



ADVANCES IN FOREST FIRE RESEARCH 2018

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DOMINGOS XAVIER VIEGAS
ADAI/CEIF, UNIVERSITY OF COIMBRA, PORTUGAL

Temporal variability of the Haines index and its relationship with forest fire in Portugal

Lourdes Bugalho

Instituto Português do Mar e da Atmosfera, Rua C do Aeroporto, Lisboa, ORCID 0000-0001-7034-0623, {lourdes.bugalho@ipma.pt}

Abstract

The above-ground atmospheric conditions, such as atmospheric stability and moisture content, play a critical role in fire behaviour, especially for larger fire. The Haines Index and Continuous Haines Index are widely used as a measure of above ground conditions relevant to wild land fire, especially in Australia. This work presents the temporal variability of the Haines index and the continuous Haines index, and its relationship with the large forest fires in Portugal in the period from 2011 to 2017.

Keywords: Forest Fire Risk, Haines Index, Continuous Haines Index

1. Introduction

Forest fires are one of the most important natural hazards affecting Portugal, especially during summer time, with enormous economic and social impact. They are also indirectly responsible for fast changes on the land cover. Wildfires typically occur during periods of increased temperature and drought.

Among the fire risks that are dependent on meteorological parameters, the most usual and known one is the FWI (Canadian Fire Weather Index), used in several countries since the mid-1990s. However, the above-ground atmospheric conditions, such as atmospheric stability, also play a critical role in fire behaviour, especially for larger fires. In 1988 Haines (Haines, DA 1988) developed the Lower Atmosphere Stability Index, or Haines Index (HI). It is used to indicate the potential for wildfire growth, given ignition has occurred. It measures the stability and dryness of the air over the fire. The HI is widely used as a measure of above ground conditions relevant to wild land fire (Potter, BE et al, 2003, Potter, BE et al, 2008, Taitl, H. et al, 2014) and it is derived from the stability (temperature difference between different levels of the atmosphere) and moisture content (dew point depression) of the lower atmosphere. The Continuous Haines Index (CHI) was developed in Australia (Mills, GA et al, 2010), since climatology conditions in Australia were considerably different compare with the original used to develop the Haines Index. For the climatology conditions in Portugal, the CHI seems also more appropriate than the HI.

Management decisions for wild fires incorporate a vast array of factors that are weighted differently. These factors can be infrastructure at risk, resources available, fuel conditions, weather conditions, firefighter safety, public safety from fire and smoke. The relative weights of the factors are highly dependent on the local specific situation, such as population density or the type and stress of the vegetation, and the uncertainty or reliability of any data used in the decisions is an important piece of information. This knowledge includes the description of the climatological characteristics of the indices HI and CHI and their sub-indices, stability term (term A) and moisture term (term B). In this work the HI and CHI indices are analyzed in their temporal variability, annual and monthly, and in their relationship with periods of large forest fires. The results are presented for the period from 2011 to 2017. The main objective of this work is to understand the behavior of HI and CHI in Portugal.