DETERMINING THRESHOLD CONDITIONS FOR EXTREME FIRE BEHAVIOUR

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THE BUSHFIRE BEHAVIOUR AND MANAGEMENT GROUP OF THE UNIVERSITY OF MELBOURNE IS CONDUCTING A PROJECT TO IDENTIFY THE THRESHOLDS BEYOND WHICH DYNAMIC FIRE BEHAVIOUR BECOMES A DOMINANT FACTOR AND DETERMINE THE COMBINATION OF CONDITIONS FOR SUCH BEHAVIOURS TO OCCUR.

INTRODUCTION

Most existing fire behaviour models have been developed based on data and observations of fires that were small to moderate in size. Consequently, they are not able to emulate the dynamic bushfire behaviour that can occur under extreme conditions.

Indeed, current operational fire spread models assume that fires will burn at an approximately constant (quasi-steady) rate of spread under a specific set of environmental conditions (e.g. VESTA, McArthur Mk5, CSIRO models).

While a number of advances have been made in understanding bushfire development under extreme conditions, these have not been quantified in a manner that is suitable for inclusion in a fire behaviour modelling framework.

According to Werth's (2011, 2016) definition the extreme fire behaviour is: "*Fire spread other than steady surface spread, especially when it involves rapid increases*"

Extreme fires can involve

- Spotting/fire storm
- Fire tornado/whirls
- Lateral vortices
- Junction zones (jump fires)
- Eruptive fires
- Crown fires
- Conflagrations
- Downbursts
- Pyro-convective events

Eruptive fires

OBJECTIVES

- Compile a database of extreme fire behaviours within Australian wildfires
- Investigate the conditions and processes under which bushfire behaviour undergoes major transitions
- Identify if threshold conditions occur that could allow for the prediction of extreme fire behaviour from environmental conditions

Conflagrations

Data to be considered include

- Fire progression/development data, mapped perimeters
- Fuel data – type (canopy, heavy fuels, surface, elevated, bark), load etc.
- Weather data (observations and simulations including, upper atmospheric conditions, DFMC, KBDI, DF etc.)
- Topography
- Weather RADAR data
- Airborne LIDAR data
- Satellite data
- On-ground fire observations / Interviews (Video and photographs)
- Fuel reduction history
- Line scans and imagery
- Information about suppression activity
- House loss data
- Fuel moisture content (field observations)

PRELIMINARY RESULTS

A large workshop with fire agency staff from WA, NSW, ACT, SA, Victoria and Queensland, as well as representatives from BoM and Geosciences Australia was held at the AFAC offices 20 May 2016 in Melbourne.

As a result stakeholders:

- Provided feedback on the proposed research methodology for examining extreme fire behaviour
- Contributed to the identification of a study set of fires
- Assisted in the identification of available datasets for the study
- Agreed to provide large spatial data sets for modelling and analyses

Map of case studies

COLLABORATION

We are happy to have feedback about our methodology and case studies. Any comment and recommendations are welcome. We are looking for new case studies and data sets.

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