

Abstract

Fire severity and drought conditions are increasing in West-Central Spain

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Abstract: Despite regional warming, fire activity is decreasing in the Mediterranean region, blurring the well-established relationship between climate and wildfires. Here, we analyzed this relationship by focusing on the fire severity component of the fire regime. We determined the temporal trends of several climate, fire activity, and fire severity variables and the relationship of the latter two to the first in West-Central Spain (30 000 km²) for a 33-yr period (1985 to 2017). Annually fire variables at summer season were fires number, burned area, fire size and fire severity (calculated using the relativized burn ratio [RBR] from Landsat satellite images). Fire severity was estimated for the whole area and for each of the main land use/land cover (LULC) types. Finally, the climate variables were maximum temperature, precipitation, and water deficit for all seasons (winter, spring, summer, and fall). Trends in those variables were assessed using the Mann-Kendal test, and the relationship between climate and fire variables was ascertained using autoregressive moving average (ARMAX) models. Main results indicated that number of fires and burned areas decreased, whereas drought conditions increased. Wildfires tended to burn preferentially in treeless areas, with conifer forests burning less frequently, and shrublands burning more so. Median RBR increased, as well as low (P_5) and high (P_{90}) percentiles. The percentage of burned areas at low severity decreased. All LULC types tended to burn at higher fire severities over time. The decreasing fire activity, but with increasing fire severity, coincides with rising maximum temperatures and drought (lower precipitation and higher water deficit). The temporal dynamics of fire activity and severity were well explained and predicted by spring and summer climate variables. Thus, while fire activity decreased, fire severity increased, driven by a more severe climate that was consistent with regional warming.

Keywords: fire severity; climate change; RBR; landsat; Google Earth engine; trend analysis; ARMAX