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Modelling fire risk in Continental Portugal

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Wildfires are a major concern in Europe, especially in Mediterranean countries, where warm and dry summers may lead to high levels of vegetation stress (Chuvieco et al., 1997). During summer months, the Mediterranean countries suffer frequent large-scale fire episodes with dramatic consequences for the ecosystems and population. In the specific case of Continental Portugal time series of burnt area show a positive trend since the early 80's together with a large inter-annual variability. Whereas the observed increase in burnt area is partially attributable to changes in farming and land use, inter-annual variability is partly due to the temperature and precipitation conditions in the preceding late spring season and partly to the occurrence of atmospheric circulation patterns of short-duration that induce extremely hot and dry spells over western Iberia. Choice of relevant meteorological variables is based on the search of statistically significant relationships between records of maximum temperature and precipitation with fire events over a 26-year period (1980-2005). Heat and water stress of vegetation involves the development of models that relate the amount of burnt area during the fire season with averages of temperature and precipitation over the preceding late spring. For instance, about 50% of observed inter-annual variability of the logarithm of cumulated burnt area in July and August over Continental Portugal is explained by the average maximum temperature and the cumulated precipitation in the previous months of May and June. On the other hand, a large amount (circa 80%) of the burnt area is due to fire events that occurred on a very small number (circa 10%) of summer days (Pereira et al., 2005). Large forest fires in Continental Portugal occur

when the atmospheric circulation forms a prominent ridge over the Iberian Peninsula with surface wind and sea level pressure anomalies associated with south-easterly conditions that favour strong anomalous warm advection from northern Africa, the air being further heated when crossing the central Iberian plateau. Accordingly, about 40% of observed inter-annual variability of the logarithm of cumulated burnt area in July and August over Continental Portugal is explained by the number of days with maximum temperature above 32žC. We will present a set of models aiming to explore the relative importance of meteorological predictors related to 1) the background conditions associated to the heat and water stress of vegetation at the onset of the fire season, and 2) extreme conditions associated to hot and dry events that occur during the fire season. The quality of developed models is discussed and an assessment is made on their potential usage for fire risk assessment.

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