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Fire weather risk analysis over Portugal in the last decades and their impacts over the atmosphere - The Monchique study case

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More intense fire seasons have been favoured by climate changes worldwide, like Russia, Brazil, the USA, Canada and Portugal. Portugal experienced numerous severe fire seasons with catastrophic wildfires that caused enormous impacts in the last years. This study aimed to investigate the fire risk evolution in Portugal over the last 40 years and the extreme wildfire emission impacts derived from remote sensing data. First, the Fire Weather Index (FWI) from 1979 to 2020, at 0.25º spatial resolution, provided by the European Centre for Medium-Range Weather Forecasts (ECMWF) ERA5 reanalysis version 4 based on meteorological variables, was used. Then, FWI monthly mean values and trends were analysed for four districts of Southern Portugal (Beja, Evora, Faro and Portalegre). The results indicate that the Faro district presented extreme fire risk values, which peaked on August 2, 2018, one day before the Monchique (a mountain in Faro) wildfire began and lasted between August 3 and 10. The Monchique wildfire was the most destructive in Portugal during 2018, with almost 27.000 ha burned. Second, based on the previous results, atmospheric products derived from the TROPOspheric Monitoring Instrument (TROPOMI) aboard the Sentinel-5 Precursor satellite, the first Copernicus mission dedicated to atmospheric composition monitoring, were collected. These datasets were obtained from Google Earth Engine (GEE), the online platform that combines multiple imageries and datasets with cloud processing to perform analyses. The Carbon monoxide (CO) and Nitrogen dioxide (NO2) concentrations, as well as Absorbing Aerosol Index (AAI) products were analysed during the fire event. The concentrations released by the wildfire reached values 3 and 5 times higher than usual for CO and NO2, respectively. Therefore, the work confirms that extreme wildfire events can release huge pollutant concentrations into the atmosphere. Also, the Sentinel-5 products are useful to evaluate the fire emission evolution in extreme wildfires events and may constitute additional valuable information to combine with ground-based information to map air quality related to wildfire occurrences.

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