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Mediterranean maquis fuel model development and mapping to support fire modeling

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Fuel load data and fuel model maps represent a critical issue for fire spread and behaviour modeling. The availability of accurate input data at different spatial and temporal scales can allow detailed analysis and predictions of fire hazard and fire effects across a landscape. Fuel model data are used in spatially explicit fire growth models to attain fire behaviour information for fuel management in prescribed fires, fire management applications, firefighters training, smoke emissions, etc. However, fuel type characteristics are difficult to be parameterized due to their complexity and variability: live and dead materials with different size contribute in different ways to the fire spread and behaviour. In the last decades, a strong help was provided by the use of remote sensing imagery at high spatial and spectral resolution. Such techniques are able to capture fine scale fuel distributions for accurate fire growth projections. Several attempts carried out in Europe were devoted to fuel classification and map characterization. In Italy, fuel load estimation and fuel model definition are still critical issues to be addressed due to the lack of detailed information.

In this perspective, the aim of the present work was to propose an integrated approach based on field data collection, fuel model development and fuel model mapping to provide fuel models for the Mediterranean maquis associations. Field data needed for the development of fuel models were collected using destructive and non destructive measurements in experimental plots located in Northern Sardinia (Italy). Statistical tests were used to identify the main fuel types that were classified into four custom fuel models. Subsequently, a supervised classification by the Maximum Likelihood algorithm was applied on IKONOS images to identify and map the different types of maquis vegetation. The correspondent fuel model was then associated to each vegetation type to obtain the fuel model map.

The results show the potential of this approach in achieving a reasonable accuracy in fuel model development and mapping; fine scale fuel model maps can be potentially helpful to obtain realistic predictions of fire behaviour and fire effects.