ACCESS-Fire

AFAC, Perth/ **2018**

Dr Mika Peace / Bureau of Meteorology and Bushfire and Natural Hazards CRC
Dr Jeff Kepert / Bureau of Meteorology and Bushfire and Natural Hazards CRC
Dr Harvey Ye / Bureau of Meteorology and Bushfire and Natural Hazards CRC

bushfire&natural HAZARDSCRC

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

What is the fire risk in the landscape on any given day?

Once a fire ignites, how fast and where will it burn and what fire behaviour will occur?

- Fire managers on (nearly) all continents "…seeing fire behavior we've never seen before."
- Risk due to populations and infrastructure on rural fringe

  climate change -> reduced rainfall and longer dry periods –> drier fuels -> higher energy release -> fire-atmosphere interactions.
- Limitations of surface-based fire prediction approaches
- Understand the processes when fire-atmosphere interactions are impacting fire behaviour -> predictive tools

Coupled fire-atmosphere models

- **Empirical or dynamical models (mesh between scales)**
- **WRF-Fire operational in Colorado, USA**
- **Coupled fire-atmosphere models have an important role**

ACCESS-Fire

Develop and test an Australian Coupled-Fire-Atmosphere modelling system, linked to the Australian Numerical Weather Prediction (NWP) operational framework and embedded in Bureau forecasting capability

ACCESS

Australian **C**ommunity **C**limate and **E**arth **S**ystem **S**imulator
Operational and research system for weather and climate time scales

The Unified Model (UM) is the UK Met Office NWP system
(collaborators include Korea, South Africa, New Zealand, Philippines)

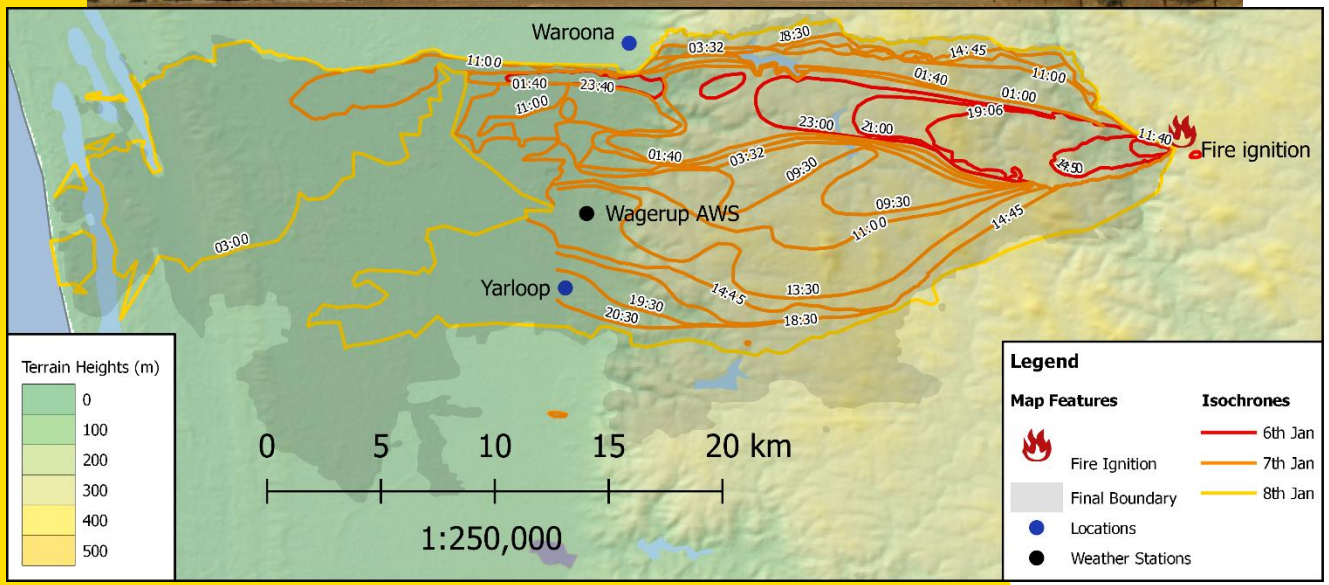
ACCESS-Fire?

- Fire model coupled to ACCESS
  Originally a project to look at Black Saturday
  (Melbourne and Monash universities)

- Very different to run than WRF-Fire

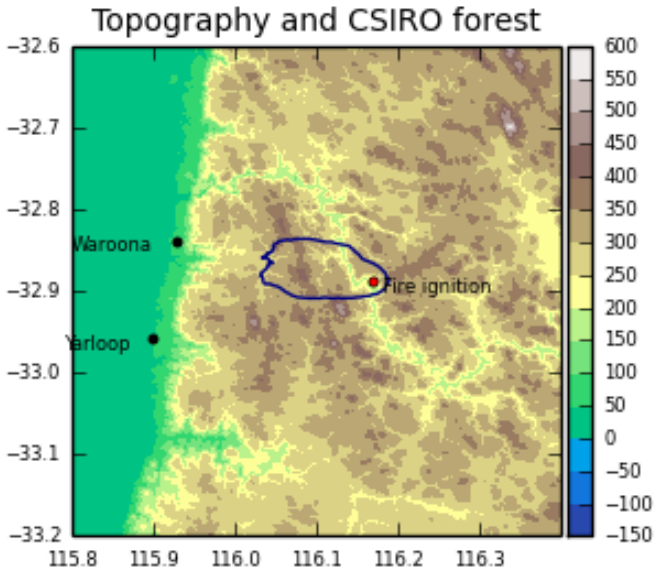
ACCESS-Fire progress

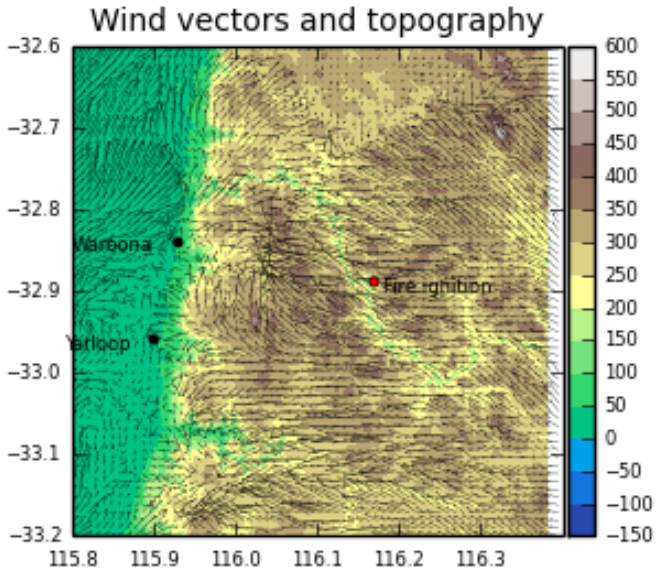
- Succession of IT problems overcome
  - Graphical interface
  - Nests to 400m ->100m resolution
  - Debugging
- Discussions with UK Met Office researchers on model development
- Initial runs of Waroona (also Sir Ivan)
- Tested different fire spread models (McArthur, CSIRO, Rothermel)
- Science analysis to come (late 2018)

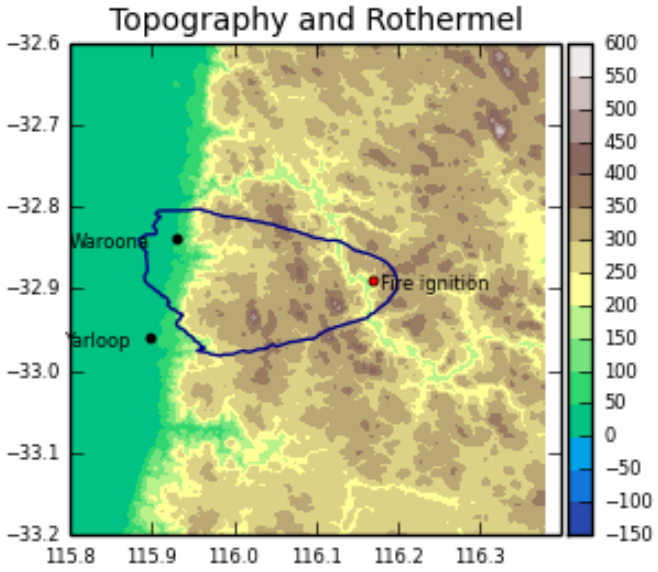


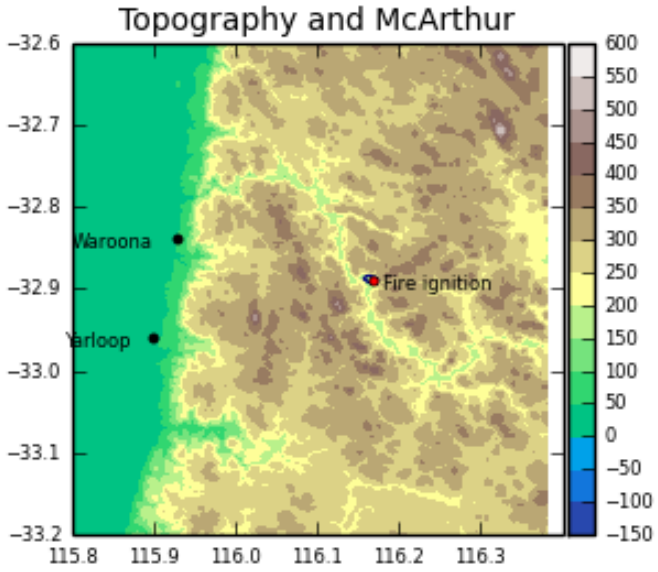
Waroona fire

- 6-7 January 2016. 166 homes destroyed, 69,000 ha burnt.
- Four periods of extreme fire behavior
  - 2 pyrocumulonimbus events
  - 2 evening ember showers.
  - Did not reconcile with FDI's.
- Study focus the ember showers at Waroona and Yarloop and fire plume–topography–meteorology interactions.
- Downslope winds a key factor in many significant fire events (Margaret River, State Mine, Waroona, Greece, California, Canberra)





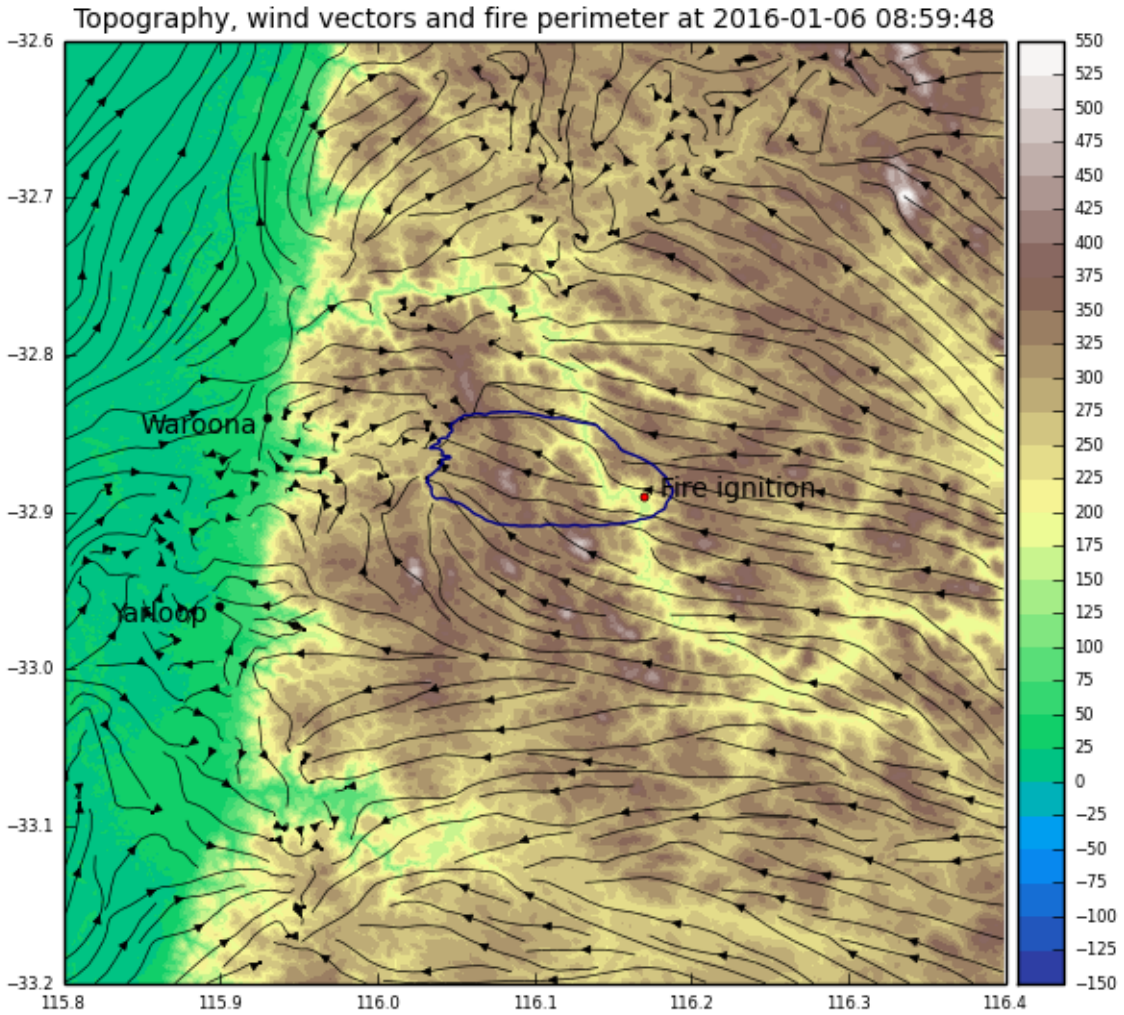


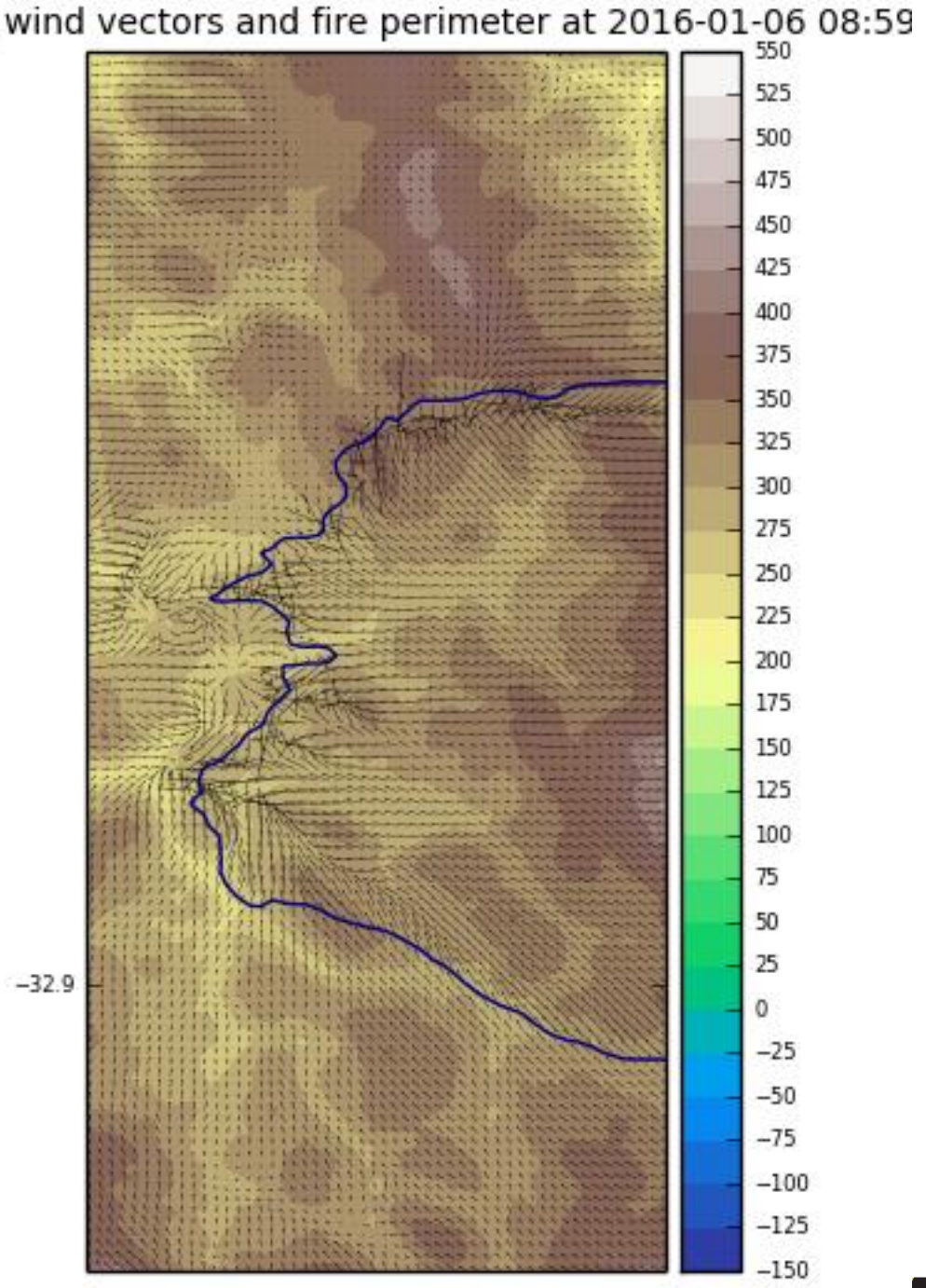


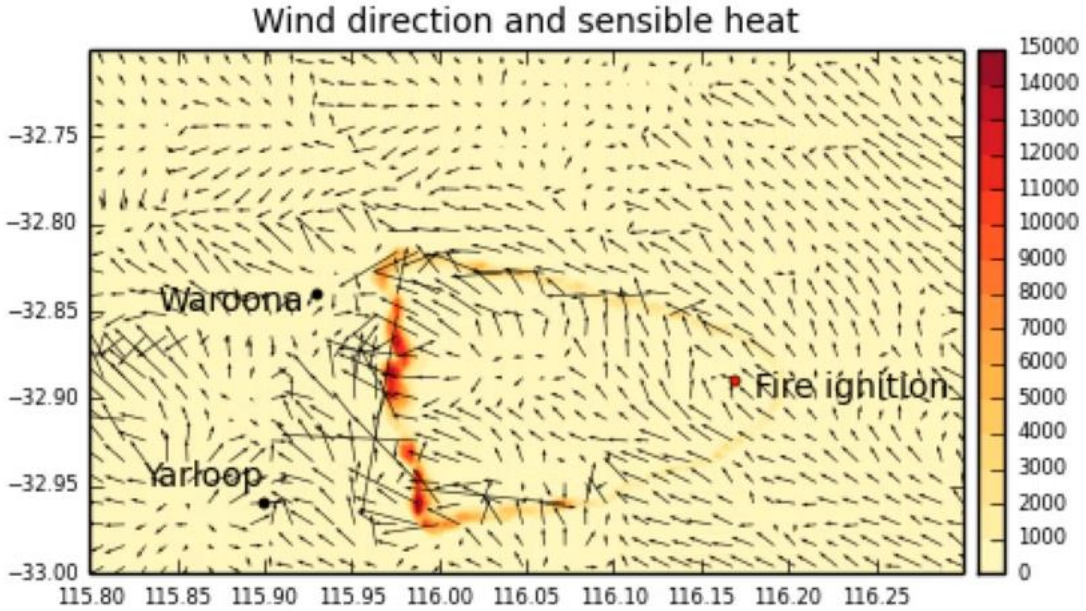
Waroona simulations

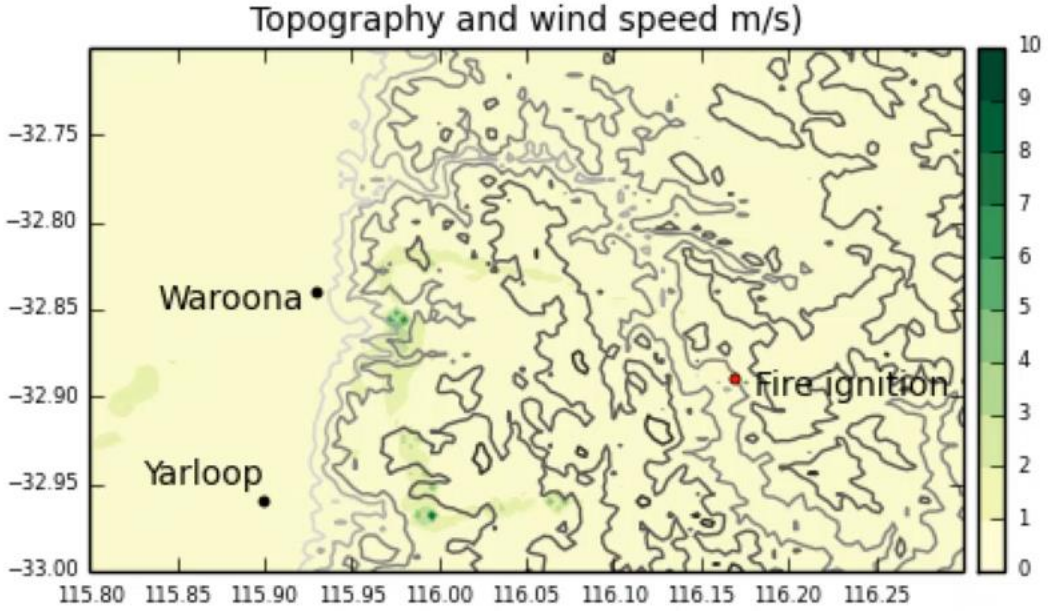
- Tests with Rothermel, CSIRO forest (Vesta) and McArthur
- Caveat – plots from different times and ignitions
- Varying spread results with fire model

Waroona with CSIRO forest at 100m



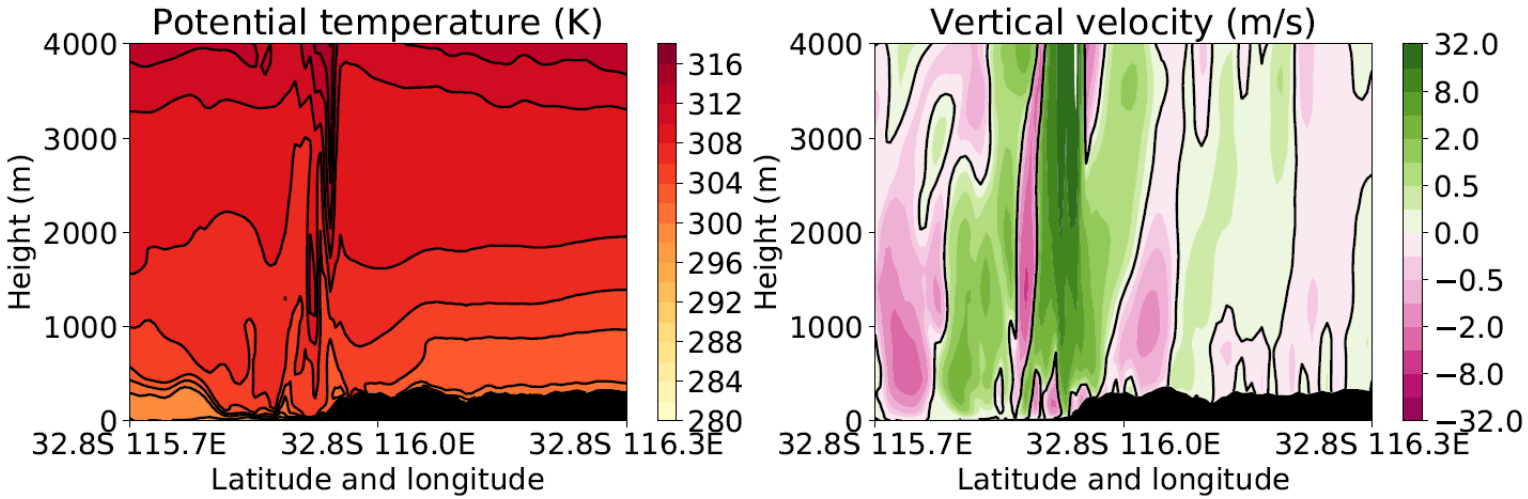


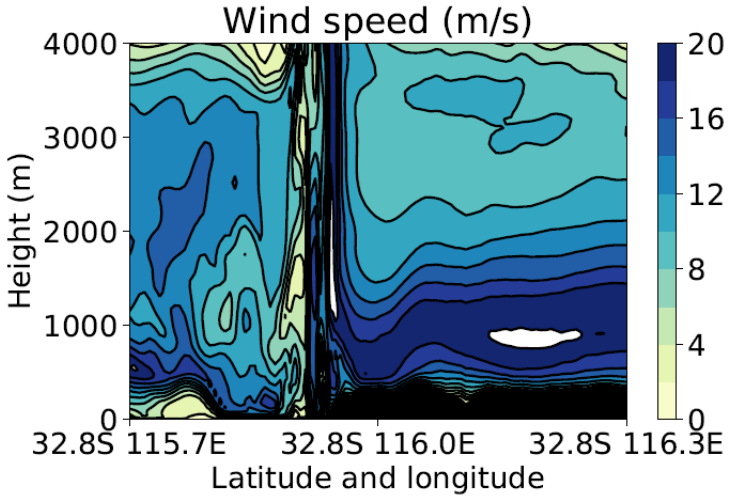


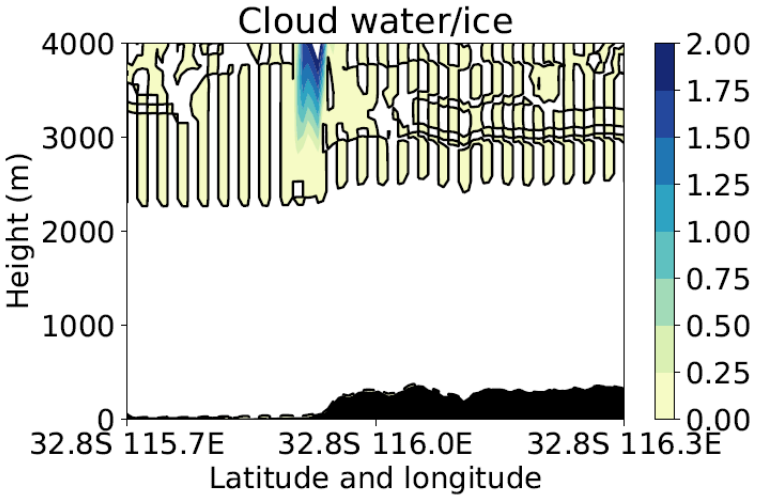


Waroona with Rothermel

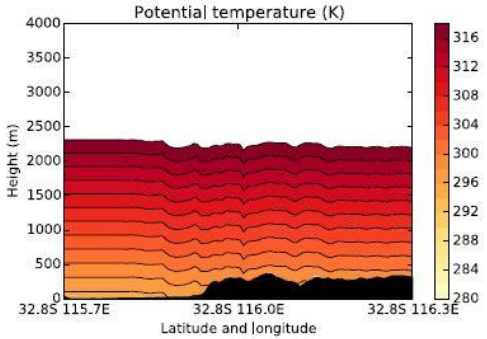
- Fire accelerates near bottom of scarp
- Vortices on fire front

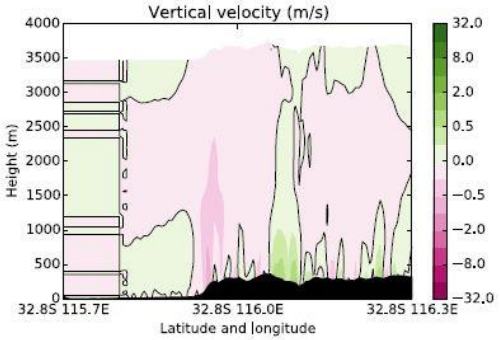


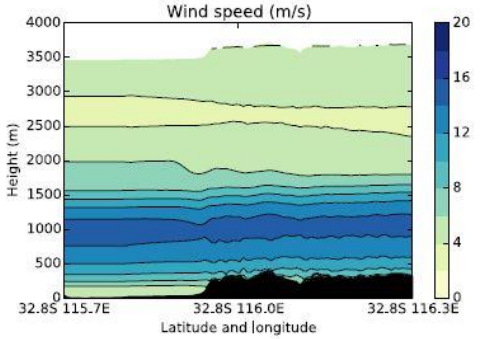


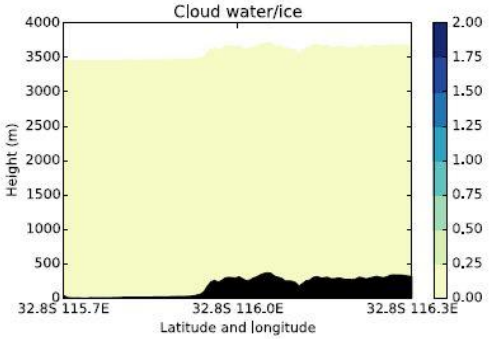


Waroona with Rothermel









- Hydraulic jump and fire plume interaction
- Fire plume vertical velocity
- Model produces cloud

Mount Solitary prescribed burn

The future

Dr Mika Peace
Bureau of Meteorology /
Bushfire and Natural Hazards CRC

mika.peace@bom.gov.au