

Simulating a 2014 wildfire in Lieksa (Finland) using the Canadian Prometheus fire growth simulation model

Fire spread modelling programs could bring many benefits to the rescue services. Information about the potential spread of an ongoing wildfire, better planning of prescribed burning and a tool for estimating the vulnerability of high importance locations to wildfires are some of the potential benefits of such a system. In this case study, the Canadian Prometheus model has been demonstrated using open data from Finland.

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Prometheus is a Canadian wildland fire growth simulator, which is based on the Canadian Forest Fire Danger Rating System (CFFDRS) and its two subsystems, the Fire Weather Index (FWI) system, and the Fire Behaviour Prediction (FBP) system. The FWI subsystem is used to calculate the effects of fuel moisture and wind on fire behaviour (Van Wagner, 1987). The FBP subsystem uses information of the 16 different fuel classes, weather, topography, foliar moisture content and the type and duration of the fire to estimate the different statistics of the modelled fire (Forestry Canada, 1992).

During the summer of 2014, a wildfire of 10 hectares was ignited in the Lieksa municipality of Finland, due to a tree falling on a powerline. The workers of Lieksa fire station gave estimates of the ignition location and time and of the final fire perimeter.

In order to model this wildfire using Prometheus, information about elevation, fuel grid, place and time of the ignition were required, together with information about the different firebreaks in the area and weather data for the duration of the fire. The 2m resolution Digital Elevation Model (DEM) of the area and the vectorized firebreaks (roads, rivers, swampland) were downloaded from the National Land Survey of Finland (NLS) spatial database. The weather data was downloaded from the Finnish Meteorological Institute (FMI) weather database. The

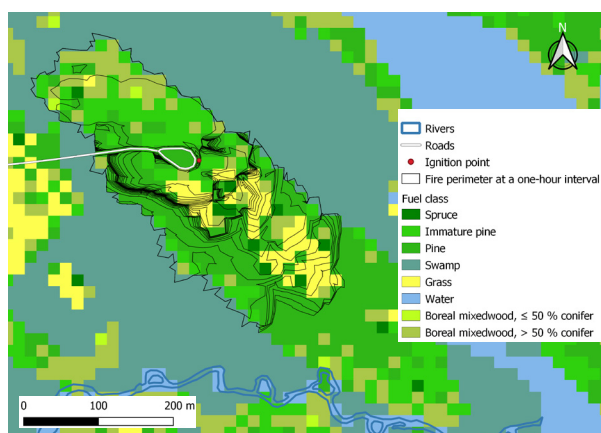


FIG 1: The different fuel classes and physical features which were used in the simulation. The main results of the simulation are the fire perimeters with a temporal resolution of one-hour. The fuel grid was provided by Arbonaut Oy Ltd.

ignition time and location were provided by the Lieksa municipality fire station. The fuel grid (Fig. 1) was created by Arbonaut Oy Ltd by classifying the different fuel classes using NLS LiDAR data and Finnish Forest centre forest resource data.

The first simulations produced unrealistic fire perimeters which were wrong in shape and size compared to the real events. By adding swamplands, roads and rivers as firebreaks, and by choosing more suitable fuel classes to represent the different vegetation types found in the area, the simulation produced a more realistic final perimeter of 11,7 hectares (Fig. 1).

This case study shows that the different types of data required to run a Prometheus simulation are high quality and open data in Finland. However, it would be important to gather information about fire spread related values in Finnish fuel types in order to ensure the accuracy of the used fuel models. This could be a great opportunity for a Nordic co-operation for collecting information from real and prescribed burns in different fuel types.

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