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Regionalising Iberia fire regimes and links with large-scale meteorological variability

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Wildfires constitute a major hazard in the Iberian Peninsula, being responsible for very significant amounts of burned area every year. In this work we analyzed records of fire occurrences in Portugal and Spain for the 1980-2005 period (a total of 66 sub-regions), in order to organize a comprehensive Iberia database. A k-means cluster analysis was then performed in order to distinguish fairly independent domains in terms of burned area time series inside the Iberian Peninsula. Best results are obtained using either 4 or 5 clusters, with spatial patterns and seasonal regimes compatible with land cover, topography and climate conditions. Despite the choice of the number of clusters results in different groups, in general the analysis tends to aggregate provinces in terms of fire regime as follows: northwestern, southwestern, central and Mediterranean areas, with the northern Provinces (Asturias, Cantabria and Basque Country) forming an additional region if we opt for 5 clusters.

It has been shown that summer burned areas in western Iberia result mainly from two distinct forcing factors, namely: 1) appropriate previous climatic conditions, i.e. a rainy winter and dry and hot spring and 2) favorable circulation patterns in summer that induce heat-wave conditions (Pereira et al., 2005). Here we evaluate the contribution of meteorological variables obtained from the high resolution CRU dataset (monthly mean temperature, monthly precipitation). Additionally we assess the role of large-scale circulation patterns, such as the NAO, SCAND, EA, EA\WR, POL, and also large-scale SST anomalies (from the ERSST.v3 database), towards summer fires regime for the individual clusters identified previously.

We particularly focused on the cluster that includes northwestern areas of Portugal and Spain for a more in depth assessment on these links. For this purpose, we compared burned areas in the months of July and August with anomalies of the previously referred variables for each month since the beginning of the corresponding year. We found some expectable correlations with late summer spring and summer temperature and precipitation series (above 0.35 and below -0.35 respectively). Moreover we have also obtained some less obvious correlations with early winter variables, particularly with SST anomalies relative to various sectors of the Atlantic (above 0.25). We also verified that there is an important number of statistically significant correlation values between summer fire regime and the considered meteorological variables from previous months (January-June). This fact raises good prospects of using these variables as predictors for statistical forecast models for the July-August burned area, with up to 2 months in advance using a similar methodology used by the authors in a recent work concerning drought episodes (Sousa et al., 2011).

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