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Abstract

Fire Behavior Pathways under Climate Change and Management Scenarios †

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Mediterranean forests are strongly influenced by forest fires; however, global change is threatening the provision of ecosystem services by altering forest dynamics. The FIREPATHS project aims to assess future wildfire danger by coupling forest dynamics, climate modeling and wildfire behavior simulation. The project explores different forest management scenarios based on several EU forest policies (promotion of carbon stocks, water vulnerability reduction, biomass production and business-as-usual) under the RCP 4.5 and RCP 8.5 climate pathways in the period 2020–2100.

We evaluated fire behavior changes in Pinus nigra forests in central Catalonia (NE Spain). Forest dynamics were simulated using data from the 3rd National Forest Inventory at stand level using the software SORTIE-nd. Simulations were conducted using climate projections under RCPs 4.5 and 8.5 (meteoland R-package), which also allow us to estimate fuel moisture content (dead and alive) and wind speed. Then, fuel parameters and fire behavior were simulated (medfate R-package), analyzing crown fire initiation potential and rate of crown fire spread to understand potential interactions.

The preliminary results revealed interesting trade-offs between ecosystem dynamics and wildfire hazard. Continuation of the business-as-usual scenario would result in the highest values of crown ROS, while management for vulnerability reduction would have the lowest rates. However, the results suggest sensitivity to climate. Crown fire initiation potential and crown fire spread rate are strongly influenced by forest dynamics, especially under RCP 8.5, which foresees a clear decline in FMC. Forest management influences the potential fire behavior, experiencing different trends depending on the climate pathway, and being particularly threatening under the increasingly hazardous conditions of RCP 8.5. This trajectory is difficult to override without a specific fire mitigation scenario. Altogether, the results indicate that climate and forest management influence fire behavior differently, highlighting the importance of taking both into account towards risk mitigation.

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