Australian Government
Bureau of Meteorology

Post-Event Report 2006/07/1:
TROPICAL LOW 'ISOBEL' and the Esperance Rain Event
30 December 2006 - 5 January 2007

Joe Courtney, Brad Santos and Andrew Burton
Perth Tropical Cyclone Warning Centre
Bureau of Meteorology
17 August 2007

Overview

A tropical low formed south of the Indonesian archipelago on 30 December 2006 and moved initially eastwards then took a general southerly track from 2 January 2007 weakening to the north of Port Hedland on near the Northwest coast on 3 January. On the 2nd the low was upgraded to cyclone intensity operationally and named '*Isobel'* but the post-analysis indicates that the low did not reach tropical cyclone intensity. The most significant impact was economic from loss of productivity caused by the disruption to mining and offshore drilling operations and by the temporary closure of the port at Port Hedland.

Tropical moisture associated with the tropical low interacted with a remarkably deep mid-latitude trough resulting in heavy rain across the Goldfields, Eucla and South East Coastal Districts. The heaviest rainfall was near Esperance .

Part A. The Tropical Low

A low formed in the trough at the western edge of an active phase of the Madden-Julian Oscillation (MJO) in the final days of 2006. Formation of a low somewhere between 110E and 120E was expected given the MJO signal (which had been associated with the development of systems in the southwestern Indian Ocean in previous weeks). Formation was assisted by a strengthening of the NW'ly monsoon driven by a surge from across the equator in the South China Sea. Strong monsoon winds are believed responsible for the sinking of a ferry containing 600 people in the Java Sea between Java and Borneo.

From formation to dissipation near the coast the system displayed the characteristics of a broad elliptical monsoon gyre with a generally dominant Low Level Circulation Centre (LLCC) at one end of the ellipse. Although there was evidence of other LLCCs within the gyre at various times they were not as long lived or as clearly evident in microwave imagery as the dominant LLCC. Based on its longevity, clear signature in the microwave imagery at most times and relative dominance over other LLCCs this feature was used to determine track positions, rather than tracking the centroid of the gyre. During

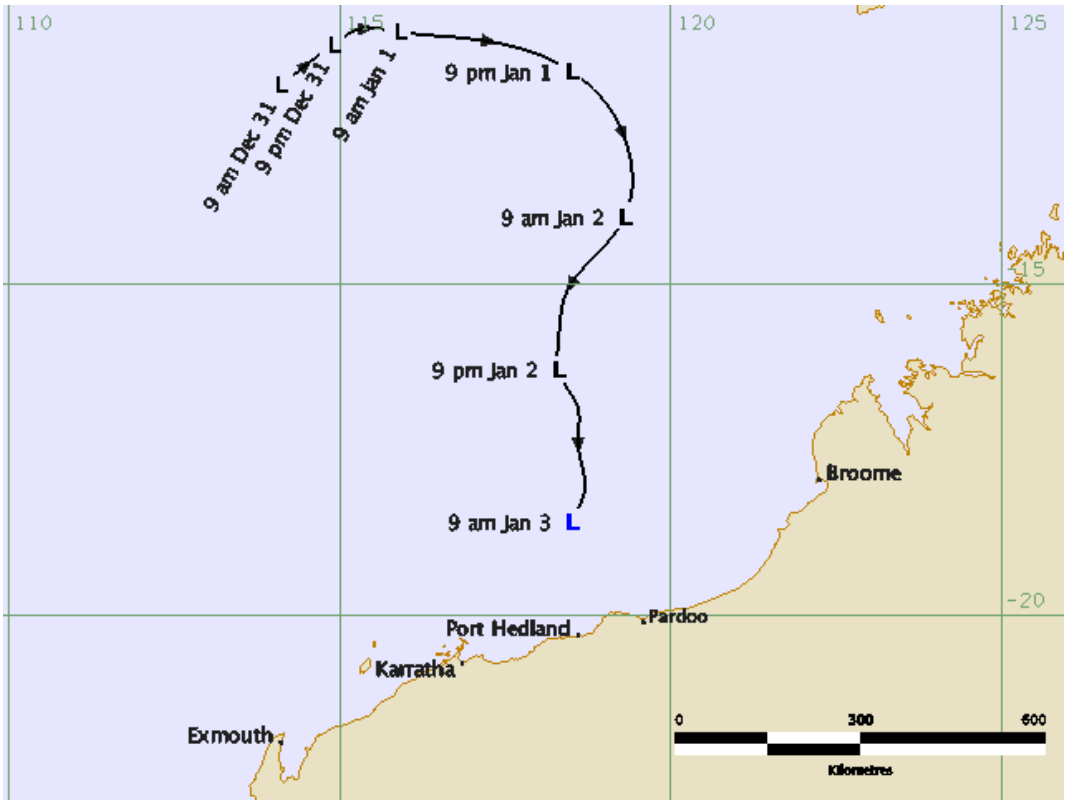
operations there were times when the centroid of the gyre was used for fixing positions due to warning policy considerations. This is likely to result in an increase in apparent error in the operational analysis track.

As is comon for monsoonal disturbances the system initially experienced easterly shear that is likely to have limited the development rate. On 1 January a well-defined LLCC (circular cloud lines indicating significant surface vorticity) became evident in the visbile imagery as it separated from deep convection and was steered east in the strong low level monsoon westerlies. At 01/0600 UTC a ship (call sign DMDZ) reported 45 knot winds as this feature passed just to the south. Scatterometer winds at around 1000 UTC indicated that the synoptic scale winds in the monsoon flow on the northern side of the gyre were around 30 knots at this stage. Organisation of convective features was poor and Dvorak estimates indicated the system was below cyclone intensity. It is likely that the strongest winds in the system were associated with the northern side of the "tightly wound" and rapidly translating LLCC. It is possible that the ship experienced these winds, which scatterometry would not be expected to resolve given the scale involved.

From 01/1200 UTC the system began to take a more southerly track. During 2 January the system approached the upper ridge and at 02/0600 UTC, with gales possible in the eastern quadrant (later supported by the scatterometry pass at 0940 UTC) the system was named operationally for warning policy reasons (principally the possibility of gales over coastal areas the next morning from an unnamed system previously described as having potential to develop into a TC, and possibility of further development overnight if the shear dropped for a sufficient period before increasing due to mid-latitude trough). This decision was also supported by an increase in convection near the centre as shown on visible imagery.

Visible imagery on 3 January shows the LLCC exposed as the convection had continued to shear southward under the influence of the mid-level trough. Disconnected from the (now weakening) convection the LLCC then rapidly weakened into an insignificant feature and was indiscernible by 0600 UTC. At this time a new pressure minimum is identifiable over land near Pardoo (991 hPa) but is only associated with light winds as the remnants of the monsoon gyre continue to dissipate.

Figure 1. Track of the Tropical Low



Part B. The Esperance Rain Event

Tropical moisture associated with a tropical low (named *Isobel* operationally) that weakened near the coast near 80 Mile Beach on Wednesday the 3rd, interacted with a remarkably deep mid-latitude trough resulting in heavy rain across the Goldfields, Eucla and South East Coastal Districts. Many rainfall records were broken.

Notable falls included:

Esperance Aero 177mm, Cheadenup 161.4 mm, Esperance 155.0 mm, Munglinup Town 153.6 mm, Telina Downs 138.6 mm, Merivale Farm 137.8 mm, Erinair 135 mm, Ravensthorpe 112.8 mm, Salmon Gums 91.6 mm.

Cumulative 48 hour falls were: 204.2mm at Cheadenup, 186mm at Esperance and 224mm at Esperance Aero. The Esperance Aero rainfall graph shows the highest rainfall fell on the afternoon of the 4th when 88.2mm fell between 12:50 and 18:50WDT.

The weekly rainfall map ending 7 January shows an area of more than 150mm in the Esperance area and in the 80 Mile Beach area. One farmer was reported as emptying over 300 mm from his rain gauge suggesting that even higher falls occurred.

The previous highest daily rainfall at Esperance was 106.6mm on 7/1/1999. In that event 206.6 mm of rain fell in three days.

The South Coastal Highway was cut when part of the bridges across the Young and Oldfields River were washed away. Preliminary Agriculture WA reports indicate that approximately 50 000 sheep died because of hypothermia and drowning. Floodwaters also damaged fences, scoured top soil and inundated some properties. Farmers did note that erosion soil erosion was not as bad as it would otherwise have been because of the use of seeding by direct drilling rather than conventional ploughing.

Bandy Creek broke its banks at the weir at the entrance to the Boat Harbour. Sand flooded into the harbour, stranding Esperance's small commercial fishing fleet and yachts that later sat on newly-created banks of sand.

Strong winds also downed power lines and high tides and heavy surf caused beach erosion. The storm surge at Esperance was measured at 60cm. Esperance recorded a wind gust of 111 km/h, eclipsing the previous highest January gust of 104 km/h that it recorded in 1975. Esperance Aero recorded 30-35 knot mean winds from 04/1750 to 05/0040 WDT as shown on the graph of Esperance Aero winds.

Figure 2. Esperance rainfall 3-5 January 2007.

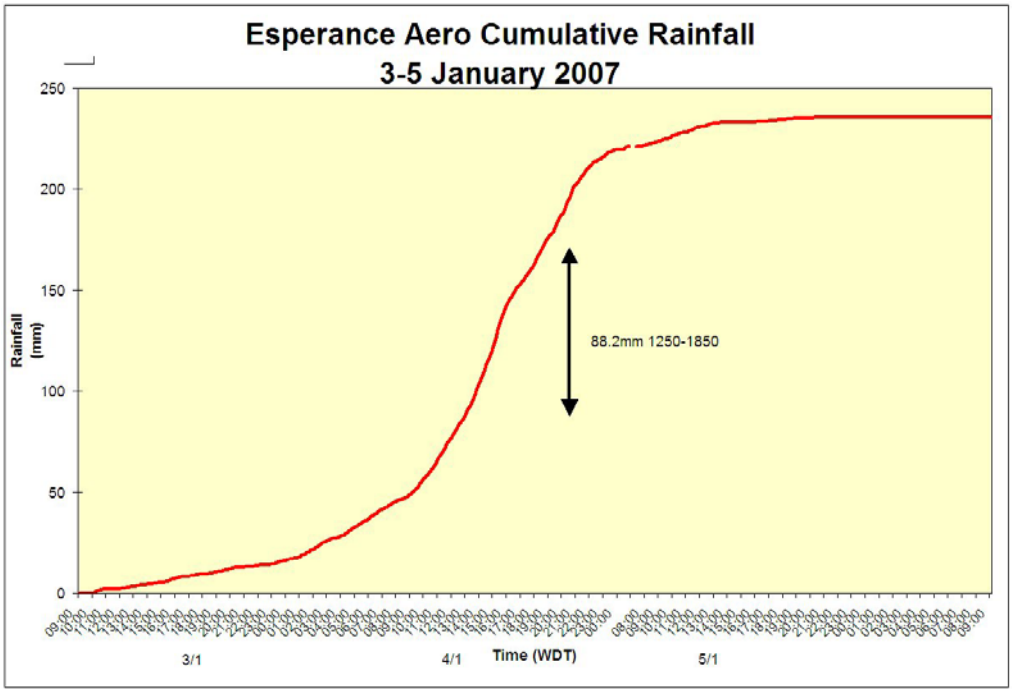


Figure 2. Weekly rainfall ending 7 January 2007.