

HighFire Risk: Weather anomalies in the high-country I Nocturnal low-level jets

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Introduction

Observations have revealed that fire weather in the high-country can be quite different to that experienced at lowland sites. Moreover, these differences can often result in higher fire danger levels in the high-country than what is experienced at lowland sites. Of particular note are significant high-country dew point depressions that occur approximately one in every seven days. Some of these dew point anomalies are due to nocturnal low-level jets, which can impact upon the high-country. Such phenomena have serious implications for any fire suppression activity being conducted in their vicinity.

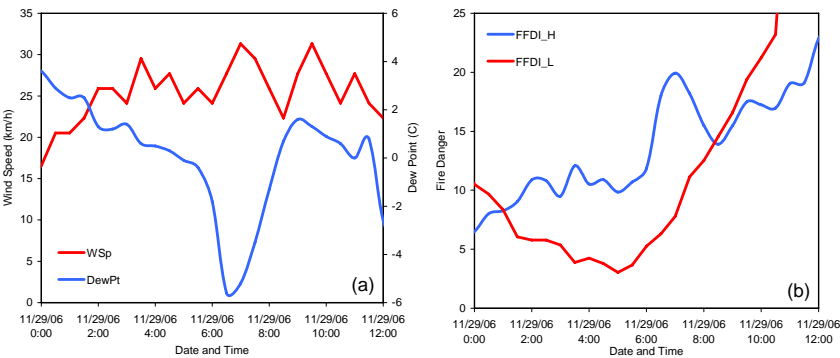


Figure 1. (a) Dew point and wind speed at Mt Ginini showing a dew point depression coinciding with strong winds, (b) corresponding forest fire danger at Mt Ginini (blue) and Canberra (red).

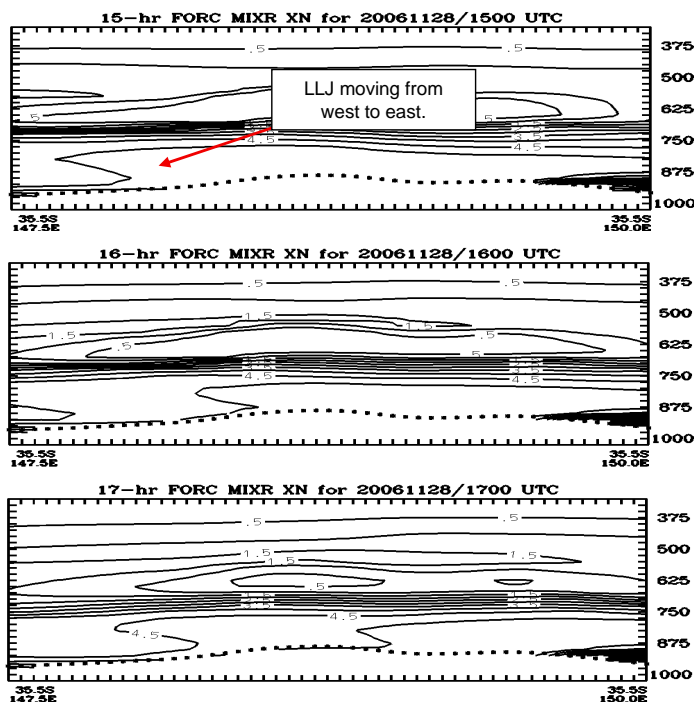


Figure 2. Meso-LAPS vertical cross-sections of mixing ratio showing the passage of a nocturnal low-level jet that impacts the high-country, bringing drier air to the surface. Local times are 01:00 – 03:00, 29/11/06.

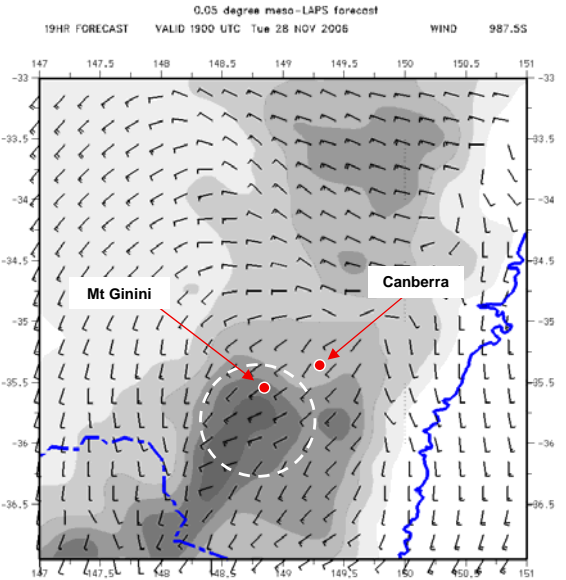


Figure 3. Meso-LAPS output of near surface wind field. A region exhibiting strong localised winds is circled. Local time is 05:00, 29/11/06.

A case study – 29/11/06 00:00-07:00

The Bureau of Meteorology's mesoscale numerical weather model Meso-LAPS was used to investigate a dew point depression event at Mt Ginini (1760 m), which was recorded in the early morning of the 29th of November 2006. Figure 1a depicts the event and the associated peak in wind speed. Figure 1b shows how the event affected local fire danger rating (DF=10), when compared with Canberra, whose dew point was steady at ~5°C during the event. Figure 2 shows meso-LAPS vertical cross-sections of mixing ratio for 3 successive hours. The passage of a low-level jet from west to east can be seen beneath the inversion in each panel. The mixing ratio isopleths indicate that drier air is being brought to the surface as the jet passes.

Figure 3 shows the surface wind field produced by meso-LAPS. The circled region of strong localised winds is consistent with a terrain induced low-level jet that impacts Mt Ginini (1760 m) but not Canberra (578 m).

Conclusions

The dew point depression event recorded at Mt Ginini in the early hours of the morning of the 29th of November 2006 was due to the passage of a terrain-induced low-level jet that impacted the more elevated parts of the landscape. The low-level jet brought drier air to the surface causing the dew point to drop significantly. Combined with strong winds gusting up to 55 km/h the drop in moisture resulted in locally elevated fire danger levels. As such, this type of event could seriously compromise fire crew safety and suppression activities, at a time when conditions would otherwise be expected to be mild.