Australian Government
Bureau of Meteorology

Severe Tropical Cyclone *Freddy*

3 – 13 February 2009

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A. Summary

A low that developed over the Kimberley moved off the coast on 3 February and slowly developed as it tracked west over open waters. Despite ongoing strong wind shear, the low reached cyclone intensity late on 7 February. After peaking on 8 February, *Freddy* weakened to below cyclone intensity during 9 February as it moved over progressively cooler ocean waters. A weak low level centre remained clearly visible on satellite images and Quickscat passes showed 20 to 25 knot winds present. The system finally dissipated on 13 February.

There were no known direct impacts from *Freddy*, although there were disruptions to some offshore industry operations.

B. Meteorological Description

Intensity analysis
A low developed over the Kimberley which moved offshore in a westerly direction overnight of 3 February. Strong northeasterly shear severely hampered the development of the low. During 4 February weak low level centres were visible at times but were well separated from convection. By 5 February convection began to show some curvature and to be more closely associated with deep convection. During 6 February microwave passes showed a much better defined low level centre more closely associated with the deep convection. A 1434 UTC ASCAT pass showed some 30 knot winds mainly in the south west quadrant.

Visible images early on 7 February showed a clearly exposed LLCC but during the day the centre moved back under the deep convection. CIMSS shear analyses showed a decrease in shear over the system by 1200 UTC 7 February. Dvorak analyses indicate the system reached cyclone intensity about 1630 UTC 7 February. By 0000 UTC shear had dropped to 10-20 knots and the system reached peak intensity (refer Fig. 2) of 45 knots.

During 8 February the deep convective banding that had formed weakened and contracted. By 1200 UTC 8 February deep convection persisted only on the western side and the LLCC had become exposed. Despite this the 2209 UTC 8 February BYU Quickscat pass (refer Fig. 3) showed areas of 40 to 45 knots, however the 0242 UTC Ascat pass showed winds had eased by this time.

Freddy weakened below cyclone strength by 1200 UTC 9 February with 35 knots winds persisting only in the southwest quadrant (1022 UTC Quickscat pass). Late on 9 February deep convection became very isolated and dissipated altogether by 10 February, leaving a clearly exposed low level circulation. Scat passes showed a band of 20 to 30 knots persisting in southern quadrants on 10 February which persisted until the system crossed 90 E on 13 February.

Motion
A dominant mid-level ridge to the south steered the system on a steady west to west southwest track throughout its lifetime.

Structure
Freddy was influenced by moderate to strong easterly shear for most of its lifetime. Deep convection was generally on the western side and gales were most evident to the west of the centre, and then later to the south owing to the steady (12 knot) translation speed.

C. Impact

Freddy remained over open waters throughout its lifetime and did not impact any islands or communities directly. However, there were some disruptions to offshore industry operations.

D. Observations

None

E. Forecast Performance

A Tropical Cyclone Watch was issued for coastal areas between Kalumburu and Broome on 3 February and then cancelled at 1000 WDT 4 February once the low moved offshore. TCWC operations were transferred to Darwin office from the 10:00WDT (0100UTC) issue on 7 February (Saturday) and then Perth resumed responsibility from the 10:00WDT (0100UTC) issue on 9 February (Monday).

Table 1. Best track summary for *Freddy,* February 2009.
Note: Add 9 hours to convert to WDT. Refer to best track database for complete track details.

Year	Month	Day	Hour (UTC)	Position Latitude S	Position Longitude E	Position Accuracy nm	Max wind 10min knots	Max gust knots	Central Pressure hPa	Rad. of Gales nm	Rad. of storm force winds nm	Radius Max. Wind (RMW)
2009	2	3	06	15.5	125.5	40			1000			
2009	2	3	12	15.5	122.5	40			1000			
2009	2	3	18	15.3	121.5	30			1000			
2009	2	4	00	15.2	120.6	30			1000			
2009	2	4	06	15.0	120.3	30			1000			
2009	2	4	12	15.0	119.0	30			1000			
2009	2	4	18	15.6	118.8	30			1000			
2009	2	5	00	16.0	118.4	30			1000			
2009	2	5	06	16.2	117.7	30	20	45	998			
2009	2	5	12	16.2	116.7	30	20	45	998			
2009	2	5	18	16.3	115.2	30	25	45	997			
2009	2	6	00	16.2	114.3	20	25	45	996			
2009	2	6	06	16.0	114.1	20	25	45	994			
2009	2	6	12	16.0	113.8	15	25	45	994			
2009	2	6	18	16.0	113.5	15	30	45	992			
2009	2	7	00	16.0	113.2	20	30	45	994			
2009	2	7	06	16.4	112.8	20	30	45	995			
2009	2	7	12	16.3	111.8	20	30	45	995			
2009	2	7	18	16.1	111.0	20	35	50	993	50		30
2009	2	8	00	16.1	110.3	20	45	65	992	50		30
2009	2	8	06	16.4	109.5	20	45	65	992	50		30
2009	2	8	12	16.6	108.6	15	45	65	992	50		30
2009	2	8	18	17.0	107.7	10	45	65	992	60		30
2009	2	9	00	17.7	106.9	10	45	65	992	60		30
2009	2	9	06	18.3	105.7	10	40	55	993	55		40
2009	2	9	12	18.9	104.5	10	35*	50	996			40
2009	2	9	18	19.3	103.3	10	30	45	999			
2009	2	10	00	19.8	102.2	20	30	45	998			
2009	2	10	06	20.6	100.4	20	30	45	999			
2009	2	10	12	20.9	100.0	15	25	45	999			
2009	2	10	18	21.2	99.0	15	25	45	1001			
2009	2	11	00	21.5	98.0	10	25	45	1000			
2009	2	11	06	21.7	97.4	10	25	45	999			
2009	2	11	12	21.5	96.9	10	25	45	999			
2009	2	11	18	21.0	96.3	10	25	45	1000			
2009	2	12	00	20.7	95.8	10	20	45	1003			
2009	2	12	06	20.4	94.6	10	20	45	1004			
2009	2	12	12	20.0	93.3	10	20	45	1005			
2009	2	12	18	19.7	91.7	10	20	45	1005			
2009	2	13	00	19.3	90.2	10	20	45	1005			
2009	2	13	06	19.0	88.9	10	20	45	1005			

* At 12 UTC 9 February the maximum wind was 35 knots. However, gales were confined to less than half-way around the centre and hence the system was not deemed at cyclone intensity and the overall gale radius is considered as null.

Table 2. Verification statistics: Track and Intensity.

Parameter	0 hr	6 hr	12 hr	18 hr	24 hr	36 hr	48 hr
Count	30	31	31	31	31	31	31
Distance (km)	63	83	103	110	117	122	128
Mean Wind (knots)	5	5	5	6	7	8	10

Figure 1. Track of Tropical Cyclone *Freddy,* 3 -13 February, 2009. All times in WDT.

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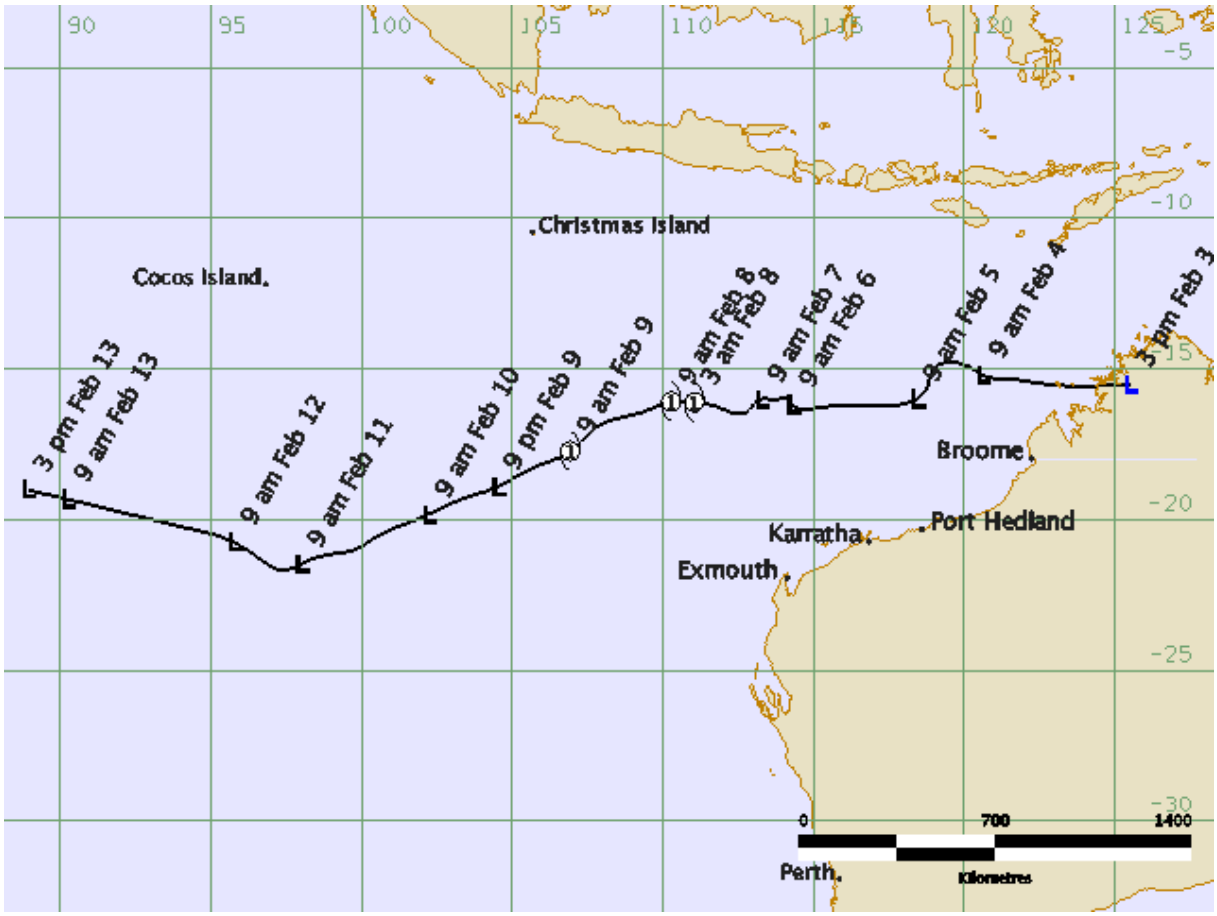

Figure 2. Microwave (SSMIS 91GHz) image at 2219 UTC 7 February 2009.
(image courtesy of US NRL: http://www.nrlmry.navy.mil/)

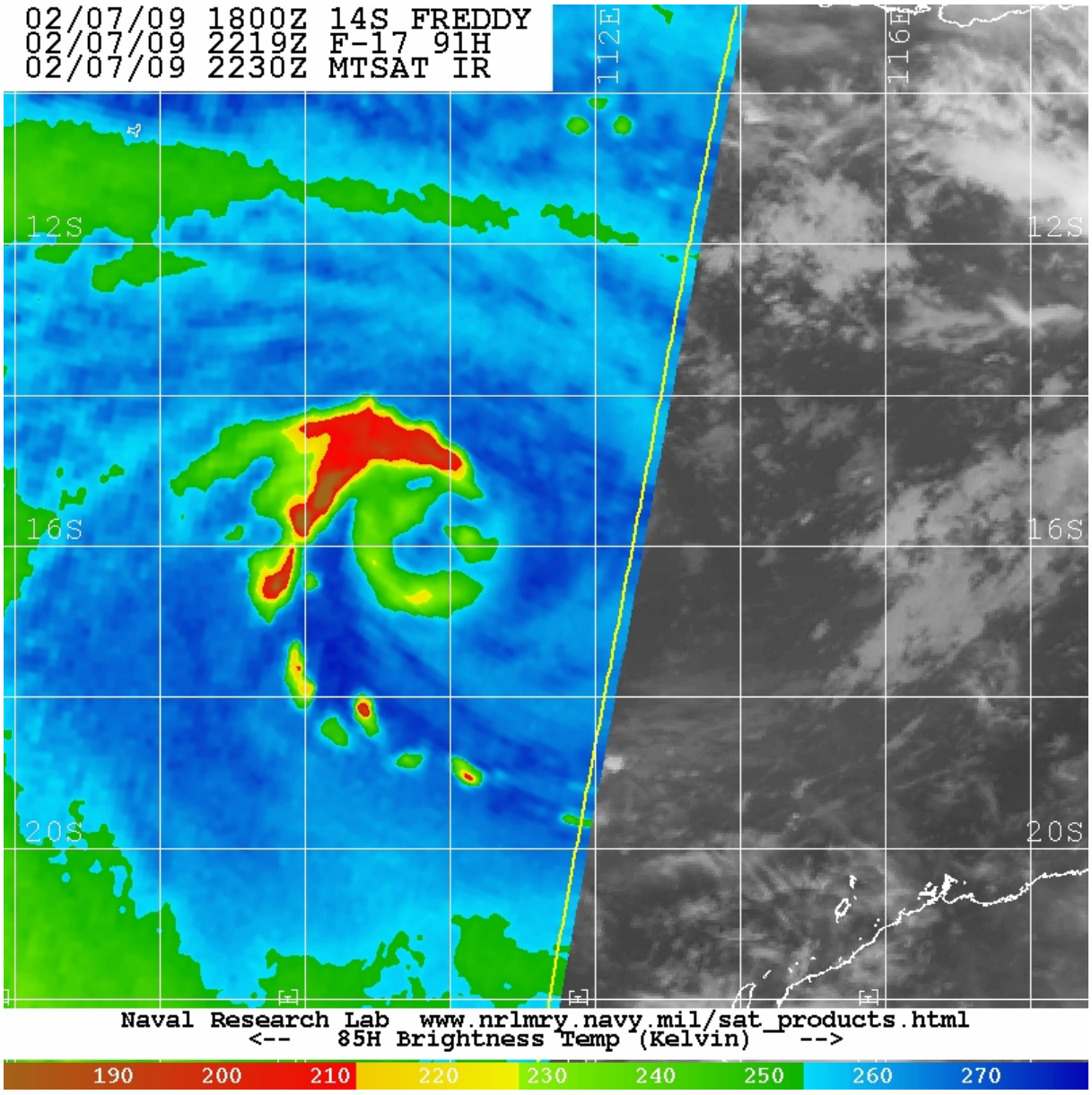

Figure 3. Quickscat BYU High resolution wind speed distribution at 2209 UTC 8 February 2009. (image courtesy of US NRL: http://www.nrlmry.navy.mil/)