ADVANCES IN
FOREST FIRE
RESEARCH

DOMINGOS XAVIER VIEGAS
EDITOR

2014

Versão integral disponível em digitalis.uc.pt
Global assessment of fire risk: using a global fuel map and climatological data to estimate fire behavior with FCCS

M. Lucrecia Pettinaria\textsuperscript{a}, Emilio Chuvieco\textsuperscript{b}

\textsuperscript{a}Environmental Remote Sensing Research Group, Universidad de Alcalá, Calle Colegios 2, 28801-Alcalá de Henares, Spain. mlucrecia.pettinari@uah.es
\textsuperscript{b}Environmental Remote Sensing Research Group, Universidad de Alcalá, Calle Colegios 2, 28801-Alcalá de Henares, Spain. emilio.chuvieco@uah.es

\textbf{Abstract}

The spatial distribution, structure, and environmental conditions of the fuels are key variables in wildland fire behavior and effects. This study developed environmental scenarios, based on global weather information and topography, in order to calculate surface fire behavior parameters using the Fuel Characteristic Classification System and a global fuel map previously developed.

The results show the geographic variation in monthly mean wind speed and fuel moisture content for the months of January and July and for the period 1981-2010. Also, the worst monthly conditions were evaluated, corresponding to the maximum monthly wind speed and minimum fuel moisture content. From these environmental scenarios, the rate of spread for the global fuels was mapped, obtaining more realistic results than in the past.

\textbf{Keywords}: Fire risk, FCCS, global fuel map, fire behavior, ECMWF

\section{Introduction}

Surface fire behavior is dependent on the available fuels and also on the environmental conditions when the fire occurs. Specifically, fuel moisture, slope and wind speed affect the speed in which fire spreads, and the energy released by it (Rothermel 1983). The different fire behavior systems that are currently widely used, such as BehavePlus (Andrews \textit{et al.} 2008), the National Fire Danger Rating System (Cohen and Deeming 1985), the Canadian Fire behavior prediction (Stocks \textit{et al.} 1989), the Fuel Characteristic Classification System (Ottmar \textit{et al.} 2007), etc., include these environmental conditions in the calculation of the surface fire parameters.

The Fuel Characteristic Classification System (FCCS) (Ottmar \textit{et al.} 2007) was designed to represent the structural and geographic diversity in wildland fuels, and combines the fuel properties into “fuelbeds”, which include the physical and chemical variables used to model fire behavior and fuel consumption, and predict emissions (Riccardi \textit{et al.} 2007). FCCS uses fuel characteristics (e.g. percentage cover, loading, depth) to calculate and report nine fire potentials, organised into three categories: surface fire behavior potential, crown fire potential and available fuel potential (Sandberg \textit{et al.} 2007a). Also, based on input environmental variables, the FCCS predicts surface fire behavior parameters using a reformulation of the Rothermel (1972) fire behavior model (Sandberg \textit{et al.} 2007b).

During previous work developing fuel maps using FCCS (Pettinari \textit{et al.} 2013; Pettinari \textit{et al.} 2014), default environmental parameters were used to estimate fire potentials and surface fire behavior such as rate of spread, flame length, and reaction intensity. The use of a defined set of environmental conditions allowed the comparison of the different fuelbeds based solely on their intrinsic characteristics, but they did not reflect the variations of weather conditions around the world, which influence fire behavior. In this study we focused on improving the fire behavior results by means of applying more realistic environmental conditions to the different regions of the world.