

Tropical Cyclone Winnie 16/03/1978 to 28/03/1978

(i) General

"Winnie" was the fourth tropical cyclone of the season to operate in the Northwestern Australian Region. It was a severe cyclone. The minimum pressure during its mature stage was estimated to be 945 mb with maximum winds of 105 km/h being generated near the centre. The track followed by "Winnie" is unusual in that it first moved generally eastsoutheastwards until maturity when it began moving southwestward and later southward. Between 21 and 25 March when "Winnie" was at its peak intensity its movement was very slow and meandering.

(ii) Development

"Winnie" was one of several tropical cyclones which developed at about the same time in the Intertropic Convergence Zone (ITCZ). "Marylou" and "Lucie" both began in the Mauritius area on the same date. Later, on 19 March, tropical cyclone "Nadine" also developed and moved eastward of 80°E on 22 March as an extra-tropical depression.

The first report of gales associated with the developing system was at 162100 GMT when the ship "NZ Waitangi" reported winds of 69 km/h. Satellite photographs provide most of the information regarding the development of cyclone "Winnie" with supporting data being received from ship observations. The cyclone reached its maximum intensity on 20 March with an estimated central pressure of 945 mb. It weakened only slowly over the following days while it remained almost stationary over tropical waters near 17°S 95°E.

By 26 March the cyclone was moving southward over cooler waters and the weakening trend was irreversibly established.

(iii) Features of the Track

Tropical cyclone "Winnie" spent its entire lifetime over the waters of the central Indian Ocean. It existed for 12 days and in that time travelled about 4400 km. The track followed by "Winnie" is shown in Figure 4.1.

The unusual features of the track are the original eastsoutheastward movement while the cyclone developed and then the slow meandering behaviour just after the cyclone had peaked.

For six days during its developing and mature stages, "Winnie" moved in a generally eastsoutheasterly direction at speeds increasing from 2 km/h on 16 March to 12 km/h on 21 March. From 22 to 25 March "Winnie" pursued a meandering track near 17°S 95°E at speeds ranging from 6 km/h to 16 km/h. On 25 March "Winnie" gradually assumed a southwesterly track at an increasing rate of movement. Thereafter its track became more southerly and its rate of movement reached 60 km/h on 28 March.

(iv) Rainfall

In the 24 hours to 230100 GMT Cocos Island received 44 mm of rain. No other rainfall data is available.

(v) Seas and Swell

"Winnie" was a severe storm and generated very rough seas and heavy swells. From 16 to 24 March various ships were located within 500 km of the centre. After 24 March the shipping remained well away from the cyclone. The only report from the latter period of the cyclone was from the "Tenshomaru" at 270600 GMT which was still reporting a 5 m northeasterly swell. Data from selected ship reports is given in Table 4.1.

By 162100 GMT the cyclone was causing 5 m seas and a 3 m swell within 240 km of the centre. Most ships reported seas of 4-6 m. By 200900 the ship "Sabie" was experiencing a 6 m westnorthwesterly swell. The ship "Nordic Breeze" which was in the vicinity of the centre from 230000 GMT to 241800 GMT reported swells above 6 m during that period. The maximum swell was 9 m at 240600 GMT when the "Nordic Breeze" was 360 km to the south of the centre.

(vi) Winds

From satellite photographs it is estimated that winds of about 185 km/h would have been generated near the centre of the storm at maturity. Numerous ships reported gales but only one ship reported winds exceeding storm force, Wind data is included in the ship reports given in Table 4.1. The "Sabie" reported winds of 167 km/h at 200900 GMT. This was the maximum wind noted. Gale force winds extended at least 500 km from the centre.

(vii) Satellite Analyses

During the period that "Winnie" operated the NOAA 4 meteorological satellite photographed the area twice daily. The imagery provided by this satellite was confined to the infra-red part of the spectrum. During the cyclone's incipient stages visual photographs from the NOAA 5 satellite were available on 15 and 16 March. A summary of data deduced from the satellite imagery is given in Table 4.2.

On 15 March the ITCZ was evident as a broad band of convective cloud extending from East Africa to Northern Australia between latitude 5°S and 15°S. Several centres of circulation could be seen on 16 March one of which became tropical cyclone "Winnie" and others further west developed into tropical cyclones "Lucie" and "Marylou" in the Mauritius area. On 17 March the circulation was defined by two broad hooking bands indicating a system of about stage T 2 in the Dvorak classification. Deepening occurred steadily over the following days. A Central Dense Overcast (CDO) could be seen on 19 March and on 20 March an "eye" was visible within the CDO. On 21 March the system was classed as T 6 as the eye was embedded about 0.5° and a 1 band encircled half of the central cloud features. On 22 March the photographs were not clear but by 23 March the cyclone had begun to weaken as the downstream convection was markedly suppressed.

From the persistence of a banding type eye which gradually expanded until it was about 1° wide, it seems that "Winnie" weakened slowly between 23 March and 27 March. At this latter date however it was moving rapidly southwards and had entered a region of strong flow aloft. As a result the system weakened rapidly during 28 March

Table 4.1

Selected Ship Reports

Ship	Position °S °E	Date/ Time (GMT)	Bearing/ Distance from Centre (km)	Wind Direction/ Speed (km/h)	Sea (m)	Swell (m)	Weather	Pressure (mb)
NZ Waitangi	11.7 83.9	162100	350/240	300/ 69	5	3	Heavy Continuous rain	1003.2
NZ Waitangi	11.2 83.2	170000	330/330	270/ 67	5		Heavy Continuous rain	1004.0
Nelladan	14.0 88.2	191500	170/120	120/ 46	3.5	NE 4	Violent rain showers	993.5
Nelladan	13.0 88.2	192100	290/ 60	230/ 65			Heavy continuous rain	991.2
Nelladan	12.3 88.2	200000	330/160	270/ 70	4		Violent rain showers	995.0
Sabie	14.6 89.1	200000	150/140	090/111	5	E 5	Heavy continuous rain	983.8
Sabie	13.9 88.9	200600	260/ 60	240/ XX	5	SW 5	Slight continuous rain	980.0
Nelladan	11.8 87.6	200600	330/320	270/ 63	4		Slight rain showers	1000.0
Nelladan	11.4 87.6	200900	330/340	260/ 63	4		Recent showers	997.0
Sabie	13.3 89.6	200900	020/ 50	310/167	6	WNW 6	Slight continuous rain	981.0
Sabie	13.0 89.3	201200	010/150	310/119	6	WNW6	Slight continuous rain	994.0
Nelladan	11.1 87.0	201500	320/530	250/ 63	4			1004.0
Merino Express	15.1 95.6	211800	080/370	020/ 74	4.5	W 6	Heavy rain showers	1007.1
Merino Express	15.7 95.9	212100	090/360	010/ 67	4.5	W 6	Recent thunderstorms	1005.0
Merino Express	14.3 96.2	220000	050/400	360/ 74	3.5	W 6	Moderate continuous rain	1007.3
Nordic Breeze	17.3 93.0	230000	270/210	180/ 61	3.5	ESE8	Moderate continuous rain	999.1

Ship	Position °S °E	Date/ Time (GMT)	Bearing/ Distance from Centre (km)	Wind Direction/ Speed (km/h)	Sea (m)	Swell (m)	Weather	Pressure (mb)
Nordic Breeze	17.8 93.9	230700	230/120	170/83	4	ESE 8	Heavy intermittent rain	997,3
Maectela Drescher	16.4 92.5	230900	300/220	200/69	2.5	ESE 5	Slight rain shower	1001.0
Maectela Drescher	16.8 92.9	231200	280/190	190/74	2.5	E 5	Heavy rain shower	1001.0
Maectela Drescher	17.2 93.4	231500	260/130	180/61	4	S 7		1004.4
Nordic Breeze	18.5 94.8	231800	180/190	110/74	4	ESE 8	Moderate intermittent rain	1001.4
Nordic Breeze	18.8 95.2	240000	170/270	100/87	5	ESE 8.5	Moderate intermittent rain	1000.2
Maectela Drescher	18.2 94.5	240000	190/210	130/69	5	-	-	1001.0
Maectela Drescher	18.1 94.5	240300	200/220	130/74	5	-	-	1003.0
Maectela Drescher	18.0 94.5	240600	200/250	130/74	5	E 5	-	1001,5
Nordic Breeze	19.2 95.7	240600	170/360	100/76	5	E 9	Moderate intermittent rain	1001.1
Maectela Drescher	18.5 94.8	240900	190/330	130/74	5	E 5	-	1001.5
Maectela Drescher	19.7 95.1	241200	180/410	130/74	5	ESE 5	-	1003.0
Maectela Drescher	19.6 95.7	241800	160/390	120/69	4	-	-	1005.4
Nordic Breeze	20.0 96.8	241800	150/480	100/69	4.5	E 7	Past showers	1004.5
Tenshomaru	24.8 89.9	270600	160/260	090/63	2.5	NE 5	-	1008.0

Table 4.2 Data from Satellite Photographs

Satellite name	Orbit Number	Date/Time (GMT)	Estimated pos. of centre		Final T No.	Min. Sea Level Pressure (mb)
			°S	°E		
NOAA 5	7343	150251	13.0	83.0		1006
	7357	160207	13.6	84.0		1003
NOAA 4	15243	170149	13.8	84.4	2.5	999
	15255	180049	14.0	85.0	3.5	990
	15268	190144	13.1	86.6	4	985
	15281	200239	13.6	89.1	5	967
	15293	210139	15.3	90.7	6	945
	15305	220039	15.8	93.2	5	967
	15318	230134	17.2	94.7	5	967
	15331	240229	16.4	95.0	4 -	981
	15343	250129	17.2	93.6	4	983
	15356	260224	18.4	91.0	4	985
	15368	270124	22.1	89.0	3.5	988
	15381	280219	27.6	87.2	3.5	994
	15393	290119	38.0	89.7	2	1003