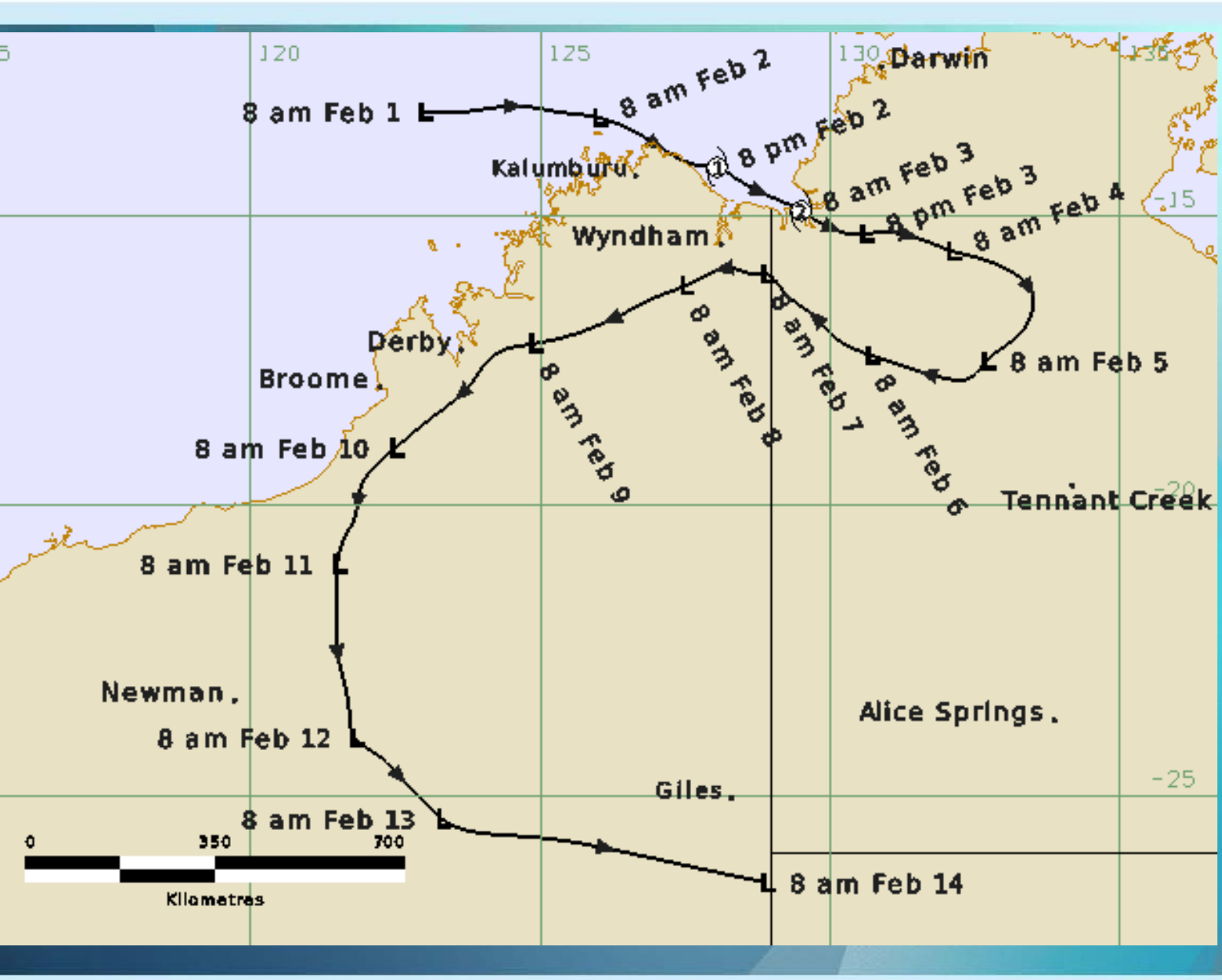
Australian Government
Bureau of Meteorology

Unnamed Tropical Cyclone 09U

1 – 14 February 2014

Joe Courtney, Severe Weather Environmental Prediction Services
9 September 2022



Contact details:

Tropical Cyclone Team Lead
Severe Weather Environmental Prediction Services
Bureau of Meteorology
PO Box 1370, West Perth WA 6872
Email: tcwc@bom.gov.au

Table of Contents

List of Figures

1. Summary

A tropical low formed north of the Kimberley and reached tropical cyclone intensity near the coast ahead of making landfall on the morning of 3 February near the mouth of the Victoria River in the Northern Territory. The system peaked in intensity at 55 kn (100 km/h; category 2) near landfall. Strong winds brought some trees and power lines down at Wadeye community on the edge of the gale extent to the north.

Severe weather warnings were issued for communities in the path of 09U from 2 February on the expectation that the system would not reach tropical cyclone intensity. It was not named in real time on the basis of anticipated imminent weakening as it moved overland. However, the system remained over water for longer than expected and upon reanalysis after the event it was determined that it first attained tropical cyclone intensity from the evening of 2 February through until the afternoon of 3 February.

The system remained well structured as it moved over land for many days thereafter and threatened to move over water and re-intensify near the west Kimberley coast on 9-10 February. However, it remained over land and eventually weakened as it near the Western Australian South Australian border on 14 February.

The system caused heavy rainfall and flooding over a wide area from western and central parts of the Northern Territory, then across the Kimberley, eastern Pilbara and central Desert areas of Western Australia. Flooding caused damage to 20 homes in Kununurra (northeast Kimberley) and made many roads impassable for a period.

Figure 1. Best track of unnamed Tropical Cyclone 09U, 1–14 February 2014 (times in AWST, UTC +8 hours).

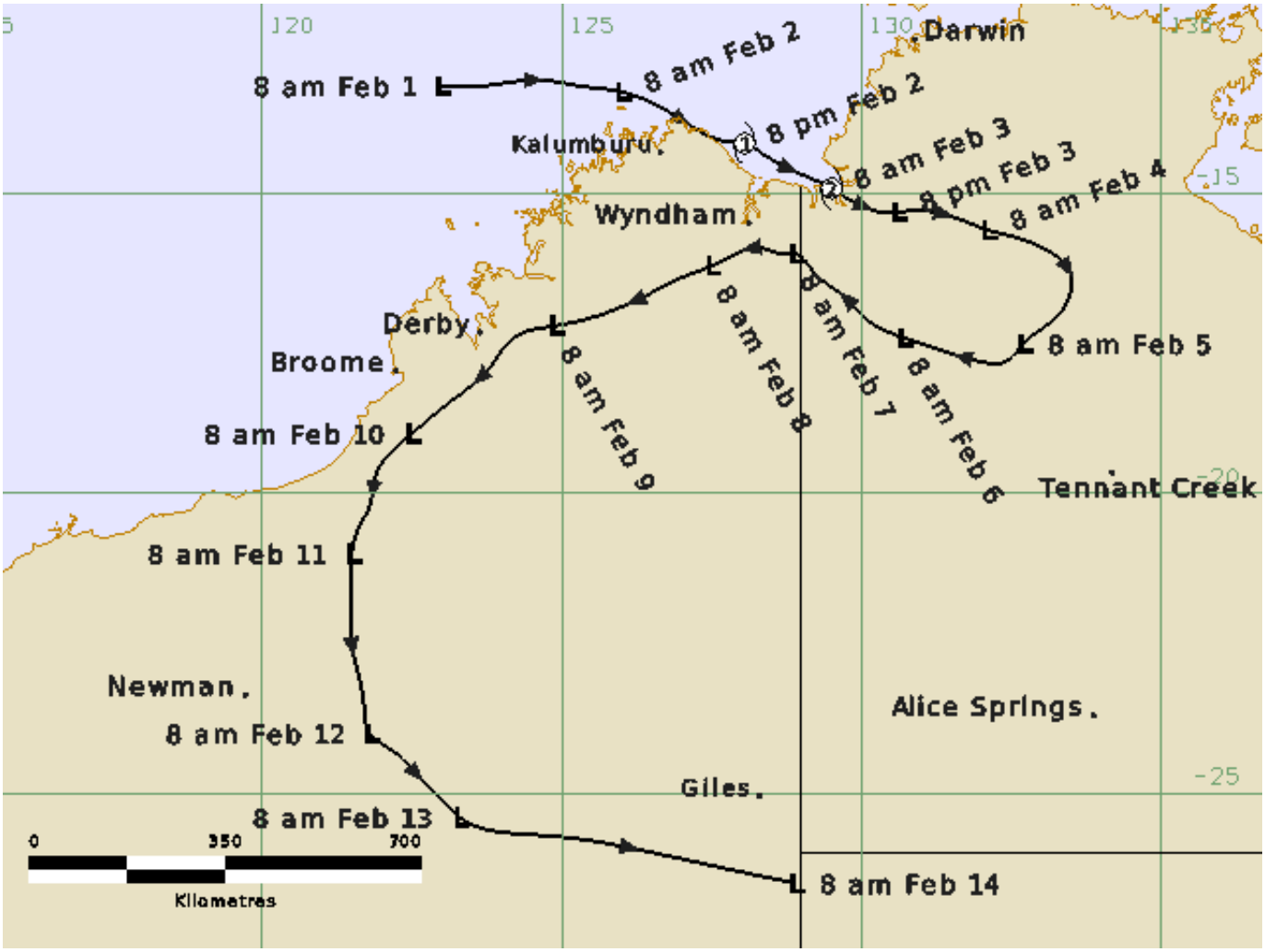
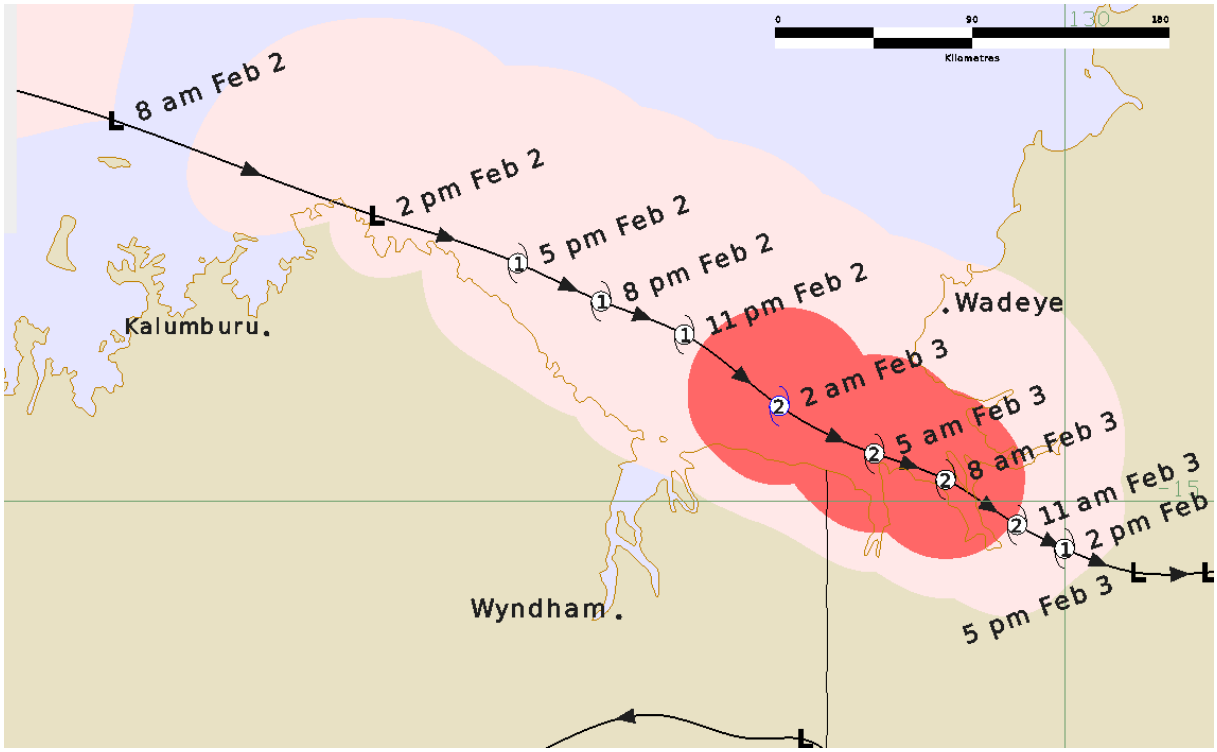


Figure 2. Detailed best track of Unnamed Tropical Cyclone 09U (times in AWST, UTC+8 hours).

The area of pink is the region of gales (34kn and higher) and the red is the area of storm-force winds (48 kn and higher).



2. Meteorological Description

2.1 Intensity analysis

Figure 1 shows the track of 09U, while Figure 2 shows the detailed tracks near the Northern Territory coast. Figure 3 is a plot of intensity estimates during the lifetime of 09U.

A tropical low formed on 1 February off the northwest Kimberley coast. The low became better defined early on 2 February when it neared the north Kimberley coast. The low passed just to the north of Kalumburu. An ASCAT-B pass at 0118 UTC 2 February indicated a small area of gales to the northwest of the centre. Deep convection developed during the day and tropical cyclone intensity is estimated at 0900 UTC 2 February. This estimate was influenced by the SSMIS 91 GHz microwave image (refer Figure 4) showing a small well-defined circulation near the north Kimberley coast.

The system was tracked on the Wyndham radar that supported further development into the morning of 3 February as shown in Figure 5. Development to 55 kn (90 km/h, category 2) intensity at 0000 UTC 3 February was supported by microwave images that showed a small eye as shown in Figure 6. just ahead of landfall on the southeastern part of the Joseph Bonaparte Gulf.

The system then weakened as it tracked overland. Satellite imagery showed a symmetric and well-developed system over land for many days as evident by the visible imager at 0332 UTC 11 February in Figure 7. Although the system threatened to move over water off the Western Australian coast on 10 February, the low remained overland.

2.2 Structure

Gales commenced northwest of the centre around 0000 UTC 2 February and extended to the northeast quadrant at 0600 UTC and to remaining quadrants at 1200 UTC 2 February. The gale radius was highly asymmetric extending to 50-60 nm (95-110 km) to the north but only to 30 nm (55 km) to the south owing to land interaction.

The radius of maximum winds was initially 30-45 nm as gales commenced but reduced to 10 nm (18 km) as the system intensified.

Refer to Table 1 for wind radii estimates.

2.3 Motion

The low was steered to the to the east southeast in its early stages assisted by the monsoonal flow. On 4 February the low took a general southerly track and then west to northwest from the 5th to the 7th under the influence of the sub-tropical ridge that strengthened to the south.
From 7 February the low tracked to the southwest, and while it threatened to move back over waters off the west Kimberley coast, it remained overland. The low tracked slowly to the south from 10 February and then to the southeast from 12 February until it dissipated over inland Western Australia on 13 February.

TABLE 1. Best track summary for unnamed Tropical Cyclone 09U.

Refer to the Australian Tropical Cyclone database for complete listing of parameters.
Note: UTC is AWWST – 8 hours and ACST – 9.5 hours.
*Not at tropical cyclone intensity as gales in two or less quadrants

Year	Month	Day	Hour UTC	Pos. Lat. S	Pos. Long. E	Pos. Acc. nm	Max Wind 10min kn	Max gust kn	Cent. Press. hPa	Rad. of gales (NE/SE/ SW/NW)	Rad. of storm (NE/SE/ SW/NW)	RMW nm
2014	2	1	0000	13.2	123.0	30	15	45	1000	0/0/0/0	0/0/0/0	-
2014	2	1	0600	13.2	123.7	35	20	45	998	0/0/0/0	0/0/0/0	-
2014	2	1	1200	13.1	124.6	30	25	45	998	0/0/0/0	0/0/0/0	-
2014	2	1	1800	13.2	125.3	30	25	45	998	0/0/0/0	0/0/0/0	-
2014	2	2	0000	13.4	126.0	25	35*	50	998	0/0/0/50	0/0/0/0	45
2014	2	2	0600	13.8	127.1	10	35*	50	996	50/0/0/50	0/0/0/0	40
2014	2	2	0900	14.0	127.7	10	35	50	994	50/30/0/50	0/0/0/0	30
2014	2	2	1200	14.2	128.1	10	35	50	995	50/30/30/50	0/0/0/0	30
2014	2	2	1500	14.3	128.4	10	40	55	991	50/30/30/50	0/0/0/0	20
2014	2	2	1800	14.6	128.8	15	50	70	984	50/30/30/60	25/20/20/25	15
2014	2	2	2100	14.8	129.2	10	50	70	986	50/30/30/60	25/20/20/25	10
2014	2	3	0000	14.9	129.5	10	55	80	984	50/30/30/60	20/20/20/25	10
2014	2	3	0300	15.1	129.8	15	55	80	986	30/20/25/50	0/0/0/20	10
2014	2	3	0600	15.2	130.0	25	40	55	988	30/15/0/30	0/0/0/0	12
2014	2	3	0900	15.3	130.3	40	30	45	992	0/0/0/0	0/0/0/0	-
2014	2	3	1200	15.3	130.6	30	30	45	992	0/0/0/0	0/0/0/0	-
2014	2	3	1800	15.3	131.2	20	30	45	994	0/0/0/0	0/0/0/0	-
2014	2	4	0000	15.6	132.1	20	25	45	996	0/0/0/0	0/0/0/0	-
2014	2	4	0600	15.8	132.8	20	25	45	994	0/0/0/0	0/0/0/0	-
2014	2	4	1200	16.4	133.5	20	25	45	995	0/0/0/0	0/0/0/0	-
2014	2	4	1800	17.0	133.3	25	25	45	995	0/0/0/0	0/0/0/0	-
2014	2	5	0000	17.5	132.7	20	20	45	998	0/0/0/0	0/0/0/0	-
2014	2	5	0600	17.8	132.4	25	20	45	996	0/0/0/0	0/0/0/0	-
2014	2	5	1200	17.8	132.0	30	20	45	998	0/0/0/0	0/0/0/0	-
2014	2	5	1800	17.6	131.3	25	20	45	996	0/0/0/0	0/0/0/0	-
2014	2	6	0000	17.4	130.7	20	25	45	996	0/0/0/0	0/0/0/0	-
2014	2	6	0600	17.1	130.1	20	20	45	994	0/0/0/0	0/0/0/0	-
2014	2	6	1200	16.7	129.7	30	20	45	996	0/0/0/0	0/0/0/0	-
2014	2	6	1800	16.3	129.2	25	20	45	996	0/0/0/0	0/0/0/0	-
2014	2	7	0000	16.0	128.9	20	20	45	996	0/0/0/0	0/0/0/0	-
2014	2	7	0600	16.0	128.7	20	25	45	994	0/0/0/0	0/0/0/0	-
2014	2	7	1200	15.9	128.3	20	25	45	994	0/0/0/0	0/0/0/0	-
2014	2	7	1800	16.0	127.9	20	25	45	994	0/0/0/0	0/0/0/0	-
2014	2	8	0000	16.2	127.5	20	25	45	994	0/0/0/0	0/0/0/0	-
2014	2	8	0600	16.4	127.0	20	25	45	992	0/0/0/0	0/0/0/0	-
2014	2	8	1200	16.7	126.4	20	25	45	992	0/0/0/0	0/0/0/0	-
2014	2	8	1800	17.0	125.7	25	25	45	988	0/0/0/0	0/0/0/0	-

Year	Month	Day	Hour UTC	Pos. Lat. S	Pos. Long. E	Pos. Acc. nm	Max Wind 10min kn	Max gust kn	Cent. Press. hPa	Rad. of gales (NE/SE/ SW/NW)	Rad. of storm (NE/SE/ SW/NW)	RMW nm
2014	2	9	0000	17.2	124.9	20	25	45	988	0/0/0/0	0/0/0/0	-
2014	2	9	0600	17.4	124.2	20	25	45	988	0/0/0/0	0/0/0/0	-
2014	2	9	1200	17.9	123.8	20	25	45	988	0/0/0/0	0/0/0/0	-
2014	2	9	1800	18.5	123.1	25	25	45	988	0/0/0/0	0/0/0/0	-
2014	2	10	0000	19.0	122.5	20	25	45	990	0/0/0/0	0/0/0/0	-
2014	2	10	0600	19.7	121.9	20	25	45	988	0/0/0/0	0/0/0/0	-
2014	2	10	1200	20.2	121.8	20	25	45	990	0/0/0/0	0/0/0/0	-
2014	2	10	1800	20.6	121.6	20	25	45	990	0/0/0/0	0/0/0/0	-
2014	2	11	0000	21.0	121.5	20	25	45	990	0/0/0/0	0/0/0/0	-
2014	2	11	0600	21.7	121.5	20	25	45	990	0/0/0/0	0/0/0/0	-
2014	2	11	1200	22.5	121.5	20	25	45	992	0/0/0/0	0/0/0/0	-
2014	2	11	1800	23.5	121.7	25	25	45	992	0/0/0/0	0/0/0/0	-
2014	2	12	0000	24.0	121.8	20	25	45	994	0/0/0/0	0/0/0/0	-
2014	2	12	0600	24.3	122.2	22	25	45	992	0/0/0/0	0/0/0/0	-
2014	2	12	1200	24.7	122.6	25	20	45	994	0/0/0/0	0/0/0/0	-
2014	2	12	1800	25.0	122.9	25	20	45	994	0/0/0/0	0/0/0/0	-
2014	2	13	0000	25.4	123.3	25	20	45	998	0/0/0/0	0/0/0/0	-
2014	2	13	0600	25.7	124.7	25	20	45	996	0/0/0/0	0/0/0/0	-
2014	2	13	1200	25.9	126.1	25	20	45	998	0/0/0/0	0/0/0/0	-
2014	2	13	1800	26.2	127.5	25	20	45	998	0/0/0/0	0/0/0/0	-
2014	2	14	0000	26.5	128.9	25	20	45	998	0/0/0/0	0/0/0/0	-

Figure 3. Plot of intensity estimates for unnamed Tropical Cyclone 09U.

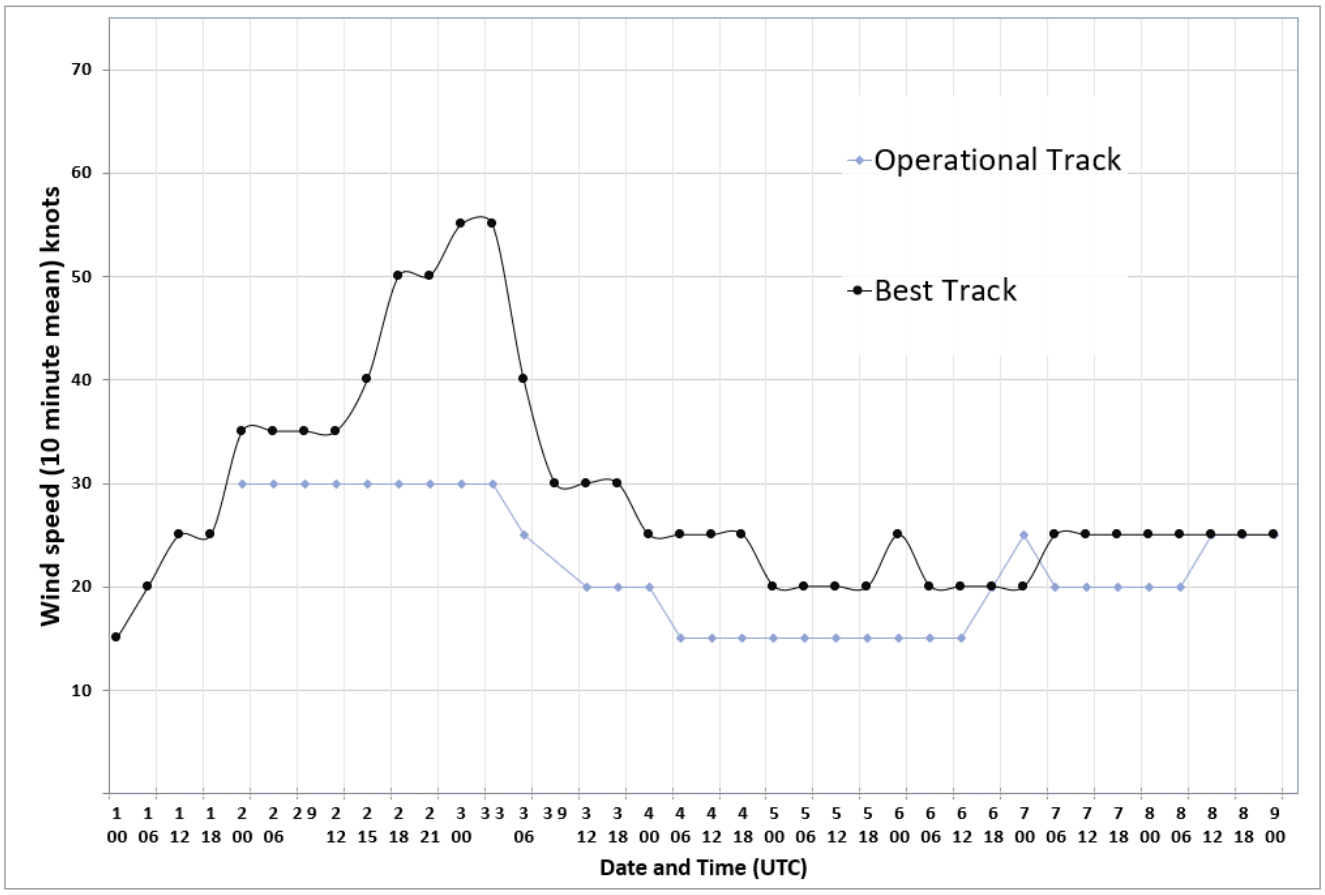


Figure 4. SSMIS 91 GHz microwave image at 0909 UTC 2 February. The centre is marked with an 'x'.

Image courtesy NRL: https://www.nrlmry.navy.mil/TC.html

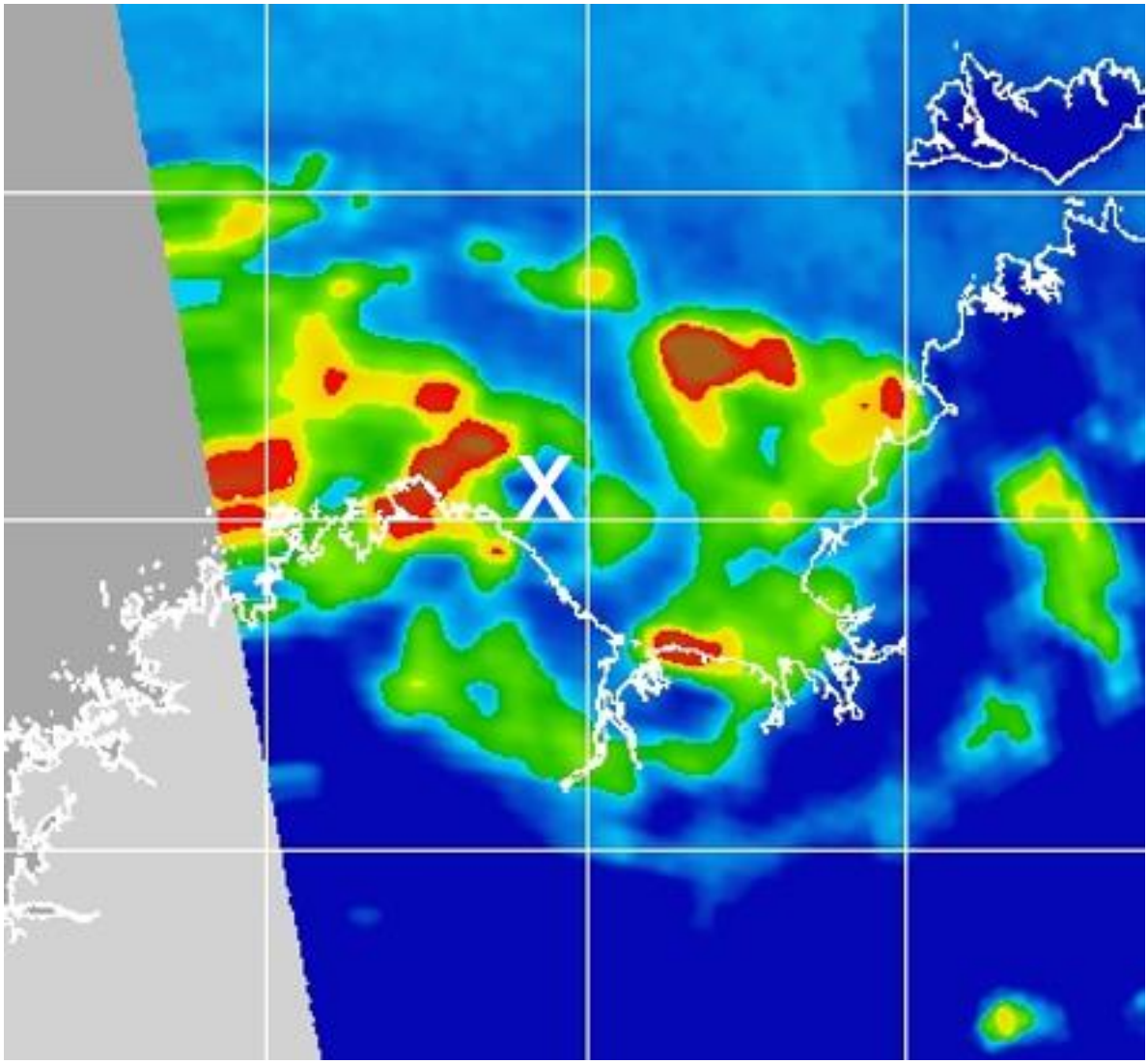


Figure 5. Wyndham radar at 2240 UTC 2 February 2014.

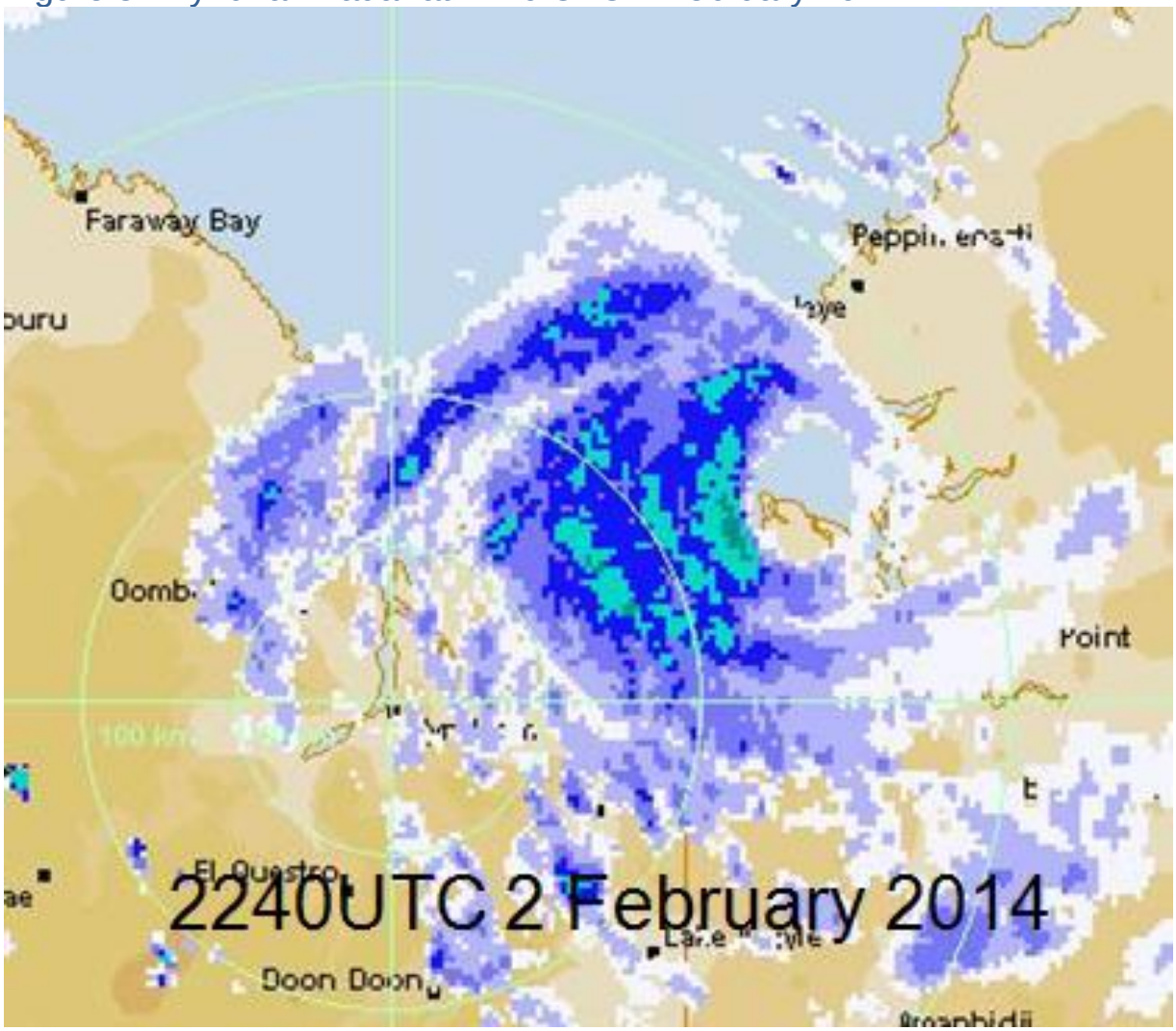


Figure 6. SSMIS 91 GHz microwave image at 2254 UTC 2 February 2014 near landfall.

Image courtesy of CIRA: https://rammb-data.cira.colostate.edu/tc_realtime/index.asp

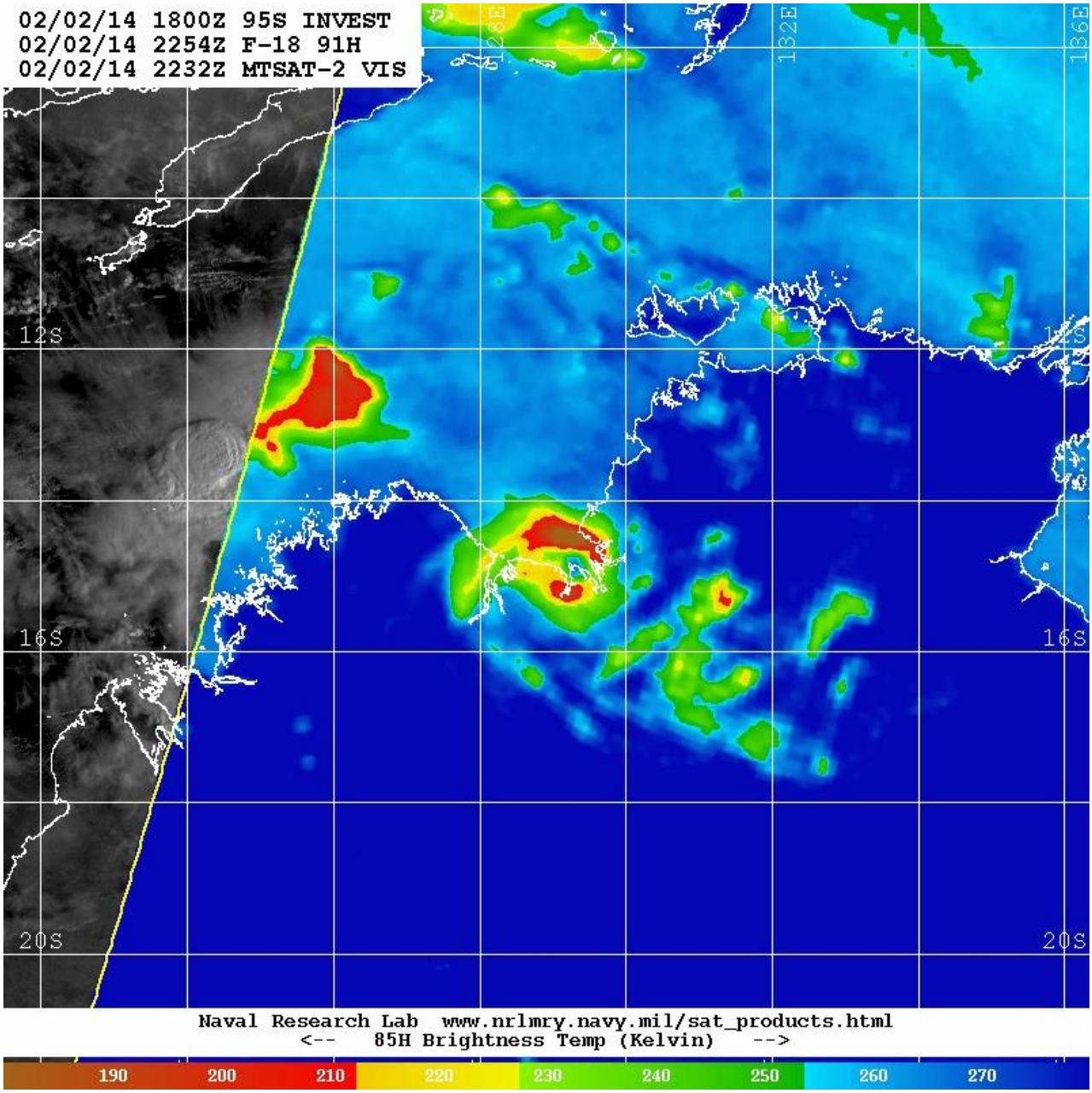
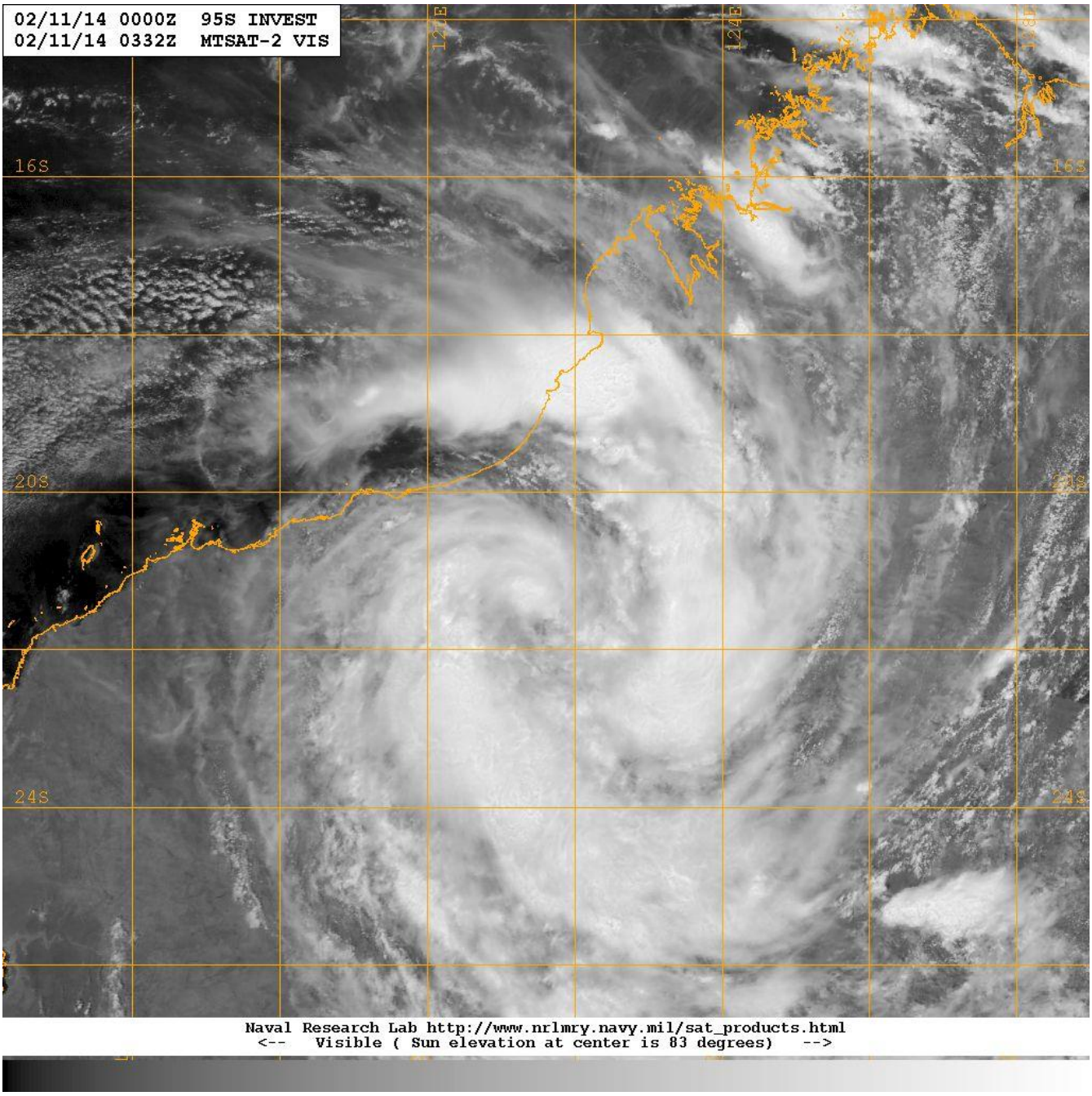


Figure 7 Visible image at 0332 UTC 11 February 2014.

Image courtesy of NRL: https://www.nrlmry.navy.mil/TC.html.



3. Impact

Damaging winds on 3 February brought down a number of trees and power lines in Wadeye as the system passed to the south.

Heavy rainfall associated with the system over subsequent days exacerbated existing flooding over the Darwin-Daly District and caused flooding to extend into the Victoria River District.

Heavy rain extended into Western Australia with the track of the system. By 8 February, flooding caused damage to 20 homes in Kununurra (Western Australia). Minor to moderate flooding occurred in the Fitzroy River catchment above Diamond Gorge and minor flooding at Fitzroy Crossing and downstream to Willare Crossing. In the Pilbara, minor flooding occurred in the Nullagine and Oakover Rivers in the De Grey River catchment.

The flooding made many roads impassable for a period.

No storm tide impacts were reported. However, the system approached the coast at the same time as the highest tide of the year (8.08 m LAT at Darwin at 2022 UTC 2 February). As a result, a significant storm tide may have occurred.

4. Observations

4.1 Wind

Observed winds at Wadeye (Port Keats Airfield) did not reach gale-force nor did measured gusts exceed 90 km/h (damaging). The highest recorded wind gust was 76 km/h at 2026 and 2058 UTC 2 February (0556 and 0628 ACST 3 February). However, trees and power lines were brought down (see impact section) suggesting damaging winds did occur at Wadeye. Gales were quite likely to have occurred on the coast as depicted in Figure 2.

4.2 Rainfall

Figure 8 shows the weekly rainfall distribution for 1-7 February and 7-13 February demonstrating cumulative falls over 200 mm extending over a large region from Northern Territory and Kimberley regions.

Some significant daily rainfall figures include:

Northern Territory:

1 February: Douglas River 207 mm; Adelaide River PO 197 mm; Howard Springs 156 mm;

2 February: Fergusson River 90 mm;

3 February: Mango Farm 92 mm;

6 February: Wave Hill 142 mm;

7 February: Keep River Rangers 127 mm; Mount Sanford 95 mm.

8 February: Keep River Rangers 147 mm; Bradshaw Range 114 mm; Timber Creek 111 mm.

Western Australia:

7 February: Microwave Tower (Kununurra) 224.2 mm; Kununurra Checkpoint 168.8 mm; Lake Kununurra 156.8 mm.

8 February: Microwave Tower 308.6 mm; Abney Hill 270.4 mm; Lake Kununurra 235.2 mm; Kununurra Checkpoint 170.8 mm; Kununurra Aerodrome 163.8 mm.

9 February: Gibb River 143.4 mm; Mount Elizabeth 141 mm; Mount Hart 133 mm.

10 February: Cygnet Bay 269.4 mm; Lombadina Airstrip 253.6 mm; Liveringa Station 229.0 mm; Country Downs 190.2 mm.

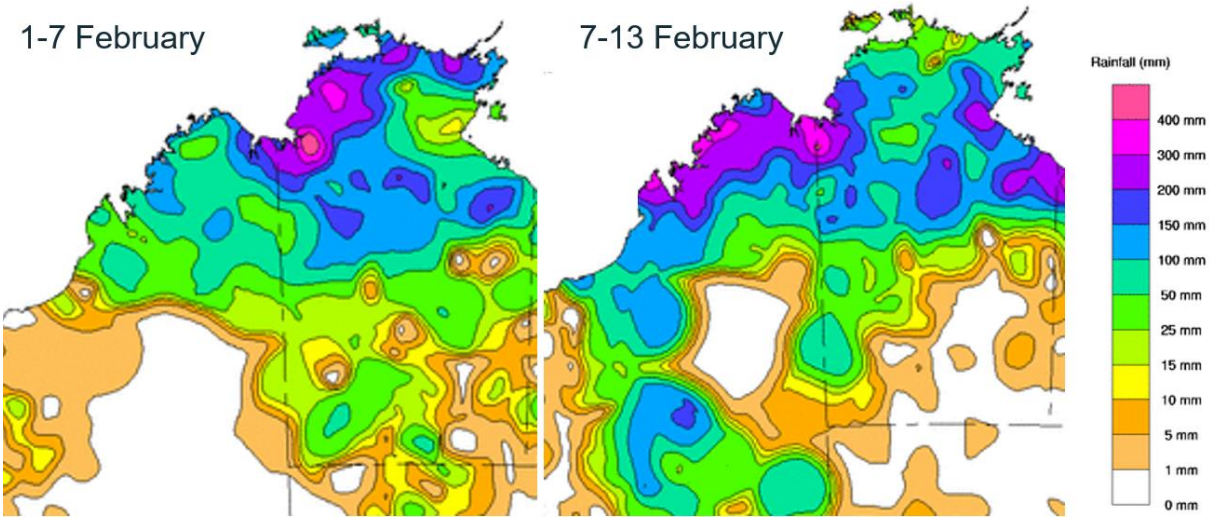
11 February: Derby Main Roads 128.4 mm; Kilto Station 118 mm; Telfer Airport 98.2 mm; Curtin RAAF 98.2 mm.

12 February: Pardoo Station; 120 mm; Anna Plains 107.6 mm; Wallal Downs 93.4 mm; Carnegie 76.4 mm.

13 February: Lorna Glen 113 mm; Eyre 64.6 mm; Arubiddy 61.4 mm.

Figure 8. Weekly rainfall distribution for 1-7 February (left) and 7-13 February (right).

Note: the rain free regions over inland Western Australia reflect a lack of observing sites in that area.



5. Forecast Performance

Severe weather warnings were issued for community in the path of 09U from 2 February on the expectation that the system would not reach tropical cyclone intensity. In this sense Wadeye (Northern Territory), being the only community affected by gales, were given advanced warning of such wind conditions.

Tropical cyclone advices were issued for the Western Australian communities between Cockatoo Island and Port Hedland on 8 February for the possibility the low would move offshore and re-intensify. The chances of this occurring diminished on 9 February but advices continued until 10 February when confidence in an overland track increased.

6. Appendix: List of abbreviations

ADT	Advanced Dvorak Technique	km/h	kilometres per hour
ACST	Australian Central Standard Time	kn	knot
AEST	Australian Eastern Standard Time	LLCC	low level cloud centre
AMSR2	Advanced Microwave Scanning Radiometer	MET	Model Expected T-number
ASCAT	Advanced Scatterometer	METOP	Meteorological Operational Satellite
ATMS	Advanced Technology Microwave Sounder	MJO	Madden-Julian Oscillation
AWS	automatic weather station	mm	millimetres
AWST	Australian Western Standard Time	MSLP	mean sea level pressure
C	Celsius	nm	nautical mile
CI	Current intensity	NOAA	National Oceanic and Atmospheric Administration
CIMSS	Cooperative Institute for Meteorological Satellite Studies (USA)	NRL	Navy Research Lab (USA)
CIRA	Cooperative Institute for Research in the Atmosphere (USA)	PAT	Pattern T-number
EIR	Enhanced InfraRed	RH	relative humidity
ERC	eyewall replacement cycle	RMW	radius of maximum winds
FNMOC	Fleet Numerical Meteorology and Oceanography Centre (USA)	RSMC	Regional Specialised Meteorological Centre
FT	Final T-number	SAR	Synthetic Aperture Radar
GCOM	Global Change Observation Mission	SATCON	satellite Consensus
GHz	Gigahertz	SMAP	Soil Moisture Active Passive
GMI	Global Precipitation Measurement Microwave Imager	SMOS	Soil Moisture and Ocean Salinity
h	hour	SSMIS	Special Sensor Microwave Imager/Sounder
hPa	hectopascal	TC	Tropical Cyclone
HSCAT	Hai Yang 2 Scatterometer (HY-2B, HY-2C)	TCWC	Tropical Cyclone Warning Centre
km	kilometres	UTC	Universal Time Co-ordinated