



Assessment and Validation of Wildfire Susceptibility and Hazard in Portugal

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Fire is a natural phenomenon, which some species use as part of their development strategies. Fire is also part of landscape renewal and a forest modeler, prior to human effort to avoid it. The Portuguese forest is an important national economic resource that has been threatened by wildfires in the last decades. Forest fires produce heavy damages and this alone justifies wildfire susceptibility and hazard assessment.

A comprehensive methodology to assess forest fire susceptibility that uses variables of strong spatial correlation is presented and applied for the Portuguese mainland. Our study is based on a chronological series of burnt areas of thirty years (1975-2004). The first twenty years (1975-1994) are used to statistical modelling, and the last ten years (1995-2004) are used for the independent validation of results. The wildfire affected areas are crossed with a set of independent layers that are assumed to be relevant wildfire conditioning factors: altitude, slope, land cover, rainfall and temperature. Moreover, the wildfire recurring pattern is also considered in the model, as a proxy variable expressing the influence of human action in wildfire occurrence.

A sensitivity analysis is performed in order to evaluate the weight of each individual theme within the susceptibility model. The validation of the wildfire susceptibility models is made through the computation of success rate and prediction rate curves. The obtained results show that it is possible to have a good compromise between the number of variables within the model and the model predictive power. A simple model based on only three variables (slope, land cover and wildfire recurring pattern) achieves an independent validation result of 80% of "future" burnt areas contained in the 38% of the territory classified as more susceptible to wildfires. Additionally, it is shown that integration of climatic variables does not produce any relevant increase in the prediction capacity of wildfire susceptibility models. Finally, the prediction rate curves produced by the independent cross validation are used to assess the probabilistic wildfire hazard at a scenario basis, for the complete mainland Portuguese territory.

The results achieved in this work set the ground for scenario-based predictions at a probabilistic basis. These results can be taken into account for land management in the long term, but also to guide some daily-life routines for those land owners whose land are included in the most hazardous zones.