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A statistical procedure for fire risk mapping in Italy

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The high topographic and vegetation heterogeneity makes Italy vulnerable to forest fires both in the summer and in winter. In particular, northern regions are predominantly characterized by a winter fire regime, mainly due to frequent extremely dry winds from the north, while southern and central regions and the large islands are characterized
by a severe summer fire regime, because of the higher temperatures and prolonged lack of precipitation.
The threat of wildfires in Italy is not confined to wooded areas as they extend to agricultural areas and urban-forest interface areas.
In view of the limited availability of fire risk management resources, most of which are used in the management of national and regional air services, it is necessary to precisely identify the areas most vulnerable to fire risk. The few resources available can thus be used on a yearly basis to mitigate problems in the areas at highest risk by defining a program of forest management interventions, which is expected to make a significant contribution to the problem in a few years' time.
Given the availability of fire perimeters mapped over a period spanning from 5 to 10 years, depending
by the region, a statistical procedure was defined in order to assess areas at risk based
on objective criteria by observing past fire events.
The availability of fire perimeters combined with a detailed knowledge of topography and land cover allowed to understand which are the main features involved in forest fire occurrences and their behavior. The seasonality of the fire regime was also considered, partitioning the analysis in two macro season (November-April and May-October). In addition, the total precipitation obtained from the interpolation of 30 years-long time series from 460 raingauges and the average air temperature obtained downscaling 30 years ERA-INTERIM data series were considered.
The analysis consists on the subdivision of the territory in classes based on the named information layers (elevation, slope,
rainfall height, temperature, etc.) with a recursive algorithm that ensures the equal numerosity of each class.
The number of fires occurred in each class is then assessed basing on time series in the last decade, in order to have an estimation of the fire hazard with a contant statistical confidence.
The analysis was carried out at a spatial resolution of 500 m on the whole Italian territory by using a dataset of fires
occurrences that spans from 2007 to 2013.