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Abstract

Fuel Moisture Content Dynamics under Climate Change in Spanish Forests †

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Abstract: The monitoring of live and dead fuels' moisture content (LFMC and DFMC) dynamics plays a crucial role in wildfire management and prevention. In this study, we estimate LFMC and DFMC across the 21st century, considering the meteorological conditions derived from medium- and high-greenhouse gas emission scenarios (Representative Concentration Pathway scenarios 4.5 and 8.5) by selecting a representative subset of global and regional climate model combinations. A stable atmospheric CO_2 concentration was also considered to assess possible CO_2 mitigation effects. We applied semi-mechanistic models to infer moisture content dynamics across 36 study sites located in peninsular Spain, which corresponds to the monospecific stands of twelve tree species. Overall, our results indicate that both live and dead fuels' moisture content dynamics will experience generalized declining trends in the coming decades. Furthermore, increases in the number of days per year when these fuels' moisture content falls below wildfire occurrence thresholds will extend the lengths of fire seasons. Moreover, we observe a significant CO_2 mitigation effect, although it is not enough to offset the declining trends in LFMC induced by climate change. Finally, the results suggest that, in ecosystems where plant biomass is abundant enough to sustain a fire, the moisture content of live fuels will be the main limiting factor for the occurrence of future large wildfires.

Keywords: climate change; wildfire; modelling; moisture content; fire season; phyrophysiology

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