and forest policy scenarios
What is future fire risk in different forest policy scenarios?	Model the fire spread with an application where user can modify forest area characteristics (i.e. fuel load distribution), e.g. based on different forest management practises
How will fire regimes change in the Boreal forest under different climate scenarios?	Simulate fire regimes in the boreal forest (Finland) and compare results obtained under different climate scenarios

RESULTS

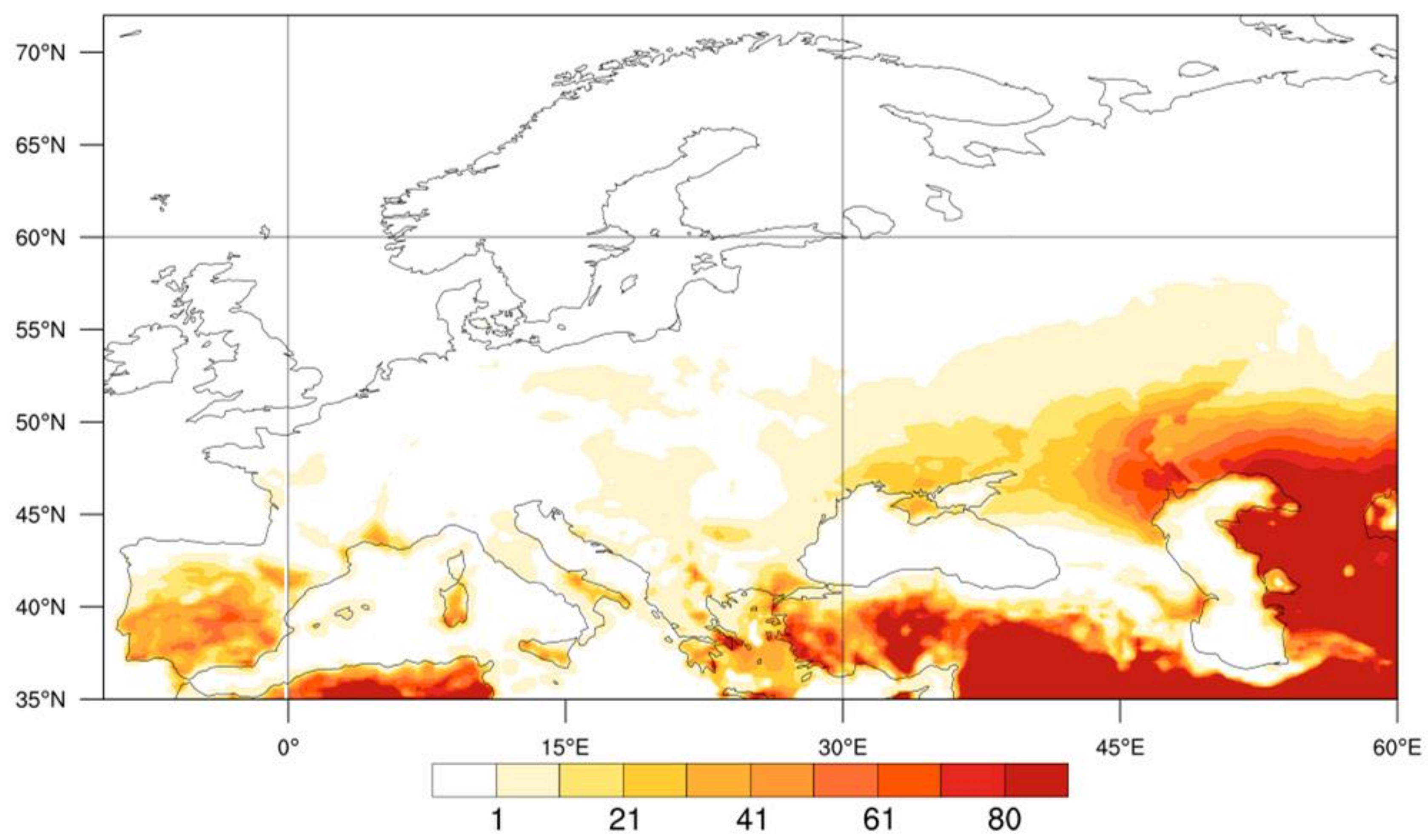

Figure 2: FWI:: ERA5 climatology of an annual number of days with FWI values exceeding Very High Danger (FWI > 38) according to the European Forest Fire Information System (1980-2010). It is evident that a pronounced north-south gradient exists, indicating a higher likelihood of fire weather conditions in Southern Europe when compared to the northern regions.

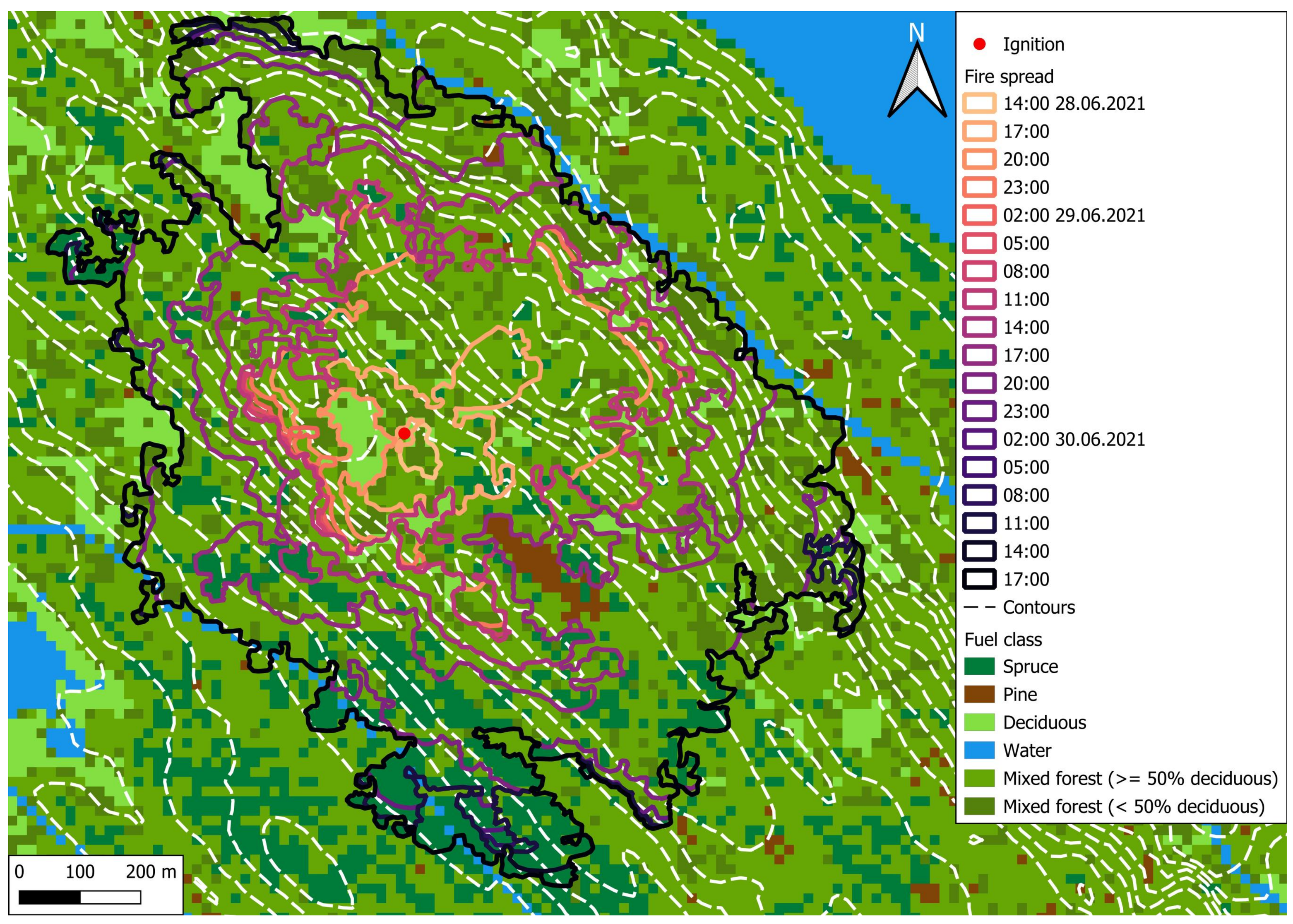

Figure 4: WISE: Example fire spread result from Koli in Eastern Finland (~125 ha). Effects of different climate and forest policy scenarios can be tested with altering fuel class and climate data.

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