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An hourly based meteorological fire danger system

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A methodology is presented to assess fire weather conditions on an hourly basis by extending the traditional daily definition of the Canadian Fire Weather Index (FWI) at 12 LST (local standard time). This work is driven by requests from entities involved in forest management and/or fire-fighting, that recognise that the strong sub-daily variability in the conditions favouring the ignition and spread of forest fires should not only be assessed but also quantified. Moreover, the extensive experience in controlling landscape fires in Portugal has put into evidence that often there are secondary peaks in "fire favouring conditions" (e.g., late afternoon wind increase), that should be identified and forecasted.

The procedure consists in computing the FWI using the meteorological conditions of each hour for the components with no memory and a linear combination of the conditions from the two previous days at 12h UTC (or previous and current day if current time is after 12h UTC) for the components that change slower in time. The result is an hourly FWI that presents a smooth transition between days and keeps the hourly FWI at 12h UTC identical to the standard daily FWI.

An analysis is performed of significant fire events in Portugal in 2016 and 2017 based on Weather Research Forecasting Model (WRF) forecasts on a 4-km resolution grid. Results show that some fire events present a strong correlation between released energy retrieved by the Spinning Enhanced Visible and Infrared Imager (SEVIRI) sensor on board Meteosat Second Generation (MSG) satellite and the hourly FWI, suggesting that meteorological conditions alone play a significant role in the behaviour of large fires along time.

According to fire risk managers that had the opportunity to try an earlier version of this hourly FWI (during the 2017 fire season in Portugal), this approach allows tracking the evolution of meteorological fire danger along the highly variable daily cycle.

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