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Analysis of fire causes spatial and temporal distribution in France

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The goal of the paper was to create a statistical model explaining spatial and temporal occurrences of forest fires depending on their causes.
In the forest fire causes databases, fire ignitions were located according to the third level of the 2003 Nomenclature of Territorial Units for Statistics (NUTS 3). 15,469 records were considered on the 2005 – 2008 period on the French territory. Global fire ignition density as well as fire ignition cause densities related to lightning, negligence and arson were considered.
Descriptive variables (land cover, topography and climate) were used to divide the whole country into homogeneous regions. According to a clustering based on multidimensional projection (Sammon's projection), NUTS 3 presenting the nearest characteristics in terms of land cover, topography or climate conditions were merged into regions. The analysis of these variables led to 3 regions: the northwest France, the eastern central France and the Mediterranean region.
In this paper, Partial Least Square regression was performed on each region to identify the main explanatory spatial variables and to model the fire density due to the different causes. 32 explanatory variables relative to human and biophysical variables were used in these analyses.
Results of the statistical analyses performed on the spatial distribution of fire density due to the different types of cause in the different French regions showed that: (i) Fire density due to natural cause was mainly favoured by land-cover variables (such as the proportion of overall vegetation, the proportion of shrubland, the surface area of farms) and was mainly mitigated by some agricultural variables (such as proportion of non-irrigated crops or pasture, farm density) ; (ii) Fire density due to negligence was mainly favoured by network and socio-economic variables and was mainly mitigated by land-cover and climate variables depending on the region ; (iii) Fire density due to arson was mainly favoured by network, topographic and socio-economic variables and was mainly mitigated by climate variables depending on the region.
Causes due to negligence or arson were maybe too global and to get better results, more detailed causes may be used. Moreover, in most works, the statistical analyses were carried out on georeferenced fire ignition points allowing the use of more accurate explanatory variables such as the distance to the road, distance to the forest, etc.