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Extreme Wildfire Spread and Behaviour: Case Studies from North Sardinia, Italy

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Worldwide, fire seasons are usually characterized by the occurrence of one or more days with extreme environmental conditions, such as heat waves associated with strong winds. On these days, fires can quickly get out of hand originating large and severe wildfires. In these cases, containment and extinguishment phases are critical, considering that the imperative goal is to keep fire crews, people and animals safe.
In this work we will present a set of large and severe wildfires occurred with extreme environmental conditions in the northern area of Sardinia. The most recent wildfire we will describe was ignited on July 13, 2011 in the Oschiri municipality (40°43' N; 9°06' E), and burned about 2,500 ha of wooded and herbaceous pastures and oakwoods in few hours. The second wildfire we will present was ignited on July 23, 2009 in the Bonorva municipality (40°25' N; 8° 46' E), and was responsible for the death of two people and several damages to houses, animals and farms. This wildfire lasted on July 25, and burned about 10,000 ha of wooded and herbaceous pastures; the most of the area was burned during the first day. The last wildfire we will describe was ignited on July 23, 2007 in the Oniferi municipality (40°16' N; 9° 16' E) and burned about 9,000 ha of wooded and herbaceous pastures and oakwoods; about 8,000 ha were burned after 11 hours of propagation.
All these wildfires were ignited in days characterized by very hot temperatures associated to the effect of air masses moving from inland North Africa to the Mediterranean Basin, and strong winds from west-south west. This is one of the typical weather pattern associated with large and severe wildfires in North Sardinia, and is well documented in the last years.
Weather conditions, fuels and topography factors related to each case study will be accurately analyzed. Moreover, a detailed overview of observed fire spread and behavior and post-fire vegetation recovery will be presented. The fire spread and behavior data collected during the events will be also compared with the results obtained with FARSITE (Finney, 1994) and FLAMMAP (Finney, 2003) models.
The main goal of this paper is to thoroughly describe the fire behavior of relevant and recent case studies, in order to learn from it and lessen the chance of making potential mistakes or hazardous firefighting operations in the same environmental conditions. Furthermore, a crucial point is to teach and prepare people and fire crews not to be surprised by severe or abrupt fire behavior under extreme environmental conditions. For these reasons, the combination of analysis, knowledge and awareness of historical case studies, field experience and computer modeling represent a key learning technique.