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Abstract

Anticipating Future Extreme Wildfires by Predicting the Probability of Ignition and Escape of Initial Attack in Catalunya †

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In recent years, the EU has implemented several firefighting-related policies to battle and reduce the negative impacts of wildfires. However, the changing environment constantly surprises us with extreme events that cause massive losses for the entire Europe, with the Mediterranean region increasing its vulnerability to these risks. Recently, the wildfire season for the region was observed to have lengthened, and along with the rapid change in fire-weather factors, resulted to extreme wildfire events. As of 2022, total burned area for the EU is recorded to be approx. 792,902 (66% forest) (EFFIS Damage Assessment, 2022). It has long been recognized that the Mediterranean cultural landscape is fire-prone, hence decision-makers see to it that responses and solutions are devoted at mitigating and reducing fire risk. With the advocacy of a paradigm shift to coexist with fire, anticipation of fire incidents is the best approach partnered with comprehensive management. Various studies on wildfires provide geospatial insights and models to foresee fire occurrence, burning extent, success in initial attack, ignition probability, etc.

This study aims to recognize and understand wildfire activity by forecasting the occurrence of extreme wildfire events in the near future. The approach is based on coupling ignition and escape models to climate (C3S) and landcover-change (SEDAC) projections to outline the spatial distribution of wildfires up to 2100. We calibrated a series of binary regression models upon historical records of wildfire ignition in Catalonia (Northeast of Spain) using machine-learning techniques under different land cover change and climate scenarios. Disaster risk reduction will be improved through this prediction by identifying wildfire management zones and prioritization of areas.

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Data Availability Statement: Fire records data can be freely downloaded from the website of the Ministry for Ecological Transition and the Demographic Challenge (https://www.miteco.gob.es/es/biodiversidad/servicios/banco-datos-naturaleza/informacion-disponible/ifn3_bbdd_descargas.htm.aspx). Landcover change (human population dynamics) data can also be freely downloaded from the website of Socioeconomic Data and Applications Center (SEDAC) (https://sedac.ciesin.columbia.edu/data/sets/browse?facets=theme:population). Climate prediction data were based on the EU-CORDEX project (available at Earth System Grid Federation; http://esgf.llnl.gov/). The original weather data is available at the Spanish Meteorological Agency upon request.

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