



FINDINGS

High-resolution simulations provide valuable insight into the meteorology of the Tathra bushfire.

Improved predictions of severe weather: The meteorology of the Tathra bushfire

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Very high-resolution simulations reveal the extreme conditions that drove the Tathra bushfire: a result of complex interactions between mountain waves, organised convection and the passage of a frontal system.

Introduction

On the 18th March 2018, a fire started at **Reedy Swamp** within the Bega Valley Shire on the New South Wales South Coast. Aided by the passage of a strong cold front, the fire burned into the town of **Tathra** during the mid-afternoon, leading to the evacuation of the township and the **destruction of 70 homes** and other structures.

Methods

We compare observations with **very high-resolution** numerical weather simulations. While forecast models typically run at 1.5km resolution or coarser, we run research simulations to **400m** and **100m** (figure 1).

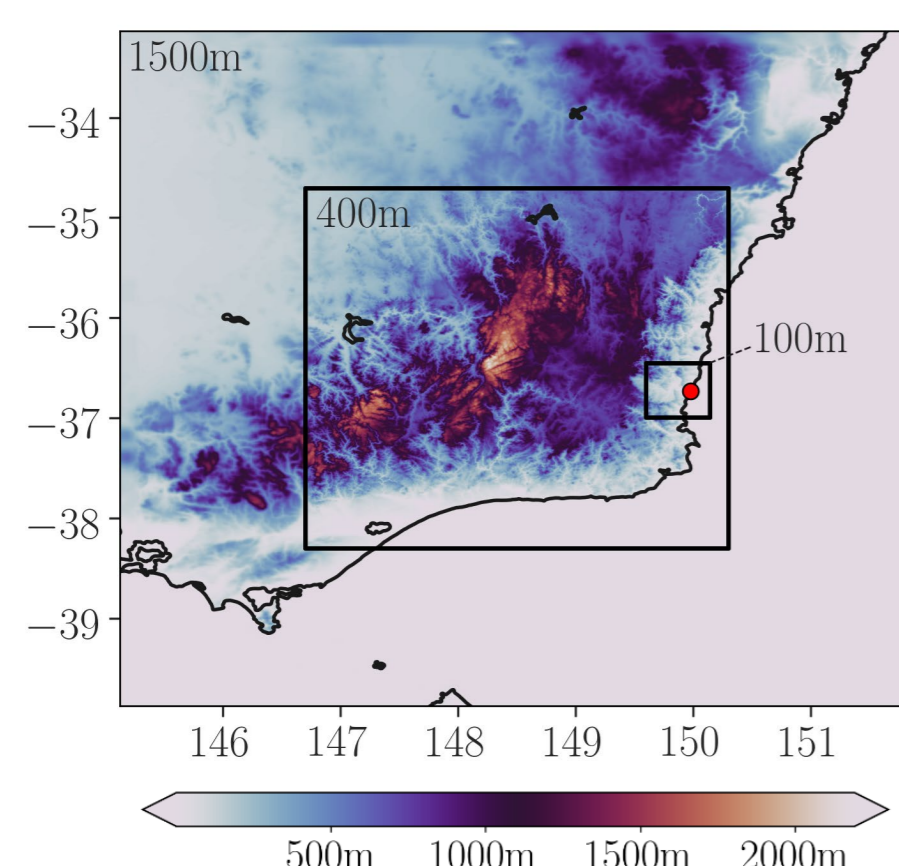


Figure 1: The three highest-resolution domains and orography. The red circle is Tathra.

Results

At high resolution, fine-scale details help to explain the observed conditions (figure 2):

Mountain waves (figure 3) likely contributed to the strong wind event around the time the fire

started and may have influenced the severity of peak fire weather in the afternoon.

Boundary layer rolls (figure 4) were responsible for strong gradients in windspeed and vertical velocity, with their movement generating highly variable conditions at a point, as observed at Bega (figure 2), and across the fireground. The rolls likely contributed to the **mass spotting** and **enhanced lee slope fire behaviour** observed near Vimy ridge; crucial for the fires jump of the Bega River and subsequent attack on Tathra.

The **frontal passage was complex**, with the cool change pushing through Merimbula around 16:30 AEDT, only for hot and gusty conditions to redevelop 20 minutes later (figure 2). The 100m simulation shows this was likely a result of interactions between **boundary layer rolls** and the developing change, which may have taken a full 2 hours to push over the fireground. As a result conditions during this period at times **oscillated unpredictably between extremes**.

Discussion

This study illustrates the utility of high-resolution simulations in understanding, and predicting, **high impact weather**. It also highlights the significant spatio-temporal variation often present in **dangerous fire weather** conditions, especially near the coast or topography, and the importance of capturing this variation in forecasts and warnings to better **predict** and **respond** to **extreme fires**.

For more information, please email david.wilke@bom.gov.au

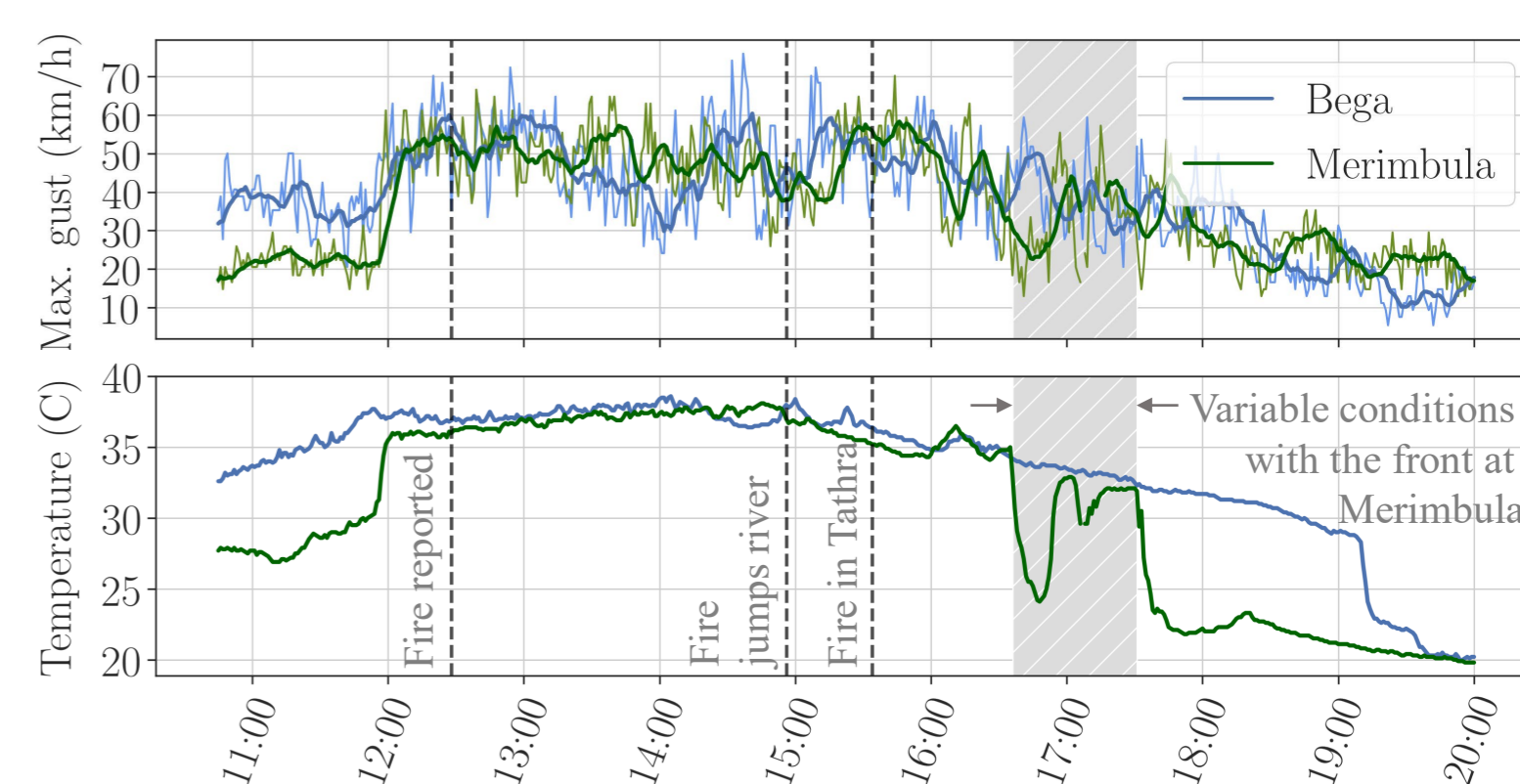


Figure 2: One-minute observations at **Bega** and **Merimbula**, the nearest weather stations to the fire. Time is in AEDT on March 18th, 2018.

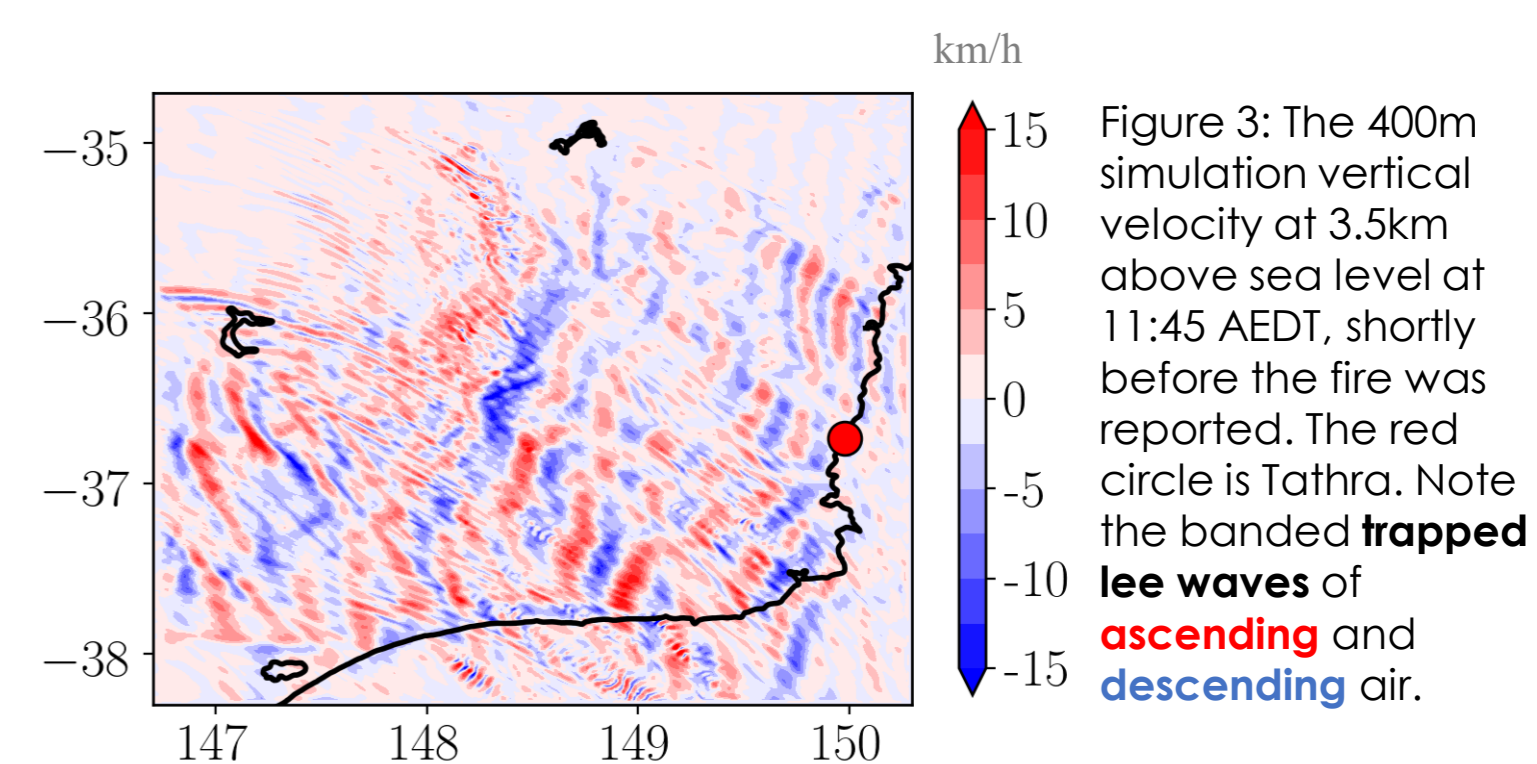


Figure 3: The 400m simulation vertical velocity at 3.5km above sea level at 11:45 AEDT, shortly before the fire was reported. The red circle is Tathra. Note the banded **trapped lee waves** of **ascending** and **descending** air.

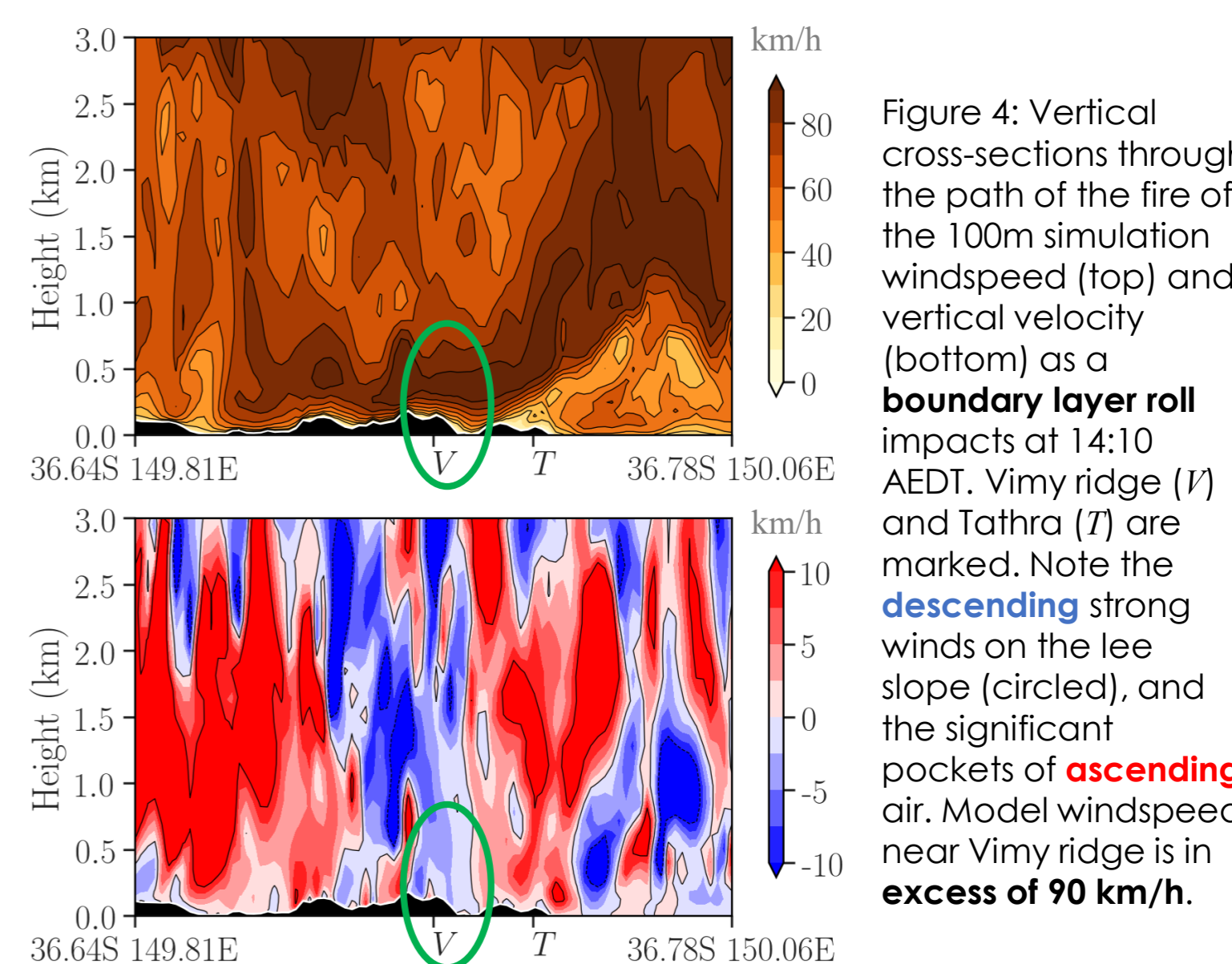


Figure 4: Vertical cross-sections through the path of the fire of the 100m simulation windspeed (top) and vertical velocity (bottom) as a **boundary layer roll** impacts at 14:10 AEDT. Vimy ridge (*V*) and Tathra (*T*) are marked. Note the **descending** strong winds on the lee slope (circled), and the significant pockets of **ascending** air. Model windspeed near Vimy ridge is in **excess of 90 km/h**.