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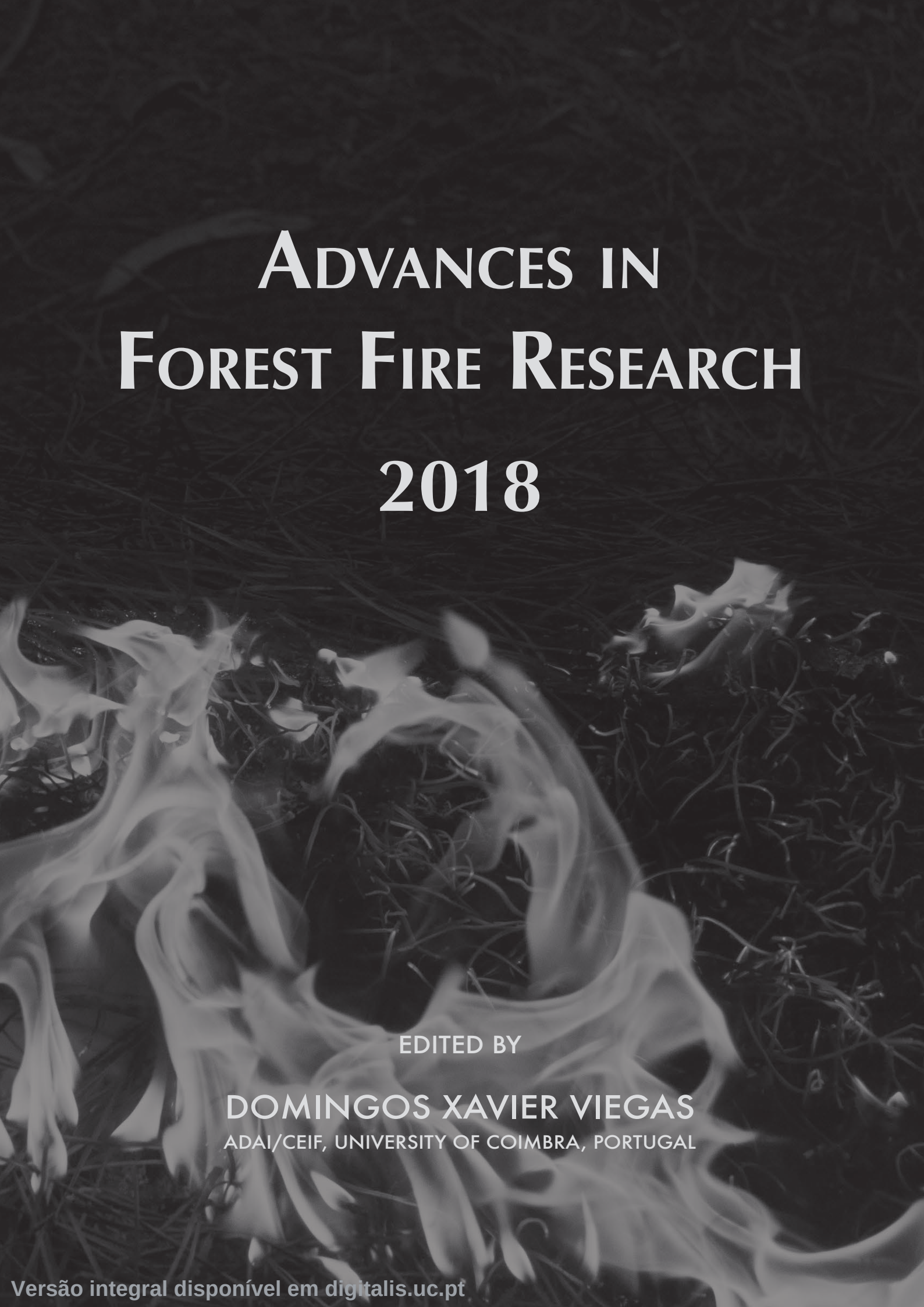

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Assessing the increase in wildfire occurrence with climate change and the uncertainties associated with this projection

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Abstract

According to climate projections, global warming is associated with increasing temperatures and dry spells in some parts of the world, especially the Mediterranean area. This climate change has already triggered increases in wildfire danger and fire season length in Southern Europe and is expected to amplify in the forthcoming decades. However, it is quite challenging for the scientific community to assess the intensity of these changes, because (i) the trend relies on the greenhouse gases (GHG) emission scenario and (ii) fire occurrence depends on multiple factors (including climate, but not only). A proper assessment of the trend in terms of fire occurrence and of uncertainties associated with this increasing trend, still lacks, especially for the French territory.

Our study refines traditional approaches of fire risk projection under climate change on two aspects: (i) the impact of climate prediction uncertainties on the prediction of fire danger, and (ii) the translation of a danger index into a fire occurrence (per size classes).

Keywords: climate change, uncertainties, fire danger

1. Introduction

The impact of climate change on wildfire danger has been extensively studied in different parts of the world. The traditional approach consists in projecting climatic danger indices like the Fire Weather Index (FWI) or its subcomponents. The FWI System is a fire danger rating system designed by the Canadian Forestry Service (Van Wagner 1987). It models the moisture content of three classes of forest fuel and combines it with the effect of wind on fire behaviour. It is noticeable that the FWI System refers primarily to a standard fuel pine type but has been widely used as a general measure of forest fire danger, even in areas with climate and vegetation markedly differing from that in Canada. Yet, a link between high FWI values and observed fire occurrences has been shown in the Mediterranean context (Good et al. 2008; Viegas et al. 1999). Regarding climate change, some studies have projected FWI at Europe scale for various GHG emission scenarios (Moriondo et al. 2006; Bedia et al. 2014a) and various climate models, predicting an increase in overall FWI values and a change in the length of the fire season (Moriondo et al. 2006). Many FWI projections have also been produced at country or regional scale in Europe. However, few studies address the origin of the uncertainties in these projections: can we separate the uncertainty coming from the climate model and the uncertainty coming from the scenario choice, and which one is predominant? Does this partition vary during the time period of interest? In a first step, we project future FWI and attempt to evaluate the resulting uncertainties for France. The interpretation of FWI projections in terms of future fire activity with metrics such as expected fire number or burnt area (e.g. Amatulli et al. 2013) is challenging. Indeed, FWI is not a straightforward proxy for fire activity, as its response function is often unknown and as a