



Abstract

# Fire Severity and Drought Conditions Are Increasing in West-Central Spain †

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† Presented at the 3rd International Electronic Conference on Forests—Exploring New Discoveries and New Directions in Forests, 15–31 October 2022; Available online: <https://iecf2022.sciforum.net>.

**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 km<sup>2</sup>) for a 33 year period (1985 to 2017). Annually, fire variables at summer season were number of fires, 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<sub>5</sub>) and high (P<sub>90</sub>) 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



**Citation:** Quintero, N.; Viedma, O.; Moreno, J.M. Fire Severity and Drought Conditions Are Increasing in West-Central Spain. *Environ. Sci. Proc.* **2022**, *22*, 65. <https://doi.org/10.3390/IECF2022-13115>

Academic Editor: Rodolfo Picchio

Published: 27 October 2022

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**Supplementary Materials:** The following are available online at <https://www.mdpi.com/article/10.3390/IECF2022-13115/s1>.

**Author Contributions:** Conceptualization, N.Q., O.V. and J.M.M.; methodology, N.Q. and O.V.; formal analysis, N.Q., O.V. and J.M.M.; investigation, N.Q. and O.V.; writing—original draft preparation, N.Q. and O.V.; writing—review and editing, N.Q., O.V. and J.M.M.; supervision, J.M.M. and O.V.; funding acquisition, O.V. and J.M.M. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research is part of the project INFORICAM (PID2020-119402RB-I00), funded by the Spanish MCIN/AEI/10.13039/501100011033 and by the “European Union NextGenerationEU/PRTR”.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Not applicable.

**Conflicts of Interest:** The authors declare no conflict of interest.