A new calibration for Fire Weather Index in Spain (AEMET)
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Abstract
The Fire Weather Index (FWI) is an index based on meteorology. The system consists of six components and it depends on weather variables taken each day at 12 UTC (or forecasted for 12 UTC): temperature, relative humidity, wind speed and rain during the previous 24 hours. FWI is an accumulative index, that is, subindexes values for a day D are used for the calculation of the final index the following day D+1. The procedures for the calculation for Iberian Peninsula and Balearic Islands were initialized by AEMET in 2008 March, being executed daily without interruption since then. Canarias Islands procedures are being executed since 2013 May. Procedures include analysis for day D and forecasts for day D+1, D+2 and D+3 in a 0.5ºx0.5º horizontal resolution grid cells with data provided by the HIRLAM numerical weather prediction model. FWI values calculated for a determinate localization have no meaning for themselves. It’s necessary to make a correspondence between the danger classes and those FWI values in order to calibrate it. For this, five danger classes split has been calculated only from a climatological point of view. Each class or risk level corresponds with a range of values of FWI between different percentiles. Thus, fire low risk corresponds with FWI values below its percentile 40; moderate risk with FWI values between percentile 40 and 65; high risk between percentile 65 and 85; very high risk between percentile 85 and 95 and extreme fire risk above its percentile 95. In the calculation of the different percentiles, a data period from May 2008 until December 2013 has been used. This period will be updated with most recent values according to the month pass.

Keywords: FWI, fire risk, danger classes, calibration, validation

1. Introduction

The purpose of the Fire Weather Index (FWI) system, based on the Canadian system, is to account for the effects of weather on forest fuels and forest fires. The system consists of six components: three primary subindexes representing fuel moisture and following daily changes in the moisture contents of three classes of forest fuel with different drying rates, two intermediate subindexes representing rate of spread and fuel consumption, and a final index representing fire intensity as energy output rate per unit length of fire front. The three primary subindexes are, according to Van Wagner, C.E., (1987):

- Fine Fuel Moisture Code (FFMC), which represents the moisture content of litter and other cured fine fuels in a forest stand, in a layer of dry weight about 0.25 kg/m².
- Duff Moisture Code (DMC), which represents the moisture content of loosely compacted, decomposing organic matter weighing about 5 kg/m² when dry.
- Drought Code (DC), which represents a deep layer of compact organic matter weighing perhaps 25 kg/m² when dry.

Those three primary subindexes plus wind are combined in pair to produce the two intermediate subindexes, ISI and BUI. Final index, FWI, is formed by a combination of the two intermediate subindexes. According to Van Wagner, C.E., (1987):

- Initial Spread Index (ISI), a combination of wind and the FFMC that represents rate of spread alone without the influence of variable quantities of fuel.
- Buildup Index (BUI), a combination of the DMC and the DC that represents the total fuel available to the spreading fire.