Geophysical Research Abstracts
Vol. 17, EGU2015-14885, 2015
EGU General Assembly 2015

Influence of the input database in detecting fire space-time clusters

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Fire incidence variability is influenced by local environmental variables such as topography, land use, vegetation and weather conditions. These induce a cluster pattern of the fire events distribution. The space-time permutation scan statistics (STPSS) method developed by Kulldorff et al. (2005) and implemented in the SaTScanTM software (http://www.satscan.org/) proves to be able to detect space-time clusters in many different fields, even when using incomplete and/or inaccurate input data. Nevertheless, the dependence of the STPSS method on the different characteristics of different datasets describing the same environmental phenomenon has not been studied yet. In this sense, the objective of this study is to assess the robustness of the STPSS for detecting real clusters using different input datasets and to justify the obtained results. This study takes advantage of the existence of two very different official fire datasets currently available for Portugal, both provided by the Institute for the Conservation of Nature and Forests. The first one is the aggregated Portuguese Rural Fire Database PRFD (Pereira et al., 2011), which is based on ground measurements and provides detailed information about the ignition and extinction date/time and the area burnt by each fire in forest, scrubs and agricultural areas. However, in the PRFD, the fire location of each fire is indicated by the name of smallest administrative unit (the parish) where the ignition occurred. Consequently, since the application of the STPSS requires the geographic coordinates of the events, the centroid of the parishes was considered. The second fire dataset is the national mapping burnt areas (NMBA), which is based on satellite measurements and delivered in shape file format. The NMBA provides a detailed spatial information (shape and size of each fire) but the temporal information is restricted to the year of occurrence. Besides these differences, the two datasets cover different periods, they comprises a quite different number of fire records and lower fire size threshold. Therefore, it was necessary to restrict both databases to a common period and fire size range. In addition, the weather conditions during the temporal dimension of the most important detected clusters were investigated since they are often very well correlated with the fire incidence. Composite analysis was used to identify and characterize the synoptic patterns of large scale climatic and dynamical meteorological fields at different levels of the atmosphere.

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This work was supported by national funds by FCT - Portuguese Foundation for Science and Technology, under the project PEst-OE/AGR/UI4033/2014 and by the project SUSTAINSYS: Environmental Sustainable Agro-Forestry Systems (NORTE-07-0124-FEDER-000044), financed by the North Portugal Regional Operational Programme (ON.2 – O Novo Norte), under the National Strategic Reference Framework (QREN), through the European Regional Development Fund (FEDER), as well as by National Funds (PIDDAC) through the Portuguese Foundation for Science and Technology (FCT/MEC).