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Abstract

Evaluating Wildfire Simulators Based on the 2021 Large Fires Occurring in Sardinia †

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Abstract: Wildfire simulators represent a fundamental tool for the planning of wildfire prevention operations, the real-time prediction of fire propagation and thus the adoption of appropriate firefighting strategies. In this paper, we provide an example of the application of the Web-based Wildfire Simulator (WWS) on fires that occurred during the 2021 fire season in Sardinia (Italy), and in particular on the Montiferru fire, a large fire that occurred in the central-western area of the island and mainly driven by the wind. The simulator used high-resolution data provided by the WRF meteorological model initialized with both GFS forecasts and ERA5-ECMWF reanalysis. Vegetation characteristics and associated fuel pattern maps were derived from the analysis of recent Sentinel2 satellite data. Fuel moisture data were estimated using weather data predicted by WRF. The evaluation of the model was carried out using the data collected in field and related to the actual fire propagation observed during the various time steps, and to the related firefighting interventions. In addition, the meteorological data recorded by a few meteorological stations located within the simulation domain and the data on fire severity collected in field were analyzed. The model was able to predict the temporal development of fire events with a good accuracy, considering the mean rate of spread and the rate of spread of the different wildfire sectors. Most of the accuracy can be explained by the goodness of the weather forecasts obtained through the use of GFS forecasts and of the fuel model map. The model was able to accurately predict the propagation of the main fire front, while several deviations from the real perimeter were observed with regard to the fire flanks propagation. In conclusion, wildfire simulators represent a useful tool for all phases of fire prevention, for their operational use in real-time, and therefore to provide information for the firefighting.

Keywords: fire behavior; large fires; wildfire analysis

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