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New tendencies in wildland fire simulation for understanding fire phenomena: An overview of the WFDS system capabilities in Mediterranean ecosystems

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Wildfire theoretical modeling endeavors predicting fire behavior characteristics, such as the rate of spread, the flames geometry and the energy released by the fire front by applying the physics and the chemistry laws that govern fire phenomena. Its ultimate aim is to help fire managers to improve fire prevention and suppression and hence reducing damage to population and protecting ecosystems.
WFDS is a 3D computational fluid dynamics (CFD) model of a fire-driven flow. It is particularly appropriate for predicting the fire behaviour burning through the wildland-urban interface, since it is able to predict the fire behaviour in the intermix of vegetative and structural fuels that comprise the wildland urban interface. This model is not suitable for operational fire management yet due to computational costs constrains, but given the fact that it is open-source and that it has a detailed description of the fuels and of the combustion and heat transfer mechanisms it is currently a suitable system for research purposes.
In this paper we present the most important characteristics of the WFDS simulation tool in terms of the models implemented, the input information required and the outputs that the simulator gives useful for understanding fire phenomena. We briefly discuss its advantages and opportunities through some simulation exercises of Mediterranean ecosystems.