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Abstract

Forest Fuel Loads Characterization: A Geostatistical Approach Investigated during the MED-Star Project †

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Abstract: In the last decade, a progressive and continuous increase in devastating forest fires has been observed. The changes in wildfire characteristics show higher levels of fire danger, longer fire seasons, and intense and rapidly spreading "mega-fires". In this context, the Interreg IT-FR Maritime (cross-border Interreg Italy-France Maritime 2014–2020 programme) MED-Star project (Strategies and measures for fire risk mitigation in the Mediterranean area), co-financed by the European Agricultural Fund for Rural Development (EAFRD), aims to strengthen capacities in fire forecasting, prevention, and suppression. In order to evaluate wildfire risk, a better understanding of distribution and characteristics of different forest fuels is crucial. Within the MED-Star project, we carried out a field survey to collect information about fuel loads on accessible areas and investigated a geostatistical approach to extend forest fuel distribution quantification to the rest of the territories. The field survey campaign acquired more than 12.000 observations on fuel loads recorded by FuelGeoData App, a mobile device application, which was developed in the project by vanzotech srl (Rimini, Italy) and is based on the photoload sampling method designed by Keane in 2007. The recorded fuel loads were modelled using information related to stands height and Sentinel missions' remotely sensed data. The stands height was obtained as a crown height model (CHM) produced by NASA as part of the GEDI (Global Ecosystem Dynamics Investigation) project. Other remote sensed information was derived by Sentinel 1 and Sentinel 2 cloud free images recorded in July 2021 (same period of the field survey). Our geostatistical approach was based on the random forest algorithm using the 70% of observations to train the model and the 30% to test model accuracy. The model results showed a general prediction accuracy higher than other previous studies in most of the fuel types investigated, highlighting how the number of observations and, as a consequence, the training sample size influence the predictive potential of the model.

Keywords: forest fuel load; random forest; MED-Star project

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