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Mapping fire probability and severity in a Mediterranean area using different weather and fuel moisture scenarios

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Although in many countries lightning is the main cause of ignition, in the Mediterranean Basin the forest fires are predominantly ignited by arson, or by human negligence. The fire season peaks coincide with extreme weather conditions (mainly strong winds, hot temperatures, low atmospheric water vapour content) and high tourist presence. Many works reported that in the Mediterranean Basin the projected impacts of climate change will cause greater weather variability and extreme weather conditions, with drier and hotter summers and heat waves. At long-term scale, climate changes could affect the fuel load and the dead/live fuel ratio, and therefore could change the vegetation flammability. At short-time scale, the increase of extreme weather events could directly affect fuel water status, and it could increase large fire occurrence. In this context, detecting the areas characterized by both high probability of large fire occurrence and high fire severity could represent an important component of the fire management planning. In this work we compared several fire probability and severity maps (fire occurrence, rate of spread, fireline intensity, flame length) obtained for a study area located in North Sardinia, Italy, using FlamMap simulator (USDA Forest Service, Missoula). FlamMap computes the potential fire behaviour characteristics over a defined landscape for given weather, wind and fuel moisture data. Different weather and fuel moisture scenarios were tested to predict the potential impact of climate changes on fire parameters. The study area, characterized by a mosaic of urban areas, protected areas, and other areas subject to anthropogenic disturbances, is mainly composed by fire-prone Mediterranean maquis. The input themes needed to run FlamMap were input as grid of 10 meters; the wind data, obtained using a computational fluid-dynamic model, were inserted as gridded file, with a resolution of 50 m. The analysis revealed high fire probability and severity in most of the areas, and therefore a high potential danger. The FlamMap outputs and the derived fire probability maps can be used in decision support systems for fire spread and behaviour and for fire danger assessment with actual and future fire regimes.