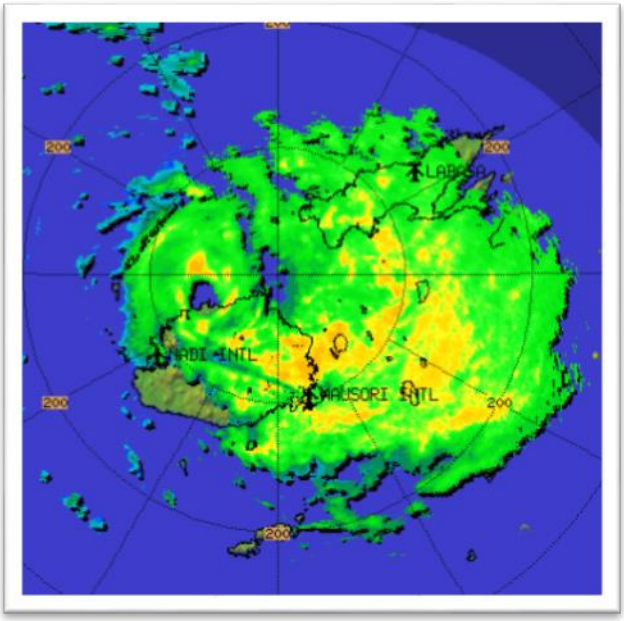
FIJI METEOROLOGICAL SERVICES

TROPICAL CYCLONE PRELIMENARY REPORT

SEVERE TROPICAL CYCLONE ANA

JANUARY 26TH – FEBRUARY 2ND 2021



TC ANA MAKING LANDFALL IN THE EARLY HOURS OF SUNDAY 31ST OF JANUARY 2021. (RADAR IMAGE 0310AM FST)

Compiled by: Shivneel Prasad

Acknowledgement

I would like to thank the following people who contributed to the completion of this report:

1. Mr. Terry Atalifo, Acting Director of Meteorology for his continuous liaison and briefing with the relevant authorities and stakeholders in advising status and updates of the cyclone during its path through the Fiji group throughout the lifetime of TC Ana.
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6. Media liaison officer Ana Sovaraki for media and social media updates.
7. FMS staff from various divisions for ensuring the facilities in working order and providing services as and when required.

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INTRODUCTION

Severe Tropical cyclone Ana (peak intensity Category 3) was monitored by RSMC Nadi during the last quarter of the month of January. TC Ana remained in the RSMC Nadi's Area of responsibility for a total of 6 days till it was later declassified as a former tropical cyclone.

Ana was the 5th Tropical disturbance and the 3rdtropical cyclone monitored by RSMC Nadi with a peak sustained wind speed of 65 knots and gusts of 90 knots forecast.

RSMC Nadi handled a total 7 tropical systems in a span of just under two months (as at 1st February 2021), 5 of which were Tropical cyclones. The most intense of these was Tropical Cyclone Yasa, a category 5 system which made a direct landfall over the island of Vanua Levu in Fiji in December 2020.

TC Ana passed over the island group of Yasawa as a category 1 system on the 30thof January 2021 and later made landfall over the northern parts of Viti Levu the same night as a category 2 system. Moving southwards across the largest island of Fiji, Ana passed very close to the capital city Suva making entry into the waters of Kadavu Passage in the early daylight hours of the 31st of January 2021.

Ana then headed towards Kadavu and made landfall over the eastern part of the island late in the afternoon on the same day.

Further moving southeast, Ana continued to weaken and was declassified from the cyclone status at 06.00pm on 2nd of February 2021. Transitioning into a subtropical low pressure system, former TC Ana exited Nadi's AOR around midnight 3rd of February 2021.

Ana had an erratic movement especially close to Fiji due to the interaction with land. It is evident in the radar images that Ana wobbled through a very significant portion of its path and this led to a significant cone of uncertainty where one point was covering most of the islands in Fiji during its approach.

Heavy rain was accompanying Ana well ahead of its approach, especially with the presence of a convergence zone over the country. Widespread flooding was experienced over major parts of the country and rainfall accumulation in excess of 200mm within 24 hours was observed at a significant number of stations before and during the approach of TC Ana.

Ana had impacts on Fiji ranging from the central division till the Northern division as well as the southernmost island groups of the country. Making a landfall TC Ana had major impacts on the infrastructure and livelihood of the citizens of Fiji. This was further amplified with the fact that the Island of Vanua Levu was devastated by Severe Tropical Cyclone Yasa (Category 5) less than a month ago.

Schools, businesses, and government department operations were greatly halted if not completely stopped. NDMO estimated the total damages from TC Ana to be approximately $100,000.00.

HISTORY (SYNOPTIC)

A low pressure system was analysed on the 24th 0f January 2021 to the west of the Fiji group. This system was continuously monitored and with convection persistent in the northeast quadrant this system was numbered TD05F (tropical Disturbance) on the 26th at 6pm. Twelve hours later further deepening and organisation led to TD05F being upgraded to a Tropical Depression as the winds began to strengthen near the center on the 27th at 6am. ASCAT data and surface reports supported this action. (Figure a). With favorable environment: good upper level divergence (Figure 1), good low level convergence (Figure 2), good outflow aloft (Figure 3) and low to moderate wind shear (Figure 4), TD05F was named Tropical Cyclone Ana Category 1 (Figure b) at 6.00am on the 30th with sustained winds of 35 knots close to the center and forecast to increase to 40 knots in the next 12 hours. This was also visibile on radar image (Figure 13).

The center of tropical cyclone Ana moved past the northern part of the Yasawa islands and headed towards Fiji's main island of Viti Levu before strengthening into a category 2 system. An upgrade to a category 2 status was done on the 31st at 1.30am (Figure c) & (Figure 14). At 6:00 a.m. local time on Sunday morning, the cyclone made landfall near Rakiraki (Figure 15) in the northern part of Viti Levu and continued to track south-southeast over the central part of Fiji (Figure 16) towards the capital area of Suva. Close to the center of the cyclone, destructive storm force winds with average speeds of 100 km per hour and momentary gusts of up to 140 km per hour continued to be felt over most parts of Fiji, including the main islands of Viti Levu and Vanua Levu, the second largest island in Fiji. The major rivers of the country have surged, some villages in the low-lying areas had been flooded and some highways across the nation had to be closed if not limited to selective transportation. Fallen trees, broken power lines and landslides were also reported in the nation.

By midday on Sunday, the center of Ana was located over the coast of Viti Levu between Suva and Navua, a town about 38 km west of Suva heading towards Kadavu in the southern part of Fiji. Very strong winds have been reported over Kadavu on Sunday morning and tropical cyclone Ana was now expected to pass over Kadavu on Sunday night. **A total of 7,612 people took shelter in 204 evacuation centers across the nation.**

The environment maintained its favorability with good upper level divergence (Figure 5), good low level convergence (Figure 6), good outflow aloft (Figure 7) and low wind shear (Figure 8), the system intensified further into a severe tropical cyclone status on the 1st of February 2.00am (Figure d) & (Figure e). In the early stages of analysis, TC Ana was not expected to acquire a severe TC strength, however, favorable environment led to continuous intensification over a couple of days and peak strength of a category 3 tropical cyclone. Severe TC Ana weakened into a category 2 12 hours later as it tracked southwards at 12.00pm on February 1st (Figure f) and further weakened to a category 1 at around 12.00pm on February 2nd (Figure g). Further moving southeast into unfavorable conditions (Figures 9 - 12) into cooler sea surface temperatures, Ana continued to weaken and was declassified from the cyclone status at 06.00pm on 2nd of February 2021 (Figure h). Transitioning into a subtropical low pressure system, former TC Ana exited Nadi's AOR around midnight 3rd of February 2021.

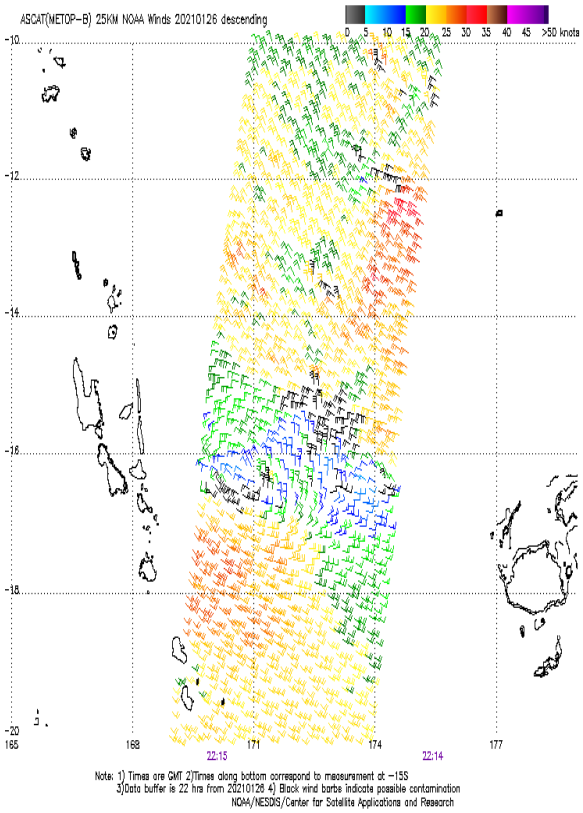


Figure a. ASCAT Winds 20210126 descending

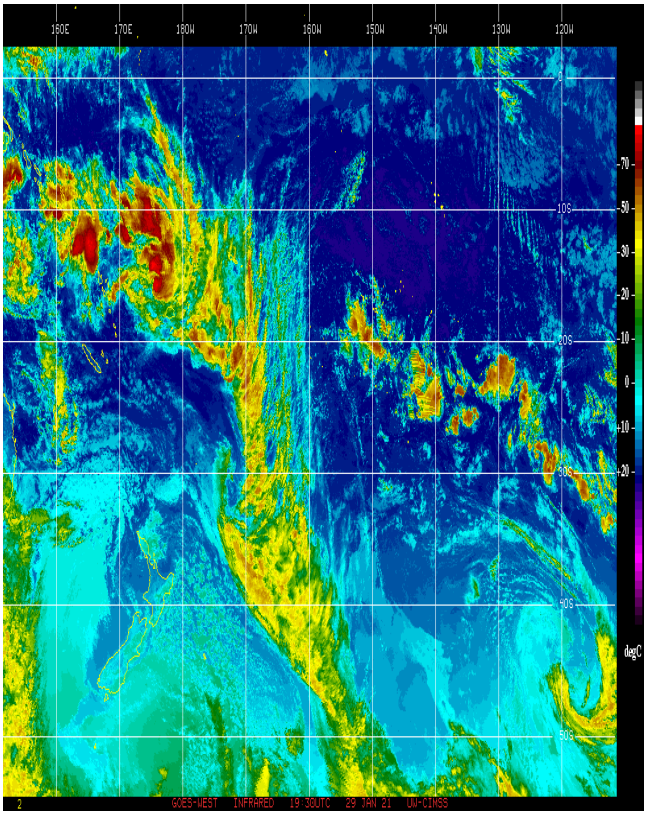
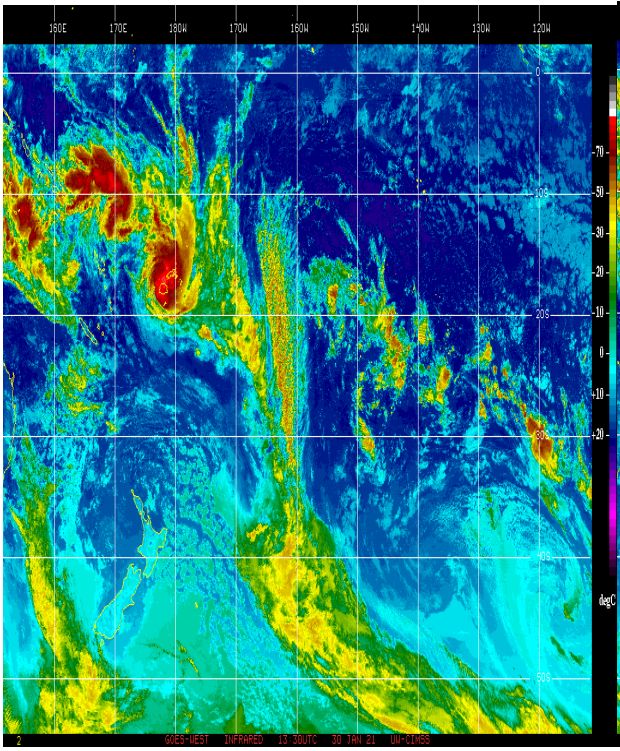


Figure b. GOES-WEST INFRARED 19:30UTC 29 JAN 21



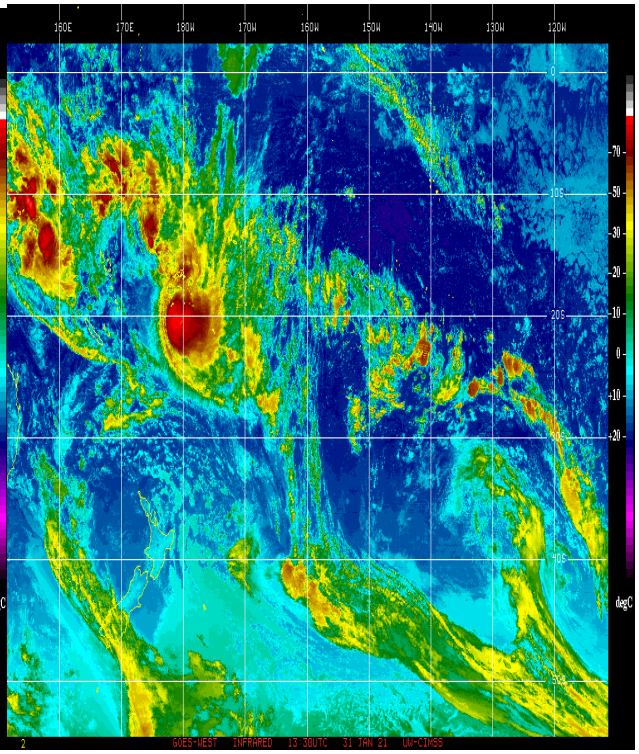


Figure c. GOES-WEST INFRARED 13:30UTC 30 JAN 21 Figure d. INFRARED 13:30UTC 31 JAN 2021

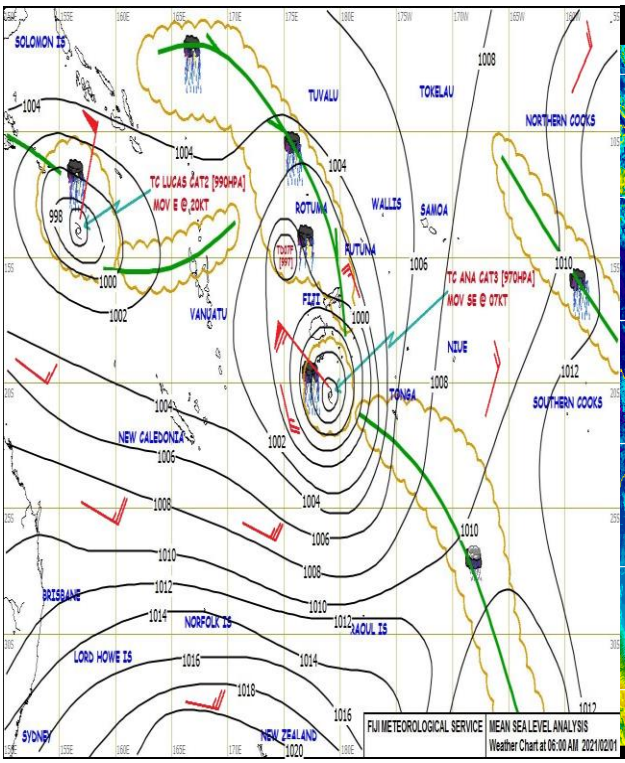


Figure e. MSLP @ 6:00am February 1st

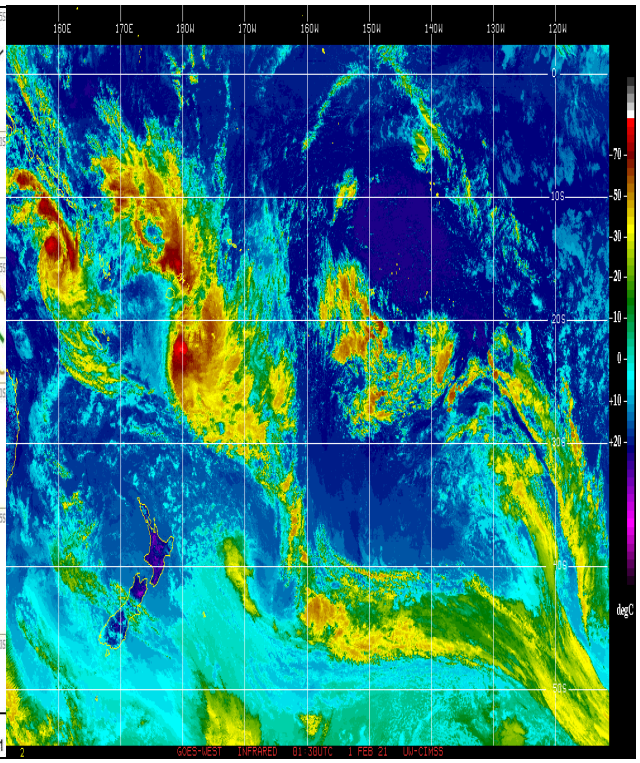
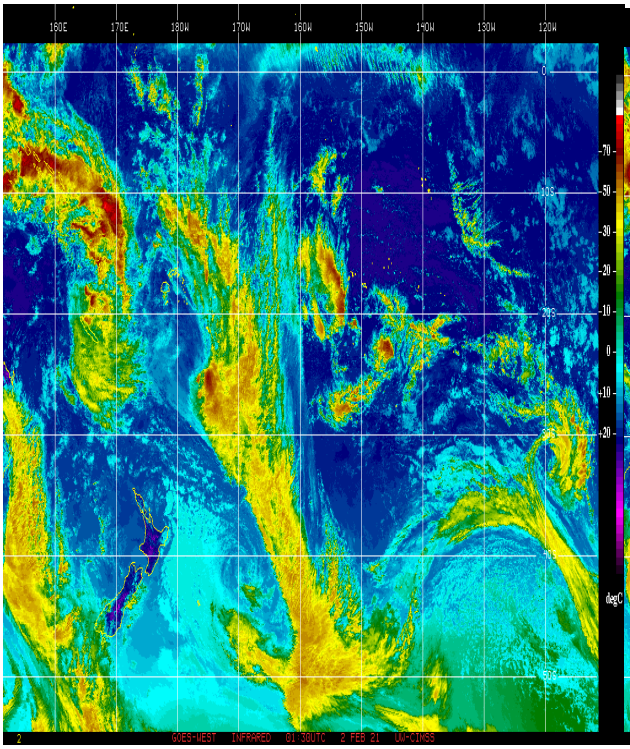


Figure f. GOES-WEST INFRARED 01:30UTC 1 FEB 21 UW-CIMMS



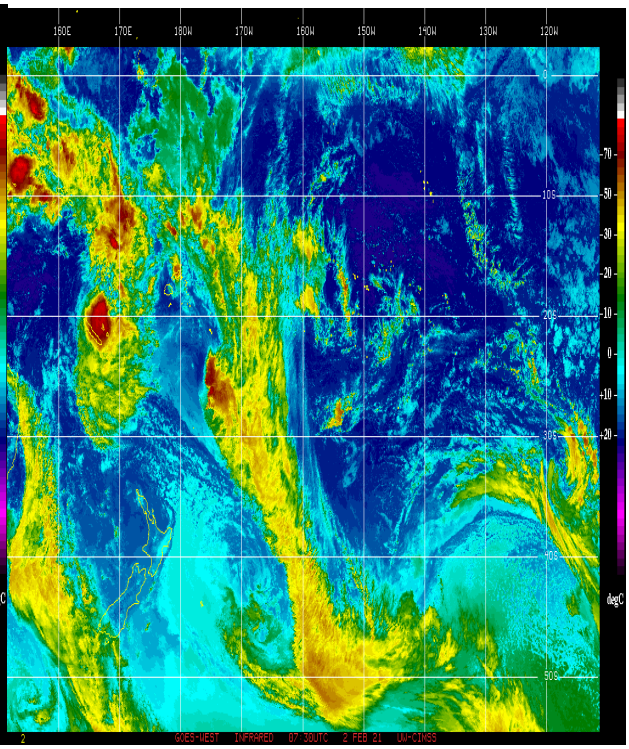


Figure g. GOES-WEST INFRARED 01:30UTC 2 FEB 21 Figure h. GOES-WEST INFRARED 07:30UTC 2 FEB 21

THE ENVIRONMENT

TD09F formation Stage

Figure 1: Upper Level Divergence analysis CIMSS

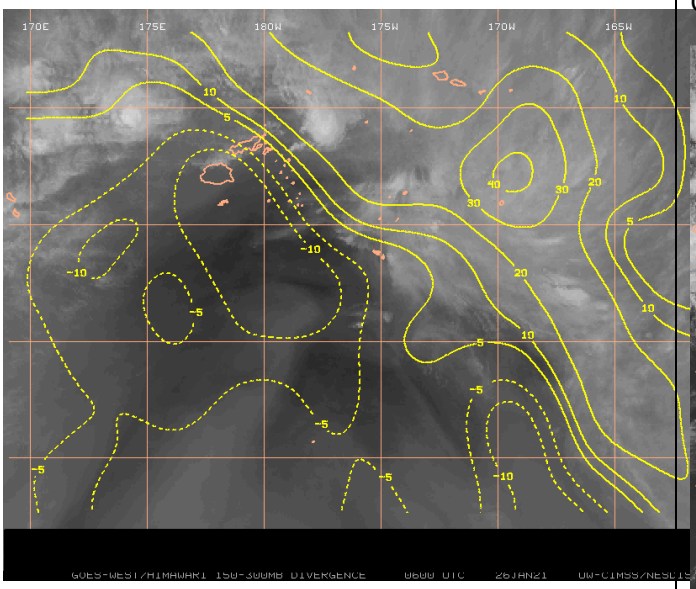


Figure 2: Low Level Convergence analysis CIMSS

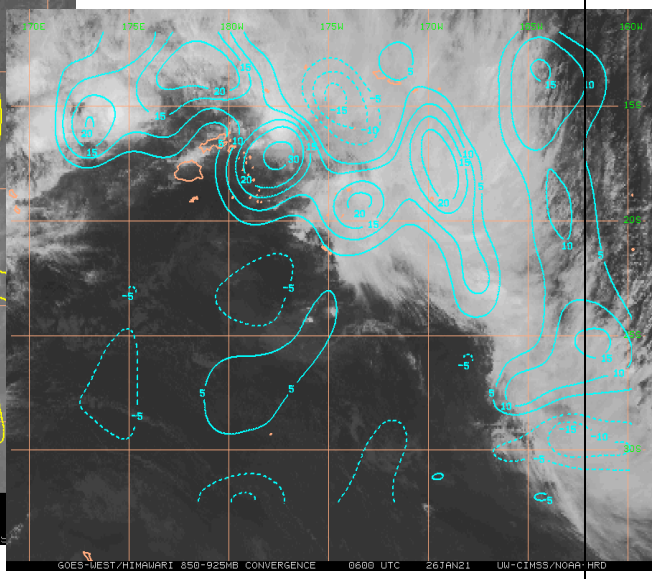


Figure 3: Upper level winds

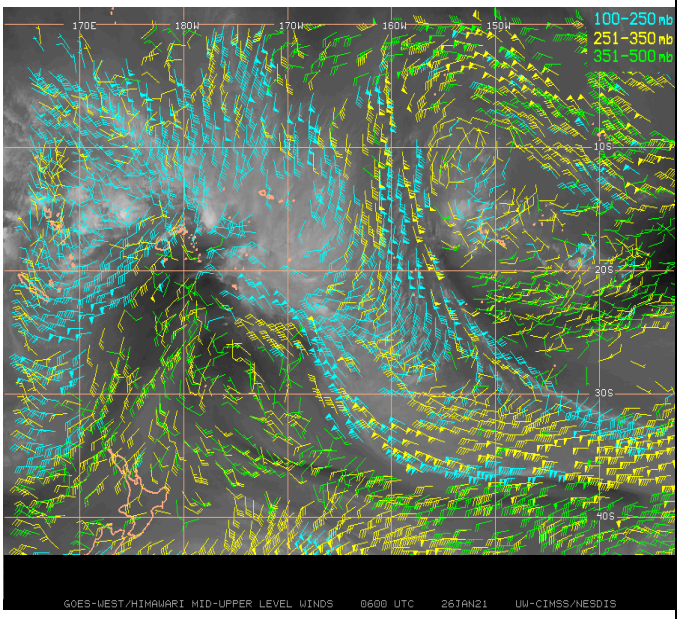
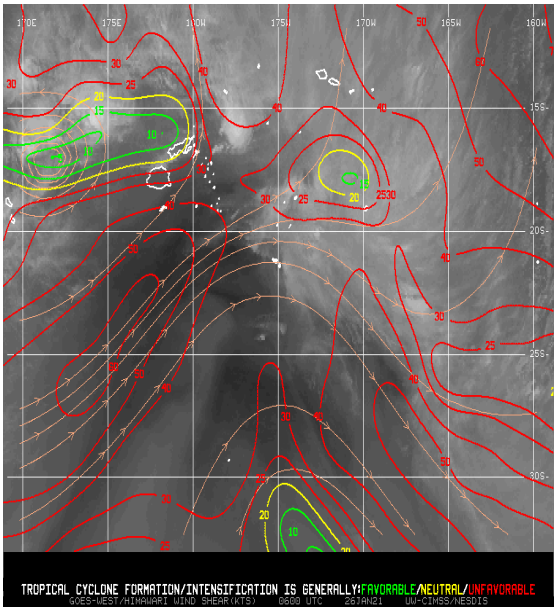


Figure 4: Wind Shear



TC intensification Stage

Figure 4: Upper Level Divergence analysis CIMSS

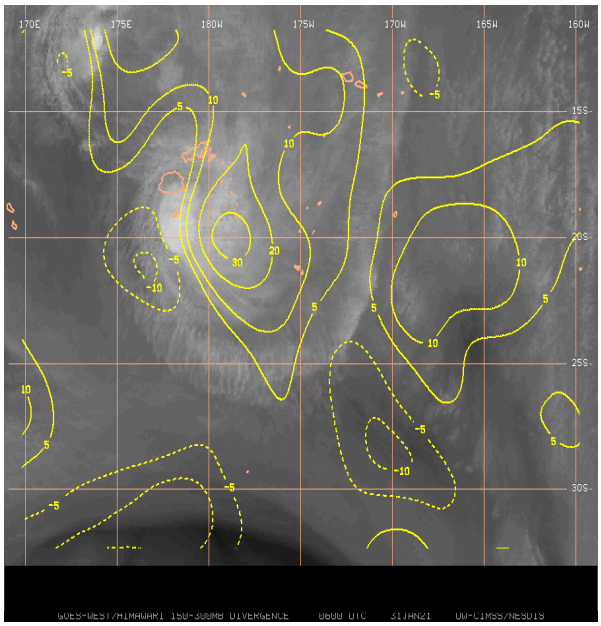


Figure 5: Low Level Convergence analysis CIMSS

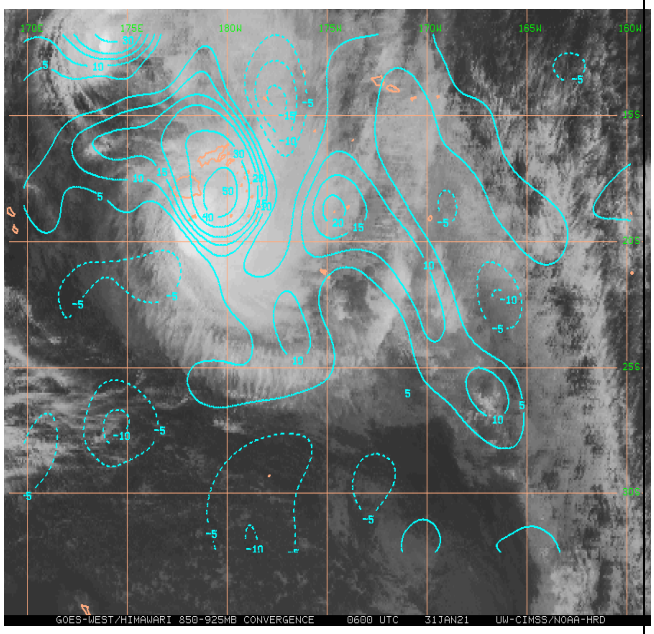


Figure 6: Upper level winds CIMMS

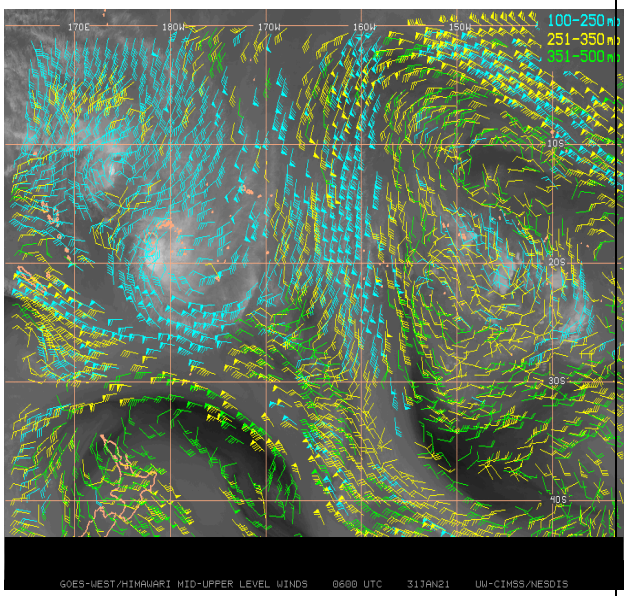
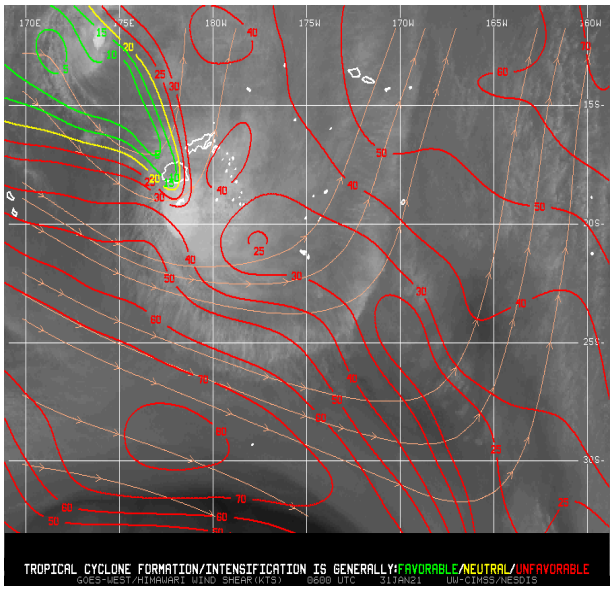


Figure 7: Wind Shear CIMMS



TC weakening stage

Figure 8: Upper Level Divergence analysis CIMSS

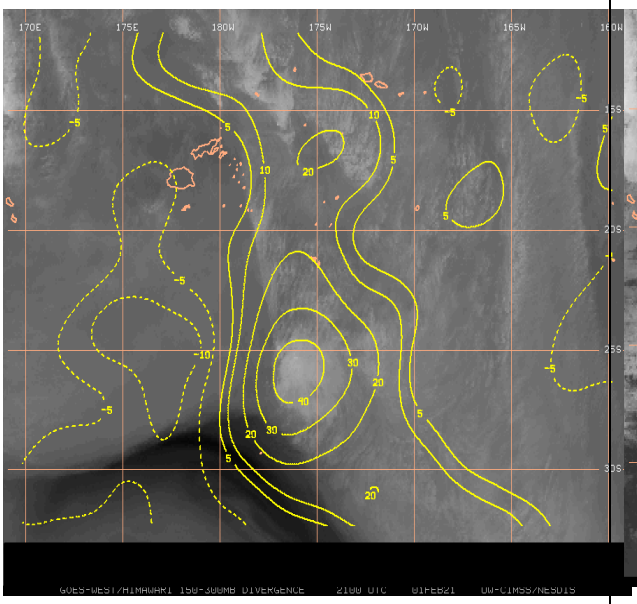


Figure 9: Low Level Convergence analysis CIMSS

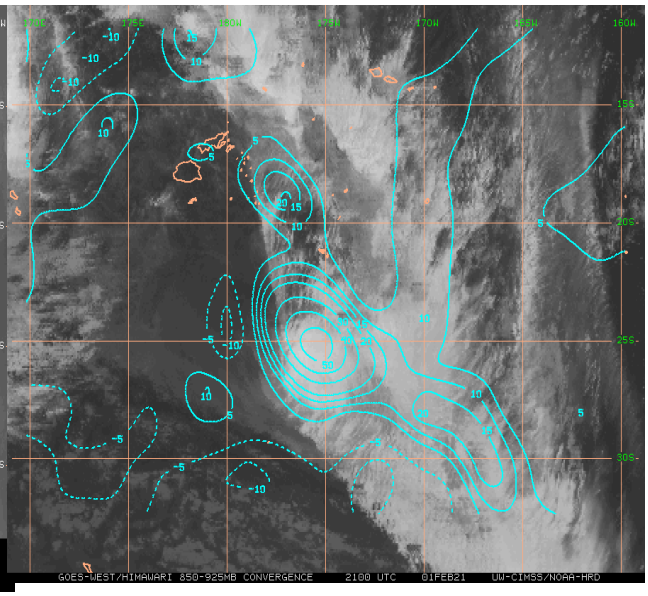


Figure 10: Upper level winds CIMMS

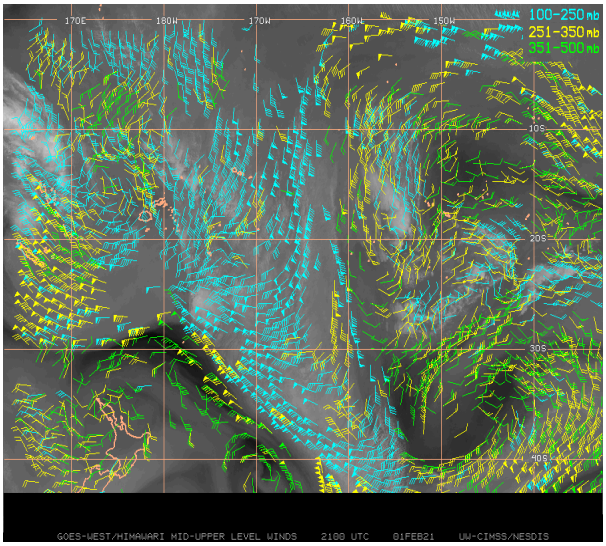
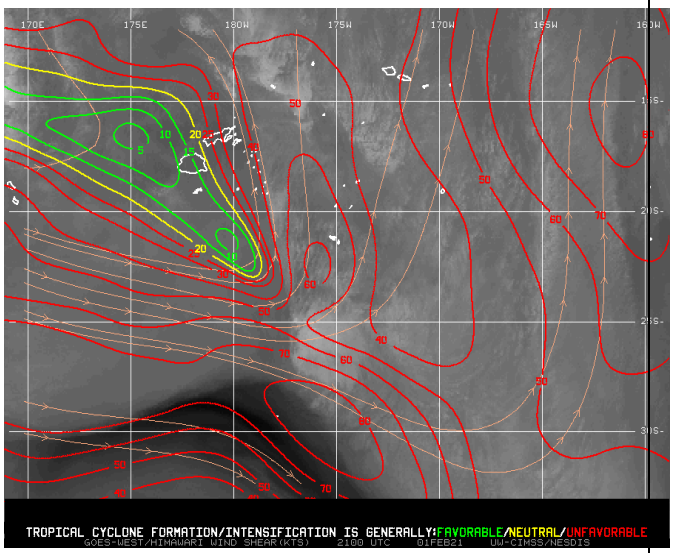
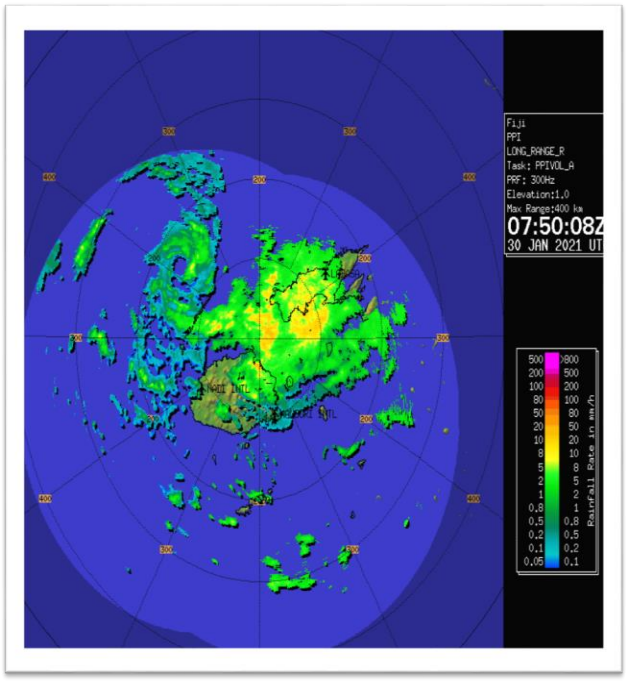


Figure 11: Wind Shear CIMMS



Radar Images



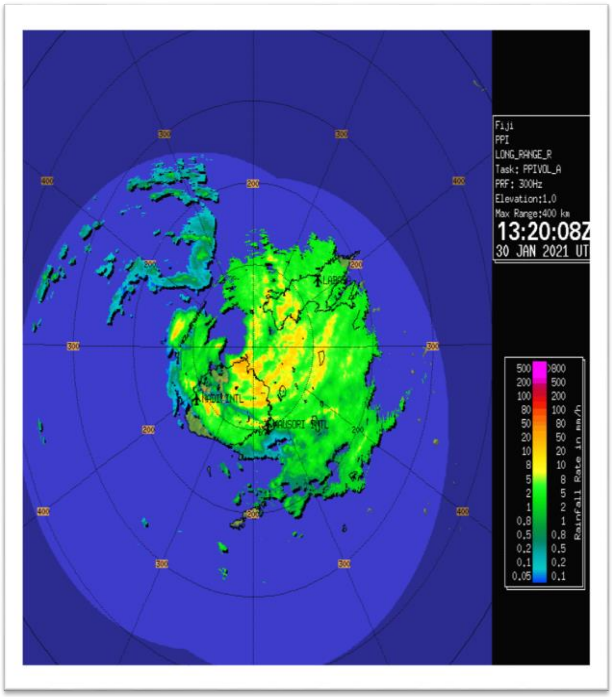
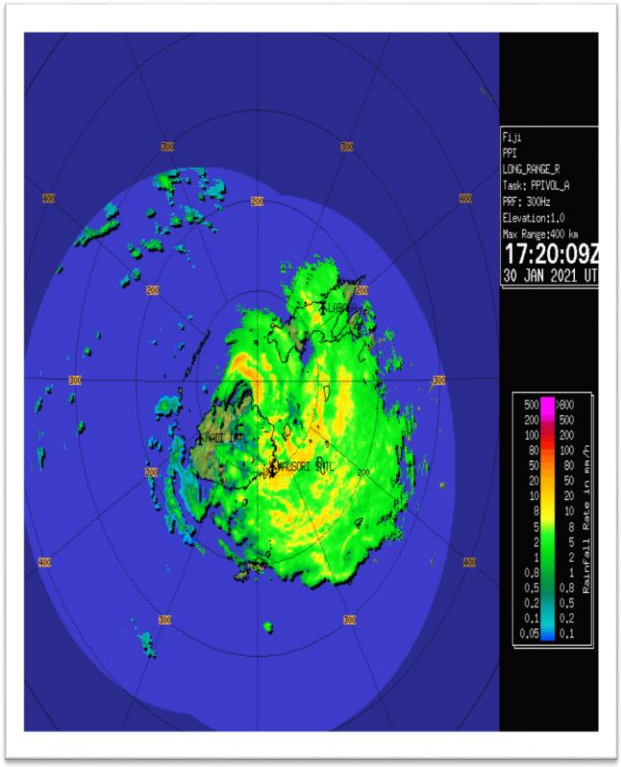


Figure 13: TC Ana Cat 1 evident on the Radar Image Figure 14: TC Ana Cat 2 evident on the Radar image



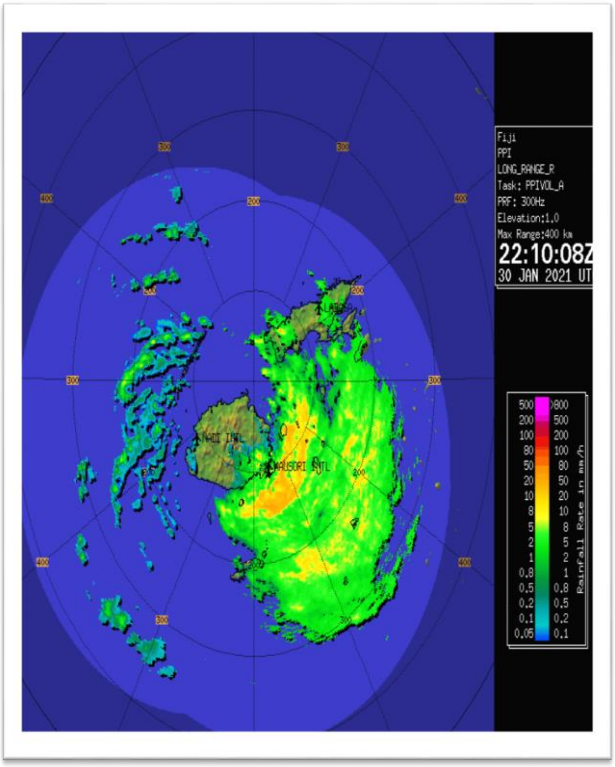


Figure 15: TC Ana making land fall

Figure 16: TC Ana crossing over Viti Levu

WARNINGS AND ADVISORIES

1. International Marine Warnings

Although several gale warnings were issued because of the presence of TC Ana, the first international marine warning associated with Ana was a gale warning issued by RSMC, Nadi at 280000UTC. Clockwise winds up to 25 knots from 60 to 150 nautical miles in the southern semicircle disturbance (TD05F) centre increasing to 35 knots in the next 24 hours.

The subsequent storm warning (first WTPS) was issued at 301200UTC estimating maximum sustained winds up to 45 knots close to the centre within 120 nautical miles in the northeast quadrant, within 090 nautical miles in the southeast quadrant, within 060 nautical miles in the southwest quadrant and 090 nautical miles in the northwest quadrant.

The following hurricane warning (first WHPS) was issued at 311500UTC estimating maximum sustained winds of 55 knots close to the centre and increasing to 65 knots in 24 hours. Hurricane force winds were expected near the centre within the next 24 hours and storm force winds expected within 100 nautical miles in the northeast quadrant, 080 nautical miles in the southeast quadrant, 060 nautical miles in the southwest quadrant and 080 nautical miles in the northwest quadrant. Gale force winds were expected within 180 nautical miles in the northeast quadrant, within 150 nautical miles in the southeast quadrant, within 100 nautical miles in the southwest quadrant and within 150 nautical miles in the northwest quadrant.

The last WOPSS was issued at 020000UTC with sustained winds of 35 knots close to the centre decreasing to 25 knots by 020600UTC. This was the last international marine warning for Ana. Thus, RSMC Nadi issued a total of twenty-two international marine warnings during the passage of TC Ana.

2. Tropical Disturbance Advisories (TDA)

RSMC, Nadi issued the first Tropical Disturbance Advisory for TC Ana at 280212UTC. The next TDA was issued at 282000UTC. Subsequent advisories were issued at approximately 6-hour intervals containing information on Tropical Cyclone Ana's position, movement, intensity, wind distribution and organizational characteristics with the expected changes every 12 hours out to 48 hours. RSMC, Nadi issued nineteen Tropical Disturbance Advisories in total, with the last TDA being issued at 020200UTC.

3. CREX

RSMC, Nadi issued fourteen CREX messages (specially coded information) on Cyclone Ana to major Global Numerical Weather Prediction Centres.

4. **Aviation Weather Advisories and Warnings**

RSMC, Nadi issued fourteen Tropical Cyclone Advisories (TCA) on Ana. These bulletins were solely for the purpose of international air navigation in Fiji's Tropical Cyclone Advisory area of responsibility.

5. **Special Weather Bulletin**

RSMC, Nadi issued forty-one Special Weather Bulletins (SWB) on TC Yasa. Particularly, alert was issued after every 6 hours and warning every 3 hours.

6. **Sigmets**

RSMC, Nadi issued seventeen Sigmets on TC Ana.

7. **The storm surge model**

The storm surge was run every 6 hours with result usually available at 0230UTC, 0830UTC, 1430UTC and 2030UTC or earlier.

WARNING NAME	NUMBER OF WARNINGS SENT
International Marine warnings	22
Tropical Disturbance Advisories	19
CREX	14
Special weather bulletin	41
SIGMETs	17

OPERATIONAL ASPECTS

The tracking and forecasting of cyclone Ana were handled satisfactorily by RSMC, Nadi even with only 2 TC Forecasters and 2 other tropical cyclones (TC Bina & TC Lucus) in the region. The first Tropical Disturbance Advisory on TC Ana was issued at 280212UTC. The use of satellite data and surface observations were major components in locating the position and movement of TC Ana. Likewise, other centres were providing fixes and movement as well. The majority of the tropical cyclone forecasts and warnings were prepared in TC Module. The usage of TC Module on preparing cyclone forecasts and warnings allowed considerable time saving and minimal constrains.

EFFECTS

Tropical Cyclone Ana caused extensive damages including infrastructure on Viti Levu and brought about extreme rainfall with severe flooding especially on the 2nd largest island Vanua Levu. The maximum wind recorded was at Rakiraki AWS with sustained winds of 52 knots at 1.20am on 31st January.

Damages to a house in Naqara, Kadavu due to TC Ana. Photo credit: TURAGA NI KORO, ISEI RAKADRUTI.

DISCUSSIONS

1. Observations

As TC Ana was anticipated to track over Fiji, all observation networks (stations) were activated as per TC directive procedures. Atmospheric conditions like wind speed, pressure, rainfall and other parameter (Appendix 2: observations) were recorded on automatic weather stations (AWS) on specific location and manual stations. There were some quality observation and reports received from few available observation networks, however, it was noted that some observation was not of the quality or standard anticipated as a few of the stations reporting estimated reading from the subjective beaufort wind scale estimation. Therefore, these observation network sources tend to vary and affected intensity forecasting. This variation could probably be due to instrument calibration error, observation instrument sheltered and flawed in standard estimation practice.

2. Post event track analysis for TC Ana

The tracking of TC Ana generally showed minimal deviation throughout its life span, however, its tracking made a significant variation from the post event track analysis (Appendix 1a). The variation in the track of Ana was observed just before it exited Nadi's RSMC AoR. This was from 311800UTC as the system started to be sheared from its LLCC and could not be ascertained using IR image.

Consequently, to ease these possible track forecast inconsistencies, TC forecasters need to consistently upgrade TC track forecasting skills to improve confidence level in determining TC positions and tracking ensure relevant tools are readily available close to real time.

3. Post event Verification of Position for TC Ana

Refer to Table 2 in APPENDIX 1

The forecasts for Tropical Cyclone Ana

issued by the Nadi RSMC have a good degree of skill as they have smaller mean distance errors in the position forecast. Most of the Global Models performed well but was limited with timely access.

For the first 12 hours RSMC Nadi did well, the error increases to more than 100km for the forecast position more than 24 hours and onwards.

ECMWF and JTWC did well out to 48 hours and this should increase confidence in using them beyond 24hrs in the future.

Refer to Table 3 in APPENDIX 1

RSMC Nadi did well in the intensity forecast of Ana out to 72 hours.

RECOMMENDATIONS

The completion of this report has brought up the following recommendations:

- A lot of focus is put on the location of the TC Center. The effects on Vanua Levu were underestimated by the public since damages anticipated may have been in relation to distance from center of TC. This was not accurate for TC Ana since the winds were not symmetrical to the center. Awareness to the public to pay more attention to the warnings rather than the center location is recommended to allow for them to prepare best for the anticipated impacts.
- Information dissemination sources are vital to keep the population informed. Social media played a vital role during passage of TC Ana. A consistent frequency of updates is recommended for effectiveness.
- Vernacular broadcast is necessary since essential information may be left out by non-expert translation. Vernacular interviews assisted better in public understanding and this should increase in frequency where possible.
- Post event ground inspection is recommended after each TC event to provide a proper verification and future reference to the impacts that a TC can have over the affected areas. Over the years this continued practice can eventually cover most of the locations in Fiji and can assist better in impact-based forecasting if documented accordingly.
- A refresher with media agencies needs to be conducted since it was noted that some agencies due to short airtime summarize the special weather bulletins to an extreme level, and this leaves out critical information.

CONCLUSION

Tropical Cyclone Ana was the third tropical cyclone to form within RSMC Nadi's area of responsibility in the 2020/2021 tropical cyclone season and affected the Fiji group causing extensive damages including infrastructure on Viti Levu and brought about extreme rainfall with severe flooding especially on the 2nd largest island Vanua Levu.

TC Ana reached a maximum of category 3 with maximum reported winds of 52 knots at 1.20am on 31st January at Rakiraki AWS.

REFERENCES

Boila, S. (2021). Heavy rain in Rakiraki. Retrieved 28 February 2021, from https://www.fbcnews.com.fj/news/heavy-rain-in-rakiraki/?fbclid=IwAR1fXA5L68sWylAngsaJBAzQ-LX2uHvOHYNQ2JfzDKF07qwiCECWbjo6LKw

Fiji Roads Authority. (2021). *Situation Report - Road Closures*.

Naidu, J. (2021). Several Roads Across Fiji Flooded, More Rain Expected. Retrieved 29 January 2021, from https://fijisun.com.fj/2021/01/29/several-roads-across-fiji-flooded/?fbclid=IwAR0fbZFEzXEx1St0QJqradMHg0B4h4m3f9FfD8RVOAtS7AGewNidDVIMQMI

Nand, E. (2021). Widespread flooding forecast from today. Retrieved 29 January 2021, from https://www.fbcnews.com.fj/news/widespread-flooding-forecast-from-today/?fbclid=IwAR2Q-OB9Y0e4OQUraiuP6eG4tdZIhRX_IKmJ75mi66HJNg_HSKvaDhIPsLc

Nand, P. (2021). Rakiraki Town closed due to flooding. Retrieved 20 February 2021, from https://www.fijivillage.com/news/Rakiraki-Town-closed-due-to-flooding-85x4rf/?fbclid=IwAR2ResSwvhcun2zVQD7d33wSl3ud7MZIvv-cC3_Ua3he9sgCFJhXxq_sEiw#.YBJHiesBJro.facebook

Turagaiviu, E. (2021). Heavy rain leads to flooding in Labasa. 28 January 2021, from https://www.fbcnews.com.fj/news/heavy-rain-leads-to-flooding-in-labasa/?fbclid=IwAR3uOYpr1FKBwkYHbAgDqY7-fUIAQumNCd0guECPapgtaOOFnMtjEWY0MCo

Turagaiviu, E. (2021). More road closures in the North. Retrieved 29 January 2021, from https://www.fbcnews.com.fj/news/more-road-closures-in-the-north/?__FB_PRIVATE_TRACKING__=%7B%22loggedout_browser_id%22%3A%22eef9f04c0a7f34139692f1432be5ccd3ff98f9a6%22%7D&fbclid=IwAR2wGxhKIyPMvLJsHHnFGl1JSvDbyWPcv29DEIaGVJZ9F8sqhU2_zspJsBE

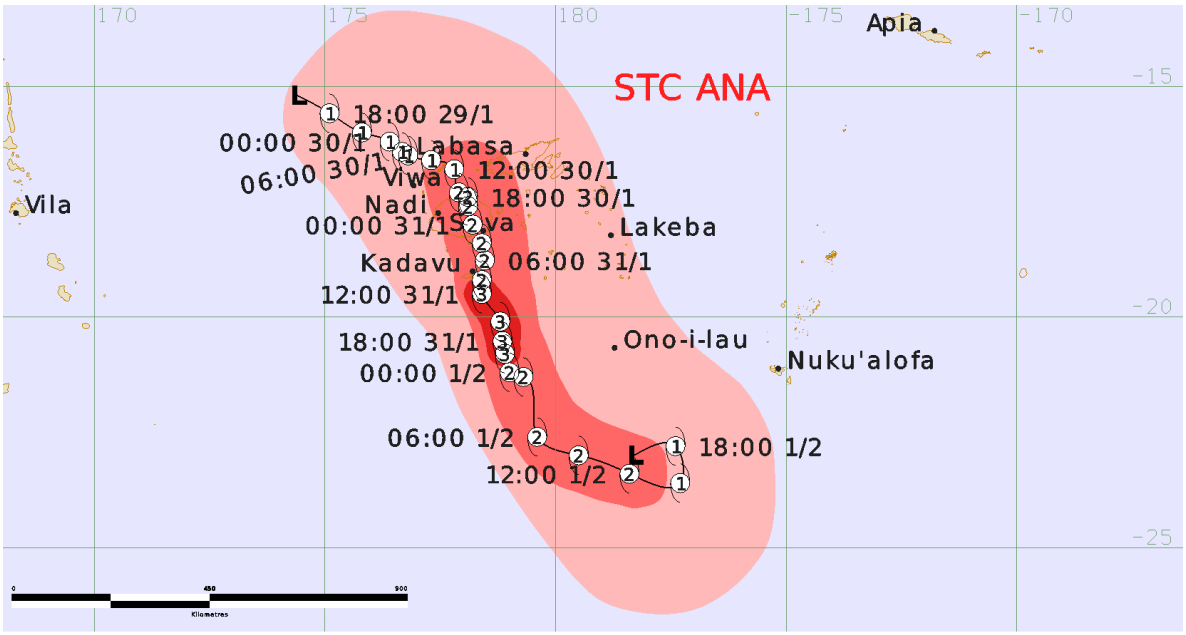
Tuvuki, S. (2021). Yasawa starts to experience heavy rain and strong winds. Retrieved 28 January 2021, from https://www.fijivillage.com/news/Yasawa-starts-to-experience-heavy-rain-and-strong-winds-84fxr5/

Vacala, K. (2021). TC Ana leaves trail of damage on Naqara, Kadavu. Retrieved 1 February 2021, from https://www.fbcnews.com.fj/news/tc-ana/tc-ana-leaves-trail-of-damage-on-naqara-kadavu/

Appendices

Appendix 1: Post Event Analysis.

1. **Post Event Best Track Analysis for STC Ana**



Note:

1) All time in UTC.

2) The track highlights the extent of:

	Gale force wind
	Storm force wind
	Hurricane force wind

2. Best Track Data and Intensity

Table 1

Time (UTC)	Lat.	Long.	Uncertainty (Nm)	Mean Wind (knots)	Wind Gust (knots)	Category	Pressure (hpa)	Radius of Max. Winds (Nm)
29/1800Z	-15.6	175.1	60	60	50	1	995	60
30/0000Z	-16.2	176.4	45	45	65	1	987	60
30/0600Z	-16.5	176.8	45	45	65	1	987	30
30/1200Z	-16.8	177.8	60	45	65	1	987	30
30/1800Z	-17.4	178.1	30	55	75	2	975	50
31/0000Z	-18.0	178.2	30	55	75	2	975	30
31/0600Z	-18.8	178.5	30	55	75	2	975	30
31/1200Z	-19.5	178.4	60	65	90	3	970	20
31/1800Z	-20.5	178.8	90	65	90	3	970	10
01/0000Z	-21.2	179.0	30	60	85	2	975	20
01/0600Z	-22.6	179.6	60	60	85	2	975	20
01/1200Z	-23.4	-178.4	60	50	70	2	980	20
01/1800Z	-22.8	-177.4	60	40	55	1	995	20

3. **Position Forecast Verification**

Table 2: The position forecast verification statistics for STC Ana based on forecast track positions issued by RSMC Nadi (NFFN) and some other sources. Mean is the mean distance error in kilometres from the forecast to the actual position of TC Ana.

	Distance	0hr	12hr	24hr	36hr	48hr	72hr
NFFN	Mean (km)	72	88	92	110	139	258
	Std Dev (km)	102	71	67	54	50	130
GFS-AVNI	Mean (km)	58	98	143	153	150	218
	Std Dev (km)	47	95	106	92	125	59
ECMWF	Mean (km)	28	42	79	81	116	230
	Std Dev (km)	29	44	93	68	49	0
JTWC	Mean (km)	40	73	94	77	72	0
	Std Dev (km)	25	54	75	62	66	0
UKMO	Mean (km)	68	84	126	191	267	0
	Std Dev (km)	50	41	44	49	26	0
JMA	Mean (km)	68	98	137	170	270	592
	Std Dev (km)	50	59	152	187	295	641

4. Intensity Forecast Verification

Table 3: The Intensity forecast verification statistics for Cyclone Ana based on Dvorak analysis, microwave imagery analysis and ASCAT by RSMC Nadi (NFFN) and some other sources. Mean is the mean speed error in knots from the forecast to the estimated intensity of TC Ana.

	Intensity	0hr	12hr	24hr	36hr	48hr	72hr
NFFN	Mean (knots)	11	12	12	12	12	10
	Std Dev (knots)	0	8	9	6	13	11
GFS-AVNI	Mean (knots)	11	11	10	8	7	5
	Std Dev (knots)	17	21	22	26	23	12
ECMWF	Mean (knots)	6	7	6	14	15	22
	Std Dev (knots)	8	8	8	17	18	0
JTWC	Mean (knots)	9	9	8	6	4	0
	Std Dev (knots)	8	6	5	11	14	0
UKMO	Mean (knots)	6	5	4	3	2	0
	Std Dev (knots)	8	8	6	8	7	0
JMA	Mean (knots)	7	6	13	18	20	22
	Std Dev (knots)	8	7	13	17	15	9

1. RSMC Nadi did well in the intensity forecast of TC Ana, as well as other models as the mean error remained less than 15knots. However, JMA performed poorly in terms of TC Ana intensity forecast from 36 hours onwards.

Appendix 2: Observations

Tables below shows the observed maximum winds and minimum pressure observed at the respective stations.

Fiji has a network of observational sites that provide date upto a frequency of every 10 minutes. Table 1.0 and 1.1 below provides the available wind observed data during the passage of TC Ana. Few observation sites were non-operational at this time, hence the nationwide coverage was not available.

Wind Speed (10 Minute Average)

STATION	MAX 10 MINUTE AVERAGE WINDS OBSERVED
RAKIRAKI AWS	**52 knots** 01.20 am 31.01.21
UDU POINT AWS	**46 knots** 03.50 pm 31.01.21
LODONI AWS	**30 knots** 02.20 am 31.01.21
LEVUKA AWS	**51 knots** 12.10 am 31.01.21
NAUSORI AIRPORT MANUAL	**41 knots** 08.00 am 31.01.21
MATUKU AWS	**32 knots** 12.40 am 01.01.21
NAVUA AWS	**38 knots** 08.30 am 31.01.21
VANUABALAVU AWS	**28 knots** 09.50 am 31.01.21
KOROLEVU AWS	**31 knots** 09.40 am 31.01.21
VIWA AWS	**34 knots** 07.10 am 31.01.21
VUNISEA AWS	**42 knots** 02.40 pm 31.01.21
YASAWA MANUAL (ESTIMATED)	**40 knots** 11.00am 30.01.21

Wind Speed (10 Minute Average)

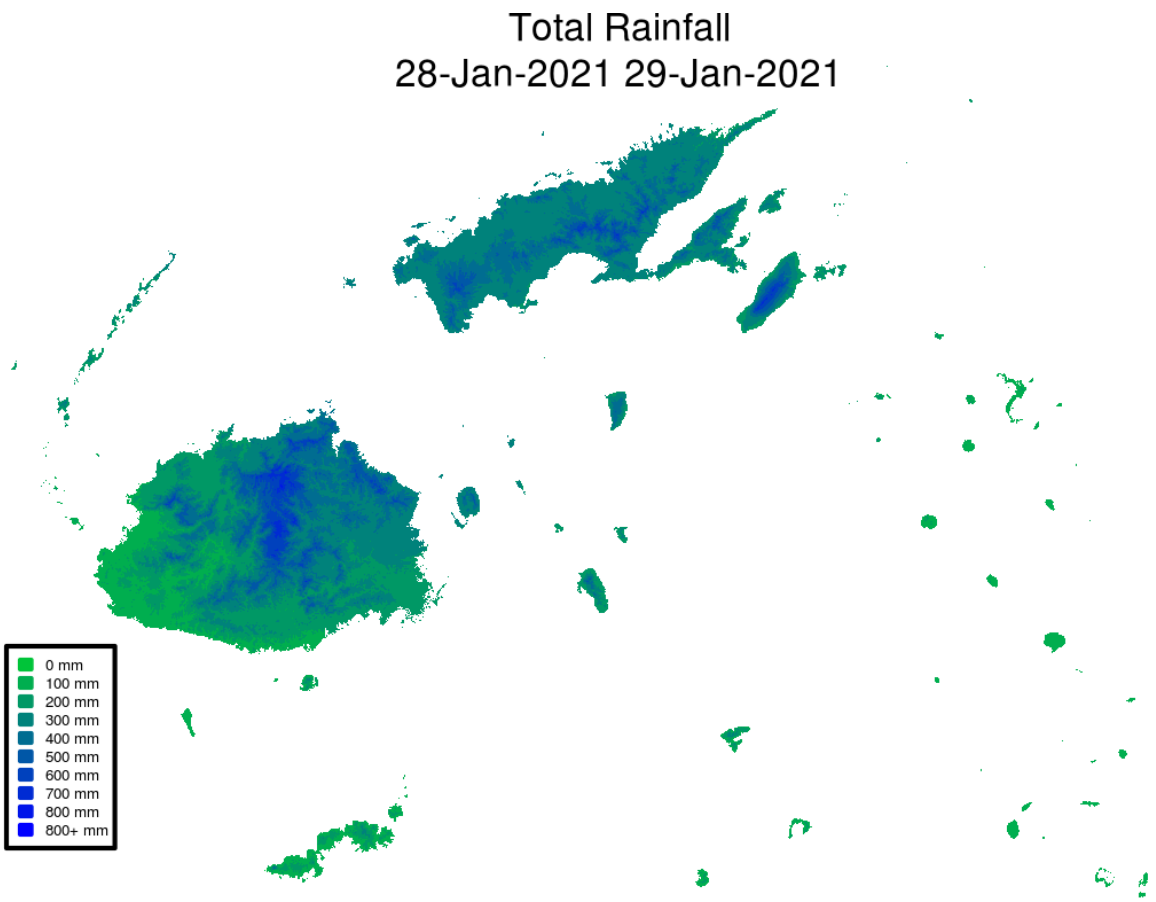
STATION	MAX MOMENTARY GUST OBSERVED
RAKIRAKI AWS	**72 knots** 05.10am 31.01.21
UDU POINT AWS	**60 knots** 09.20am 31.01.21
LODONI AWS	**54 knots** 07.00 am 31.01.21
LEVUKA AWS	**67 knots** 12.00 am 31.01.21
NAUSORI AIRPORT MANUAL	**58 knots** 08.00 am 31.01.21
MATUKU AWS	**48 knots** 01.40 am 01.01.21
NAVUA AWS	**59 knots** 08.40 am 31.01.21
VANUABALAVU AWS	**47 knots** 09.50 am 31.01.21
KOROLEVU AWS	**54 knots** 09.50 am 31.01.21
VIWA AWS	**48 knots** 06.50 am 31.01.21
VUNISEA AWS	**68 knots** 03.30 pm 31.01.21
YASAWA MANUAL (ESTIMATED)	**52 knots** 11.00 am 30.01.21

NOTE: Winds speeds have been rounded down due to conversion from m/s to knots for AWS stations to avoid overstating winds observed.

Rainfall Analysis

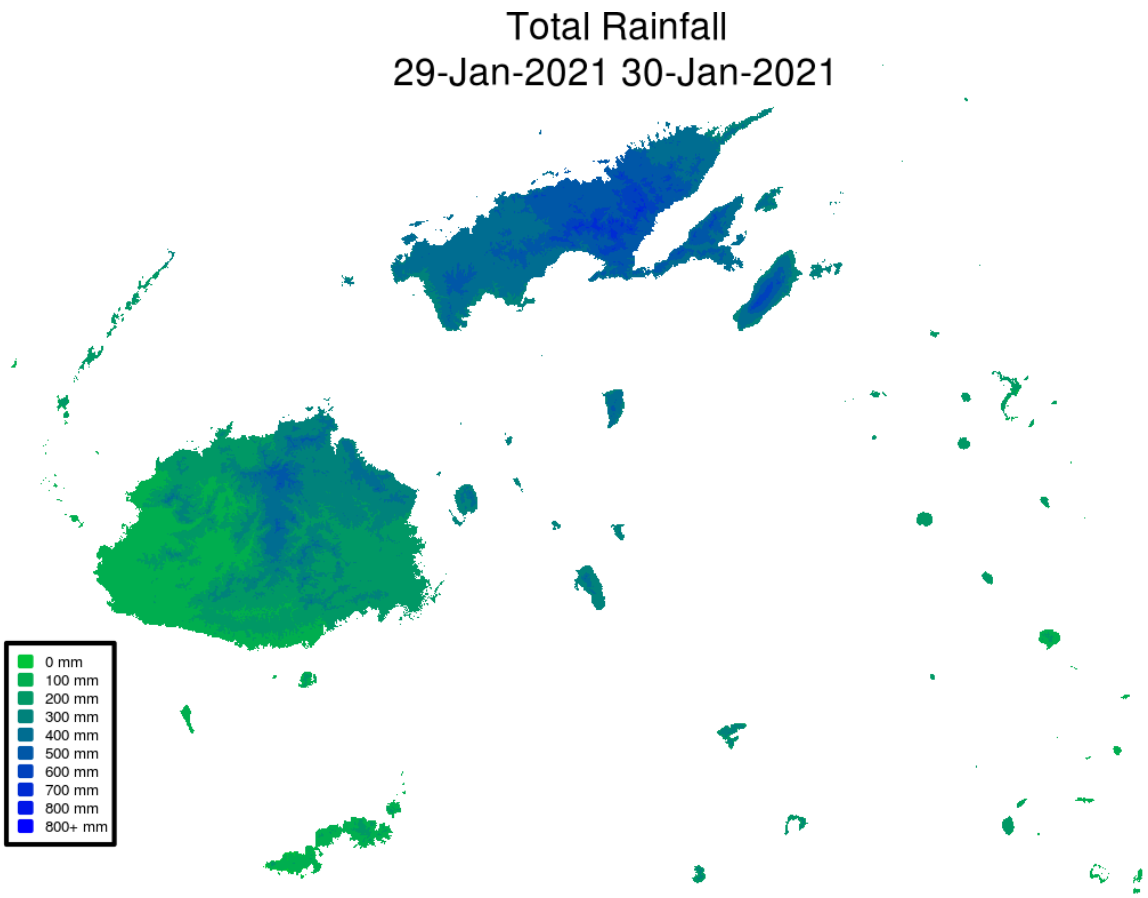
24 HOUR RAINFALL ACCUMULATION DATA FOR 29TH JANUARY 2021

STATION	24 HOUR MANUAL RAINFALL (mm)	24 HOUR AWS RAINFALL (mm)
KORONIVIA	139.0	
NAUSORI AIRPORT	111.3	
MONASAVU DAM	160.3	145.0
LAUTOKA MILL	138.5	126.5
BA RARAWAI		175.0
PENANG MILL		212.0
LEVUKA		148.5
KUBULAU		105.0
LOMAIVUNA		222.5
KAIYASI		202.0
TAVUA		182.5
YAQARA		188.0
RAKIRAKI		222.5
DOBUILEVU		184.5
NADARIVATU		506.0
TOGE		222.5



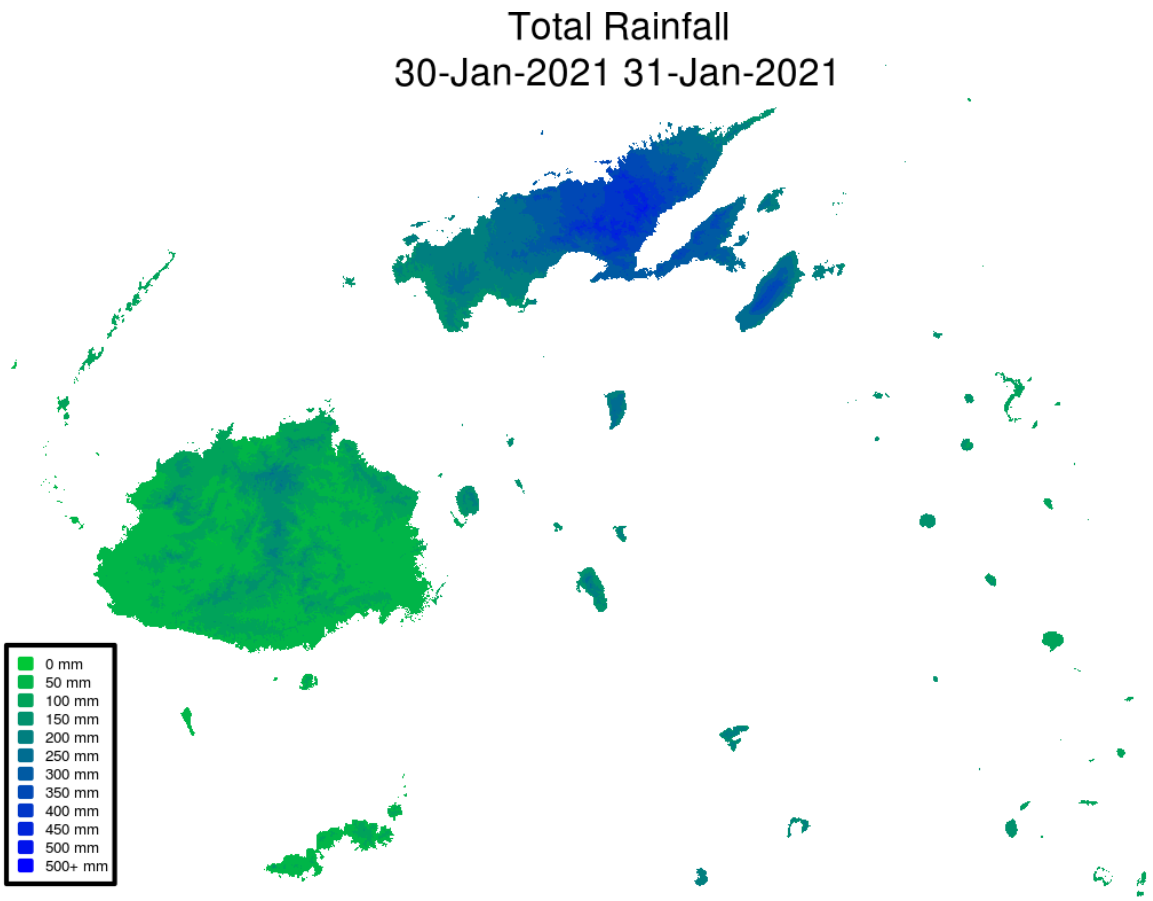
24 HOUR RAINFALL ACCUMULATION DATA FOR 30TH JANUARY 2021

STATION	24 HOUR MANUAL RAINFALL (mm)	24 HOUR AWS RAINFALL (mm)
ROTUMA	110.0	
MONASAVU	212.0	211.5
DOBUILEVU		107.0
NADARIVATU		436.0
TOGE		217.5
RARAWAI		100.0


Total Rainfall
29-Jan-2021 30-Jan-2021
0 mm
100 mm
200 mm
300 mm
400 mm
500 mm
600 mm
700 mm
800 mm
800+ mm

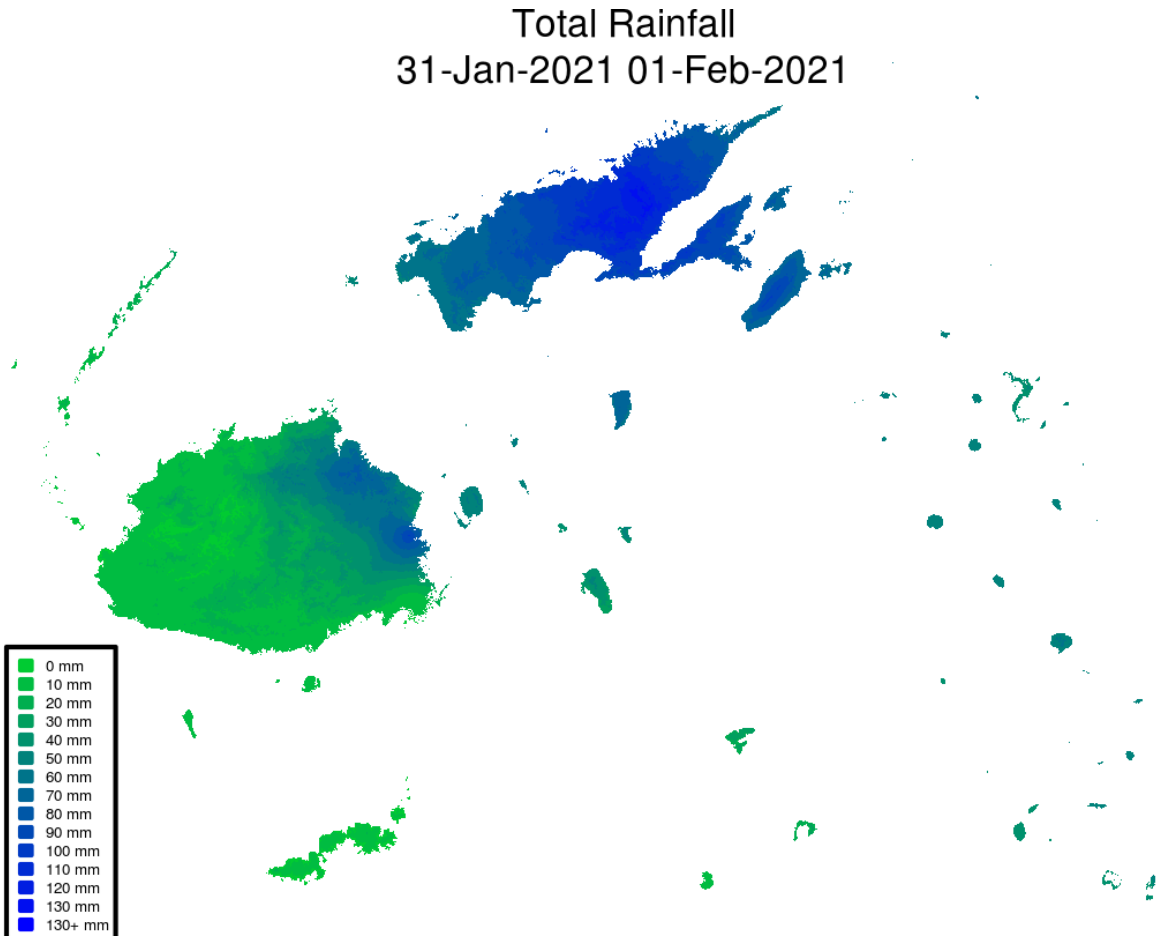
24 HOUR RAINFALL ACCUMULATION DATA FOR 31TH JANUARY 2021

STATION	24 HOUR MANUAL RAINFALL (mm)	24 HOUR AWS RAINFALL (mm)
UDU POINT	110.7	
NAUSORI AIRPORT	119.6	
MONASAVU		221.0
PENANG		287.0
LEVUKA		170.0
SEAQAQA		350.0
LOMAIVUNA		162.0
RKS		191.5
NASINU		125.5
SAQANI		104.0
TAVUA		122.0
WAINIKORO		179.0
YAQARA		202.0
DOBUILEVU		269.0
NADARIVATU		351.5



24 hour rainfall accumulation data for 1st February 2021

STATION	24 HOUR MANUAL RAINFALL (mm)	24 HOUR AWS RAINFALL (mm)
MONASAVU	100.0	99.0
BA RARAWAI	127.4	122.0
PENANG	299.4	33.0* (Disagreement between AWS and manual reading)
MATUKU	160.5	164.0
SEAQAQA		163.0
WAINIKORO		139.0
NADARIVATU		211.5



24 hour rainfall accumulation data for 2nd February 2021

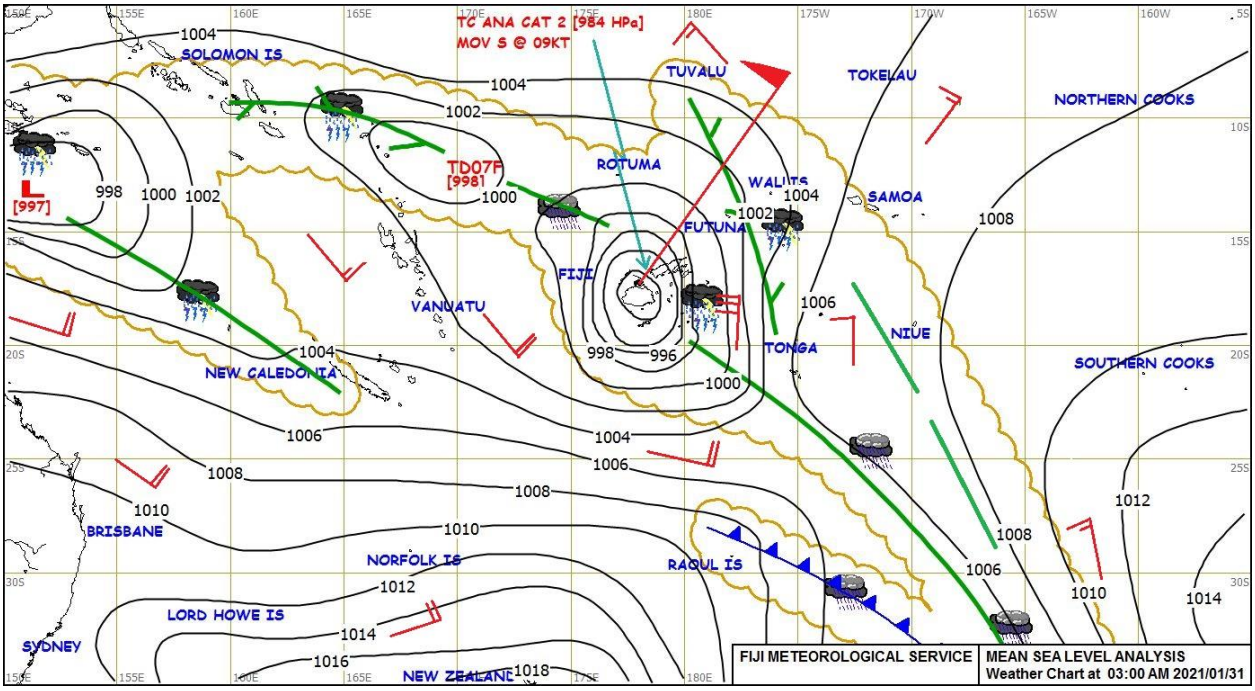
STATION	24 HOUR RAINFALL (MANUAL)	24 HOUR RAINFALL (AWS)
SEAQAQA		136.5

TC Speed

The speed and direction of movement of TC Ana as per table below:

DATE & TIME	SPEED (KNOTS)	DIRECTION
26/01/21 0600Z	ESE	04
26/01/21 1800Z	SE	04
27/01/21 0600Z	SE	04
27/01/21 1800Z	SE	05
28/01/21 0600Z	SE	06
28/01/21 1800Z	SE	06
29/01/21 0600Z	SE	06
29/01/21 1800Z	SSE	06
30/01/21 0600Z	SSE	07
30/01/21 1800Z	S	07
31/01/21 0600Z	S	07
31/01/21 1800Z	S	07
01/01/21 0600Z	S	07
08/01/21 1800Z	S	07

Appendix 3



MSLP: TC Ana as it crossed over Viti Levu