# MODELLING THE FIRE WEATHER OF THE BLUE MOUNTAINS FIRES OF OCTOBER 2013

**Simon E Ching[1,3], Robert J B Fawcett[2], William Thurston[2,3], Kevin J Tory[2,3], Jeffrey D Kepert[2,3]**

[1] Bureau of Meteorology, Adelaide, South Australia
[2] Bureau of Meteorology, Docklands, Victoria
[3] Bushfire and Natural Hazards CRC, Melbourne, Victoria

## HIGH RESOLUTION SIMULATIONS OVER THE BLUE MOUNTAINS REGION ON 17 OCTOBER 2013 SHOW SEVERAL INTERESTING METEOROLOGICAL FEATURES.

### STATE MINE AND MT YORK ROAD FIRES

- In October 2013, a number of significant fires broke out in NSW. The most intensive fire activity was in the period between 13 October and 26 October, when there were 627 incidents and 164 054 hectares burnt.
- The fires on the afternoon of 17 October were the most destructive, with more than 200 houses destroyed across the Blue Mountains region.


Figure 1. Final perimeter of the State Mine and Mount York Road Fires, October 2013. The blue triangle marks the approximate location of Mount Boyce AWS.

### THE SIMULATIONS

- A high-resolution research version of ACCESS, the Bureau of Meteorology's operational Numerical Weather Prediction (NWP), is used to perform the simulations.
- Embedded in the ACCESS global model, a sequence of 3 nested model simulations, with horizontal resolutions of 444 m (STAGE3), 1.2 km (STAGE4) and 3.6 km (STAGE5), have been performed.
- The simulations are initialized at 03 UTC on 16 October 2013.

### GENERAL METEOROLOGICAL SITUATION

- On 17 October, a cold front passed through central NSW during the day.
- Before the passage of the front, the day was characterized by elevated values of the Forest Fire Danger Index (FFDI) in the simulations (Figure 3).
- At Mount Boyce, wind directions backed from northwest to southwest through the day, with peak wind speeds in the early afternoon. Around 21 UTC on 17 October, winds jumped abruptly to an easterly direction (Figure 2).

### MODEL VERIFICATION

- The weather at Mount Boyce, the AWS closest to the State Mine fire (Figure 2), was simulated satisfactorily by the model, despite some discrepancies with the observations.
- A dry slot around 03 UTC on 17 Oct was captured by the simulation, evident in the depressed screen dew points, although it arrived about an hour early. Another dry slot at around 07 UTC, however, was missed.
- An abrupt wind change around 21 UTC on 17 October arrived early by about 3 hours in the simulation.

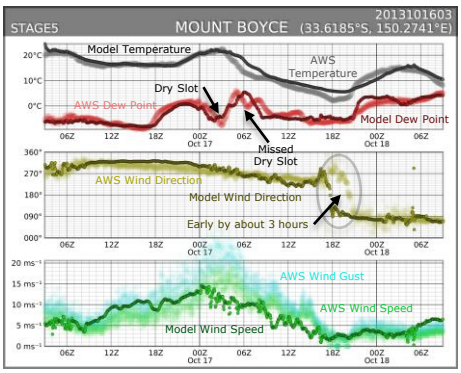


Figure 2. Comparison of the 444 m simulation and AWS data for Mount Boyce

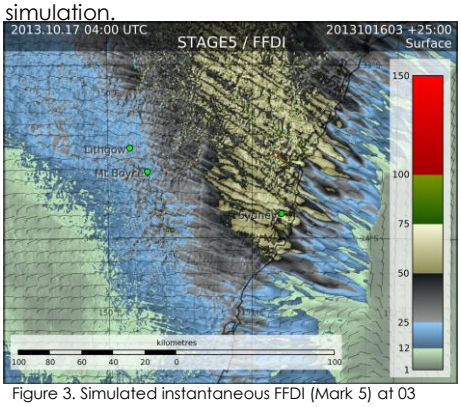


Figure 3. Simulated instantaneous FFDI (Mark 5) at 03 UTC on 17 October (444 m nest) assuming a drought factor of 10. Wind barbs indicate surface winds.

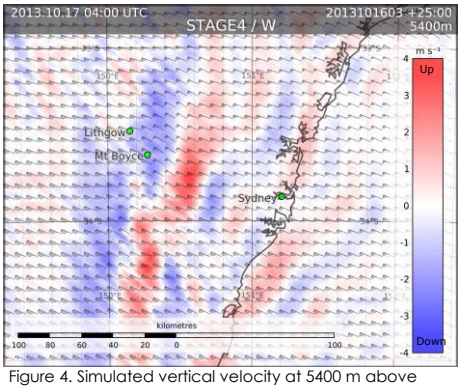


Figure 4. Simulated vertical velocity at 5400 m above mean sea level at 04 UTC on 17 October (1.2 km nest). Wind barbs indicate horizontal winds at the same level.

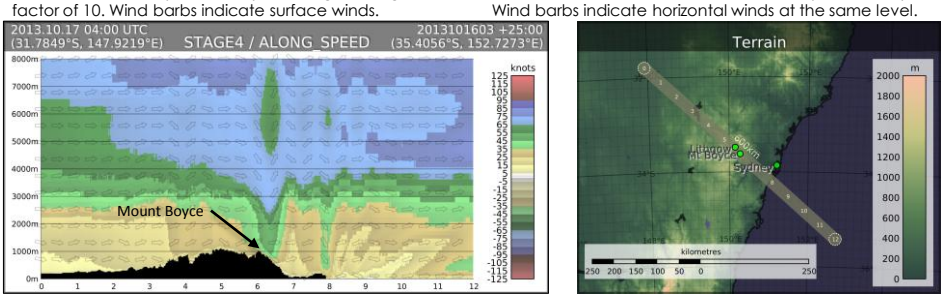


Figure 5. Vertical cross-section of horizontal wind speed along a line across Mount Boyce at 04 UTC on 17 October (1.2 km nest). Positive(negative) values indicate flow from left (right) to right (left). Arrows indicate 3D wind directions projected onto the cross-sectional plane. The map on the right shows the orientation of the cross-section line.

### DISCUSSION

- 17 October was characterized by mild temperatures (Figure 2). Main drivers for severe fire conditions on the day include low humidity, the winds (including speed and fluctuations) (Figure 2) and the structure of the atmosphere.
- The simulation shows elevated instantaneous FFDI values over the Sydney plain and the Blue Mountains area (afternoon of 17 October, see Figure 3). Thin bands of relatively lower FFDI over the area are evident due to variation in surface winds driven by upstream topography.
- Strong upper winds intruded down towards the surface about the Blue Mountain fires region at 04 UTC on 17 October (Figure 5). This pattern persisted for about 6 hours from 00 UTC.
- Mountain waves were simulated at the same time (Figure 4). This appears to be the cause of the elevated surface winds and associated gustiness seen in the observations.

**ACKNOWLEDGEMENTS:**
This work has been supported in part by the Bushfire and Natural Hazards CRC (BNHCRC). The simulations were performed with the assistance of the National Computational Infrastructure (NCI).