Geophysical Research Abstracts
Vol. 15, EGU2013-13316, 2013
EGU General Assembly 2013

Vegetation stress and summer fire activity in Portugal

DaCamara Carlos and Nunes Sílvia
Fundacao da Faculdade de Ciencias da Universidade de Lisboa, Lisboa, Portugal (cdcamara@fc.ul.pt)

Fire activity in Mediterranean Europe is closely related to the climatological background where the occurrence of rainy and mild winters, followed by warm and dry summers, may induce high levels of vegetation stress over the different regions making them prone to the occurrence of fire events.

The aim of the present study is to investigate whether years of very high or very low levels of fire activity over forests in Portugal are linked to contrasting vegetation cycles associated to high and low degrees of vegetation stress during the summer season. The present study relies on time series of yearly amounts of burned areas provided by Instituto de Conservação da Natureza e das Florestas (ICNF), the national authority for forests as well as on monthly values of NDVI and of brightness temperature as obtained from the Mediterranean Extended Daily One Km AVHRR Data Set (MEDOKADS) product provided by the Free University of Berlin. Both datasets cover the 16-year period from 1990 to 2005.

The area of forest is first identified by means of a k-means cluster analysis that is performed on climatological yearly means of NDVI and brightness temperature. Monthly means of NDVI and of brightness temperature are then evaluated over the area of forest and composites are made for severe and mild years of fire activity defined as those with yearly burned areas respectively above the third quartile and below the first quartile.

The composite of severe years presents a brightness temperature cycle with values above average during spring and summer together with values of NDVI below average during summer, the behavior of both parameters providing an indication of vegetation stress. In contrast, the composite of mild years of fire activity presents an NDVI cycle with values well below average during spring, an indication of lack of biomass, and a brightness temperature cycle with values below average during spring and summer, an indication that vegetation is not under stress.

Results from composite analysis are then used to formulate a Sugeno model based on the following fuzzy rules applied to spring (April-June) mean values of NDVI and to summer (July-August) mean values of brightness temperature: i) if spring NDVI is average and summer temperature is high, then the year is of high fire activity; ii) if spring NDVI is average and summer temperature is average, then the year is of average fire activity; iii) if spring NDVI is low and summer temperature is average, then the year is of low fire activity. The Sugeno model correctly identifies the level of fire activity of 14 out of the 16 years considered (4 high, 6 average, 4 low); of the remaining two average years one is incorrectly classified as of high fire activity and the other is incorrectly classified as of low fire activity. Results obtained suggest using this type of models to anticipate levels of fire activity at the beginning of the summer season, an information that is of use for forest and civil protection services.