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Assessing potential changes in fire weather in Europe

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Weather conditions play an important role on the different phases of wildfire activity since fire ignition (lightning), development (wind, air temperature and relative humidity) and extinction (precipitation). In addition, the spatial and temporal variability of temperature and precipitation have a very strong influence on fuel availability and flammability at multiple time and spatial scales, with an impact that may greatly vary by ecosystem and wildfire regime. One common procedure to account for the role of the weather conditions on fire risk is through the use of meteorological fire indices. On this respect, those included in the Canadian Forest Fire Weather Index System (CFFWIS), in particular the Fire Weather Index (FWI) and the Daily Severity Rating (DSR) that, respectively rate fire intensity and the difficulty of controlling fires, are commonly used in Europe. These fire indices are based on consecutive daily observations of temperature, relative humidity, wind speed, and 24-hour rainfall and the main objective of this study is to assess future changes in the statistical distribution of these meteorological variables and fire indices in Europe. Observed data from European Climate Assessment and simulated data by COSMO-CLM model for the actual (C20) and future (A1B and B1) climate scenarios were used in this study to identify changes in the mean and the variance, from present to future climate conditions. Special attention was devoted to regions most affected by wildfires in Europe, identified with the European Forest Fire Information System (EFFIS) satellite wildfire database. When comparing present climate with future climate scenario B1 (A1B), results points to statistical significant increase in the means of the temperature ranging from 2ºC (4ºC) in July and August, for the period 2021-2060 and 5ºC (7ºC) for the period 2061-2100. In the spring, especially in June, the increase is similar. On the contrary, the mean relative humidity decreases up to 15% in some places, in summer months. The precipitation values decreases in almost places of Mediterranean countries, with special emphasis in spring months. The changes are greater in the late period of the 21st century and will induce a significant increase in fire risk in summer and late spring, larger in the Iberian Peninsula and southern France. The fire season will be more severe and longer in these countries, especially in the A1B scenery, and there is possible that new regions of Europe will be affected by wildfires.

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