Lightning-fires and associated atmospheric conditions

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Introduction

Lightning-fires, and the atmospheric conditions associated with their occurrence, are examined based on data provided for Victoria by the Department of Sustainability and Environment.

It is intended that a greater understanding of lightning-fires will ultimately lead to reductions in the response time to these fires and the damage that they cause.

Characteristics of lighting-fire data

- About 30% of fires were attributed to lightning during the available period of data (1/1/2000 until 31/1/2009), although they were responsible for about 90% of the total area burnt.
- Most lightning-fires are ignited in the late-afternoon (Fig. 1), predominantly because this is when most thunderstorms occur.
- The high number of lightning-fires that occur during January (Fig. 2) can only partly be attributed to the fact that thunderstorms occur most frequently during January in Victoria: factors such as fuel moisture and weather conditions influence the chance that an ignition is sustained.
- There is some indication that ignitions can be sustained by fuels of one size or depth, even though fuels of another size or depth have very high moisture contents.
- Some ignitions can smoulder for many days before growing large enough to be observed.
- When lightning occurs, the chance of fire was found to be much higher than average when less than about 2-3 mm of rainfall occurs, indicating the importance of the concept of '**dry lightning**' (Fig. 3).

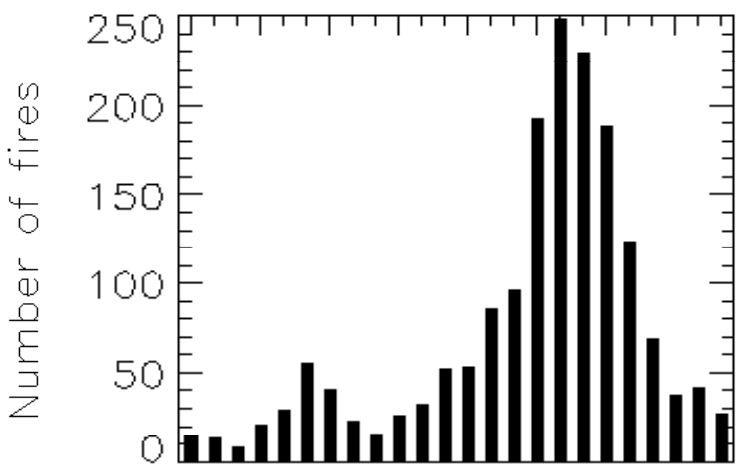

Fig. 1. Lightning-fire data categorised by hour of ignition.

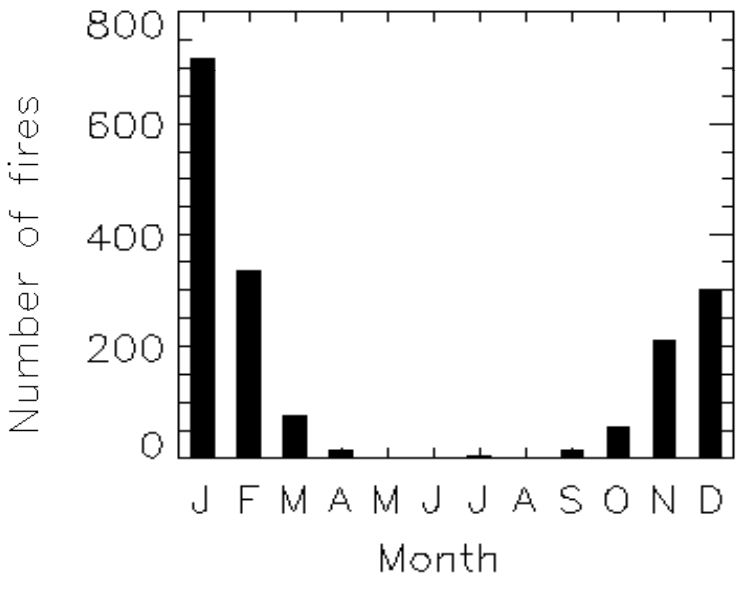

Fig. 2. Lightning-fire data categorised by month of ignition.

Predicting lightning-fires

A method for forecasting dry lightning has been developed in North America based on high instability combined with low atmospheric moisture levels (essentially a modified version of the Haines Index). The method **provides an indication that thunderstorms will be high-based with low precipitation.**

- The results of applying this method in Victoria are similar to those obtained in North America, suggesting some degree of universality in the processes through which dry lightning occurs.
- Meteorological data (e.g. relative humidity, temperature and wind speed) and fuel moisture data were found to further improve lightning-fire forecasts.

It is intended that the results of this study will be used to produce a lightning-fire forecasting tool for trial during the 2009-2010 fire season.

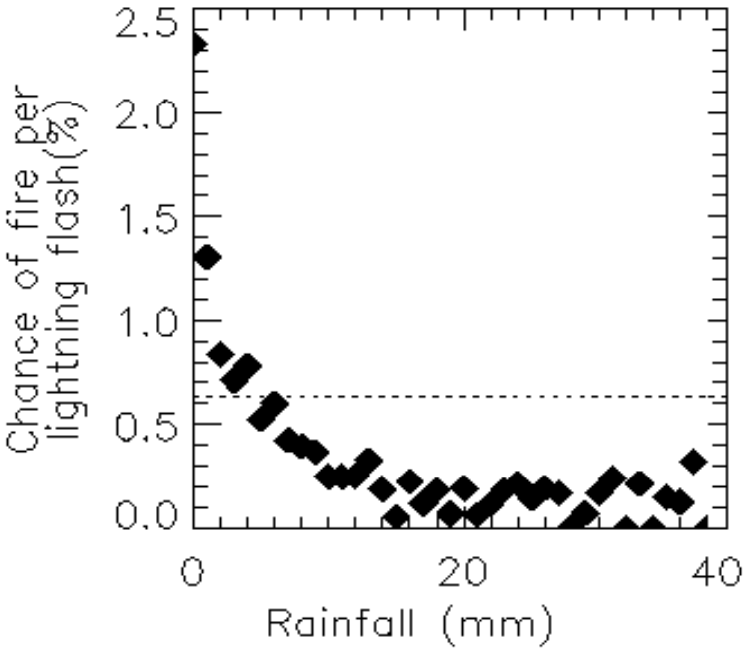

Fig. 3. The chance of fire per lightning flash, shown for different rainfall amounts (dotted line represents the average value).

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