Australian Government
Bureau of Meteorology

Tropical Low 14U

25 – 30 January 2017

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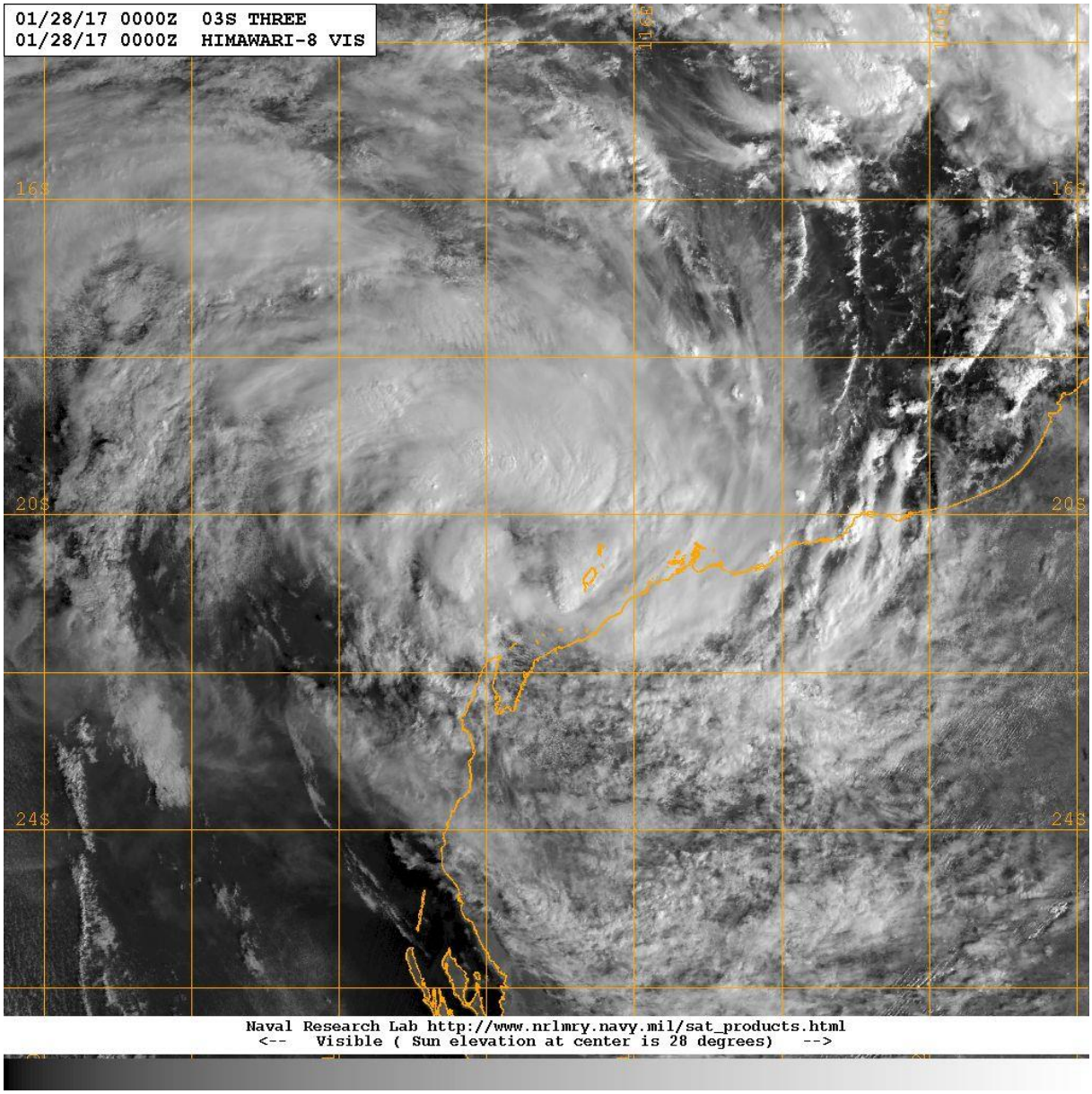


1 Summary

A low (14U) which formed in the Gulf of Carpentaria on 23 January moved west across the top end of Australia. The low moved into the Western Australian area of responsibility (AOR) early on 25 January, south of Wyndham and continued to move to the west. On 26 January the low moved offshore and over open water north of Broome. Convection increased and became more organised and the low showed signs of developing during 27 January. Gale force winds were observed at offshore and coastal locations during 27 and 28 January as 14U moved rapidly to the west, parallel to the Pilbara coast. Gales were present in southern quadrants and 14U reached an estimated maximum 10-minute mean wind speed of 45 knots (kn) (83 kilometres per hour (km/h)) at 1800 Universal Time Coordinated (UTC) 27 January (0200 Australian Western Standard Time (AWST) 28 January=UTC+8 hours) but the low did not continue to develop into a tropical cyclone. The low moved west into the Indian Ocean and weakened by 30 January.

Tropical Cyclone Advices were initiated at 0700 UTC 25 January and covered the coastal areas between Bidyadanga and Ningaloo, gradually being extended west along the Pilbara coast during the event. Tropical Cyclone Advices were cancelled at 1000 UTC 28 January when 14U was located well to the north west of Exmouth and moving further away from the Western Australia mainland.

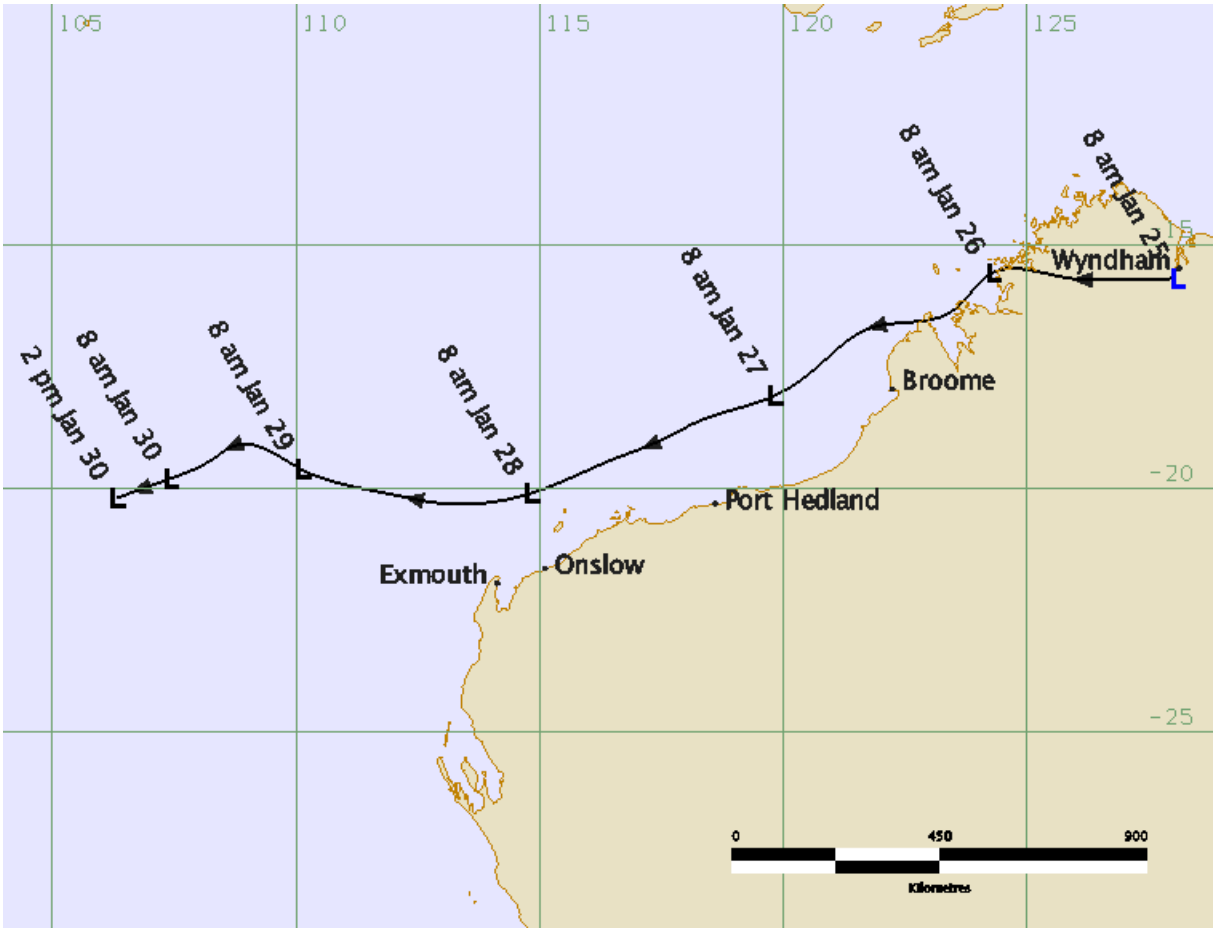
The low was responsible for heavy rainfall and flooding through parts of the Kimberley. The heaviest 24 hour rainfall recorded to 9am Australian Western Standard Time (AWST) was 177mm at El Questro (25 January), 93mm at Mount Rob (26 January) and 95mm at Country Downs (27 January). Following the heavy rainfall, the Fitzroy River at Fitzroy Crossing peaked above 8 metres (m), below the minor flood level (9.5 m). Downstream of Fitzroy Crossing, Noonkanbah and Willare approached the minor flood class levels.

Significant river rises occurred in the Kimberley. Minor to moderate flooding occurred in the Ord River at Tarrara Bar and Flying Fox Hole. The King River at Cockburn North peaked above the major flood level (3.0 m). River rises up to 7.0 m were recorded in the Dunham River at Dunham Gorge. River rises were also observed in the upper Ord River catchment.

In the west Kimberley, river rises were recorded in the Lennard River (around 3.5 m) and Isdell River (around 5.0 m).

The strongest wind gust recorded was 59 kn (109 km/h) at Legendre Island at 2025 UTC 27 January.

FIGURE 1. Best track of Tropical Low 14U 25-30 January 2017 (times in AWST, UTC+8).



2 Meteorological Description

2.1 Intensity analysis

A low moved offshore from the Kimberley coast north of Broome early on 26 January. The low slowly developed as it continued to move in a southwest direction and convection and curved banding increased during 26 January. A partial Advanced Scatterometer (ASCAT) pass at 1404 UTC 26 January showed a weak, elongated low just to the northwest of Broome (refer Figure 2). By 1800 UTC 26 January a Dvorak Data-T (DT) 1.5 classification was made. The Visible (VIS) image at 0000 UTC 27 January showed a broad low level circulation with increased deep convective bands. It is likely that there were multiple low level centres at this time. The DT number was increased to 2.0. During the day bands of convection formed but were not wrapped tightly into the centre of the system and the DT number remained at 2.0. As 14U moved north of Bedout Island the observing site recorded a maximum 10-minute mean wind of 37 kn (68 km/h) at 1300 UTC 27 January. Overnight on 27 January numerous sites along the Pilbara coast recorded gale force winds with the maximum 10-minute mean wind of 45 kn (83 km/h) recorded at Legendre Island at 2025 UTC 27 January. The low reached a 10-minute mean wind peak intensity of 45 kn (83 km/h) between 1800 UTC 27 January and 1800 UTC 28 January as it continued to track west (refer Figure 3). By 29 January VIS imagery revealed a sheared and exposed low level centre to the east of the remaining deep convection in western quadrants. ASCAT passes failed to capture the western half of 14U but it is likely gales remained in these quadrants during 29 January. By 30 January the separation between the decreasing deep convection and the low level centre had increased and it is likely gales were no longer present near the centre of the low.

Objective guidance from Satellite Consensus (SATCON) and Cooperative Institute for Meteorological Satellite Studies (CIMSS) and National Environmental Satellite, Data, and Information Service (NESDIS) Advanced Dvorak Techniques (ADT) are shown in Figure 4. CIMSS ADT, CIMSS AMSU and SATCON showed reasonable agreement throughout the period 27 – 29 January. NESDIS ADT estimated the intensity about 10 kn lower than the other methods. Observations from Legendre Island and Barrow Island during the period 1800 UTC 27 January to 0000 UTC 28 January supported the higher estimates. Figure 5 shows an enlarged map of the area where surface observations were recorded.

2.2 Structure

Tropical low 14U is not considered to have been a tropical cyclone as gales were never present in more than two quadrants throughout its lifetime. Gale radii in southern quadrants were in the range 70 to 100 nautical miles (nm) (130 – 185 kilometres (km)) and were 90 nm (167 km) in western quadrants on 29 January. Radius to maximum winds (RMW) ranged from 50 nm (93 km) to 40 nm (74 km) at its most intense.

Model analysis fields from the European Centre (EC) suggest that 14U had periods when multiple centres were present as it moved west, parallel to the Pilbara coastline. The failure of 14U to consolidate around one centre of rotation and the proximity of land to the low centre were likely contributing factors to the low not developing into a tropical cyclone.

Vertical wind shear estimates from CIMSS are shown in Figure 6. Shear increased to near 20 kn (37 km) by 0600 UTC 28 January and continued to increase during 29 January. Satellite imagery on 29 January confirmed 14U was being negatively affected by strong vertical wind shear with the low level centre exposed and deep convection present in only western quadrants.

2.3 Motion

A mid-level ridge located over central Australia was responsible for steering 14U in a generally west southwest direction from 25 – 30 January.

3 Impact

The threat of a potential tropical cyclone moving west, parallel to the Pilbara coast caused many disruptions to industry, both offshore and coastal activities.

As the low traversed the Kimberley it produced heavy rainfall and flooding. The heaviest 24 hour rainfall recorded to 9am AWST (0100 UTC) was 177mm at El Questro (25 January), 93mm at Mount Rob (26 January) and 95mm at Country Downs (27 January). Following the heavy rainfall, the Fitzroy River at Fitzroy Crossing peaked above 8 metres, below the minor flood level (9.5 m). Downstream of Fitzroy Crossing, Noonkanbah and Willare approached the minor flood class levels.

Significant river rises occurred in the Kimberley. Minor to moderate flooding occurred in the Ord River at Tarrara Bar and Flying Fox Hole. The King River at Cockburn North peaked above the major flood level (3.0 m). River rises up to 7.0 metres were recorded in the Dunham River at Dunham Gorge. River rises were also observed in the upper Ord River catchment.

In the west Kimberley, river rises were recorded in the Lennard River (around 3.5 m) and Isdell River (around 5.0 m).

4 Observations

4.1 Wind

Rowley Shoals Automatic Weather Station (AWS) recorded a maximum 10-minute mean wind speed of 32.7 kn (60 km/h) at 0407 UTC 27 January. A maximum wind gust of 40 kn (70 km/h) was recorded at 0351 UTC 27 January.

Bedout Island AWS recorded a maximum 10-minute mean wind speed of 37 kn (68 km/h) at 1300 UTC 27 January. A maximum wind gust of 43 kn (80 km/h) was recorded at 1300 UTC 27 January. Gale force winds (greater than 34 kt (63 km/h)) were recorded between 1230 – 1330 and at 1430 UTC 27 January.

Legendre Island AWS recorded a maximum 10-minute mean wind speed of 44.9 kn (83 km/h) at 2028 UTC 27 January. A maximum wind gust of 59 kn (109 km/h) was recorded at 2025 UTC 27 January. Gale force winds (greater than 34 kt (63 km/h)) were recorded between 1601 – 1615 and 1857 – 2207 UTC 27 January.

Roebourne AWS recorded a maximum 10-minute mean wind speed of 40 kn (74 km/h) at 1758, 1759 and 1800 UTC 27 January. A maximum wind gust of 49 kn (91 km/h) was recorded at 1759 UTC 27 January. Gale force winds (greater than 34 kt (63 km/h)) were recorded between 1757 – 1809 UTC 27 January.

Onslow AWS recorded a maximum 10-minute mean wind speed of 34.8 kn (64 km/h) at 0016 UTC 28 January. A maximum wind gust of 46 kn (85 km/h) was recorded at 0040 UTC 28 January. Gale force winds (greater than 34 kt (63 km/h)) were recorded between 0010 – 0030 and at 0049 UTC 28 January.

Varanus Island AWS recorded a maximum 10-minute mean wind speed of 43 kn (80 km/h) at 2130 UTC 27 January. A maximum wind gust of 52 kn (96 km/h) was recorded at 2130, 2134 and 2300 UTC 27 January. Gale force winds (greater than 34 kt (63 km/h)) were recorded at 1740 and between 2054 UTC 27 January and 0100 UTC 28 January.

Barrow Island AWS recorded a maximum 10-minute mean wind speed of 44.4 kn (82 km/h) at 2305 UTC 27 January. A maximum wind gust of 53 kn (98 km/h) was recorded at 2341, 2343 and 2347 UTC 27 January. Gale force winds (greater than 34 kt (63 km/h)) were recorded between 1953 – 2003 UTC, 2118 – 2125 UTC 27 January, 2132 UTC 27 January until 0127 UTC 28 January and between 0243 – 0249 UTC 28 January.

4.2 Pressure

Location	Pressure (hPa)	Time in UTC
Rowley Shoals AWS	994.8 hPa	0746 – 0748, 0808 UTC 27 January
Bedout Island AWS	993.6 hPa	0800 UTC 27 January
Legendre Island AWS	992.5 hPa	2026 UTC 27 January
Roebourne AWS	995.7 hPa	1751 – 1755 UTC 27 January
Onslow AWS	996.5 hPa	0839 – 0840 UTC 27 January
Thevenard Island AWS	995.6 hPa	22330, 2233, 2235, 2241 UTC 27 January
Barrow Island AWS	992.4 hPa	2132, 2134, 2135 UTC 27 January

4.3 Rainfall

The heaviest 24 hour rainfall recorded to 9am AWST was -

- 177mm at El Questro (25 January);
- 93mm at Mount Rob (26 January) and;
- 95mm at Country Downs (27 January).

5 Forecast Performance

The accuracy statistics obtained by comparing the forecast positions against the best track positions for 14U are

	0	06	12	18	24	36	48	72	96	120	144
Absolute error (km)	53	68	86	96	102	111	155	166	232	305	411
RMS error (km)	64	76	98	109	116	126	189	201	287	460	615
Sample Size	16	16	17	18	19	19	18	14	10	6	3

Figure 7 is a plot of the accuracy figures for 14U compared to the five year mean.

TABLE 1. Best track summary for Tropical Low 14U

Refer to the Australian Tropical Cyclone database for complete listing of parameters. AWST is UTC + 8 hours.

Year	Month	Day	Hour UTC	Pos. Lat S	Pos. Long. E	Pos. Acc. n mi	Max Wind 10 min kn	Max gust kn	Cent. Press. hPa	Rad. of gales (NE/SE/ SW/NW)	Rad. of storm (NE/SE/ SW/NW)	RMW n mi
2017	01	25	0000	15.7	128.1	20	10	45	1003			
2017	01	25	0600	15.7	127.6	20	10	45	1000			
2017	01	25	1200	15.7	126.5	30	10	45	1000			
2017	01	25	1800	15.7	126.0	20	15	45	998			
2017	01	26	0000	15.6	124.3	20	20	45	998			
2017	01	26	0600	16.4	123.5	20	20	45	998			
2017	01	26	1200	16.7	121.8	30	25	45	998			
2017	01	26	1800	17.5	120.7	30	25	45	998			
2017	01	27	0000	18.1	119.8	30	30	45	998			
2017	01	27	0600	18.6	118.3	30	35	50	994	0/70/0/0		
2017	01	27	1200	19.0	117.5	30	45	55	989	0/100/70/0		
2017	01	27	1800	19.4	116.5	30	45	65	989	0/80/70/0		
2017	01	28	0000	20.1	114.8	30	45	65	989	0/90/70/0		
2017	01	28	0600	20.3	113.0	30	45	65	986	0/90/70/0		
2017	01	28	1200	20.1	111.9	20	45	65	986	0/0/70/0		
2017	01	28	1800	19.8	110.7	15	45	65	986	0/0/90/0		
2017	01	29	0000	19.6	110.1	10	40	55	988	0/0/90/90		

Year	Month	Day	Hour UTC	Pos. Lat S	Pos. Long. E	Pos. Acc. n mi	Max Wind 10 min kn	Max gust kn	Cent. Press. hPa	Rad. of gales (NE/SE/ SW/NW)	Rad. of storm (NE/SE/ SW/NW)	RMW n mi
2017	01	29	0600	19.3	109.6	10	35	50	992	0/0/90/90		
2017	01	29	1200	19.1	108.8	15	30	45	998			

FIGURE 2. METOP-A ASCAT pass at 1404 UTC 26 January 2017 as 14U moved to the west of Broome.

Image courtesy of https://manati.star.nesdis.noaa.gov/datasets/ASCATData.php

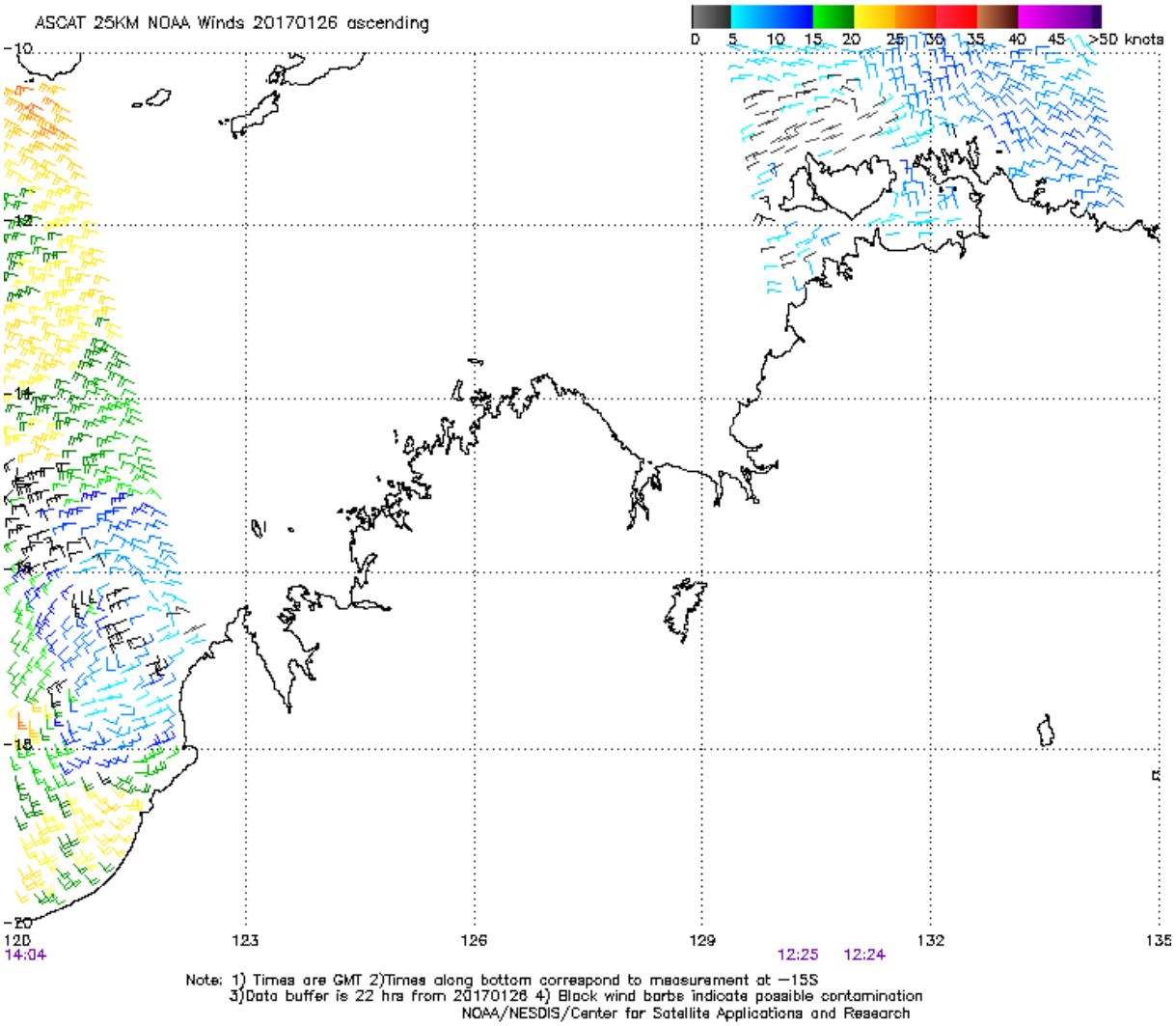


FIGURE 3. Himawari-8 Visible imagery at 0000 UTC 28 January 2017 during the time 14U was at peak intensity.

Image courtesy of https://www.fnmoc.navy.mil/tcweb/cgi-bin/tc_home.cgi

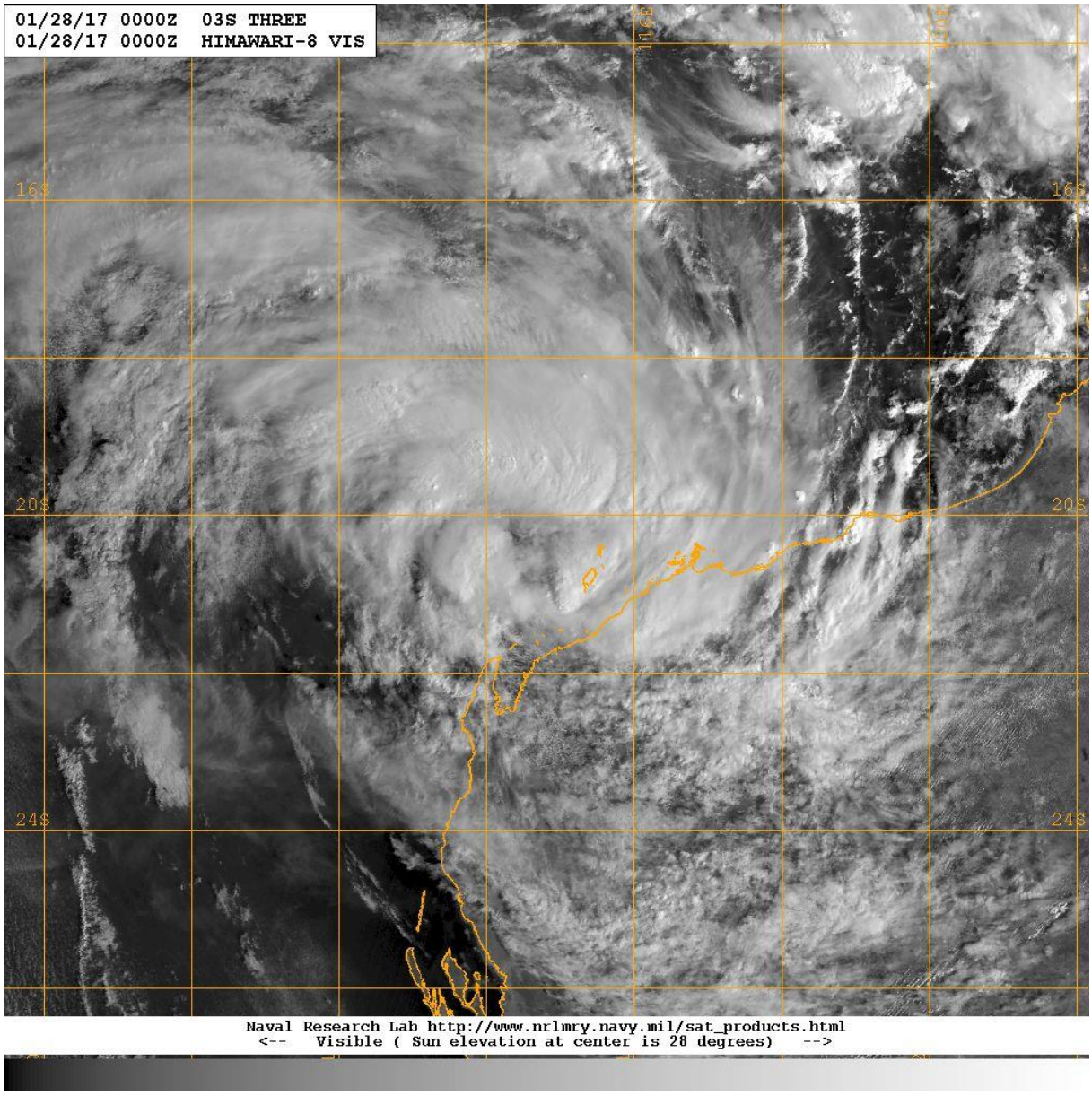


FIGURE 4. Comparison of objective and subjective intensity analysis techniques.

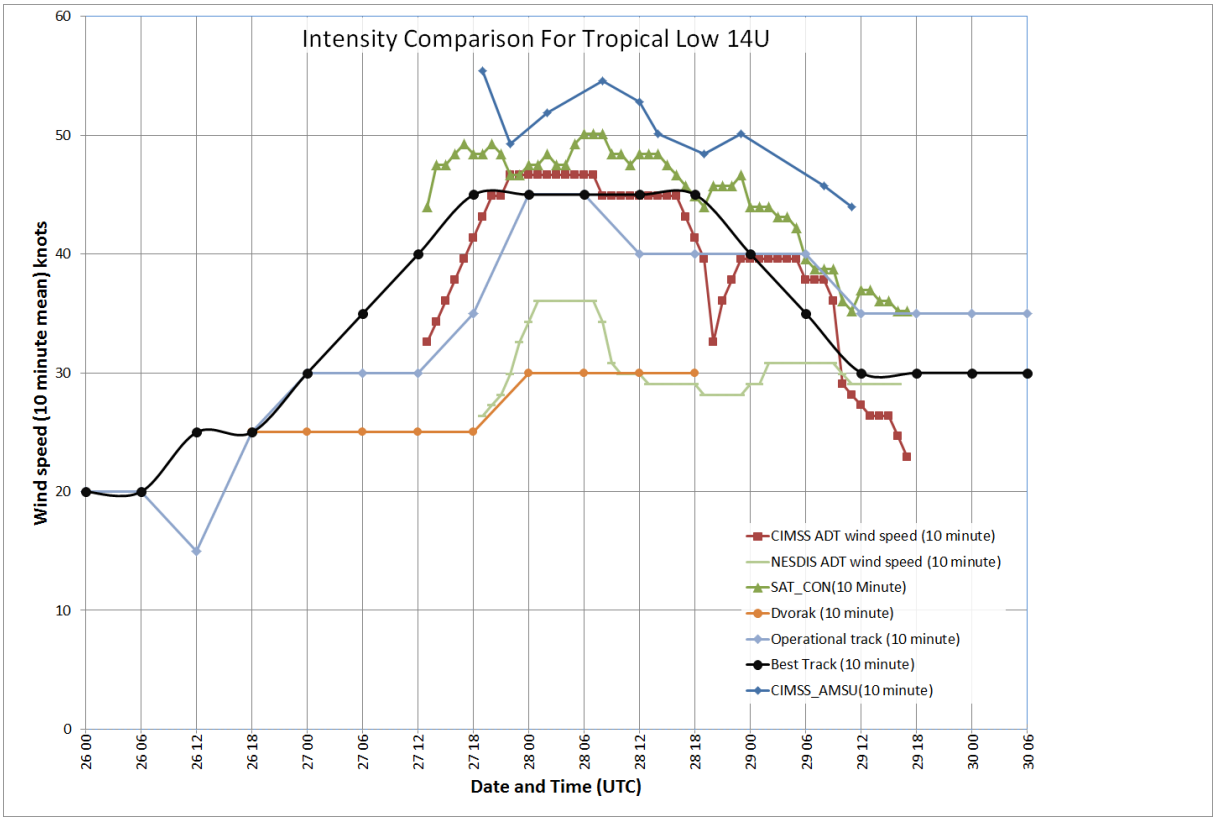


FIGURE 5. Enlarged map of the area where surface observations were recorded.

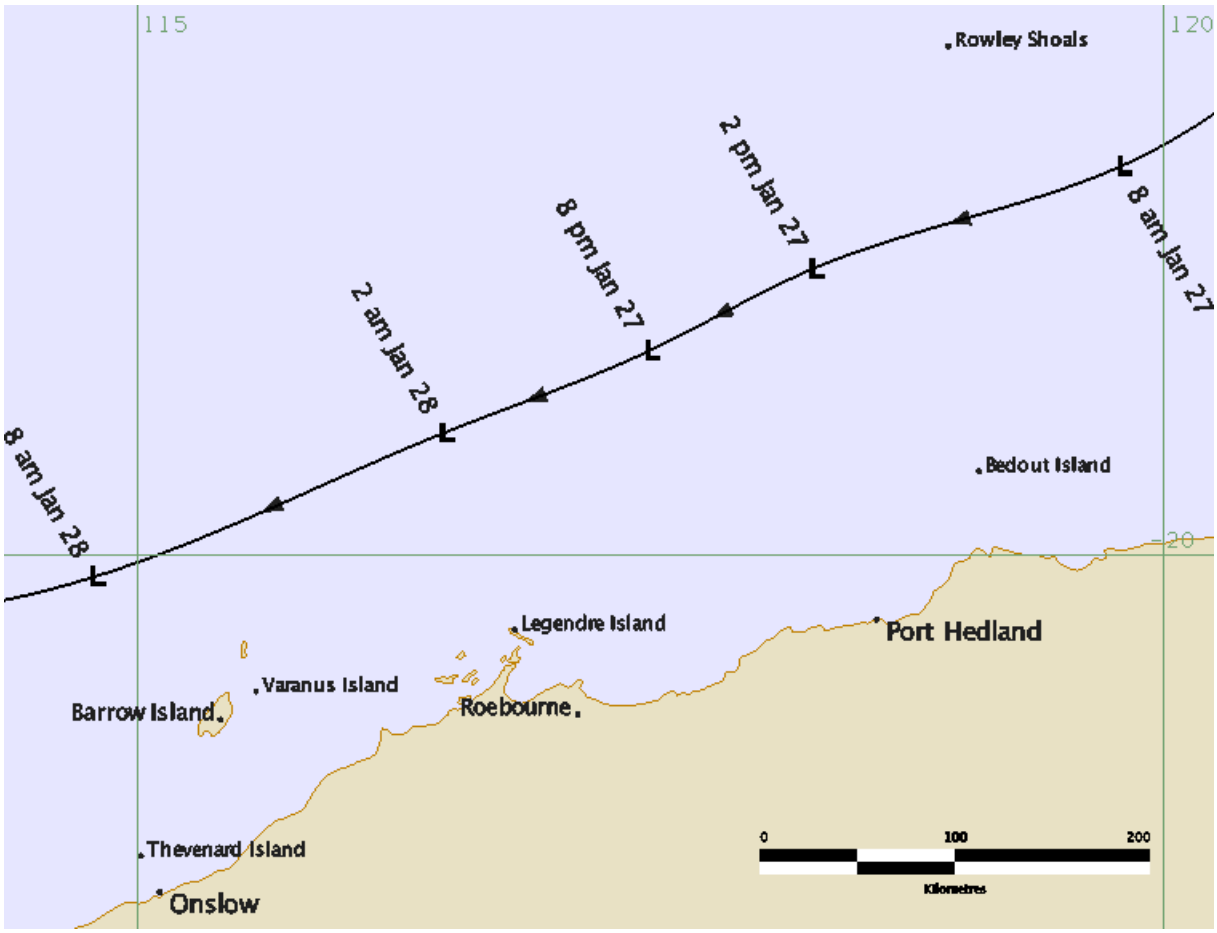


FIGURE 6. Comparison of CIMSS wind shear and intensity for 14U.

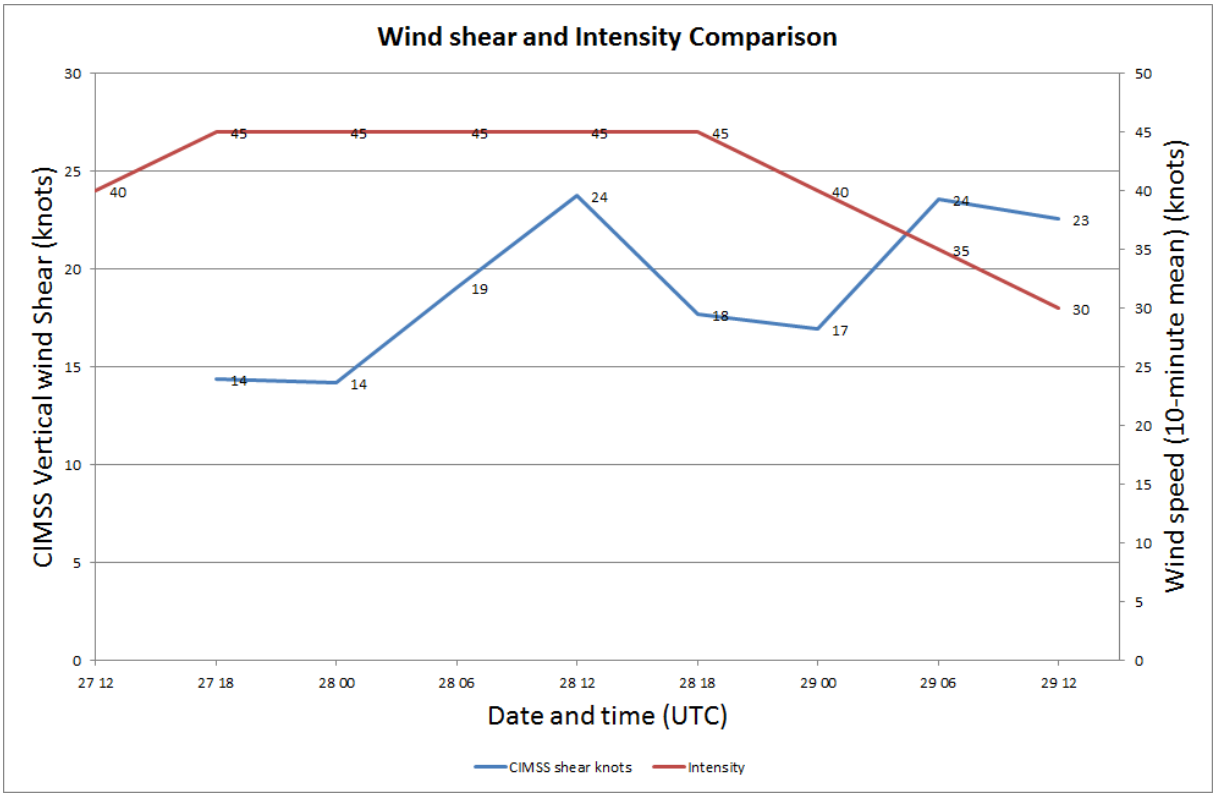


FIGURE 7. Accuracy figures for 14U compared to the five year average error.