



Multivariate cluster analysis of forest fire events in Portugal

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Portugal is one of the major fire-prone European countries, mainly due to its favourable climatic, topographic and vegetation conditions. Compared to the other Mediterranean countries, the number of events registered here from 1980 up to nowadays is the highest one; likewise, with respect to the burnt area, Portugal is the third most affected country.

Portuguese mapped burnt areas are available from the website of the Institute for the Conservation of Nature and Forests (ICNF). This official geodatabase is the result of satellite measurements starting from the year 1990. The spatial information, delivered in shapefile format, provides a detailed description of the shape and the size of area burnt by each fire, while the date/time information relate to the ignition fire is restricted to the year of occurrence.

In terms of a statistical formalism wildfires can be associated to a stochastic point process, where events are analysed as a set of geographical coordinates corresponding, for example, to the centroid of each burnt area. The spatio/temporal pattern of stochastic point processes, including the cluster analysis, is a basic procedure to discover predisposing factors as well as for prevention and forecasting purposes. These kinds of studies are primarily focused on investigating the spatial cluster behaviour of environmental data sequences and/or mapping their distribution at different times. To include both the two dimensions (space and time) a comprehensive spatio-temporal analysis is needful.

In the present study authors attempt to verify if, in the case of wildfires in Portugal, space and time act independently or if, conversely, neighbouring events are also closer in time. We present an application of the spatio-temporal K-function to a long dataset (1990-2012) of mapped burnt areas. Moreover, the multivariate K-function allowed checking for an eventual different distribution between small and large fires. The final objective is to elaborate a 3D-Kernel density map to visualise and highlight spatio-temporal local aggregations performed by the investigated events.

References

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