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Supporting FIRE-suppression strategies combining fire spread MODelling and SATellite data in an operational context in Portugal: the FIRE-MODSAT project

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Large wildfires are infrequent but account for the most severe environmental, ecological and socio-economic impacts. In recent years Portugal has suffered the impact of major heat waves that fuelled records of burnt area exceeding 400.000ha and 300.000ha in 2003 and 2005, respectively. According to the latest IPCC reports, the frequency and amplitude of summer heat waves over Iberia will very likely increase in the future. Therefore, most climate change studies point to an increase in the number and extent of wildfires. Thus, an increase in both wildfire impacts and fire suppression difficulties is expected. The spread of large wildfires results from a complex interaction between topography, meteorology and fuel properties. Wildfire spread models (e.g. FARSITE) are commonly used to simulate fire growth and behaviour and are an essential tool to understand their main drivers. Additionally, satellite active-fire data have been used to monitor the occurrence, extent, and spread of wildfires. Both satellite data and fire spread models provide different types of information about the spatial and temporal distribution of large wildfires and can potentially be used to support strategic decisions regarding fire suppression resource allocation. However, they have not been combined in a manner that fully exploits their potential and minimizes their limitations. A knowledge gap still exists in understanding how to minimize the impacts of large wildfires, leading to the following research question: What can we learn from past large wildfires in order to mitigate future fire impacts?
FIRE-MODSAT is a one-year funded project by the Portuguese Foundation for the Science and Technology (FCT) that is founded on this research question, with the main goal of improving our understanding on the interactions between fire spread and its environmental drivers, to support fire management decisions in an operational context and generate valuable information to improve the efficiency of the fire suppression system. This project proposes to explore an innovative combination of remote sensing and fire spread models in order to 1) better understand the interactions of fire spread drivers that lead to large wildfires; 2) identify the spatio-temporal frames in which large wildfires can be suppressed more efficiently, and 3) explore the essential steps towards an operational use of both tools to assist fire suppression decisions.
Preliminary results combine MODIS active-fire data and burn scar perimeters, to derive the main fire spread paths for the 10 largest wildfires that occurred in Portugal between 2001 and 2012. Fire growth and behavior simulations of some of those wildfires are assessed using the active fires data. Results are also compared with the major fire paths to understand the main drivers of fire propagation, through their interactions with topography, vegetation and meteorology. These combined results are also used for spatial and temporal identification of opportunity windows for a more efficient suppression intervention for each fire event. The approach shows promising results, providing a valuable reconstruction of the fire events and retrieval of important parameters related to the complex spread patterns of individual fire events.