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Could the fire season of 2003 in Continental Portugal be anticipated?

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Europe was exceptionally warm and dry from May to the end of August 2003 (Black et al. 2004). In particular, the summer of 2003 was characterized by persistent anticyclonic conditions leading to strong heatwaves (Burt et al. 2004, Fink et al., 2004). The average summer temperature in Europe has exceeded, very likely, the average temperature of any previous summer over the last 500 years (Luterbacher et al., 2004). In fact, it has even been suggested that the monthly/seasonal values for summer 2003 for countries such as Switzerland could bear a closer resemblance with climate change scenarios projections for late XXI century (Schär et al., 2004; Beniston, 2004). From an environmental and health perspective, it was the relatively short-lived heatwave that occurred during the first fortnight of August 2003 that had a major impact in Europe. This intense heatwave was directly responsible for a steep increase of mortality rates throughout Western Europe, and with catastrophic amplitude in France (Trigo et al., 2005a). In Portugal, an estimate of the excess mortality for the 1^{st} fortnight of August 2003 was about 2000 people, mostly above 75 years old. As a consequence, an extraordinary value of total summer burnt area value was registered in 2003 in Portugal. It should be stressed that Portugal and the north-western provinces of Spain presented the largest number of fires in Europe (nearly 50%). These fires were directly responsible, among other consequences, for the loss of 21 lives. The huge amount of burnt area (BA) observed in the summer 2003 inspired the effort of investigating the possibility of foresee it.

The meteorological data used in this work consist of daily values of SLP, from

NCEP/NCAR Reanalysis project (defined over a grid of 2.5º×2.5º, covering the area 30º-50˚N and 30˚W-10˚E) as well as of daily values of geostrophic wind and atmospheric circulation indices as obtained from weather typing analysis, for the 1980-2003 period. The wildfire data consist of fire occurrences and burnt areas for each district of Continental Portugal, in the concurrent period, provided by the Portuguese Forest Service, DGF.

In a companion work, (Trigo et al., 2005b), this exceptional fire season of summer 2003 in Portugal is appraised with the space-time evolution of a particular 2003 summer heatwave with both local and synoptic-scale meteorological data. In a previous work (Pereira et al., 2005, hereafter P05) we have shown that the extent of BA in Portugal is mostly conditioned by two meteorological phenomena, namely the existence of long dry periods with absence of precipitation in late spring and early summer (climate anomaly) and the occurrence of very intense dry spells in days of extreme synoptic situations (weather anomaly). However, the circulation patterns and weather conditions at surface and at higher levels during the summer 2003 heat wave, identified in Trigo et al. (2005b), present noteworthy differences in relation to the extreme synoptic situations associated with the occurrence of large wildfires, identified in P05.

Therefore, our methodology is based on two different approaches. First, we intent to model the interannual burnt area variability exploring the relevance of the meteorological parameters on the high variability of annual burnt area in Portugal for the 1980-2003 period. Following P05, monthly and seasonal precipitation averages, mean, maximum and minimum temperature as well as principal components of the most relevant meteorological fields are tested and used as predictors of total summer burnt area models. Secondly, a parametric model was developed to appropriately characterize the observed fire size distribution during the period 1980-2002 and then applied to the summer season of 2003. Since the parametric models revealed in the past to be especially useful to assess the effect of meteorological conditions on fire spread some of these variables will be used as predictors to estimate the fire risk, for example, analyzing the dependence of the probability of occurrence of wildfires on independent meteorological parameters.

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