Fire-atmosphere interactions in ACCESS-Fire

November 2020 workshop

Mika Peace
Jeff Kepert
Harvey Ye
Jesse Greenslade

Project Sponsor Beth Ebert

Bureau of Meteorology and
Bushfire and Natural Hazards CRC

Australian Government
Bureau of Meteorology

bushfire&natural HAZARDSCRC

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

© BUSHFIRE AND NATURAL HAZARDS CRC 2018

Can we model these processes?

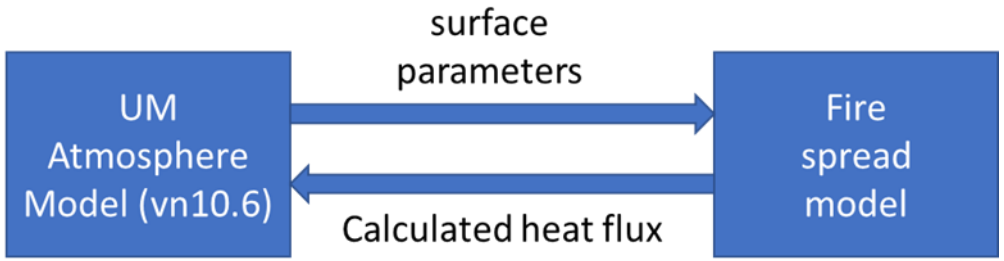
Mount Solitary prescribed burn

Fire-Atmosphere Interactions

Coupled fire atmosphere models have an atmospheric and fire component

Investigate the interactions between a fire and the surrounding atmosphere

ACCESS-Fire: Australia's research and operational weather and climate prediction model coupled to a fire-spread model

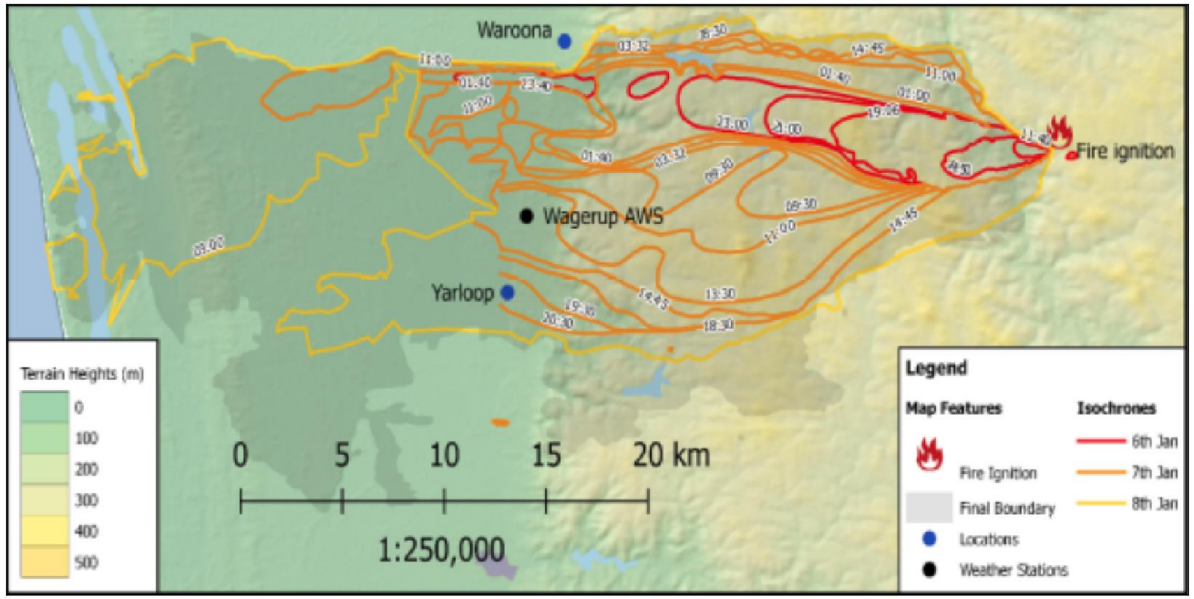


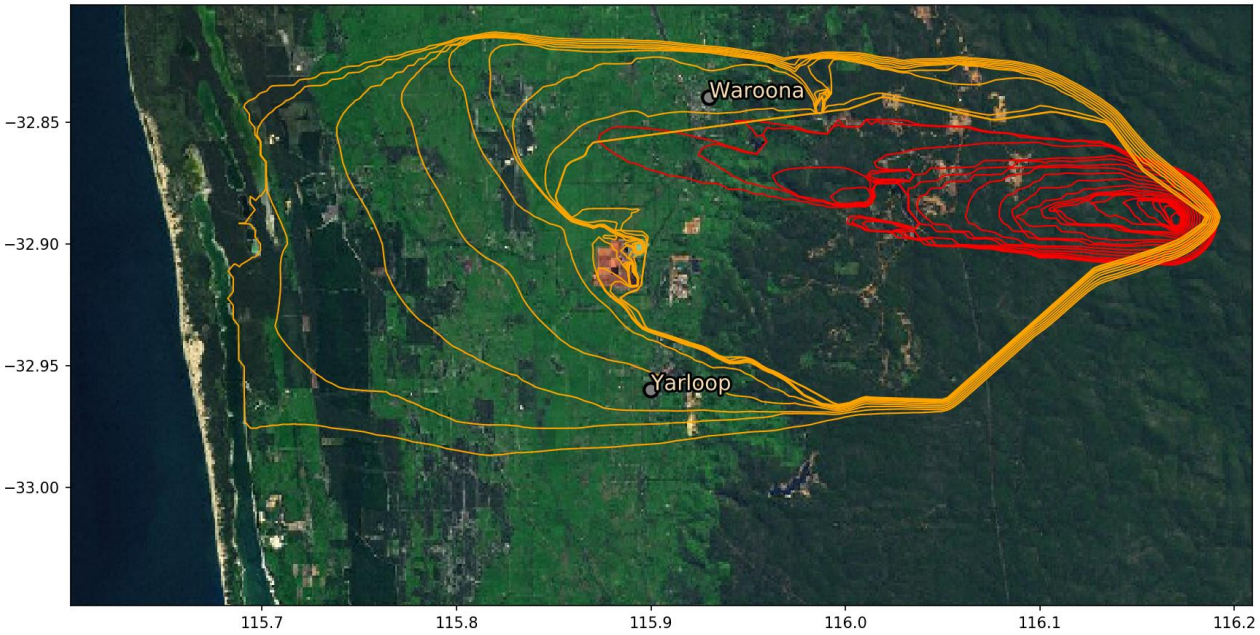
Waroona fire

6-7 January 2016. 166 homes destroyed.
69,000 ha burnt. 2 fatalities

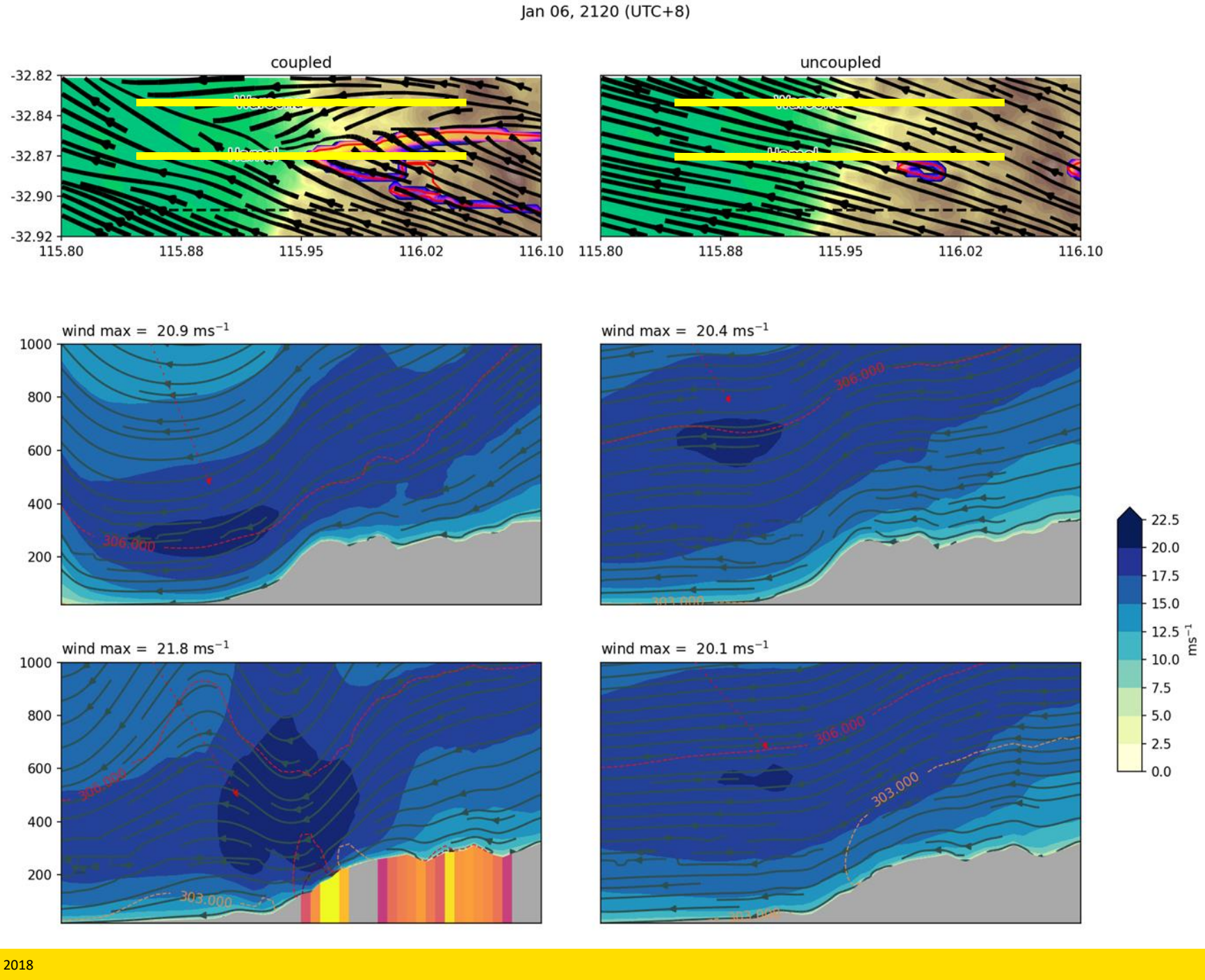
Four periods of extreme fire behavior
2 pyrocumulonimbus events
2 evening ember showers.

Fire behaviour did not reconcile with current risk measures





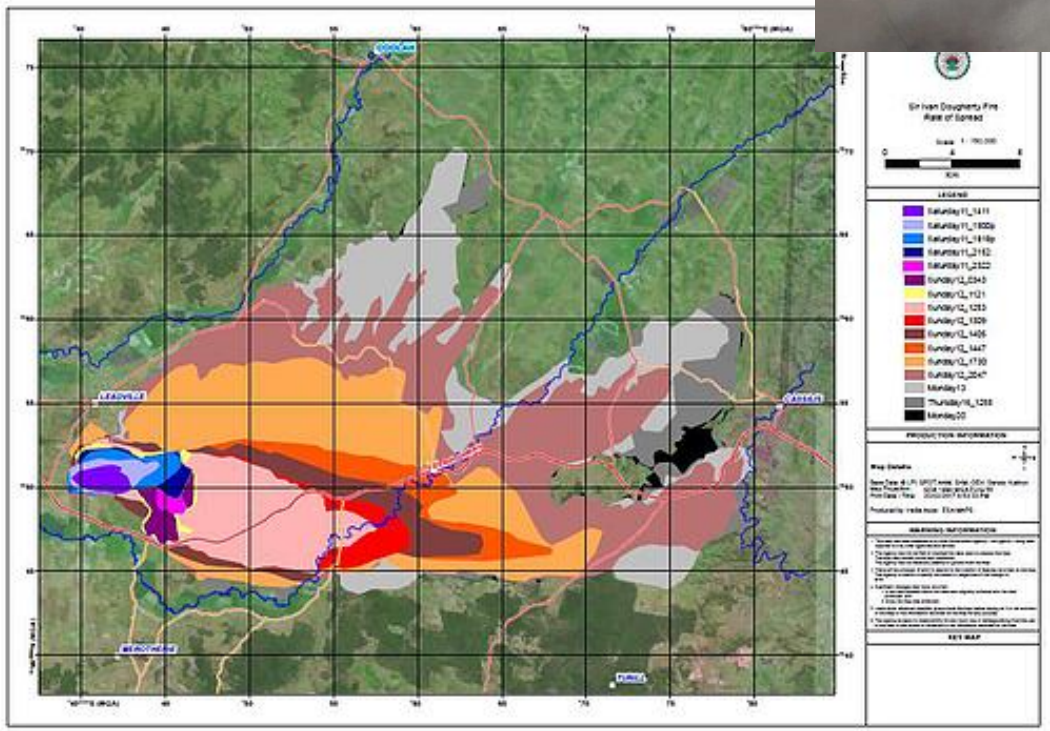
© BUSHFIRE AND NATURAL HAZARDS CRC 2018



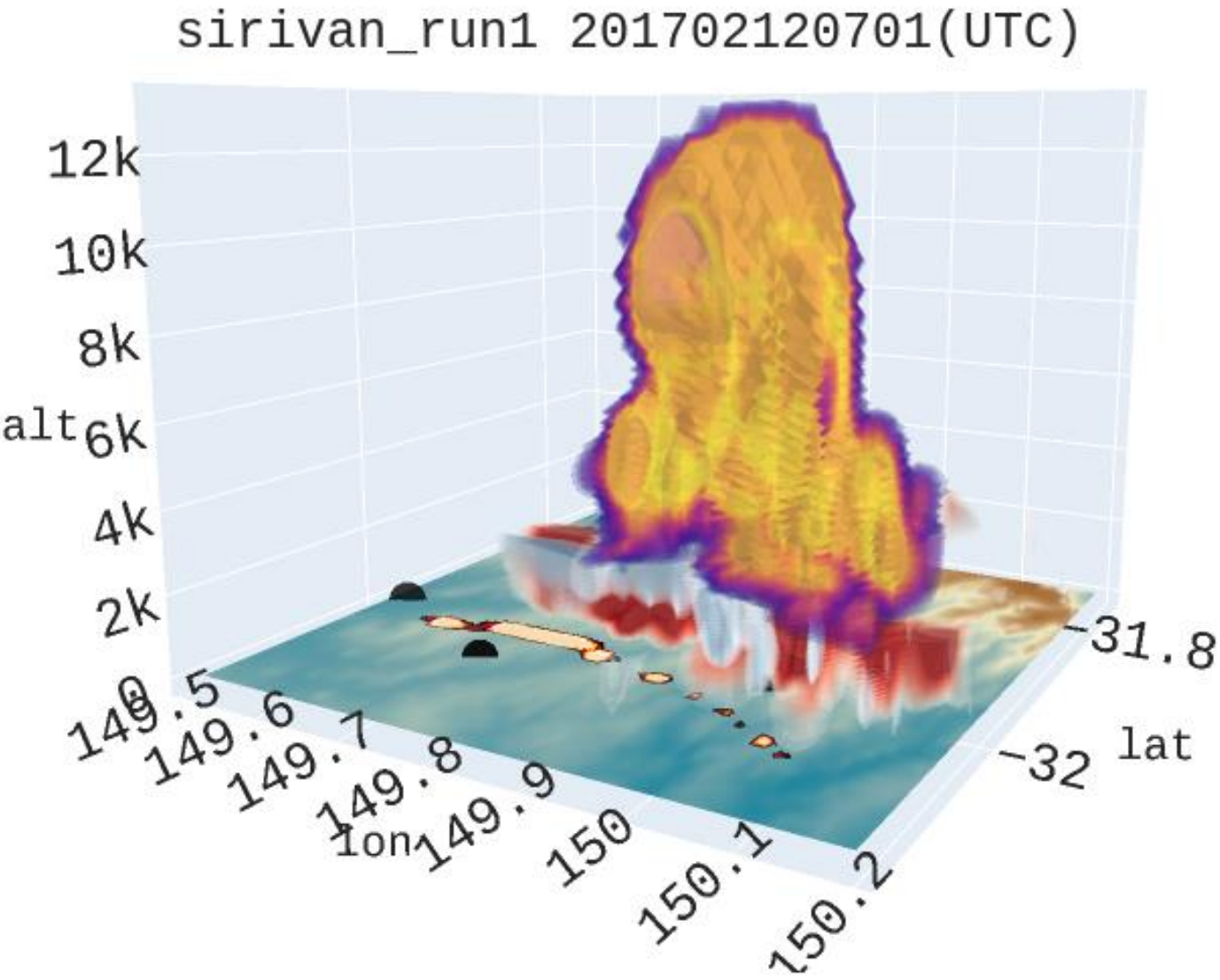
© BUSHFIRE AND NATURAL HAZARDS CRC 2018

Sir Ivan fire

12 February 2017
Burnt 55,000ha, 55 homes lost
Very dry fuels due to severe drought
PyroCb with the wind shift in the afternoon



© BUSHFIRE AND NATURAL HAZARDS CRC 2018



© BUSHFIRE AND NATURAL HAZARDS CRC 2018

Fire prediction

2019-2020 season highlights future fire risk in a changing climate

International challenge

Demand for accurate and timely fire prediction and fire simulations

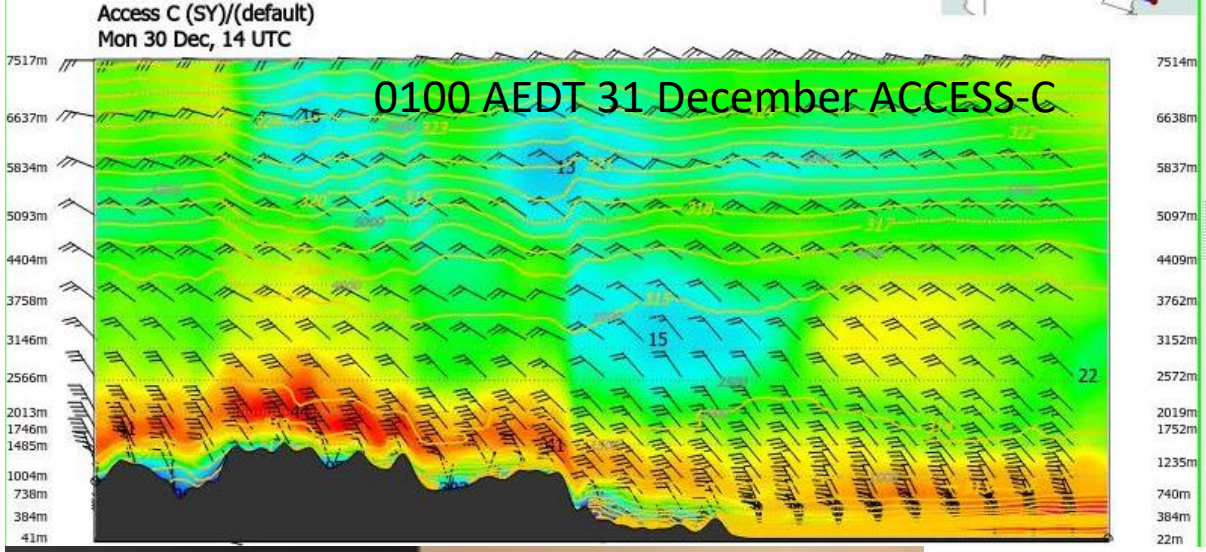
Community expectations – science that resonates

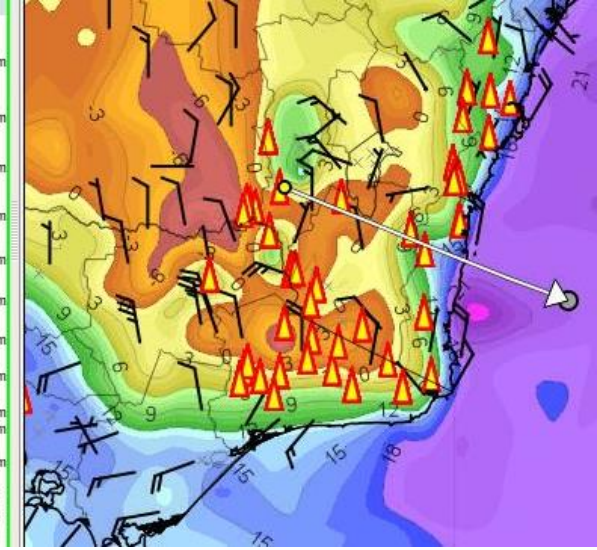
© BUSHFIRE AND NATURAL HAZARDS CRC 2018

Badja fire

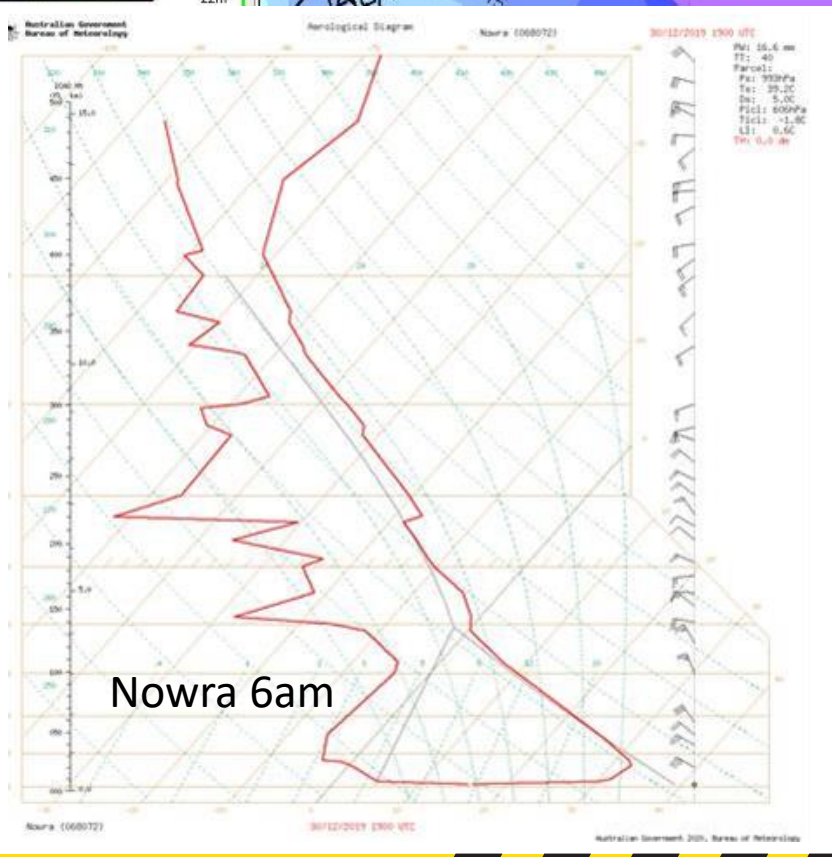
Overnight run 36 km. Deep flaming. Media reports of extreme fire behaviour and a tornadic vortex in the middle of the night

Discrepancy between official forecast and available observations and the fire behaviour
(10+ C in T, 30% in RH and 25 km/h in WS)





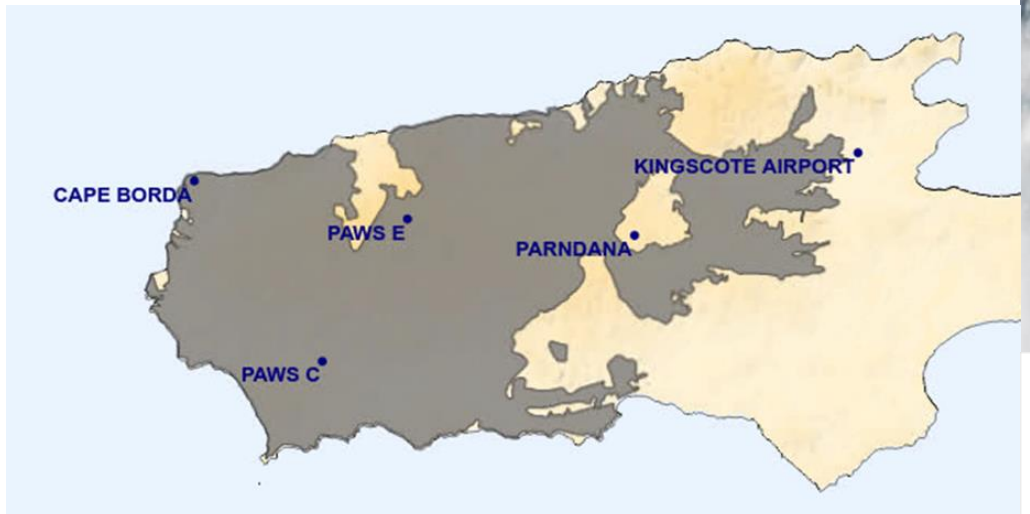
Supplied video 23:30AEDT Monday, December 30, 2019 of the Badja Fire. (AAP Video/Supplied/NSW RFS)
https://www.news.com.au/national/raw-aerials-show-badja-forest-road-fire/video/6197496f4b6ef02cdb1cc8df6de4d320

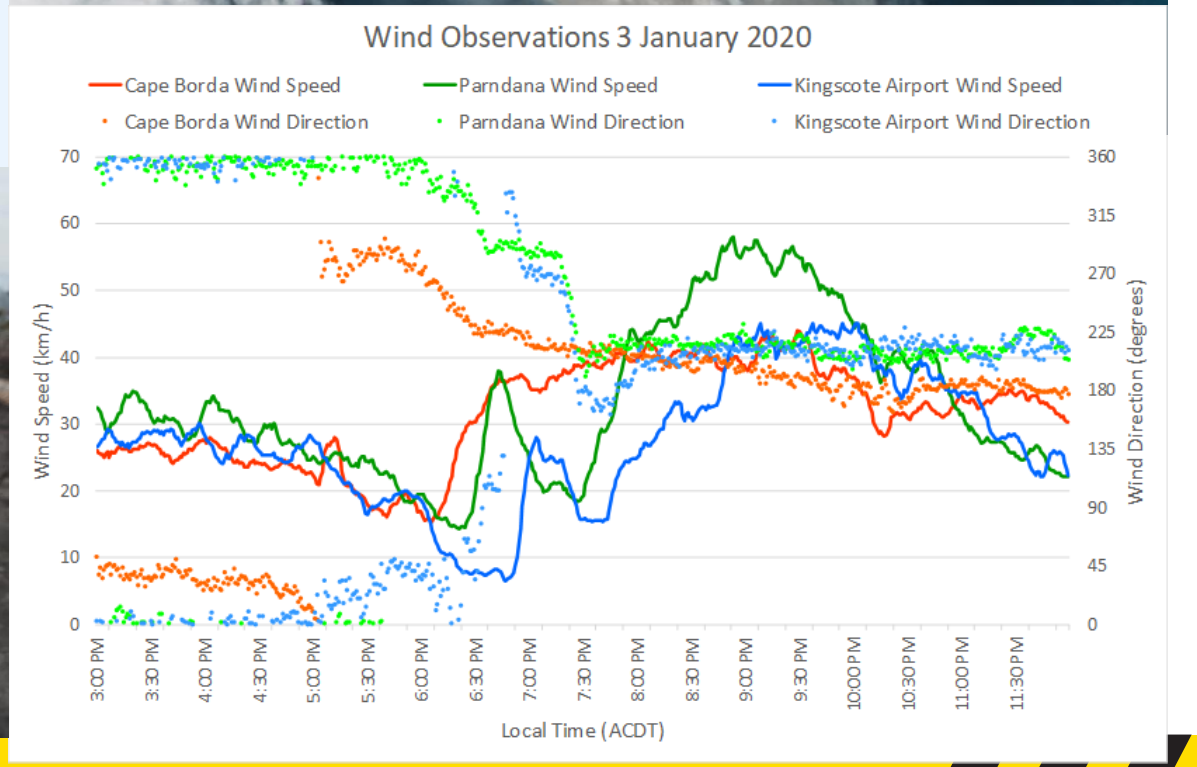


© BUSHFIRE AND NATURAL HAZARDS CRC 2018

Kangaroo Island fire

Fire run 3 January
Fire spread didn't reconcile with surface winds





© BUSHFIRE AND NATURAL HAZARDS CRC 2018

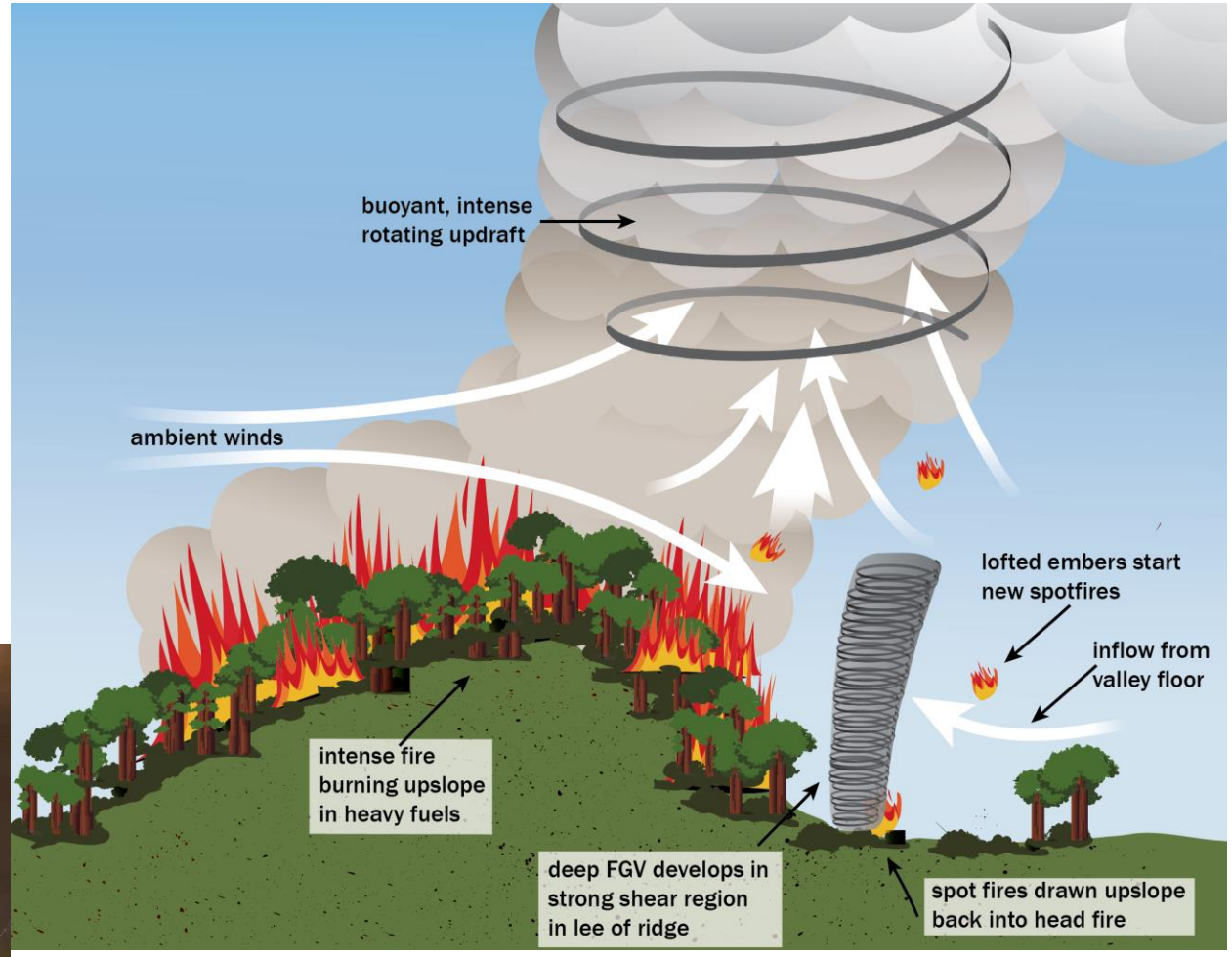
Credit: Koala photo Adelaide Now.

Fire Generated Vortices

Numerous fires produced fire generated vortices with tornado strength winds (300+ km/h)

Fire tornadoes (with pyroCb) in recent USA fires (several cases)

Can we identify favourable vortex environments?
Can we model them explicitly?



© BUSHFIRE AND NATURAL HAZARDS CRC 2018

The real-time paradigm

Pattern recognition (conceptual models) and scientific evidence (computational model output)

Process. Systems. Documentation. Accountability.

People make decisions – not models. Decisions must be evidence based.

© BUSHFIRE AND NATURAL HAZARDS CRC 2018

ACCESS-Fire – A new Australian coupled fire atmosphere modelling capability for fire meteorology research and prediction

Simulations enhance our scientific understanding

Fire impacts in a changing climate – robust, science based operational tools to inform warning messages and community response

Thank you

© BUSHFIRE AND NATURAL HAZARDS CRC 2018