ICFBR*2022 Machine learning models to build and project wildfire severity across ecosystem functions and vegetation types on large territories

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Potential fire severity is an important component of fire risk since it is representing the vulnerability *per se* of the ecosystems. However, it is commonly neglected in risk analysis mainly due to the absence of robust models to project on the territories. Traditionally, because of data managing constraints, studies addressing fire severity were focused on limited number of fire events preventing their use over larger areas. Nowadays, free data and processing platforms such as Google Earth Engine (GEE) allow processing huge amount of data. Thus, we aimed to test the these new capabilities for building robust empirical models for fire severity.

Methods

The study area, located in the central Mediterranean basin, covers the French regions of PACA and Corse, and the Italian regions of Sardinia, Liguria and Tuscany (Fig.1).

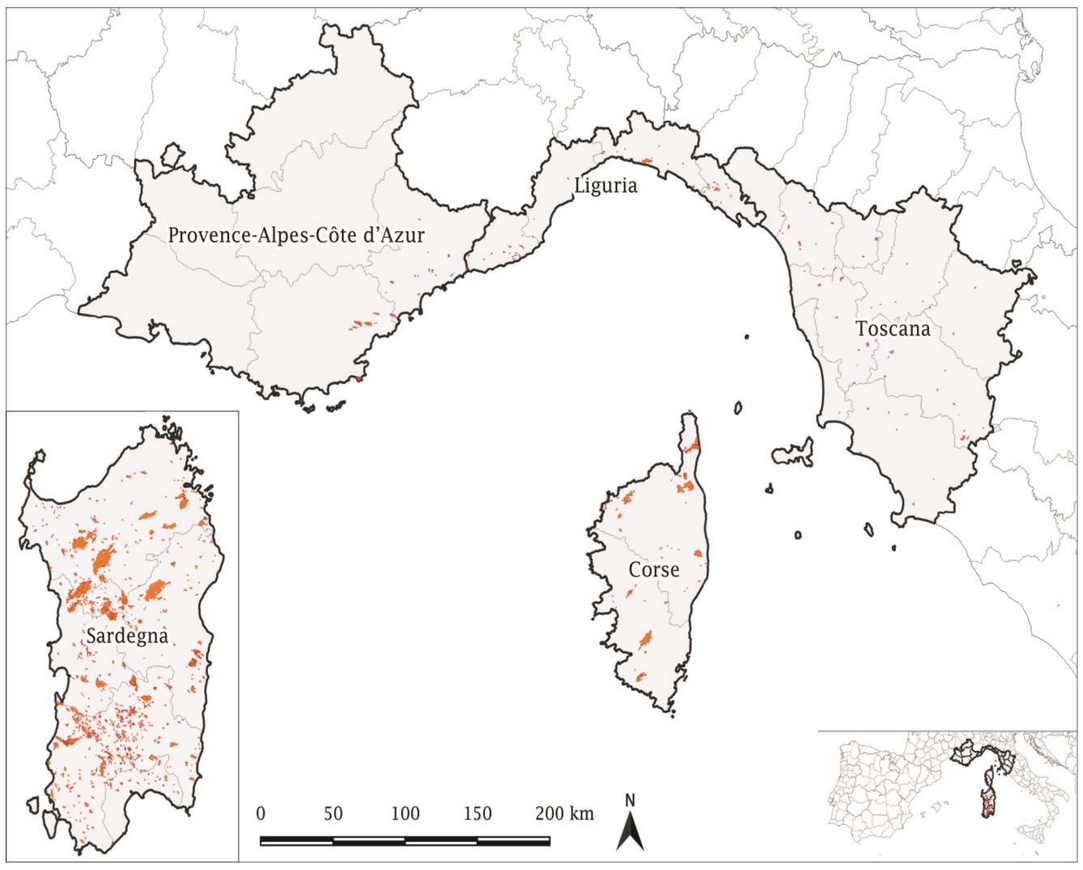

Figure 1. Fire perimeters larger than 25ha (in orange) within the study area (period 2004-2019)

Fire perimeters for the French regions were obtained from the French National Forest Office (ONF) whereas for the Italian region were provided by the former Corpo Forestale dello Stato (CFS).

Fire severity was calculated on GEE using the relativized delta Normalized Burn Ratio (rdNBR) following the procedure suggested by Parks et al., (2018).

Random forest algorithm used variables covering **topography, vegetation** (NDVIfireday, NDWI anomalies), and **burning conditions** (Rothermel package using Downscaling from WindNinja).

GEE → WINDNINJA → R → Random forest

Results

rdNBR model explained 77% of the variance with an absolute mean error of 141 (dimensionless). The variance explained was similar when calibrating and validating the model separately for each specific forest type (data not shown)

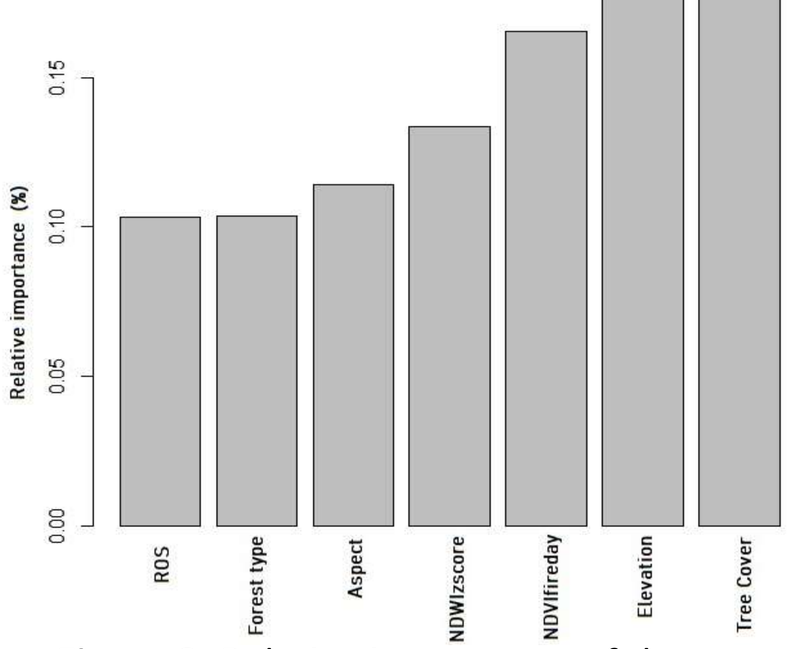

Figure 2. Relative importance of the variables used in the model

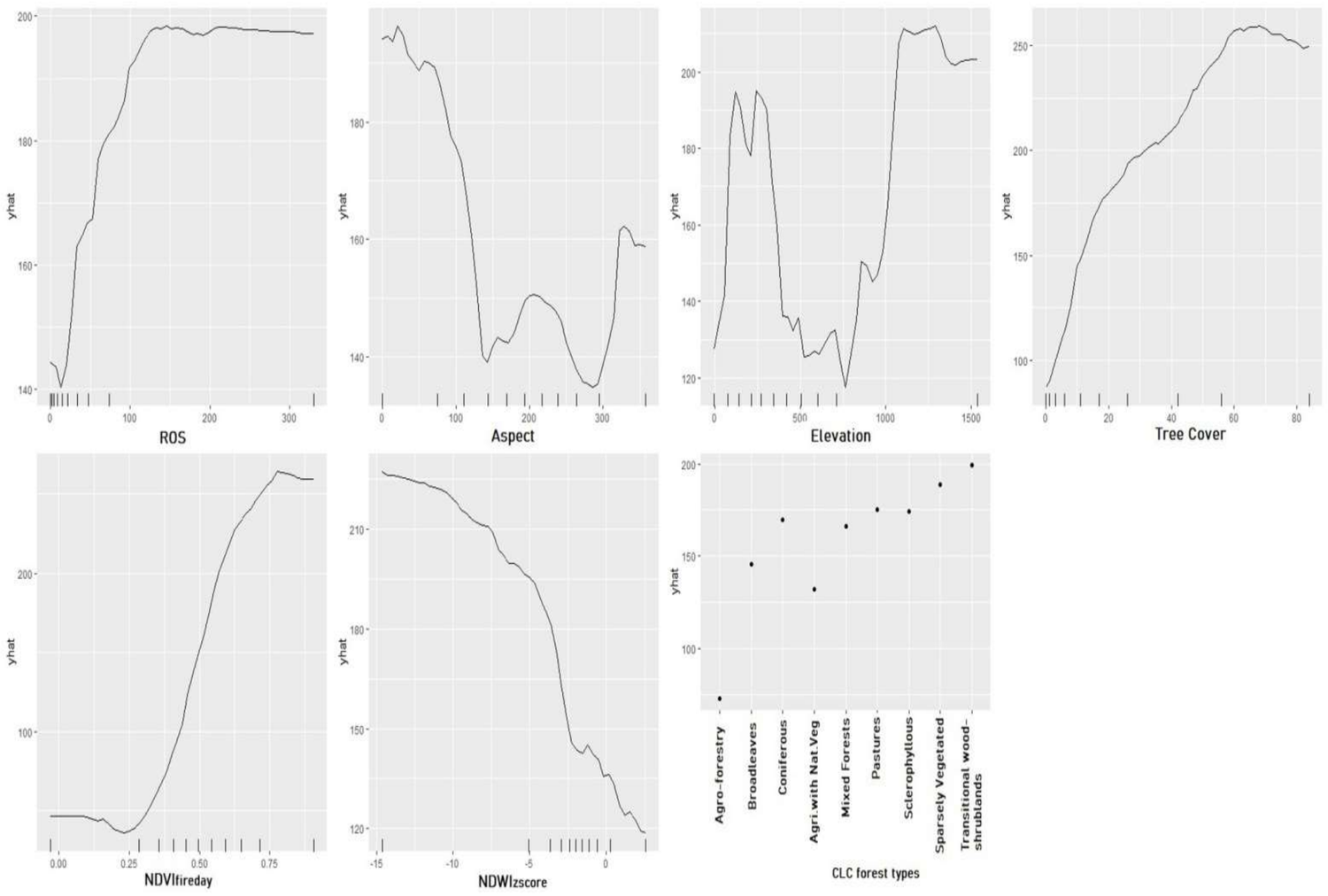

Figure 3. Partial dependence plots for each explanatory variable

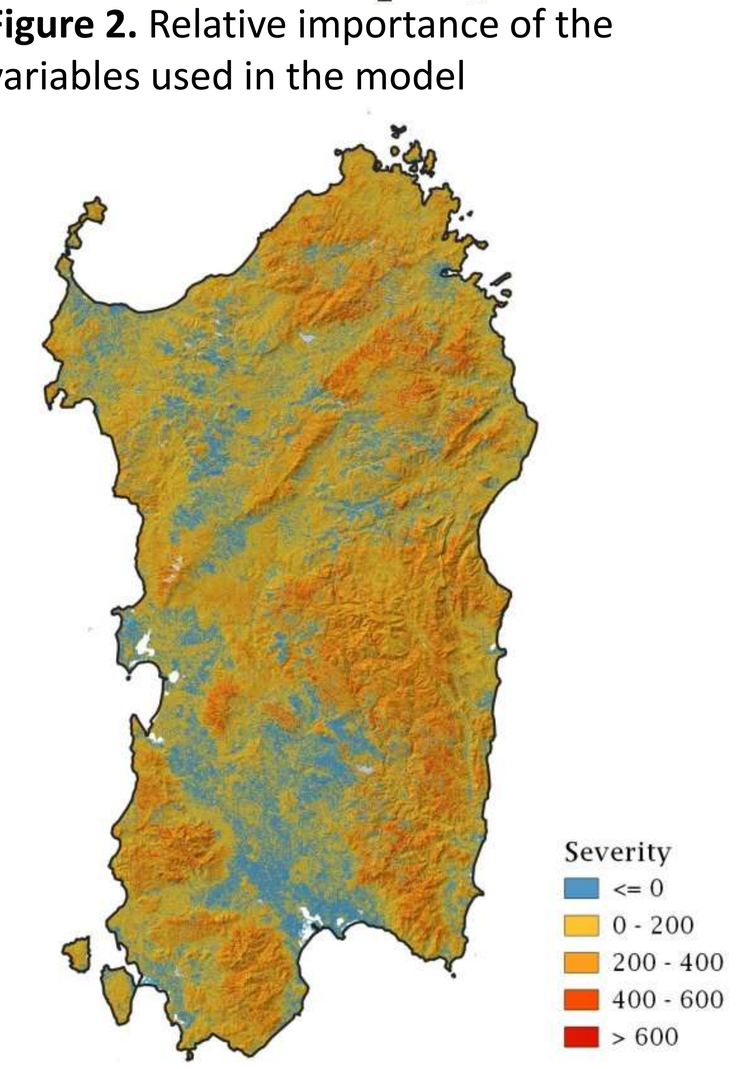

Figure 4. Projected fire severity for 19th August 2019 in Sardinia

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