

FIJI METEOROLOGICAL SERVICE

TROPICAL CYCLONE REPORT 91/2

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TROPICAL CYCLONE VAL

4 - 13 December 1991

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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TROPICAL CYCLONE REPORT 92/1

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INTRODUCTION

A surge in the westerlies to the north of the Inter-Tropical Convergence Zone (ITCZ) in early December started off a small circulation which later developed into destructive Tropical Cyclone Val.

A tropical depression developed, initially with gales in its northern semicircle, just to the southeast of Tuvalu on 4th December 1991 and moved northeast for nearly two days. The system was named 'VAL' around 0700 UTC* on the 5th immediately after it had acquired tropical cyclone characteristics with gales developing all around its centre. Steered by upper north to northwest winds, Val began curving towards the south, then southeast, and headed straight for Samoa.

Val attained hurricane force winds close to its centre as it approached Savaii and continued to develop, reaching peak intensity with maximum average winds estimated at 90 knots and gusts to 130 knots as it affected both American and Western Samoa

Soon after the cyclone passed across Savaii, it made a sharp clockwise loop, which brought it almost over Savaii the second time, completing the loop by 1800 UTC on the 8th. Thereafter, the system moved generally eastsoutheast for about 24 hours, passing close to Upolu in Western Samoa and overhead Tutuila in American Samoa. It later curved southeastwards and sped across the open sea between Niue and Southern Cooks.

The cyclone caused severe damage over the Samoas and minor to moderate effects over five other countries that it affected. Over Western Samoa, fifteen lives were lost. Savaii, which experienced the brunt of the cyclone, was most severely battered with about 95 percent of its houses either destroyed or badly damaged. Preliminary estimate of damage over Western Samoa neared 200 million US Dollars. Over American Samoa, destruction to crops was severe while houses suffered extensive damage. However only one life was lost. Damage was estimated in excess of 50 million US Dollars.

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

HISTORY

On the 4th of December, a small depression developed along the ITCZ near Tuvalu. The system deepened slowly as it moved initially northeastward. By 050700+ UTC the depression was estimated to have acquired tropical cyclone characteristics with gale force winds all around its centre. It was subsequently named Tropical Cyclone 'VAL'. Meanwhile another depression had formed far to east near Northern Cooks, which later became tropical cyclone "WASA".

Val intensified steadily over the next two days as it curved towards the southeast, away from Tuvalu. It attained storm intensity within 18 hours of being named and continued on its southeastward track at about 08 knots, heading straight for Western Samoa. Around 070000UTC, about 18 hours before Val made landfall on Savaii in Western Samoa, it was upgraded to a hurricane with estimated average winds of 65 to 70 knots close to its centre.

By 071200 UTC, Val was situated about 30 miles north of Savaii. Steered now by upper-level northerlies, it curved south and headed directly for the island of Savaii. Val reached its peak intensity with maximum average winds of about 90 knots close to its centre just before making landfall on Savaii around 071800 UTC. Storm force winds of 50 knots were forecast within 80 miles of the cyclone centre and gales out to about 150 miles from the centre.

Influenced by upper-level winds, and probably also due to land effect of Samoa, after crossing Savaii Val underwent some erratic movement making a clockwise loop to the southwest of the island. As it did this, the system slowed down prolonging the damaging effects of the heavy seas and destructive winds over Samoa. The combined effects of extension of gales further outward and very strong low level convergence occurring in the northeast sector of the cyclone resulted in gales over Pukapuka and nearby islands in the Northern Cooks. Upon completing the loop the system moved eastwards, and headed straight for American Samoa. The eye of the cyclone passed over Tutuila around 100200 UTC as forecast by the Nadi TCWC. Pago Pago, situated on Tutuila recorded maximum average winds of 70 knots and gusts up to 99 knots as the cyclone centre passed overhead. The lowest pressure recorded was 27.88 inches (944hpa).

After devastating the Samoas, Val accelerated to about 12 knots as it curved to the southeast and appeared to threaten the Southern Cook Islands. It eventually tracked well to the west of the Cooks. The system also began to weaken a little as a result of encountering increased vertical wind shear and cooler seas. It lost its hurricane intensity soon after 120600 UTC, as it accelerated towards the southeast. Six hours later it crossed the 25 degrees South latitude, after which further warnings were issued by the Regional Warning Centre at Wellington. The system maintained storm intensity for a further two days before finally degenerating into a weak depression.

+0700 UTC on the 5th

WARNINGS AND ADVISORIESa) International Marine Warnings

The Nadi TCWC issued its first International Marine Warning on the depression at 041357 UTC. At this stage gales were estimated within 200 miles of the depression centre in the northern semicircle. Two more warnings were issued on the depression until the system was designated a cyclone around 050700 UTC. Thereafter, warnings were issued at six hourly intervals on the cyclone.

Warnings were upgraded to storm category at 051915 UTC and to hurricane 24 hours later as Val intensified steadily. The cyclone reached its peak intensity 24 hours after the first hurricane warning was issued and only a few hours before making landfall over the northern coast of Savaii. Val maintained its hurricane intensity for four days before being downgraded to a storm. Warnings were adjusted accordingly. The Nadi TCWC issued its final warning on the system at 121919 UTC following which Wellington took over primary responsibility for the cyclone.

b) Tropical Disturbance Advisory (TDA)

The Nadi TCWC issued the first TDA on the system at 042004 UTC and subsequent advisories every 12 hours. These advisories contained detailed information on the system and were specifically tailored for the requirements of meteorological offices in the region. In total, seventeen such advisories were issued by the Nadi TCWC.

Advisories on Val were also received at Nadi from various other cyclone warning and advisory centres such as the Joint Typhoon Warning Centre in Guam, Honolulu Satellite Centre and Bracknell. These advisories contained useful information on location, intensity, past movement and other organisational characteristics of the cyclone. The frequency of issue of these bulletins varied from 3 to 12 hours. As the cyclone moved southeast it fell on the edge of the GMS satellite picture coverage and due to insufficient information, its location and tracking became difficult. The Nadi TCWC relied largely on advisories from Honolulu during these later stages of the cyclone.

c) Special Weather Bulletin (SWB)i) Tokelaus

A strong wind warning was brought into effect for Tokelaus soon after the formation of the initial depression near Tuvalu. The first SWB containing an alert was issued for Tokelaus at 051400 UTC when it was considered that the cyclone could pose threat to the Islands on its eastward track. The alert was maintained in SWB Number 2 issued six hours later.

SWB Number 3 issued at 060200 UTC contained the first gale warning for the whole of Tokelaus. Ten hours later the first report of gales was received. Winds subsequently decreased as the cyclone curved towards the southeast and passed within 200 miles southwest of Tokelaus. Further bulletins were issued at 6 hourly intervals with the final issue, SWB Number 6, being at 062000 UTC. By then Val had curved southeast and was moving away from the this group of islands. However, squally conditions persisted over the islands for the next few days.

ii) Tuvalu

At the time when the depression was in its developing stages, Tuvalu was influenced by the active convergence zone and squally northwesterlies associated with the system. A strong wind warning was maintained for Tuvalu during the entire period. No significant damage was reported.

iii) Wallis

Along its southeastward track, Val posed a reasonable threat to Wallis Island. The first SWB containing a gale warning was issued at 062000 UTC for the island. Twelve hours later, following two more SWBs issued six hours apart, the system began to move away from Wallis and the gale warning was cancelled. Wallis Island did not experience any gales and no damage was reported.

iv) Tonga

As Val moved southeast, towards Samoa, threat of gales or stronger winds extending as far as Northern Tonga increased. The first SWB for Tonga was issued at 062030 UTC containing a gale warning for Niuafouu and Niuatoputapu (Keppel). The rest of Tonga was put on alert. The warning was maintained in SWB Number 2 issued at 070200 UTC. Soon afterwards, Val began moving away from Tonga and the gale warning was cancelled in the third SWB issued six hours later.

Following its passage across Savaii in Western Samoa, Val changed course and started heading southwest. As a result, the cyclone posed a second threat to Northern Tonga and the Niuatoputapu Group was again placed under a gale warning in SWB Number 4 issued at 080200 UTC, some 18 hours after the issue of SWB Number 3. The rest of Tonga was placed under a strong wind warning.

No gales were experienced in Niuafouu but Niuatoputapu reported its first gale around 090000 UTC. In SWB Number 9 issued at 090200 UTC, Niuatoputapu was placed under a storm warning as Val appeared to continue moving closer to the Group. Storm force winds were experienced some time around 090900 UTC and lasted until 091700 UTC. Thereafter, the winds decreased very steadily. In total, 18 SWBs were issued for Tonga on Val, all storm warnings being disseminated three hours apart.

v) Samoa

The first SWB containing an alert for Samoa was issued at 060800 UTC when it was apparent that Val would affect the Group with gales or stronger winds. At this stage the cyclone was some 250 miles northwest of Savaii. In SWB Number 2 issued 6 hours later, the whole of Samoa (both Western and American Samoa) was placed under a gale warning. Faleolo reported its first gale at 070400 UTC, Apia at 070000 UTC, and Pagopago in American Samoa at 071400 UTC.

Warnings for Western Samoa were upgraded to storm category in SWB Number 3 issued at 061930 UTC and to that of hurricane in SWB Number 5 issued at 070130 UTC as Val directly threatened the Group. In SWB Number 5 American Samoa was placed under a storm warning. Six hours later in SWB number 7, a hurricane warning was issued also for American Samoa. By this time Val had come within 60 miles of Savaii, still moving in a southeast direction. Around 070900 UTC communication with Western Samoa was lost.

Then with a change in track of the cyclone towards the south, directly towards Savaii, the threat of the cyclone centre passing very close to American Samoa decreased. Hence the warning for American Samoa was downgraded to that of gale in SWB Number 13 issued at 080130 UTC and subsequent seven SWBs issued three hours apart. All this while a hurricane warning was maintained for Western Samoa. Meanwhile Val underwent some erratic movement, making a clockwise loop just southwest of Savaii. It was not until the cyclone had completed this loop that it became evident that the system would be moving east, directly towards American Samoa. Warnings for American Samoa were then upgraded to storm category in SWB Number 21 issued at 090130 UTC and to hurricane in SWB Number 23 issued six hours later. Thereafter, warnings were adjusted accordingly as the cyclone passed directly over Tutuila, curved southeast later, and sped away from the Samoas.

Altogether thirty nine SWBs were issued for the Samoas over a period of 5 days. The final issue was at 110730 UTC.

vi) Cook Islands

At 102300 UTC, the first SWB was issued for the Cooks containing a gale warning for Palmerston Island and an alert for the rest of Southern Cooks. On its southeasterly track, Val was expected to pass close to Palmerston Island but after 110000 UTC, the system changed its course and curved more towards south-southeast. This spared Southern Cooks from the main fury of the cyclone.

Palmerston reported its first gales at 111500 UTC, sixteen hours after the initial warning was issued. Pukapuka in Northern Cooks, where winds are manually estimated, started to report gales at 110500 UTC. Val passed approximately 200 miles west of Palmerston around 111500 UTC. Six hours later, winds at Palmerston peaked to storm force as Val was moving southwards away from the Cooks. The peak in the winds could be attributed to the very active rain squalls that were evident in satellite imagery at the time. Subsequently, a gale warning was also issued for Rarotonga and Mangaia but the islands escaped with only strong winds. By 121800 UTC Val was located about 250 miles southwest of Rarotonga and was moving rapidly away from the Cooks.

Altogether ten SWBs were issued on Val for the Southern Cooks, the last one being complied at 120130 UTC.

EFFECTS

Val was the second cyclone to cause severe destruction to the Samoas during this decade, the other being Ofa in 1990. Val caused gales or stronger winds and moderate to severe effects in at least 5 different countries. Prolonged effect of high seas and heavy waves caused serious coastline damage especially over Samoa.

Initial estimate of the damages over both American and Western Samoa was placed over \$300 million U.S. Dollars.

Samoa which suffered badly during Tropical Cyclone Ofa in 1990, was almost completely devastated by Val. Most people believed that the effect of Val was much worse than that of Ofa.

Some meteorological data reported from various stations during the passage of Val are listed below in Table 1.

Table 1

Wind and Pressure reported by various meteorological stations during the passage of Val.

Station Name	Max. Average Winds (Knots) and time (UTC)	Maximum Gust	Lowest Pressure Recorded (hPa)
<u>Tuvalu</u>			
Funafuti	36/041300	52	1002.0
<u>Wallis Is.</u>			
	20/070500	35	996.1
<u>Tokelau++</u>			
Atafu	40/061200	-	-
Fakaofu	40+/100000	-	-
<u>Tonga++</u>			
Keppel	50/091200	-	-
Niuafo'ou	Below gale force		
<u>American Samoa</u>			
Pago Pago	70/121045	99	27.88 inches (944.1 hPa)
<u>Western Samoa</u>			
Apia	Data not available.		
Faleolo			
<u>Cooks Islands</u>			
Aitutaki	20/between 112300-120600	33	997.1
Pukapuka	37/110500	50	996.4
Palmerston	57+/112100	71	988.7

+ Enhanced by convective rainbands and not due to cyclone alone.

++ Data extracted from synoptic charts.

Table 2

Reports of damage received during the passage of Tropical Cyclone Val.

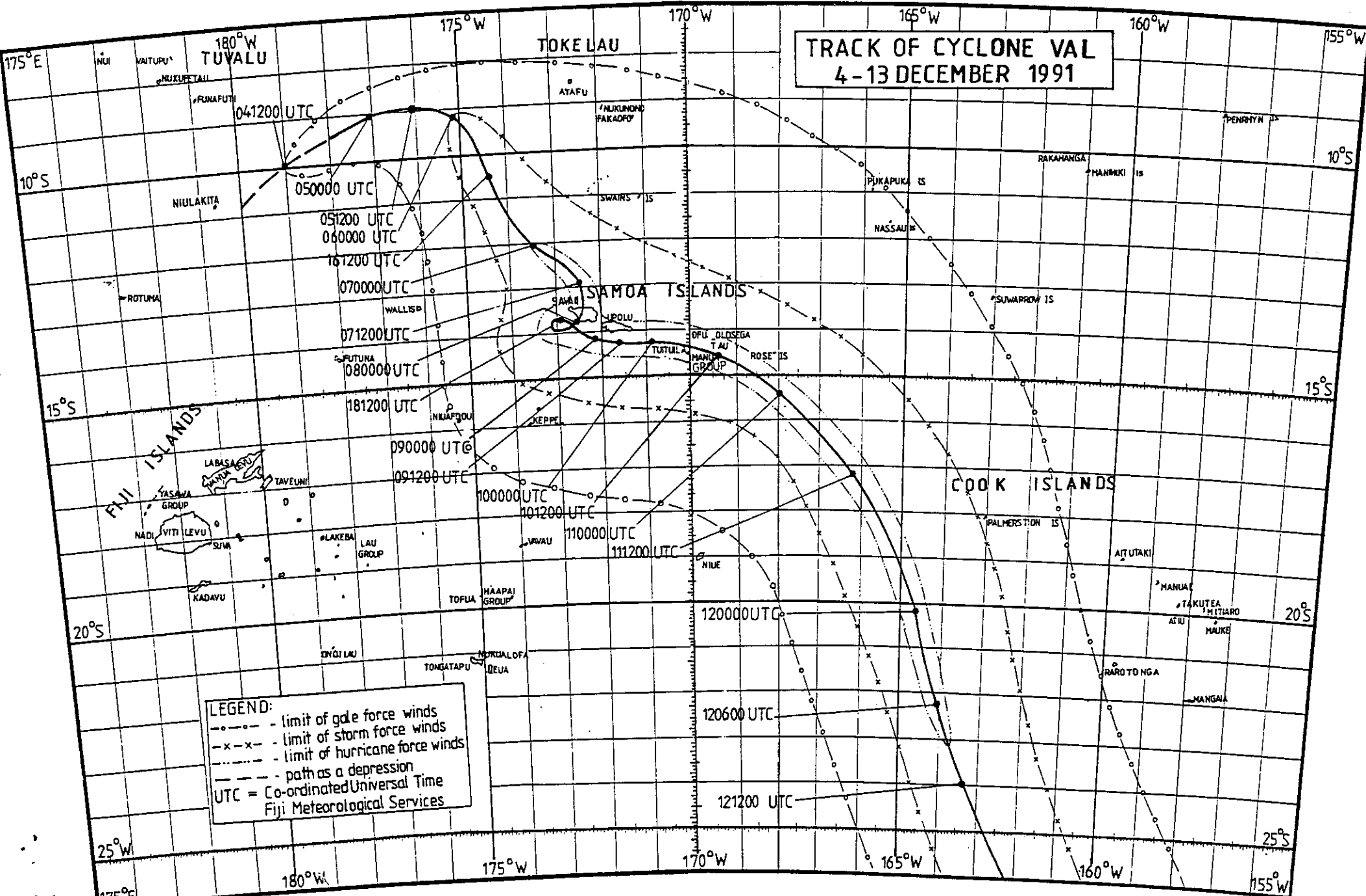
Country	Effects
Wallis Island	Minor. Some fallen trees. Minor flooding of coastal areas.
American Samoa	Severe. 100 percent crop damage. 90 percent of houses either damaged or destroyed. One life lost. Over 200 injured.
Western Samoa	Severe. 95% houses damaged or destroyed. Severe crop damage.

Conclusion

Val was a major cyclone of this decade and will go on record as causing one of the most severe impacts in recent history.

The cyclone affected a total of 7 countries of the South Pacific with damage costing several hundred million US dollars. Of these the Samoas suffered most damage. This was so because the cyclone attained peak intensity just before approaching the Islands and passed directly over them, moving very slowly as it did so thus prolonging the effect of destructive winds over both Western and American Samoa. It was sad that Val hit the two groups of islands while the Samoans were still trying to recover from the severe impact of cyclone Ofa which battered their country less than two years ago.

TRACK OF CYCLONE VAL 4-13 DECEMBER 1991



LEGEND:
 -o-o- - limit of gale force winds
 -x-x- - limit of storm force winds
 -·-·- - limit of hurricane force winds
 - - - - path as a depression
 UTC = Co-ordinated Universal Time
 Fiji Meteorological Services