

FIJI METEOROLOGICAL SERVICE

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TROPICAL CYCLONE REPORT 90/6

TROPICAL CYCLONE SINA
24 - 30 NOVEMBER 1990

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Note: Tropical Cyclone Reports are intended to be quickly available, preliminary, descriptive reports for public use. Their early issue means that details may be subject to subsequent correction.

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INTRODUCTION

Sina was the first tropical cyclone to have occurred in the Southwest Pacific in the 1990/91 cyclone season. It formed out of a depression about 230 miles northwest of Rotuma on 24th November, 1990 and lasted for a total of about 7 days during which it affected four countries, causing severe impact over at least one.

The initial movement of Sina was rather erratic as the cyclone underwent a small clockwise loop around 0000 UTC* on the 25th. Thereafter, it followed a fairly southerly track for about 24 hours, as it developed rapidly to hurricane intensity, then curved gradually towards southeast, and later moved east-southeast as it approached Fiji. The centre of the cyclone passed about 20 miles south of the southwestern coast of Viti Levu in the early hours (FST**) of 27th November, and close to or over several islands in the Moala and Southern Lau Groups during that day. After crossing Fiji, the system made a brief curvature to the southeast, but then took a sharp eastward turn as it approached Tonga. It passed between Hapaai and Tongatapu Groups in the afternoon of 29 November, meanwhile losing hurricane intensity. Thereafter, it maintained an eastward path for a further 24 hours during which the cyclone centre passed about 100 miles south of Niue. The system finally recurved to the south as it neared the Southern Cooks, thus sparing the Islands from its main fury.

Sina reached peak intensity around 1800 UTC on 26th November, about 18 hours after it had developed hurricane force winds around its centre. Maximum average winds associated with the cyclone were estimated to be 75 knots with momentary gusts up to 110 knots.

The Regional Tropical Cyclone Warning Centre at Nadi, besides supplying regular warnings, advisories and information to aviation and shipping, issued Special Weather Bulletins containing alerts and warnings on Sina to the countries of Fiji (including Rotuma), Tonga and Southern Cooks, and Special Advisories to Vanuatu and the Solomon Islands. Of these Fiji was the worst hit with damage estimated at F\$26.2 million (US\$18.5 million). Luckily no lives were lost.

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

**FST - Fiji Standard Time

HISTORY

A shallow depression which had been pre-existent in the South Pacific Convergence Zone for some time, first showed signs of any noticeable organization early on 23rd November, 1990. It was located about 250 miles west-southwest of Funafuti in Tuvalu at that time and was generally slow-moving. Following establishment of an upper level outflow over the system soon afterwards, its prospects for further development gradually became good. Consequently, the cloud associated with it began to increase both in convection and organization, with subsequent increase in winds. As this happened the system started to drift towards west-southwest at about 08 knots.

By 1800 UTC on 24th November, the system had shown considerable organization with enough spiral banding and other characteristics to suggest the existence of gale force winds around the depression centre. With such indications, and the persistence of conditions surrounding the depression favouring its further development, the system was designated a tropical cyclone and code-named "Sina" at 1910 UTC on the same day (0710 hours FST on 25th).

Soon after it was named Sina slowed down temporarily and is anticipated to have made a small clockwise loop before taking a southerly course and accelerating to about 12 knots. Meanwhile, the system continued to develop and by 1500 UTC on the 25th it had reached storm intensity with average winds estimated at 50 knots close to centre and gales extending to about 120 miles from centre. By late on the 25th, the "eye" of Sina began to appear in satellite imagery thus indicating the cyclone to have reached hurricane intensity. Gradually, as Sina became more intense, the eye became very distinct in satellite imagery. The system was anticipated to have reached peak intensity around 1800 UTC on the 26th with average winds estimated at 75 knots and momentary gusts up to about 110 knots close to its centre. The radius of storm force winds was estimated to be no more than 50 miles while gales were forecast within 150 miles of the cyclone centre.

For almost 24 hours after it had attained hurricane intensity, the movement of Sina became rather erratic as the system came under the influence of a changing upper-level steering flow. By 0000 UTC on the 27th (1200 hours FST), the cyclone lay about 160 miles northwest of Nadi. Soon afterwards it started to show gradual curvature to the southeast, towards Fiji. By midnight (FST) Sina had reached very close to Fiji and was tracking on a pretty east-southeast course, which eventually lead the system to pass about 20 miles south of the south coast of Viti Levu and over Vatulele, Moala Group and Southern Lau Group. After crossing Fiji Sina curved briefly towards southeast, but then made a sharp easterly turn as it approached the southern part of Tonga. As it did this, the cyclone lost its hurricane intensity and later crossed between Hapaai and Tongatapu Groups with storm intensity.

After crossing Southern Tonga, Sina maintained an almost easterly track for a further 18 hours, as it accelerated to about 20 knots. The cyclone centre passed about 100 miles south of Niue just before 0000 UTC on the 30th with the Island experiencing marginal gale force winds. As it approached Southern Cooks the cyclone recurved to the southeast, meanwhile undergoing rapid weakening under the influence of strong vertical shear and due to entering into cooler waters. By 0000 UTC on 1st December the

system had lost its tropical cyclone characteristics and was consequently downgraded. The resulting depression maintained storm force winds for several days afterwards as it moved into higher latitudes and became extra-tropical.

WARNINGS AND ADVISORIES

a) International Marine Warnings

Although the general area of low pressure to the west of Tuvalu was being monitored by Nadi for some time, the first gale warning was not issued until 0715 UTC on the 24th when the system began to show some definite organization, with conditions favourable for further development. Average winds of about 30 knots were estimated around the depression centre at that time, which were expected to increase to 35 knots within the next 12 hours. The system developed as expected and 12 hours later it was designated a cyclone with warnings being upgraded accordingly. A storm warning was issued at 0115 UTC on the 25th as Sina underwent rapid intensification. 24 hours later, the first hurricane warning was issued with average winds estimated at 65 knots close to the cyclone centre, increasing to 75 knots within the next 12 hours. The system again developed as expected and reached its peak intensity around 1800 UTC on the 26th. This was reflected in the warning issued around this time, and subsequent three warnings as Sina maintained this intensity. Thereafter, Sina underwent slight weakening, though still maintaining hurricane intensity for a further 24 hours. Warnings were downgraded to storm category around 0000 UTC on the 29th, just as the cyclone approached the Tonga Group. Thereafter, it continued to weaken slowly. Nadi issued its final warning at 1915 UTC on the 30th, by when the cyclone was fast approaching 25 degree South Latitude, the southern boundary of Nadi's area of responsibility for issuing international maritime warnings. Further warnings were issued by Wellington which quickly downgraded the system to a depression, though still maintaining storm intensity for it in several of their bulletins.

b) Advisories

The first Tropical Disturbance Advisory by the Nadi TCWC was issued on the system at 0730 UTC on the 24th while it was in its early stages of development as a depression. Thereafter, advisories were issued every 12 hours till 2000 UTC on the 30th, giving up-to-date information on the cyclone position, movement, intensity, wind distribution and organisational characteristics, with expected changes over 24 hours. In total, 14 Tropical Disturbance Advisories were issued by Nadi to meteorological centres in the region, and beyond.

During early stages when the cyclone was heading towards west-southwest, it posed threat to both Solomons and Vanuatu. Six hourly Special Advisories were issued for both the countries commencing around 0145 UTC on the 25th, giving information as in a Tropical Disturbance Advisory plus specifics on the nature of the threat and likely areas to be affected. The information was to assist the national meteorological services of these countries in preparing accurate and timely warnings for their public. A total of four Special Advisories were issued to Solomon Islands and six to Vanuatu.

Besides Nadi, centres in Honolulu, Noumea, Bracknell, Guam and Tahiti also issued warnings or advisories on Sina at various stages of its life span. The involvement of so many warning centres in the issuing of warnings reflects upon the vast area covered by the cyclone. The advices received especially from Honolulu and Guam proved very helpful to Nadi in precisely monitoring the cyclone.

c) Special Weather Bulletins (SWB)

i) Fiji

The first Special Weather Bulletin for Fiji was issued at 9.00am (FST) on the 26th (2100 UTC on 25th) containing an "ALERT" for the whole Group. At this time Sina still had storm intensity and was located about 360 miles northwest of Nadi, and moving southwards. With a slight acceleration of the cyclone towards Fiji, following the alert being repeated in SWB Number two issued 4 hours later, the first gale warning was issued for the Yasawa and Mamanuca Groups, western half of Viti Levu and islands to its south. The alert was maintained for the remaining parts of Fiji in this third SWB issued at 4.30pm on the same day. No significant changes were made in subsequent three SWBs issued at three hourly intervals. By early on the 27th, Sina had come within about 220 miles northwest of Nadi and was likely to curve more towards southeast. Based on this, a storm warning was issued for Yasawa and Mamanuca Groups in SWB Number seven compiled at 4.30 am on this day. This warning was extended to cover Western and Southwestern Viti Levu in SWB Number eight issued 3 hours later. The rest of Viti Levu was placed under gale warning. For a small period later that day the cyclone underwent some erratic movement and appeared to be curving southwards at one stage. This prompted the Nadi TCWC to downgrade the warnings to that of gale in SWBs ten and eleven issued at 1.30pm and 4.30pm, respectively. However, the system soon began to curve smoothly towards southeast, and then east-southeast, and warnings were once again upgraded.

From late afternoon of the 27th, Sina came within range of the Nadi Radar which greatly helped in the tracking of the cyclone by providing more precise location of its centre and associated rain bands. With the curvature of Sina towards east-southeast it became apparent that the southern parts of Fiji would be hit directly by the cyclone. A hurricane warning was consequently brought into force for Vatulele, Kadavu and nearby smaller islands in SWB Number fourteen issued at 1.30 am on the 28th. A storm warning was maintained for Western and Southwestern Viti Levu, Mamanuca Group and other nearby islands. As the cyclone moved closer Fiji and its project path became more definite, hurricane and storm warnings were extended to cover Ono, Moala, Totoya and nearby islands in the Koro and Southern Lau Groups in SWBs fifteen to twenty-two issued three hours apart.

By early on the 29th Sina had virtually crossed the Southern Lau Group and was moving southeast at about 12 knots. The final warning, for Fiji on this system was issued at 4.30am on that day as Sina sped away from the Group.

ii) Tonga

With the east-southeast movement of Sina, the system posed a direct threat to Tonga. The first SWB for Tonga was issued at 2030 UTC on the 27th carrying a tropical cyclone alert for Tongatapu, Hapaai and Vavau Groups. Following another alert issued five and a half hours later, Tongatapu and Hapaai were placed under gale warning in SWB Number three. A temporary drift of the cyclone towards southeast followed by its persistent movement to the east, necessitated cancellation of the alert for Vavau in SWB Number four issued at 1330 UTC on the 28th, and subsequent upgrading of the warning for Tongatapu to that of storm in SWB Number six issued at 1930 UTC on the same day. Following two more storm warnings for Tongatapu, in bulletins now compiled at three hourly intervals, the final SWB was issued for Tonga at 0430 UTC on the 29th as Sina began to move away from the Group.

iii) Southern Cooks

On its persistent eastward track, after crossing Southern Tonga and passing about 100 miles south of Niue, Sina also posed threat to Southern Cooks. An alert was therefore issued for the whole of Southern Cooks in SWB Number one compiled at 0400 UTC on the 30th. Four hours later, a gale warning was issued for Rarotonga and Mangaia as the system appeared to turn east-southeast. A strong wind warning was brought into effect for the rest of Southern Cooks. By then Sina had weakened considerably with average winds of marginal storm force close to its centre. Warnings were maintained in SWB Number three issued at 1400 UTC on that day. Shortly afterwards, Sina began to curve sharply towards south-southeast thus sparing the Cooks from its major effect. The gale warning was subsequently cancelled in the final SWB for Southern Cooks issued at 1930 UTC on the 30th.

EFFECTS

Sina caused most destruction to Fiji, cutting across the southern and southwestern parts of the country from the evening of 27th November to early morning of the 29th. The cyclone centre passed close to or overhead the southwestern coast of Viti Levu, Vatulele, Beqa, Northern Kadavu and islands in the Moala and Southern Lau Groups, where the effect was severe. Storm to hurricane force winds with average speeds up to 65 knots and momentary gusts to 95 knots battered these areas for several hours as the cyclone moved steadily east-southeast either destroying or damaging houses and other building structures, bringing down electricity and telephone lines, uprooting trees and severely affecting crops and vegetation including sugar cane and pine plantations. Luckily the heavy rain that was associated with Sina did not last long enough to cause any major flooding.

Though there was considerable suffering, no human lives were lost. Loss of livestock was also minimal. Total damage to the country was estimated to be slightly over \$F26 million (\$US18.5 million), nearly 80 percent of which accounted for losses to the sugarcane crop, the pine forest and agriculture. Also, over 80 percent of the damage occurred in the Western Division.

Over Tonga the effect of Sina was minor and included damage to some weaker structures, banana plantations and electric and telephone lines mainly on islands in the Tongatapu Group. No estimates of the total damage were available.

Niue experienced strong and gusty winds as Sina passed about 100 miles to the south of the island between 1600 and 2200 UTC on the 29th. The island suffered some damage to its wharf as a result of high seas and waves. Minor damage to crops also occurred especially from salt spray from the sea.

Cook Islands also suffered only minor damage from Sina, mostly to weak structures and shallow-rooted crops.

Some useful meteorological data recorded at various stations during the passage of Sina is presented below :

	W I N D S		
	Highest Mean Wind Dir/Speed(Kts)Time+	Maximum Gust Speed(Kts)Time+	Lowest Pressure/Time+
<u>Fiji</u>			
Yasawa	07037/270100	45/270100	996.8/271500
Viwa	330/45/271200	330/58/271200	990.2/271200
Laucala Bay	020/30/272030	56/272030	985.8/272100
Lakeba	280/45/290000	60/290000	995.2/290000
Vunisea	150/48/272100	58/272100	986.0/272200
Matuku	330/90++/280600	100++/280530	965.0/280400
Ono-i-Lau	-	53/281500	986.5
Nadi	360/54/271320	98/271320	986.5
<u>Cook Islands</u>			
Rarotonga	35040/301440	53/301435	996.8/301500
<u>Niue</u>			
	330/32/291800	45/291800	993.3/292100
<u>Tonga</u>			
Nukualofa	140/52/290530	75/290535	981.9/290335
Fua'amotu Airport	140/43/290530	70/290540	988.8/290340

+ All times in UTC (e.g. 270100 means 0100 UTC on 27). For local Fiji time add 12 hours.

++ Manually overestimated. Lowest pressure recorded corresponds to average winds of about 65 knots, as was the estimated intensity of Sina at that time.

CONCLUSION

Sina was a relatively small, but quite intense tropical cyclone with a rather tight circulation. As a result, its effects were not felt on land until the cyclone came very close.

Luckily Sina was already past its peak intensity when it affected Fiji and had weakened considerably as it crossed Southern Tonga. Nonetheless, the areas that it affected suffered moderate to severe damage.

It was also fortunate that not a single human life was lost as a direct result of Sina. Loss of livestock and property was also relatively small. Most of this can be attributed to greater public awareness of the cyclone's impending threat and more than adequate advance warning to people which allowed them to take precautionary measures well before Sina impact.

The Nadi radar, which has had ongoing problems with its weather surveillance mode, miraculously performed well during the wake of Sina thus enabling the system to be tracked precisely during the period it threatened Fiji.

