

RSMC NADI – TROPICAL CYCLONE CENTRE

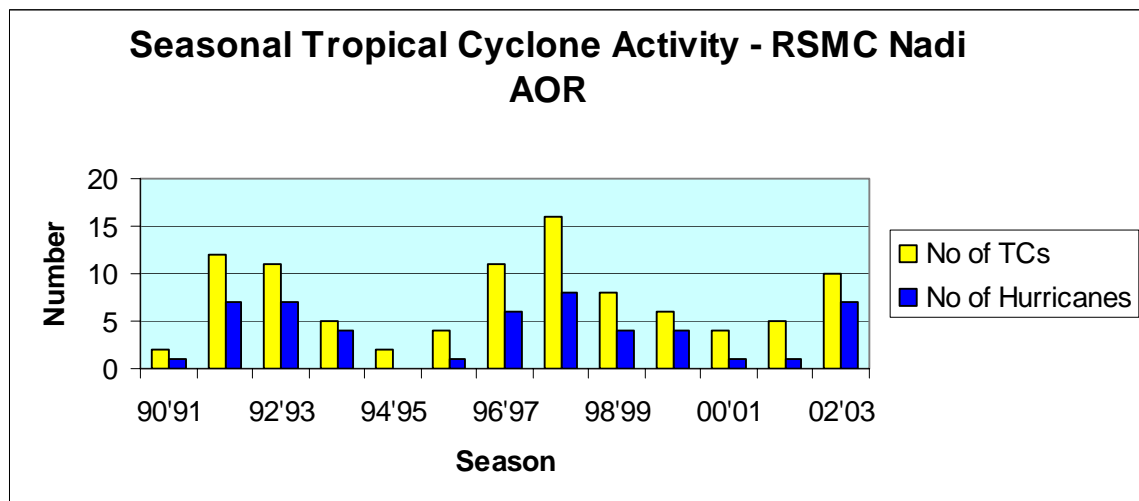
TROPICAL CYCLONE SUMMARY 2002-2003 Season

Introduction

A summary is presented of tropical cyclone activity during the 2002/2003 Tropical Cyclone Season for the Regional Specialised Meteorological Centre Nadi - Tropical Cyclone Centre (RSMC Nadi-TCC) Area of Responsibility (AOR) covering from Equator to 25°South Latitude and 60°East to 120°West Longitude.

Tropical Cyclone activity in the 2002/2003 Tropical Cyclone Season, in the RSMC Nadi area of responsibility (AOR) was slightly above average, following three consecutive seasons of below average occurrence. Ten tropical cyclones occurred in the region, of which seven attained hurricane intensity, one storm and three gales. One of these became a tropical cyclone inside Brisbane's AOR before moving into RSMC Nadi's.

Figure 1 Tropical Cyclone Activity in RSMC Nadi AOR by Season



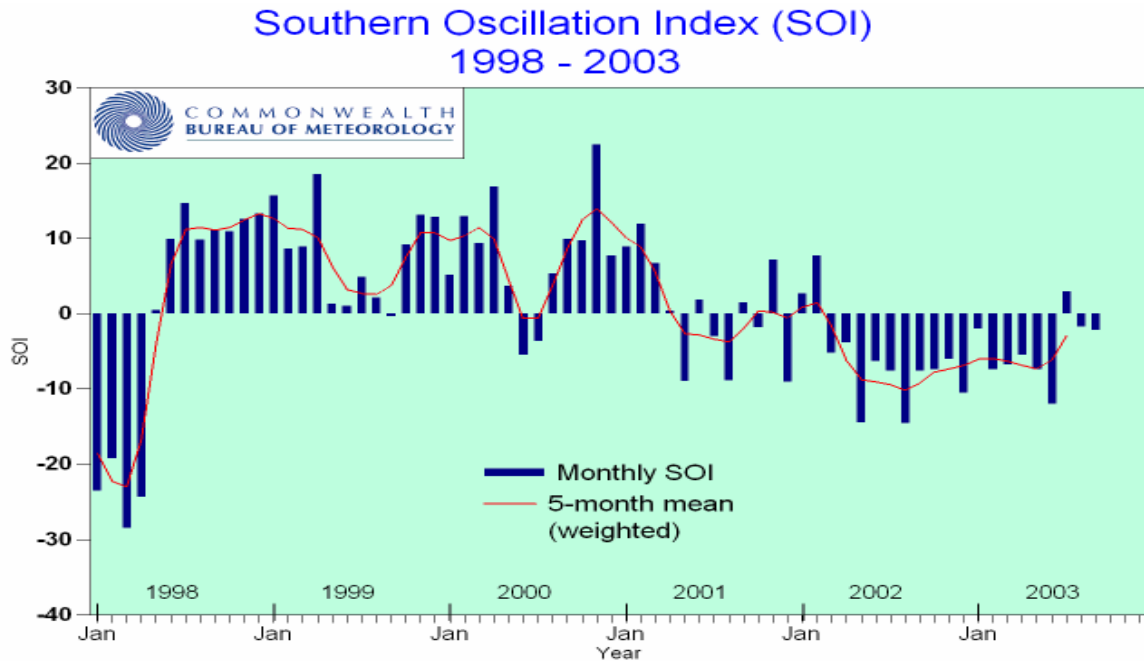
Climatic Indices

A moderately warm ENSO persisted throughout the 2002-2003 Tropical Cyclone Season (refer **Figure 2**). The SOI values remained negative, a trend adopted since early 2002. Sea Surface Temperature (SST) warmest anomalies, persistent east of the dateline gradually eased towards the end of the Season. SST anomalies were weak in the Coral Sea region throughout the Season.

Though varied, the impact of the negative Julian-Madden Oscillation (MJO) pulses across the Southwest Pacific generally brought strong convective activity and tropical cyclone development. Towards the end of the Season, weak westerly wind anomalies at lower

levels and easterly anomalies in the upper levels persisted around the date-line near the equator. By April, an easterly anomaly had set in, signaling the collapse of El Nino.

Figure 2 Southern Oscillation Index values vs 5-Month Running Means for the period 1998 to 2003.



Special Features

The region registered its, arguably, most intense tropical cyclone yet, in Tropical Cyclone *Zoe*. Remarkably enough, no life was lost as it battered the eastern-most islands of the Solomons - Fataka, Anuta and Tikopia in the Temotu Province.

Of the ten tropical cyclones in this moderately warm ENSO Season, five developed east of the Dateline while the remaining five, to the west. Two of the ten were very short-lived systems – *Yolande* (12 hours) and *Fili* (18 hours). *Gina* was an out-of-season cyclone, developing in June.

A total of seventeen tropical disturbances were monitored by RSMC Nadi throughout the 2002/3 Season, which were also assigned numbers of the sequence (01F, 02F....etc). Ten attained tropical cyclone status.

Table 1 Tropical Cyclones in the RSMC Nadi area of responsibility, for the 2002-2003 Season. All dates and times are in UTC¹. (* - named by Brisbane TCWC).

Name	Low first identified			Initial tropical cyclone phase			
	Date	Lat.	Long.	Date	Time	Lat.	Long.
Yolande	03 Dec	17.0°S	179.0°W	05 Dec	0000	20.4°S	174.2°W
Zoe	23 Dec	08.0°S	176.0°W	25 Dec	2100	10.8°S	175.5°E
Ami	09 Jan	08.0°S	176.0°W	12 Jan	0000	10.8°S	179.4°W
Beni	19 Jan	08.0°S	170.0°E	25 Jan	0000	13.2°S	161.2°E
Cilla	24 Jan	16.0°S	174.0°E	27 Jan	0000	18.0°S	178.0°W
Dovi	05 Feb	11.0°S	163.0°W	05 Feb	2300	14.0°S	162.7°W
Erica*	01 Mar	21.0°S	147.9°E	04 Mar	0600	20.5°S	154.0°E
Eseta	08 Mar	13.0°S	176.0°E	10 Mar	0600	16.2°S	172.2°E
Fili	13 Apr	13.5°S	178.0°W	14 Apr	1800	20.4°S	171.6°W
Gina	04 Jun	10.5°S	171.0°E	05 Jun	0600	11.3°S	169.1°E

Name	Maximum Intensity (knots)					End of Tropical Cyclone Phase			
	Date	Time	Lat.	Long.	Int.	Date	Time	Lat.	Long.
Yolande	05 Dec	0600	21.0°S	173.2°W	35	05 Dec	1200	21.7°S	172.1°W
Zoe	28 Dec	0600	12.5°S	169.5°E	130	01 Jan	0000	20.3°S	175.1°E
Ami	14 Jan	1200	23.1°S	176.2°W	80	15 Jan	1200	29.1°S	163.3°W
Beni	29 Jan	1200	17.7°S	164.7°E	110	31 Jan	1800	24.3°S	163.5°E
Cilla	29 Jan	0000	22.3°S	167.5°W	40	29 Jan	1200	22.5°S	166.0°W
Dovi	09 Feb	0000	20.2°S	168.5°W	110	11 Feb	0000	26.0°S	169.0°W
Erica*	13 Mar	1200	20.6°S	162.7°E	115	15 Mar	1200	30.0°S	179.0°E
Eseta	13 Mar	0600	22.2°S	175.3°W	100	14 Mar	1200	31.0°S	160.0°W
Fili	15 Mar	0600	28.0°S	170.0°W	50	15 Apr	1200	29.4°S	170.6°W
Gina	07 Jun	1800	17.2°S	161.8°E	80	09 Jun	0600	16.5°S	162.0°E

Verification Statistics

Position forecast verification statistics for each cyclone (**Table 2**) were derived by comparing the initial and forecast positions (given in warnings issued by RSMC Nadi-TCC) with post analysis ‘best track’ positions. It must be noted here that the Australian Tropical Cyclone Workstation (ATCW) verification programme used by RSMC Nadi-TCC is sensitive to temporal amount of data. Consequently, forecasts for *Yolande* could not be verified at all, while *Fili*, beyond the 0 hours.

Overall, initial position errors for individual tropical cyclones were similar to previous Seasons. *Gina*’s relatively large error was basically due to difficulty in tracking the low-level circulation centre, while being subjected to strong vertical shear. However, the aggregate this season registered a marked improvement.

At 12 hours, errors for individual cyclones continued to show improvements when seen against past seasons. However, persistence did slightly better than forecasts with *Zoe*. This was attributed to the loop the cyclone executed. When all the cyclones were aggregated, though, the test revealed forecasts performing better than persistence.

¹ UTC - Universal Co-ordinated Time (same as Greenwich Mean Time)

Again, at 24-hours, the aggregate reveals forecast skills over persistence. Errors for the past four seasons have been consistently maintained below 200 kilometres (refer Figure 3). This was despite better performance of persistence over forecasts for *Cilla*, which was due to the difficulty in forecasting the southward turn, complicated by the cyclone's abrupt deceleration.

Figure 3 RSMC Nadi Forecast Errors since TC Season 1994/95.

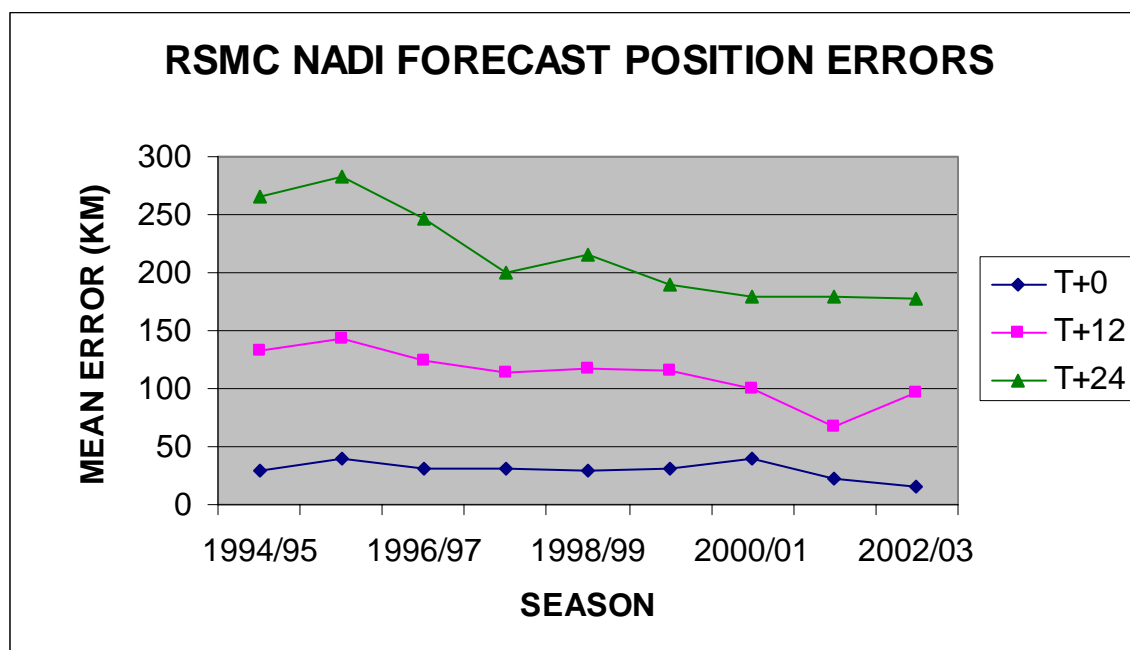


Table 2 Position forecast verification statistics for official warnings issued by RSMC Nadi. Forecast positions are verified against the official best track. Persistence errors (in brackets) are included for comparison. *Yolande* could not be verified at all, while *Fili*, beyond 0 hours, due to insufficient data.

Lead-time	0 hours		12 hours		24 hours	
	Mean error (km)	Number	Mean error (km)	Number	Mean error (km)	Number
Yolande	-	-	-	-	-	-
Zoe	13	26	75(73)	22	134(180)	18
Ami	6	12	95(161)	8	293(596)	4
Beni	14	30	94(104)	26	165(304)	22
Cilla	10	11	131(130)	9	269(220)	7
Dovi	15	21	58(80)	19	76(160)	15
Erica*	3	10	93(107)	10	232(308)	7
Eseta	9	16	106(147)	12	240(465)	10
Fili	20	4	-	-	-	-
Gina	32	17	153(165)	14	233(359)	12
Aggregate	15	150	96(112)	120	178(279)	94

In Table 3, the radius of the circles (centred on the centroid of the errors) containing 50% of the operational initial positions, is smaller than 0.5 degree of latitude (55.5 km) for all

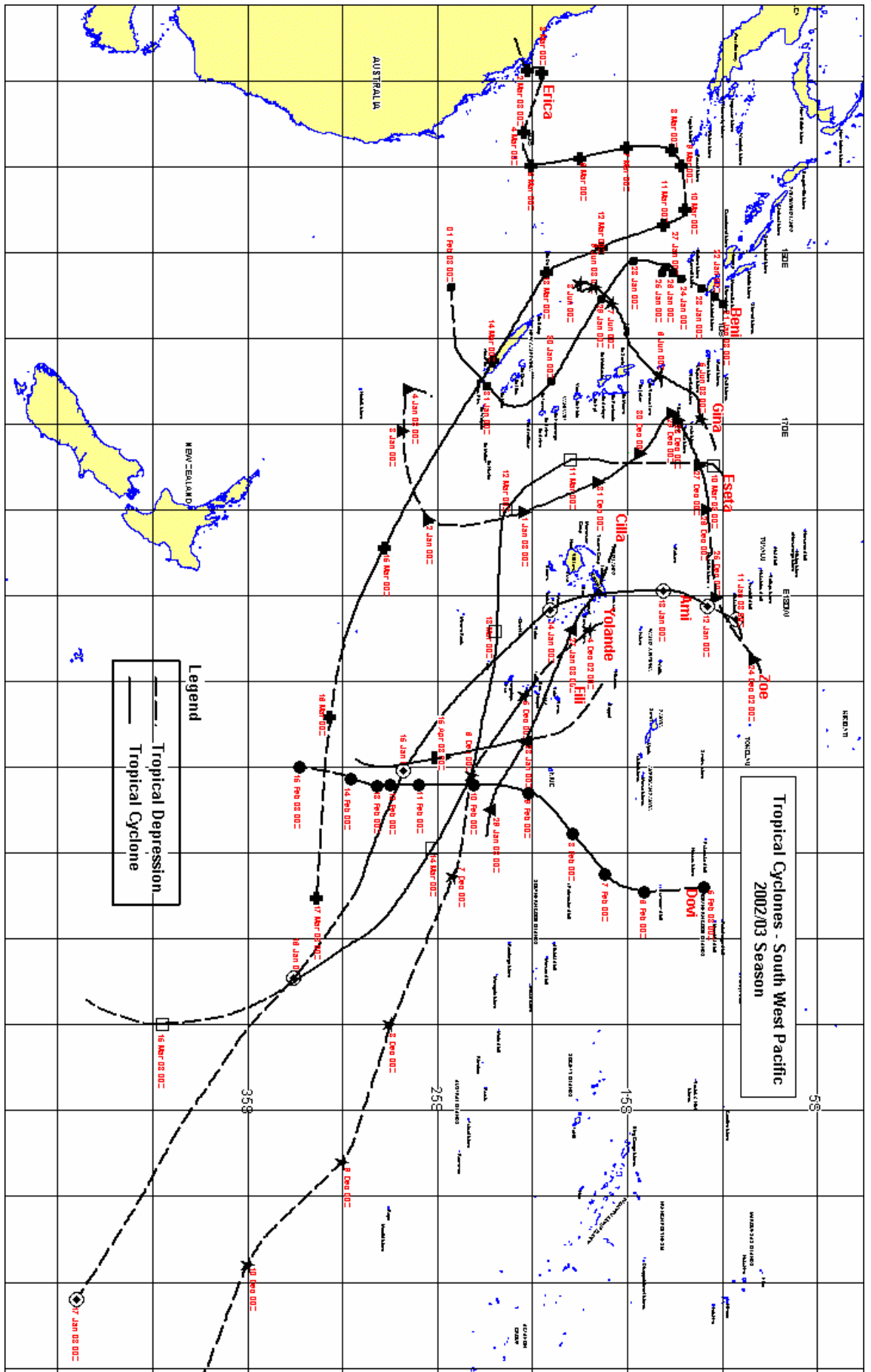
cases. Therefore the location of systems could be summed up as falling within the category of "Position Good" most of the time.

The forecast error centroids and size of the radius of the 50% circle (centred on the centroid of the errors) indicate bias and consistency of bias in the forecast positions. For instance, *Gina* consistently ran west of the expected track, forcing the easterly bias of the centroids. Particularly *Eseta*, and to a lesser degree *Cilla* and *Erica*, all registered large westerly bias, at 12 and 24 hours. This was attributed to the difficulty in forecasting re-curvature.

Table 3 Centroid of errors for initial (0-hour lead time), 12-hour and 24-hour forecast positions given in warnings issued by RSMC Nadi with the radius of the circle enclosing 50% of the positions. All distances are in kilometres. *Yolande* could not be verified at all while *Fili* not beyond the initial position (very short-lived systems).

Lead-time	0 hours		12 hours		24 hours	
Name	Centroid E-wd, N- wd	Radius of 50% circle	Centroid E-wd, N- wd	Radius of 50% circle	Centroid E-wd, N- wd	Radius of 50% circle
Yolande	-	-	-	-	-	-
Zoe	3,-3	16	-29,-23	62	-53,-47	103
Ami	1,2	6	-20,58	72	-57,179	108
Beni	3,2	16	-31,-25	76	-80,-32	125
Cilla	-5,1	12	-34,10	87	-85,25	212
Dovi	3,-1	14	-8,-20	54	-5,-31	74
Erica*	-0,-1	5	-57,51	69	-101,115	144
Eseta	5,-3	11	-76,24	68	-207,77	104
Fili	3,-14	15	-	-	-	-
Gina	24,-13	50	66,-29	165	72,-40	194
Aggregate	5,-3	24	-22,-4	96	-58,5	160

Figure 4 Tracks of *Yolande, Zoe, Ami, Beni, Cilla, Dovi, Erica, Eseta, Fili and Gina.*



Tropical Cyclones in the RSMC Nadi Area of Responsibility (AOR), 2002/2003 Season.

In the discussion that follows, distances are in nautical miles and wind speeds are 10-minute averages.

Yolande (02F) : 5 December 2002

A Tropical Depression (02F) was first identified embedded along an active monsoon trough over the southern parts of Tuvalu on 29/1800 UTC November 2002. Quikscat revealed the strong winds confined to the northeast semicircle, under the associated active and deep convection. Between 30th November and 4th December, convective activity associated with 02F pulsated under strong diurnal influence. Eventually, around 04/2255 UTC, it was named *Yolande* while located about 90 nautical miles east of Nukualofa, Tonga, and moving southeast. *Yolande* accelerated a little towards the southeast after being named but by 05/0600 UTC, the llcc was clearly exposed under increasing northwest shear. 6 hours later, satellite imageries showed the llcc displaced about 100nm to the northwest of the deep convection. Consequently, *Yolande* was downgraded to a Tropical Depression at 05/1200 UTC. The cyclone attained a peak intensity of 35 knots at 05/0600 UTC. Damage brought by *Yolande*, was minimal.

Zoe (04F) : 25 December 2002 - 01 January 2003

Tropical Cyclone *Zoe* was perhaps one of the most intense cyclones seen in the RSMC Nadi area of responsibility (AOR), yet. It was the second tropical cyclone of the 2002/2003 Tropical Cyclone Season. The cyclone developed to the north of Rotuma and moved steadily westwards, undergoing rapid intensification. It passed close to the islands of the Temotu Province (Solomon Islands) before turning southeast and passing about 180nm to the west of Fiji. *Zoe* had a total life span of about seven days and a peak intensity of about 130 knots. The cyclone affected the islands of Fataka, Anuta and Tikopia (all in the Temotu Province) with severe damages mostly to vegetation and infrastructure.

A Tropical Depression (04F) was first identified within the SPCZ about 360nm to the east of Funafuti in Tuvalu around December 23/2100 UTC 2002. The depression generally moved west-southwest while developing slowly. Around 25/0900 UTC it was located about 130nm to the north-northeast of Rotuma and still drifting west-southwest. Overnight, convection erupted over the llcc and rapidly cooled. Spiral bands' curvature increased markedly while wrapping tightly around the centre. Outflow over the system also significantly improved overnight. Vertical shear decreased significantly over and downwind of the depression. Subsequently, at 25/2100 UTC, the depression was upgraded to a tropical cyclone and named *Zoe*. With gale intensity, it was then located about 120nm to the northwest of Rotuma and moving westwards at about 10 knots.

Zoe continued to intensify very rapidly attaining storm intensity around 26/0600 UTC and hurricane by 26/1800 UTC. By 27/0000 UTC, the eye was clearly evident from both infra-red and visible satellite imageries. Around 27/1200 UTC the cyclone turned towards the southwest, passing between the islands of Anuta and Fataka slightly after 27/1800 UTC. The cyclone reached peak intensity of 130 knots around 28/0600 UTC while located just east of Tikopia. Between 28/0600 UTC and 29/0000 UTC, *Zoe* executed a small clockwise loop after which it began to track southeast.

Zoe began to rapidly weaken, under strengthening shear and cooler SSTs, as it continued on its southeast track, passing about 180nm to the west of Nadi, Fiji, around 31/0600 UTC. The cyclone was downgraded to a tropical depression by 0000 UTC on the 1st of January, 2003 when it was located about 210nm to the southwest of Nadi.

Damage to vegetation and infrastructure was severe on the island of Tikopia, although, amazingly, no deaths or major injuries were sustained by the small community on this island. Residents escaped the fury of Zoe by sheltering inside the mountain caves. They claim that 5-10m storm surge waves inundated the coasts engulfing most of the villages. Media reports state that crops on Tikopia were totally destroyed and that it would take at least three years for the residents of Tikopia to grow all the food they needed. Initial surveys revealed that about 70 houses were destroyed and some water sources were contaminated by seawater. Tikopia was the worst affected as the cyclone became slow moving for about 12 hours just east of the island executing a clockwise loop. Fataka island is uninhabited. On Anuta, no deaths or major injuries were reported and damage to vegetation and infrastructure was considerably less than that on Tikopia. About 90% of the houses remained intact and 70% of vegetation unharmed. Communication to the islands were severed following the passage of the cyclone but was re-established about a week after.

In Vanuatu, some islands in the northern parts of the country experienced inundation by seawater. Some villagers collected fish in their village greens when the water receded. The extent of damage is yet to be ascertained. However, a survey by French Military found that there were no fatalities on the islands of Mota Lava.

In Fiji, no damages were reported although people living around the southwestern coasts of Viti Levu reported seeing large waves out to sea. None of these waves inundated land areas. Yasawa reported maximum average winds of 33 knots while at Nadi a maximum gust of 40 knots was recorded.

Ami (05F) : 12 - 15 January 2003

Ami was the third tropical cyclone to form in RSMC Nadi's AOR during this Season. It was a relatively intense tropical cyclone with maximum (10-minute) average winds of about 80 knots and momentary gusts of 120 knots at its peak intensity. The cyclone caused destructive to very destructive storm to hurricane force winds over Fiji's Northern and Central Divisions, and damaging gale force winds over Tonga and Tuvalu. Damage in Fiji was extensive and severe due to high winds, heavy seas and torrential rainfall that led to the worst ever flooding in the northern town of Labasa. 14 lives were lost with at least 3 persons still missing.

A Tropical Depression (TD 05F) was first identified as an embedded system in an active monsoon trough to the east of Tuvalu, or about 240 miles east of Funafuti at around 09/2100UTC January 2003. It steadily moved southwest to lie close to Niulakita early on the 12th, with development greatly affected by diurnal influence and relatively strong vertical shear. However, overnight on the 11th, 05F underwent rapid development and subsequently it was named *Ami* around 0000 UTC on the 12th, while located just east of Niulakita. It was then moving steadily southwest with gale intensity, gradually turning southwards as it neared Rotuma. Throughout the 13th, *Ami* accelerated steadily southwards towards Fiji making landfall along the northern coast of Vanua Levu, some 30nm northeast of Labasa Town around 13/1400 UTC, with hurricane intensity. On the

14th, the cyclone raced through the Lau Group gradually swinging southeast as it departed Fiji. The system passed to the southwest of Tonga late on the 14th whilst on its way out of RSMC Nadi-TCC's AOR. *Ami* retained its tropical cyclone characteristics for another 18 hours, inside TCWC Wellington's AOR before becoming extra-tropical at 15/1200 UTC. *Ami* reached peak intensity around 14/0600 UTC while located about 60nm south-southwest of Lakeba or about 100nm north-northwest of Ono-i-Lau.

Most of the damage in Tuvalu was on Niulakita island. Damage to housing was moderate but fruit-bearing tree crops and coastal areas were severe. Rotuma and Futuna, though experienced strong winds, were spared from any significant damage.

In Fiji, the total confirmed number of fatalities was 14 with 3 people still missing. Damage was severe in the social, economic, infrastructure and utilities sectors, particularly in the Macuata, Cakaudrove and Lau Provinces. Communication to and from, as well as within these areas was severed for several days after the passage of *Ami*. Severe flooding of Labasa Town took a heavy toll on the township's residents and caused serious health and environmental risks. Water supply in the Northern Division was severely disrupted, leaving residents without clean drinking water for several days subsequently forcing Government to cart fresh water from mainland Viti Levu. Torrential rain also caused landslides in certain areas of the three Provinces above. High waves and heavy surge generated by *Ami* caused coastal and inland inundation in many areas along the cyclone's path, in some areas, quite severe. The estimated cost of damage inflicted by *Ami* was \$F104 million as released by the Fiji National Disaster Management Office (NDMO).

In Tonga, except for the inter-island ferry M V Olovaha left stranded on a reef in Tongatapu, damage was mainly to fruit-bearing trees.

Beni (06F) : 25 - 31 January 2003

Beni developed in the vicinity of the Solomons. It was named at 25/0000 UTC while stalling just southeast of Rennell Island in the Solomons, apparently executing a clockwise loop. Once it emerged out of this loop, it trekked slowly south-southwest before turning southeast, accelerating a little. The centre of *Beni* remained over open waters for its entire life, between the Solomons, New Caledonia and Vanuatu. The cyclone reached peak intensity of 110 knots at 29/1200 UTC while located about 210nm west of Port Vila and heading southeast at 11 knots. Most of the damage caused by *Beni* was from sea swell/surge. However, the remnants of former TC Beni eventually washed up on the Queensland coast, Australia, where it caused widespread rain and flooding. One person was killed as a result of this flooding.

A tropical disturbance was first identified on the MSL charts at 19/1800 UTC embedded along a monsoon trough and moving west-southwest about 05 knots. It was then located over 200nm to the northeast of the eastern parts of the Solomons. Lying under a diffluent upper flow and SST around 30C, 06F intensified while steadily drifting west-southwest. Till the 23rd, the llcc was still exposed with deeper convection sheared off to the west. On the 24th, convection began to increase about the llcc, as shear abated. Overnight, convection erupted over the llcc with outflow fair in all quadrants and developing further. Organisation underwent a marked improvement and subsequently, the system was named *Beni* at 25/0000 UTC.

Beni made a slow clockwise loop over to the southeast of Rennell after being named. It also encountered shear and diurnal influence, making development rather reticent.

Nonetheless, at 26/0600 UTC, the partly exposed llcc slipped back under the increasing convection with spiral bands wrapping tightly around the centre. It was then upgraded to a Storm. Conditions continued fluctuating after this with shear significantly playing a retarding role on intensification. At 28/0000 UTC, a ragged and cloud-filled eye-like feature appeared in the Visible imagery only. During the evening this feature disappeared, to only reappear in the early hours of the 29th, well-defined and shrinking in size. After re-analysis, *Beni* attained hurricane intensity around 28/0000 UTC. After some explosive development early on the 29th, *Beni* intensified rapidly to reach its peak at 29/1200 UTC.

The cyclone's demise was more rapid than its development. Under increasing shear, warmer air entrainment and anomalously cooler SSTs *Beni's* structure began to dissipate after 29/1200 UTC. After 31/1200 UTC, it was further downgraded to a depression, while located about 120nm south of New Caledonia. Between the 30th and 31st, *Beni* had changed course from southeast through south to southwest, influenced by a building ridge to the south.

Damage in Vanuatu was mainly from sea swells/surge causing inland inundation in some coastal areas.

Cilla (07F): 25 - 30 January 2003

Cilla was a minor tropical cyclone, with respect to intensity and effects. 07F developed to the west-northwest of Fiji around the 25th and steadily trekked southeast. It was named *Cilla* just east of the Lau Group, Fiji, and heading towards Tonga at 27/0000 UTC. Shear continually affected the cyclone as it continued east, arresting intensification and making it difficult to locate the llcc. Consequently, it was downgraded to a depression at 29/0600 UTC. The cyclone reached peak intensity of 40 knots at 29/0000 UTC while located about 260nm southeast of Niue.

An area of persistent deep convection was located about 180nm north-northwest of Nadi around 25/1800 UTC and moving slowly southeast. It was then lying under an upper ridge axis with favourable diffluent flow aloft. The system was embedded in a quasi-stationary monsoon trough lying northwest-southeast across Fiji and Tonga. At the far northwest end of this trough was Tropical Cyclone *Beni*. Shear and dense cirrus made it difficult to locate the llcc using satellite imagery through the 26th. On Nadi Radar, multiple eddies were detected but not the common one. However, through the morning of the 27th, the main llcc was located about 150 nm east of Fiji. Coldest tops were confined to the northeastern quadrant of the system at this time. At 27/0000 UTC the llcc slipped under the deep convection and subsequently 07F was named *Cilla*. *Cilla* steadily moved southeast across the central parts of Tonga and keeping well south of Niue. The cyclone gradually accelerated to 20 knots through the 28th, but abruptly slowed on the 29th. Shear caught up with the system then and subsequently caused its decay after 29/0600 UTC. It became extra-tropical late on the 30th, some 375 nm southwest of Rarotonga.

Damage in Tonga was confined to vegetation and fruit-bearing trees. Strongest winds recorded at Ha'apai were 28 knots with gusts to 58 knots. Power on Lifuka, the main island of the Ha'apai Group was out for about 3 hours during the night of the 27th, as *Cilla* moved southeast across central parts of Tonga. Communications was also affected but restored the next day.

Dovi (09F) : 05 - 10 February 2003

Dovi was yet another intense tropical cyclone for the 2002/3 Season. The cyclone developed over the Northern Cooks waters maintaining a general southerly track for most of its life, which was spent over open waters. Though it came to close proximities of Palmerston Island in the Southern Cooks and Niue, no fatalities or damage, apart from swell/surge along coastal areas, are known to have been caused by *Dovi*.

09F was almost an instant development, at the expense of 08F, which was being monitored to the east-southeast of American Samoa up till the 4th. 09F was first identified on the MSL charts around 05/0000 UTC, while located about 120nm southwest of Manihiki in the Northern Cook Islands. It was embedded along an active SPCZ. Since inception, the system began drifting southwards about 10 knots. 6 hours later, under minimal shear, convection began to rapidly increase about the Ilcc. Overnight, though, deep convection increased and cooled further with very significant improvement in organisation. 24 hours after detection, 09F was named *Dovi*, while located about 60nm southeast of Suvarrow Island in the Northern Cooks and moving south-southwest about 08 knots.

Overcoming some diurnal influence, *Dovi* continued to intensify under increasingly favourable conditions. By 06/1800 UTC, the cyclone reached storm intensity. At this time, the cyclone was located about 160nm south of Suvarrow island and heading southwest about 08 knots. 12 hour later, by 07/0600 UTC, the system underwent explosive development, subsequently attaining hurricane intensity. *Dovi* peaked at 110 knots around 08/1800 UTC while located about 120nm east-southeast of Niue island and heading southwest, but anticipated to gradually turn southwards under a mid-level subtropical ridge to the east. At 09/0600 UTC, while turning south, weakening was anticipated to be rather rapid as the strengthening steering field was pushing the cyclone rapidly into very strong shear regime. By 10/1200 UTC it had weakened to a storm. 12 hours later, inside TCWC Wellington's AOR, with shear stripping off the deep convection, *Dovi* became extra-tropical.

Erica (13F): 3 - 16 March 2003

Erica was the first tropical cyclone of the 2002/2003 season to be named by Brisbane TCWC, inside the Queensland Tropical Cyclone Warning Centre's AOR. However, it was New Caledonia that was to bear the brunt of the cyclone as it carved its swath eastward over the Coral Sea to become the strongest cyclone to affect this nation in recent history.

The cyclone originally developed from a tropical low embedded in a monsoon trough north of the Tiwi Islands, in Australia's Northern Territory on February 13th. Two days later it crossed inland near the Western Australia/Northern Territory border. The low then trekked across the interior of Australia, passing to the south of Alice Springs and then back towards Queensland. By March 3rd, it entered the Coral Sea near the Whitsunday Islands. By 03/2300 UTC, Quikscat showed the Ilcc well removed from the gales, which were located in an area of heavy rain that appeared to be associated with a zone of warm air advection generated as a thermal trough at 700 hPa developed over the region. Shear abated through the 4th and by 04/0600 UTC, it was named *Erica* while located about 425 miles east-southeast of Townsville.

Soon after being named, *Erica* was embedded in an elongated north-east to southwest cloud structure. Under the influence of a low to mid-level ridge to the south, *Erica's* Ilcc was steered back towards the west-northwest, and thence on a path generally between the

north and northwest while losing its upper-level cloud structure against moderate shear. *Erica* eventually lost cyclone status at 07/2230 UTC. During this initial period as a cyclone, *Erica* attained a peak intensity of 55 knots.

For the next six days, the lcc of the remnant depression drifted slowly to the northeast and thence eastward, to lie just south of the Solomons. During this time it regained an upper-level cloud structure under improving conditions favouring redevelopment. Eventually *Erica* was renamed as a tropical cyclone at 10/1800 UTC whilst located about 200nm south-southwest of Honiara and moving south-southeast. For the following two days as it intensified reaching hurricane intensity at 11/1800 UTC. By 13/0600 UTC *Erica* was located approximately 300nm west-northwest of Noumea, New Caledonia, moving southeast at 8 knots under a weak mid-level ridge to its east. At this time, *Erica* reached its peak intensity of 115 knots. The cyclone's eye had shrunk in diameter and become symmetrical. Outflow remained good in all quadrants; however, UW-CIMSS charts depicted increasing upper-level shear to the south of the cyclone.

Erica made landfall a little after 13/1800 UTC approximately 120nm northwest of Noumea. The cyclone centre was then accelerating southeast along the island, over land, crossing out to sea at the extreme southern end of the island. It became extra-tropical by 15/1200 UTC while heading steadily southeast.

At Cape Tribulation, damage was significant with trees uprooted, large branches broken. One such felled branch crushed a car. In the Mossman and Port Douglas areas reports included leaves being stripped from trees, trees being blown almost horizontal to the ground, large trees being blown over and boats dragging their moorings. One large tree fell on a house at Oak Beach, some 15 km south-southeast of Port Douglas. Power was lost in several areas due to downed power lines by trees and felled branches. The northern beach suburbs of Cairns were also affected with similar damage.

Erica's main impact was on the main island of New Caledonia. Damage was extensive along the main island's west coast and in the capital, Noumea. Roofs were torn off, trees uprooted, power and phone lines cut, and roads closed. Many root crops were destroyed in the Northern Province; however, the water supply system was left largely intact. *Erica* left up to 1000 homeless as well as seriously damaging public buildings. Two fatalities were reported with nine people seriously injured and over one hundred with less serious injuries.

The small towns of Bourail, Kone, Pouembout, Koumac and Voh in the North Province suffered extensive damage including loss of electricity and telecommunications. In the small village of Pohe, up to 90 percent of crops were destroyed. Extensive damage was also reported in the southern village of Yate near the main hydro-electric dam, where about half of the population was left without shelter.

Schools sustained damage estimated at more than US\$15 million, particularly to secondary schools the university. The French government immediately released more than US\$25 million to rebuild 1000 homes in New Caledonia destroyed by the cyclone. A further contribution of US\$17 million to meet the full cost of the emergency housing program was anticipated.

Eseta (12F) : 10 – 14 March 2003

Eseta was a relatively intense tropical cyclone whose development was enhanced by the favourable MJO pulse propagating eastwards at the time, inside RSMC Nadi AOR. The cyclone developed about 300nm north-northwest of Nadi, and circumnavigated Fiji on its way towards Wellington's AOR. In executing this, it kept well away from Fiji until it changed course towards the east to come within 80nm of Ono-i-Lau, the southern-most island of the Group. As it continued east, the cyclone also came within 60nm of Tongatapu Group in Tonga. Tropical Cyclone *Eseta* attained a peak intensity of 100 knots while located southeast of Ono-i-Lau.

A tropical disturbance was first identified on the MSL charts on March 8th about 60nm west of Rotuma, with little organisation and drifting generally towards the west. 12F was apparently influenced by shear and diurnal variations which effectively subdued any development. On the 10th, the system was lying under a diffluent upper outflow and minimal shear region with the llcc partly exposed. Quikscat pass in the evening confirmed presence of gales though confined certain sectors and some distance away from the centre. Overnight, convection increased with banding wrapping tightly around the llcc. 12F was then named *Eseta* at 10/1730 UTC, while located about 300nm west-northwest of Nadi and moving south about 05 knots. After re-analysis though, *Eseta* attained tropical cyclone status around 10/1200 UTC.

After being named, the cyclone went through some explosive intensification reaching storm by 11/0000 UTC and developing a ragged eye by 11/0600 UTC. However, intensity was not upgraded to hurricane till 12/0000 UTC. In retrospect, *Eseta* attained hurricane intensity around 11/1800 UTC. The cyclone was then located about 260nm south-southwest of Nadi and moving southeast about 12 knots. Under a well-established mid-level ridge over Fiji, the cyclone was steered around it but eventually to within 80nm of Ono-i-Lau, the southeast-most island of the Group. On its way out of Nadi AOR, it brushed past, within 60nm of Nukualofa, the Capital of Tonga. *Eseta* steadily accelerated after 12/0000 UTC and continued to steadily intensify to reach its peak around 13/0600 UTC with 100 knots close to centre. It was then located about 150nm west-southwest of Nukualofa. By 13/0600 UTC, it accelerated further to about 25 to 30 knots under a near gale northwest steering field, and into stronger shear region. As a consequence, *Eseta* rapidly lost its organisation and warm-core characteristics and by 14/1200 UTC, inside TCWC Wellington's AOR, it became extra-tropical.

Tropical Cyclone *Eseta* spent its life at sea, passing well to the south of Fiji. Except for some heavy rain and flash flooding, damage if any was minimal. In Eua, Tonga, damage was mainly to fruit-bearing trees, root crops and kava. There are no known reports of casualties as a direct consequence of this cyclone.

Fili (16F) : 13 - 15 April 2003

A persistent area of deep convection was first identified about 200nm northeast of Fiji around 13/0000 UTC moving southeast slowly. The disturbance was then lying under an upper ridge axis in a weak shear regime. At the surface, SST was around 30°C. Suggestions of cyclonic curvature of low-level clouds were evident then. Late on the 14th, shear was increasingly becoming more prominent, keeping the deep convection displaced to the southeast of the llcc. Overnight, though, 16F was caught up in a strong northwest steering field, accelerating the system through central Tonga. This subsequently neutralized the resultant shear on the 16F, thus allowing for further development. Around 14/1800 UTC, it was named *Fili*, while located about 210nm east-northeast of Nukualofa, Tonga, and moving southeast at 20 knots. Intensity was then estimated at 35 knots and

with potential to increase further. Shortly after 15/0000 UTC, *Fili* made its exit from RSMC Nadi AOR into Wellington TCW's with 45 knots and moving southeast at 35 knots. It became extra-tropical by 15/1200 UTC under intense shear. *Fili* peaked around 15/0600 UTC with a maximum average wind speed of 50 knots close to the centre, attributed partly to its translational speed. No damage or casualties are known to have resulted from *Fili*.

Gina (17F) : 4 - 9 June 2003

Gina was first identified as a westward-moving depression to the northeast of Vanuatu within an area of fairly persistent convection stretching west toward the Solomon Islands on June 4th. Late on the 4th, 17F was moving towards the west-southwest at about 5 knots under the steering influence of the low to mid-level ridge to the south. Under favourable conditions, the system developed further and was subsequently named *Gina* at 05/0600 UTC about 240nm northeast of Espiritu Santo, Vanuatu.

Throughout the 6th, *Gina* accelerated a little to lie within 30nm to the north-northwest of the northern tip of Espiritu Santo. All this while the cyclone was gradually intensifying. At 07/0000 UTC, it attained hurricane intensity, while steadily on a west-southwest track and generally away from Vanuatu. While the organization remained good, convection was diminishing gradually. *Gina* reached peak intensity of 80 knots at 07/1800 UTC while located about 730nm west of Port Vila, Vanuatu. By this time the cyclone had slowed considerably and in the initial stages of an anticlockwise loop. *Gina* had also, at this time, moved into a region of stronger shear and cooler SSTs. *Gina*'s demise was rapid with convection torn away from the lcc to the southeast by the strong shear. By 09/0600 UTC *Gina* had lost its cyclone characteristics and was subsequently downgraded to a depression. It was located about 730nm west-northwest of Port Villa.

No report of damage or loss of life, from either of the islands in the eastern Solomons or northern Vanuatu due to *Gina* has been received. However, the Australian media reported that the vessel *Grace 2* sailing from Bowen (North Queensland) to Vanuatu foundered when it encountered *Gina* on the 8th. A mayday was broadcast, and in a three-hour rescue operation, the Indonesian Ship *Daio Copihue* picked up the crew while en route from New Zealand to Japan.



References:

1. **Australian Bureau of Meteorology web site**, <http://www.bom.gov.au/>, for Monthly SOI values and 5-month running mean, from 1998 to 2003.