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# Investigating Over Critical Thresholds of Forest Megafires Danger Conditions in Europe Utilising the ECMWF ERA-Interim Reanalysis

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The European Forest Fire Information System (EFFIS) has been established by the Joint Research Centre (JRC) and the Directorate General for Environment (DG ENV) of the European Commission (EC) to support the services in charge of the protection of forests against fires in the EU and neighbour countries, and also to provide the EC services and the European Parliament with information on forest fires in Europe. Within its applications, EFFIS provides current and forecast meteorological fire danger maps up to 6 days. Weather plays a key role in affecting wildfire occurrence and behaviour. Meteorological parameters can be used to derive meteorological fire weather indices that provide estimations of fire danger level at a given time over a specified area of interest. In this work, we investigate the suitability of critical thresholds of fire danger to provide an early warning for megafires (fires > 500 ha) over Europe. Past trends of fire danger are analysed computing daily fire danger from weather data taken from re-analysis fields for a period of 31 years (1980 to 2010). Re-analysis global data sets coming from the construction of high-quality climate records, which combine past observations collected from many different observing and measuring platforms, are capable of describing how Fire Danger Indices have evolved over time at a global scale. The latest and most updated ERA-Interim dataset of the European Centre for Medium-Range Weather Forecast (ECMWF) was used to extract meteorological variables needed to compute daily values of the Canadian Fire Weather Index (CFWI) over Europe, with a horizontal resolution of about 75x75 km. Daily time series of CFWI were constructed and analysed over a total of 1,071 European NUTS3 centroids, resulting in a set of percentiles and critical thresholds. Such percentiles could be used as thresholds to help fire services establish a measure of the significance of CFWI outputs as they relate to levels of fire potential, fuel conditions and fire danger. Median percentile values of fire days accumulated over the 31-year period were compared to median values of all days from that period. As expected, the CWFI time series exhibit different values on fire days than on all days. In addition, a percentile analysis was performed in order to determine the behaviour of index values corresponding to fire events falling into the megafire category. This analysis resulted in a set of critical thresholds based on percentiles. By utilising such thresholds, an initial framework of an early warning system has being established. By lowering the value of any of these thresholds, the number of hits could be increased until all extremes were captured (resulting in zero misses). However, in doing so, the number of false alarms tends to increase significantly. Consequently, an optimal trade-off between hits and false alarms has to be established when setting different (critical) CFWI thresholds.