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The influence of thinning and prescribed burning on future forest fires under different climate scenarios

Florence Gérard[1], Sam Rabin[2], and Almut Arneth[2]
[1]Karlsruhe Institute of Technology, Karlsruhe, Germany
[2]Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research / Atmospheric Environmental Research, Garmisch-Partenkirchen, Germany (sam.rabin@kit.edu)

Forest fires in some regions have intensified over recent decades due to climate change. This trend threatens ecosystems (habitat and biodiversity loss), human health (particulate-matter pollution, smoke), property (burned urban areas, burned forestry yields, monetary loss), and potentially climate mitigation goals (rising carbon dioxide levels, possibly decreased land carbon sink).

Here, we investigate whether forest management can reduce future impacts of forest fire and help to control fire regimes in the future. We are using the process-based dynamic global vegetation model LPJ-GUESS with the fire module SIMFIRE-BLAZE to explore this question. The analyzed treatments compare a non-managed stand with stands receiving thinning, prescribed burning, or both. We focus on two regions: The Iberian Peninsula (due to its long history of burning) and Eastern Europe (which may become more fire-prone in the future). Results are compared between CMIP6 scenarios of low-intensity vs. high-intensity climate change (RCPs 2.6 and 8.5, respectively).

The results show that prescribed fire raises the amount of burned area but possibly not the property risk because fire line intensities are mitigated; thinning can reduce the amount of prescribed fire required. Thinning reduces fire emissions whereas prescribed burning is the other way around, which could contribute to health and climate risks caused by particulate-matter-pollution. Managements do not seem to have effects on the carbon balance according to end of the century carbon pools, which implies that they do not actively help achieve climate mitigation goals.