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## **Looking for Climate Change Signals in the Canadian Forest Fire Ignition Record**

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### **Abstract**

The potential impact of climate change on forest fire risk is of significant concern, especially in determining whether there is increasing fire ignition risk as measured by increasing annual trends in ignitions, or the lengthening of the "fire season" within each year, or both. We propose a mixture-model framework using logistic generalized additive models to investigate these characteristics, where the error structure incorporates an extreme value distribution. This is necessary, since the smooth terms do not adequately describe the extreme events, which are of primary interest in the context of climate change. We present the general modelling framework, a discussion of model selection, and a simple estimation technique for a preliminary analysis of the extreme residuals. We illustrate its application using data for lightning-caused forest fire ignitions over a period of 42 years in a 9,884,943 hectare region of boreal forest of Ontario, Canada. Seasonal and annual changes in ignition risk are observed and discussed, but we identify significant outstanding confounding factors that need to be addressed before one can assess the extent to which those changes can or cannot be attributed to climate change.