
❖ NSW Lightning Bolt ❖



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1 Introduction

Another year and another eventful severe weather season, with Severe Thunderstorm Warnings issued for over 90 days in the 2012-2013 Severe Thunderstorm Season.

In this issue of *Lightning Bolt* we examine in detail two of the more interesting events of the season—a series of tornadoes affecting the Illawarra region, and the bushfires that resulted in many house losses and badly damaged the Siding Springs Observatory at Coonabarabran.

2 Tornadoes in the Illawarra Region 23 February 2013

On Sunday, 23 February 2013, in the early hours of the morning, residents in a number of communities in the Illawarra region, including Kiama, Albion Park, Jamberoo and Shoalhaven, woke up to nightmarish conditions as howling winds together with torrential rain tore through their communities. The full magnitude of the destruction did not become clear until sunrise but as the day unfolded, it was evident that a significant weather event had occurred.

Kiama suffered the most damage, with high levels of debris, power lines and trees down and significant structural damage to houses with some destroyed beyond repair. Furthermore, asbestos was found to be mixed amongst the debris leading to some residents being unable to return home during the clean-up. It came as no surprise that rumours of tornadoes circulated.



Damage from the Kiama Tornado 23 February 2013. Photo Credit: Andrew Treloar, Bureau of Meteorology.

The weather event that was experienced was caused by an east coast low that developed off the coast of Southern Queensland. It tracked down the New South Wales coast, eventually heading inland and weakening before crossing over the border into Victoria. East coast lows are synonymous with large areas of heavy rain, flooding, damaging winds and seas, and coastal erosion. Within these systems more intense damage, occurring within shorter time frames, is usually a result of narrow bands of strong low level horizontal wind shear and enhanced convection. These conditions can lead to localised severe weather and are favoured locations for waterspouts and tornado development.

Hot on the heels of ex-tropical cyclone Oswald, which caused extensive flooding less than a month earlier, this system initially moved slowly down the northeast coast of NSW resulting in torrential rainfall and damaging winds over a two day period. Rainfall of 415mm over a 24 hour period was recorded at Mount Seaview Weather Station in Yararas, breaking an all-time record since the station first opened in 1949. Riverine flooding was also experienced in northeast NSW with evacuation orders issued for areas downstream of the swollen rivers. Sadly two deaths resulted.

As the east coast low tracked further south it weakened but continued to produce heavy rain, isolated thunderstorms, damaging winds and rough seas along the east coast of NSW. In particular 161mm of rainfall was recorded over a 24 hour period at Robertson near Wollongong and significant wind damage to properties was reported in the Randwick and Camden areas of Sydney.

To investigate reports of tornadic activity, employees from the Bureau of Meteorology toured the worst affected parts of the Illawarra area and assessed the damage using aerial photographs, first hand reports, visual damage to trees, and structural damage to property. After this investigation, it was confirmed that the intense localised damage to the Illawarra region was caused by a family of tornadoes.

Three tornado paths were identified, with tornado strengths assessed using the Fujita Scale. These were a category F0 tornado that moved from Minnamurra to Jamberoo, an F1 that crossed the coast at

Kiama, and the strongest, a category F2 tornado that moved from Seven Mile Beach to Nowra, where it caused damage to the Nowra council chambers. A category F1 tornado indicates approximate wind speeds of 117-180 km/h and an F2 corresponds to 181-253 km/h.

3 Coonabarabran Bushfires 13 January 2013

Late on Saturday, 12 January 2013, a number of bushfires started in the Warrumbungle National Park and Pilliga State Forest, in northwest NSW. The outbreak of these fires was facilitated by very hot and dry conditions ahead of a slow moving surface trough over central New South Wales. On Sunday 13 January 2013, the bushfire intensified, as extreme heat led to afternoon temperatures soaring into the mid to high forties over much of northern NSW.

A low pressure trough moved through the area during Sunday afternoon, resulting in a period of strong and gusty west to northwest winds, with fire dangers reaching extreme levels. One fire burning in the Warrumbungle National Park became very active and burned rapidly eastwards towards the Siding Springs observatory and Coonabarabran.

The unstable atmosphere created by the trough also led to the development of thunderstorms, and subsequently strong and erratic wind gusts over the region. These conditions are highly conducive to plume driven fires and Pyrocumulonimbus clouds, which occur when the heat released from the fire plume leads to new thunderstorms developing. Weather radar showed this type of thunderstorm activity developing from around 2:40pm, with storm tops at around 10-12km.

Behind the trough a cooler yet exceptionally windy southerly change was moving across central NSW driven by a high pressure system positioned over the Bight. This wind change reached Coonabarabran at approximately 6:30pm. Further investigation into the wind change shows that it was strengthened by a record breaking north to south temperature gradient with the temperature recorded at 3.00pm for Walgett at 47.2 degrees Celsius, whereas Deniliquin recorded only 14.3 degrees Celsius, a temperature difference of 32.9 degrees.



Wambelong bushfire approaching Siding Springs observatory around 5pm on 13th January 2013.
Source: NSW RFS

Therefore instead of providing relief, the wind change resulted in the fire swiftly changing direction, shifting from moving to the east to a much broader northerly front which moved rapidly towards the town of Bugaldie. During the overnight period the southerly winds and general fire fighting conditions eased.

The culmination of the above meteorological conditions resulted in bushfires that caused the highest loss of property due to bushfire in New South Wales or the Australian Capital Territory since the devastating Canberra bushfires of January 2003. Over 50 homes and 100 outbuildings were destroyed, mostly in rural areas to the west and north-west of Coonabarabran, and over 40,000 hectares burnt including 90 percent of Warrumbungle National Park. However, although large loss of wildlife and livestock was suffered and numerous evacuations took place, remarkably no loss of human life was recorded.

4 Radar Upgrades

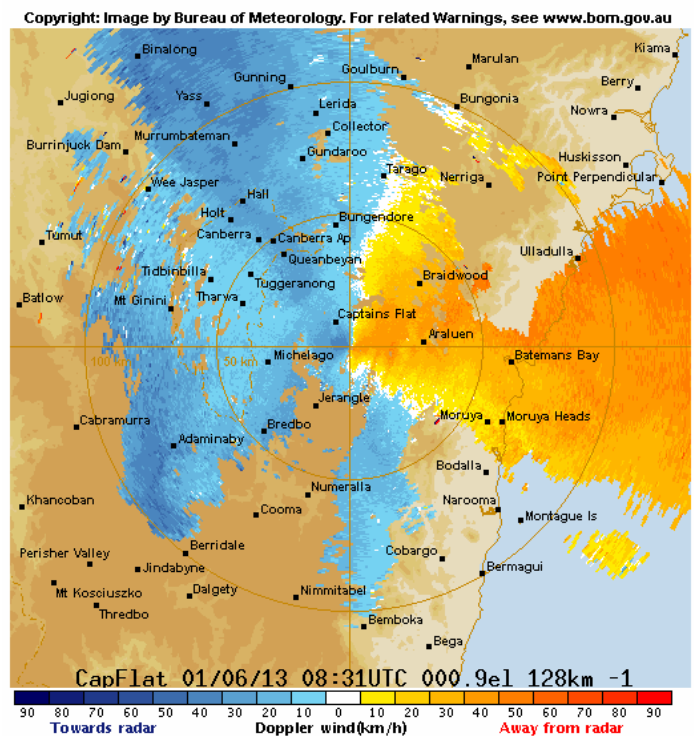
Major upgrades to the Captains Flat and Lemon Tree passage radars have been carried out in early 2013. The upgrades are part of a project being undertaken by the Bureau, known as the Strategic Radar Enhancement Project (SREP) to look at improving the coverage, quality and usage of weather radar data for Australia.

The upgrades will mean that images from these radars are now available every six minutes instead of every ten minutes. These two radars are also now capable of producing Doppler wind and rainfall accumulation images, bringing the total number of high resolution Doppler radars in NSW to five.

Doppler radars produce an estimate of the velocity of their targets towards or away from the radar by measuring a shift in phase of the returned radar pulses. This information can assist forecasters in determining the likely strength of wind gusts with thunderstorms and wind changes, and can also be used to help initialise high resolution numerical weather models.

Rainfall accumulation images combine the radar information with readings from the Bureau's extensive network of rain gauges to produce a maps of total accumulated rainfall across an area. This information can help forecasters identify localised areas that may be experiencing exceptionally heavy rainfall for inclusion in warnings, as well as improving estimates of catchment wide rainfall totals that are used for forecasting riverine floods.

These upgrades follow on from a similar upgrade to the Wollongong radar in early 2011.



Doppler wind image from Captains Flat radar from the 1st of June 2013.

Australian Weather Calendar 2015 Photo Competition: Indigenous Weather Knowledge

Did you know that you can submit photos for consideration in the next Bureau Weather Calendar? Entry for the 2014 calendar has recently closed, however the 2015 competition has just opened with the theme of Indigenous Weather Knowledge. If you have taken a truly spectacular photo of any interesting weather phenomena, you should consider entering them. For details see <http://www.bom.gov.au/calendar/contest/>

Contact:

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Online Spotter Reporting

The online spotter report form has been successfully used by spotters throughout the previous seasons. Forecasters really appreciate receiving real-time reporting which adds greatly to their understanding of the weather situation. A link to the online reporting form can be found on the Bureau's Storm Spotters network page at:

www.bom.gov.au/storm_spotters/index.shtml

Username: bomg0007 Password: Xy27mEne

It is important that only those people who are registered Storm Spotters have access to these features so please don't share these details around with anyone not part of the Spotter network. New spotters may join by filling out the application form also available from the Spotter Network webpage.

What to Report

Spotters are asked to report to the NSW Bureau of Meteorology if they observe :

- ◆ Hail 2 cm diameter (\$2.00 coin size) or larger
- ◆ Damaging winds (90 km/h) or greater (eg. trees snapped, uprooted, large branches down; roofing tiles / iron lifted; structural damage to well constructed buildings)
- ◆ Tornadoes (rotating funnel clouds)
- ◆ Very heavy rainfall with "flash" flooding of low lying areas (around 30mm in 30 min or 40mm in one hour)

As soon as it is safe, phone your report to our "freecall" number:

1800 060292

This greatly assists the Bureau in monitoring severe storms and passing on warnings to other communities.

Please post us your spotter report card by mail or via the online form even if you do call. This ensures that our record of your event is correct. The information you provide helps us build a better picture of severe thunderstorms across the State.

Moved or changed your details?

Please let us know! We'd like to keep our spotter database up-to-date. Anyone who suspects that they may have been removed from our database but wishes to continue as a spotter should call or email us, or send in a new application form stating on it that they have already registered but are sending in new details on the form. Thanks to everyone who has notified us in the past of changes to their details. It is a great help to us.

The Lightning Bolt is produced by the Bureau of Meteorology's NSW Severe Weather Section.

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The Lightning Bolt

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