

# Translation of observed and modelled extreme bushfire behaviours to improve fire prediction and fireground safety

## Dr Shiva Prasad

Director Research and Implementation  
Natural Hazards Research Australia

## Dr Mika Peace

High Impact Weather  
Bureau of Meteorology

### Module 1: Introduction to extreme fire behaviour module

[RESUME COURSE](#)



Photo: Janice Newnham

This training was developed to share the research learnings from case studies of fires that burned during the 2019–2020 Black Summer fire season. The case studies were conducted using the coupled fire-atmosphere model ACCESS-Fire in order to understand how interactions between the fire and surrounding atmosphere drove the observed fire behaviour.

#### This training has three modules:

1. this introductory module;
2. a module on Fire-Generated Vortices (FGVs);
3. a module on Low-Level Jets (LLJs) and their interaction with a fire plume.

### Module 2: Fire-Generated Vortices (FGV)

[RESUME COURSE](#)



Photo: Ned Dawson/NSW Rural Fire Service

#### Learning time: 1 hour

Welcome to the Fire-Generated Vortices module. In this module, you will learn how to identify fire-generated vortices (FGVs) and the environments that are favourable to their formation. You will explore what resources are available to help you assess FGV potential and communicate the risks they pose to crews and assets. At the end of this module, you will have an opportunity to reflect and apply your learning to your own workplace context.

#### The aims of this module are to

1. enhance your knowledge of fire-generated vortices (FGVs)
2. develop an understanding of key risk factors of FGVs at firegrounds
3. explore the information available that can be shared between Fire Meteorologists and Fire

### Module 3: Low-Level Jets (LLJ)

[START COURSE](#)



Photo: Department of Fire and Emergency

#### Learning time: 1 hour

The aim of this module is to develop your knowledge of low-level jets (LLJs) to understand the risks they pose when interacting with a fire plume to drive enhanced surface fire behaviour.

#### The aims of this module are to:

1. enhance your knowledge of LLJs
2. develop an understanding of key risk factors for LLJs at firegrounds
3. explore the information available that can be shared between Fire Meteorologists and Fire Behaviour Analysts to assess the possibility of an LLJ impacting fire behaviour.

# BNHCRC post-Black Summer Research

- Coupled fire atmospheric modelling reconciled the meteorology with observed fire behaviour
- Modules are a follow-up project to share research learnings with an operational audience using an applied, contemporary approach

## Training Modules Project Team:

Nicola Moore (NHRA) *Project Manager*

Mika Peace (High Impact Weather) *Fire Meteorology*

Chris Morton (DEECA) *Predictive Services and AFAC PSG Training*

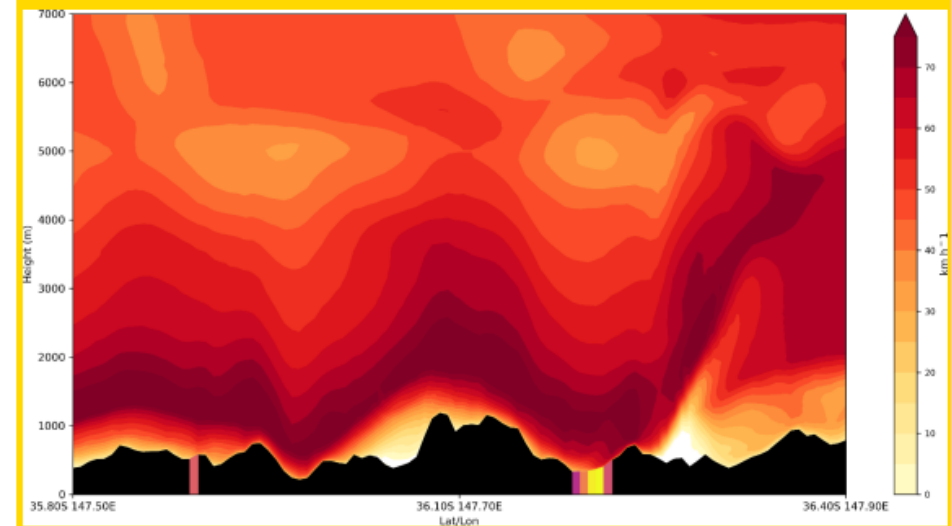
Siri Sawatdeenarunat, Lexie Keeton and Evvie Pappas (Curio) *Learning Developers*

[bnhcrc.com.au](http://bnhcrc.com.au)

## COUPLED FIRE-ATMOSPHERE SIMULATIONS OF FIVE 'BLACK SUMMER' FIRES USING THE ACCESS-FIRE MODEL

Mika Peace, Barry Hansrum, Jesse Greenslade, Dragana Zovko-Rajak, Abhik Santra, Jeffrey Keperl, Paul Fox-Hughes, Harvey Ye and Jeffrey Jones.

Research Group, High Impact Weather, Bureau of Meteorology, Melbourne, Victoria.



# Training materials that contextualise learning in operations

## Goals

Translate research findings and present as educational and training materials for professional development.

## Results

3 E-learning modules for a key audience of Fire Behaviour Analysts and Fire Meteorologists

## Approach

NHRA engaged an external learning developer with training design expertise.

Collaboration between Researchers, Fire Meteorologist, Fire Behaviour Analysts and learning specialists

Scenario-based learning drawing on Black Summer case studies and operational data



# Module 1: Introduction to extreme fire behaviour module

RESUME COURSE



Photo: Janice Newnham

## Participants will learn...

- What is extreme fire behaviour
- Principles for **evaluating** and **communicating** the risks of extreme fire behaviour
- How Fire Mets and FBANs can collaborate – the information, tools available to each group and their skills and knowledge.
- Introduction to coupled fire atmospheric modelling for interpretation of case studies in Modules 2 and 3





## Module 2: Fire-Generated Vortices (FGV)

RESUME COURSE



Photo: Ned Dawson/NSW Rural Fire Service

### Participants will learn...

- What FGV are and how they form
- Identify when conditions are favourable for an FGV to occur
- Hazards and risks presented by FGV
- How to communicate potential FGV risks to incident management personnel and field crews.



## Module 3: Low-Level Jets (LLJ)

START COURSE



### Participants will learn...

- To look at the wind structure above the surface and understand the potential for plume mixing processes at a large fire.
- How the energy release of a fire may interact with boundary layer winds
- When to use elevated winds as input to fire predictions to assess potential worst-case scenarios
- How to communicate potential LLJ risks to incident management personnel and field crews





# Where to from here

- NHRA is working to identify hosting options for the modules to make them available to agencies via licence.
- Training modules available for FBANs and Fire Mets before next bushfire season.
- NHRA will garner feedback and evaluate - potential for further training modules for research utilisation in the future.



# The modules

Online show





# Project learnings

Feedback from agencies and target audience

Compare impact and value with project report or journal publication (return on investment)

Who will access the modules?

Longevity of project artefacts

More streamlined process next time

Other research that could be similarly developed as modules.

