



2020

Annual Climate Summary



GOVERNMENT OF FIJI
MINISTRY OF INFRASTRUCTURE
& METEOROLOGICAL SERVICES

Highlights



Three tropical cyclones (TCs) had a direct impact on Fiji during 2020. Severe TC Yasa, which was one of the strongest TCs to be ever recorded in the southwest Pacific, made a landfall over Vanua Levu as a Category 5 system in December, resulting in widespread devastation in the Northern Division. In April, severe TC Harold affected Fiji as a Category 4 system, making a landfall on Kadavu and passing through the southern Lau Group, leaving a trail of destruction. TC Tino affected the Fiji Group in January with gale to storm force winds.



The national average mean air temperature for Fiji in 2020 was 2nd warmest on record. Furthermore, the most recent decade ending in 2020 was also warmest on record in Fiji. The national average mean, maximum and minimum air temperatures between 1959 and 2020 have increased by 0.9°C, 0.8°C and 1.0°C, respectively.



Fiji's national average rainfall in 2020 was close to the long-term average. Fiji's rainfall continue to display large year-to-year variability associated with the El Niño and La Niña events. A number of extreme rainfall events were recorded in Fiji during the year, including rainfall associated with the three TCs, and also due to lingering and active troughs of low pressure in other months.



Sea-level rise near Fiji measured by satellite altimeters from 1992 to 2020 was between 3-4mm/yr. A state of the art sea level monitoring station at the Lautoka Wharf had a similar relative sea level trend with 3.5mm/yr. The mean annual sea surface temperatures in many areas of the northern half of Fiji's EEZ were warmest on record in 2020.

Large Scale Climate Drivers

El Niño Southern Oscillation (ENSO)

The year-to-year variability in Fiji's climate is strongly influenced by the ENSO phenomena. The two extremes of this phenomena are El Niño and La Niña. While no two El Niño and La Niña events are exactly the same, they tend to have some general impacts on Fiji's climate. El Niño events often lead to drier than usual condition over Fiji, which can result in drought events. On the other hand, La Niña events usually brings more rainfall than usual, which can lead to floods, especially during the Wet Season from November to April.

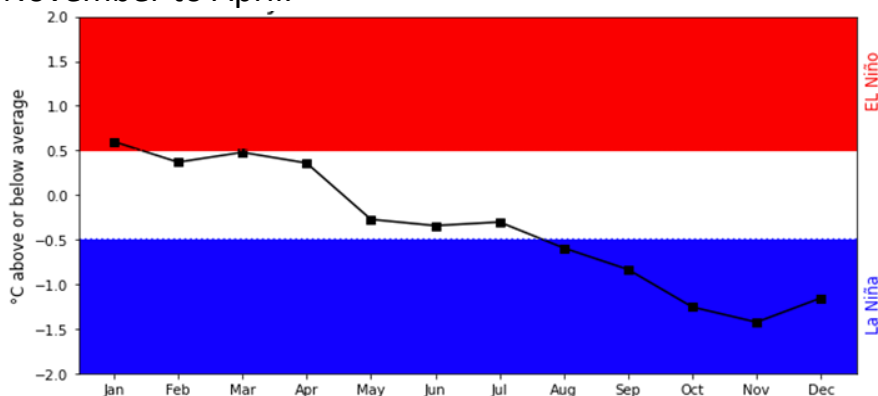


Figure 1: Monthly NINO3.4 anomalies indicate that the Pacific Ocean was leaning towards El Niño during the beginning of the year, but it transitioned into a La Niña during the latter half of 2020. Data source: NOAA.

The tropical Pacific was in a neutral ENSO state during the first half of 2020, but was leaning towards a weak El Niño. However, a La Niña event established during the other half of the year.

Warmer than usual sea surface temperatures were present in the western half of the equatorial Pacific at the beginning of 2020. This pattern persisted till April, with anomalies of more than 1.0°C persisting in a large area of the western Pacific. This prompted some scientists to call this a western Pacific El Niño event. While some of the atmospheric indicators occasionally leaned towards a weak El-Niño during this time, most indicators exhibited ENSO-neutral conditions. This prevented declaration of an El Niño event.

The warm ocean waters in the western half of the equatorial Pacific Ocean began to show signs of cooling from the later part of April. By May, cool anomalies emerged in the eastern equatorial Pacific Ocean. The cooling continued and by latter part of August

Large Scale Climate Drivers (Cont.)

there was clear coupling response from the atmosphere, which indicated establishment of a weak La-Niña event. The sea surface temperatures continued to cool, with the La Niña event strengthening to a moderate event during September. The year ended with a moderate La Niña event well established in the tropical Pacific.

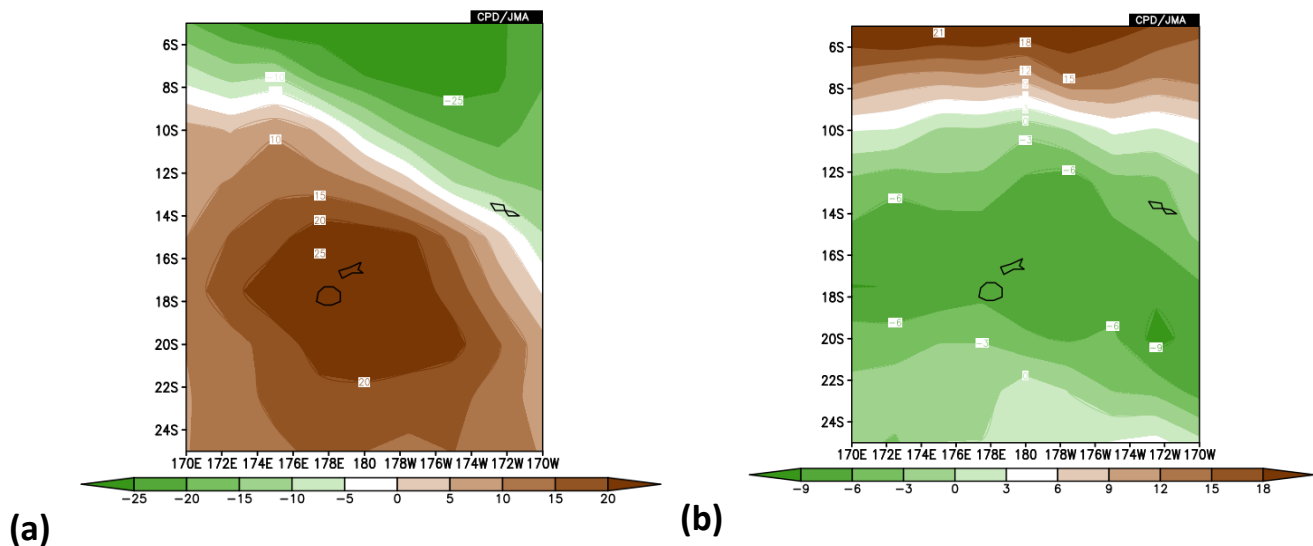


Figure 2: Outgoing longwave (OLR) radiation anomalies for (a) January to February; and (b) September to December 2020. Significantly suppressed cloud cover (positive OLR anomalies) was present over the Fiji Group during January and February 2020, while enhanced cloud cover (negative OLR anomalies) persisted during September to December 2020. Image source: Japan Meteorological Agency.

Fiji's weather at the beginning of the year displayed El Niño like characteristics, with the South Pacific Convergence Zone displaced northeast of its normal position away from the Fiji Group. Consequently, most parts of the country were drier than usual in the first two months. As the year progressed, Fiji's climate varied with some months experiencing wetter than usual condition and others with drier than normal. However, Fiji's climate was typical of La Niña during the last four months of the year with wetter than normal condition experienced at most of the places.

Note: All normal in this summary is with respect to 1981-2010 average unless otherwise stated.

Large Scale Climate Drivers (Cont.)

Madden Julian Oscillation (MJO)

The Madden Julian Oscillation is an eastward moving pulse of rainfall and cloudiness in the tropical Pacific which usually begins in the Indian Ocean and then makes its way around the globe with a periodicity of 20-90 days.

When the active phase of MJO is in the western Pacific then there is usually a surge in the convective activity in the southwest Pacific. The South Pacific Convergence Zone becomes more active, with formation of a number of low pressure systems, tropical disturbances, tropical depressions and tropical cyclones within a period of two to three weeks in the region around Fiji.

During 2020, seven active MJO pulses passed through the western Pacific. The strongest of these pulses was in January, followed by the pulse in December (Figure 3).

A very strong MJO pulse was in the western Pacific from January 15-24. During this pulse, tropical cyclone Tino formed in the region. Tropical cyclone Tino and its predecessor tropical depression, 04F, resulted in gale force winds and significant rainfall over parts of Fiji. The second active pulse in the region was from February 12-20, with tropical cyclone Uesi and Vicky forming during this time, but these tropical cyclones did not affect Fiji.

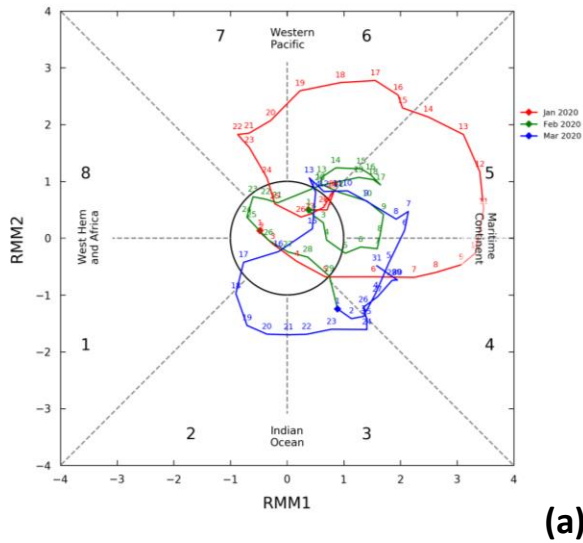
A short lived active MJO pulse was in the western Pacific from March 12-13, but it did not have any significant influence on Fiji's climate.

An active MJO passed through the western Pacific from April 6-9. During this active phase, severe tropical cyclone Harold affected Fiji with hurricane force winds, mini tornadoes and heavy rainfall. Another wave of an active MJO pulse was in the region from May 24-26, but without much impact.

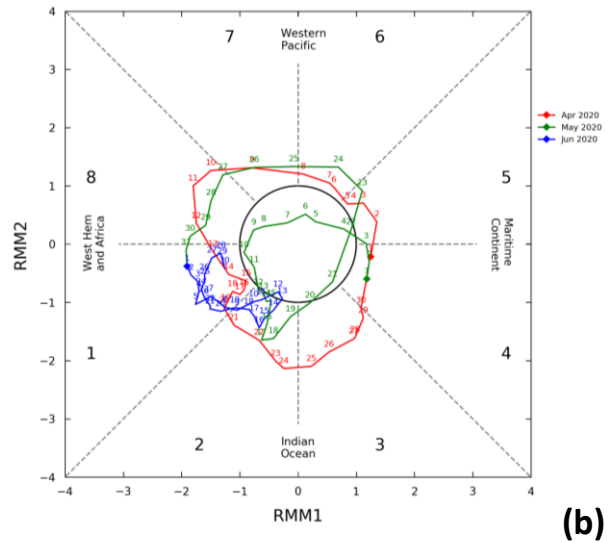
In the later part of the year, two active MJO were in the western Pacific, that is, from October 24 to November 1, and from December 20-21. However, both these pulses did not have a significant impact on Fiji.

Large Scale Climate Drivers (Cont.)

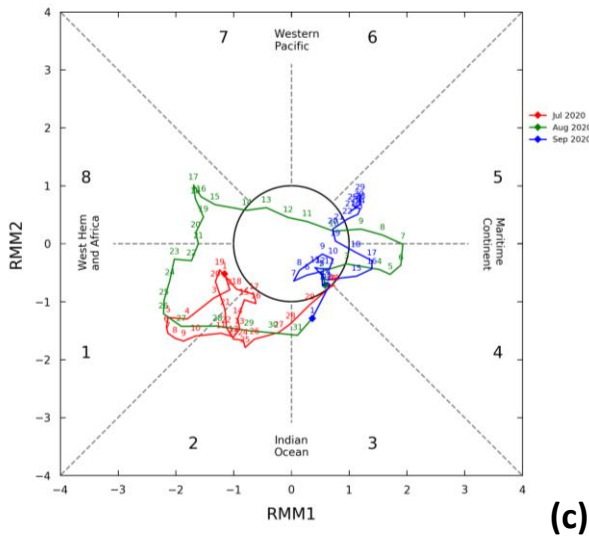
(RMM1, RMM2) phase space for 01-Jan-2020 to 31-Mar-2020



(RMM1, RMM2) phase space for 01-Apr-2020 to 30-Jun-2020



(RMM1, RMM2) phase space for 01-Jul-2020 to 30-Sep-2020



(RMM1, RMM2) phase space for 01-Oct-2020 to 31-Dec-2020

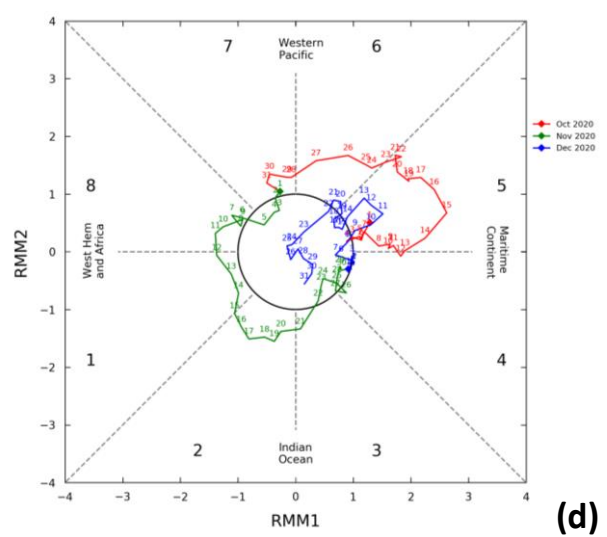


Figure 3: The MJO phase diagram illustrates the progression of the MJO through locations along the equator around the globe. When the index is within the centre circle the MJO is considered weak. Outside of this circle the index is stronger and will usually move in an anti-clockwise direction as the MJO moves from west to east. Phases 6 and 7 are western Pacific. Data source: BoM.

Rainfall

Fiji's national average rainfall for 2020 was 2554mm, which was 108% of the long-term average. This ranks 2020 as the 22nd wettest year in 63 years of record (Figure 4).

Fiji's national annual average rainfall is not showing any significant increasing or decreasing trend between 1958 to 2020, with a large year-to-year variability associated with the El Niño and La Niña events (Figure 5). Similarly, the national average Wet (November to April) and Dry (May to October) Seasons also have no significant trends.

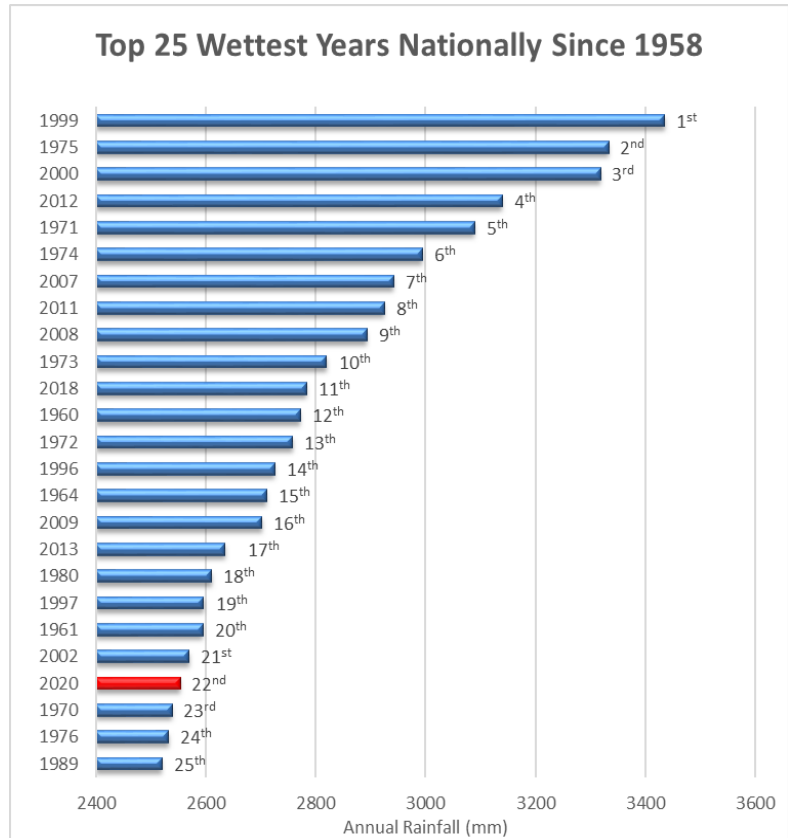


Figure 4: National average annual rainfall ranking.

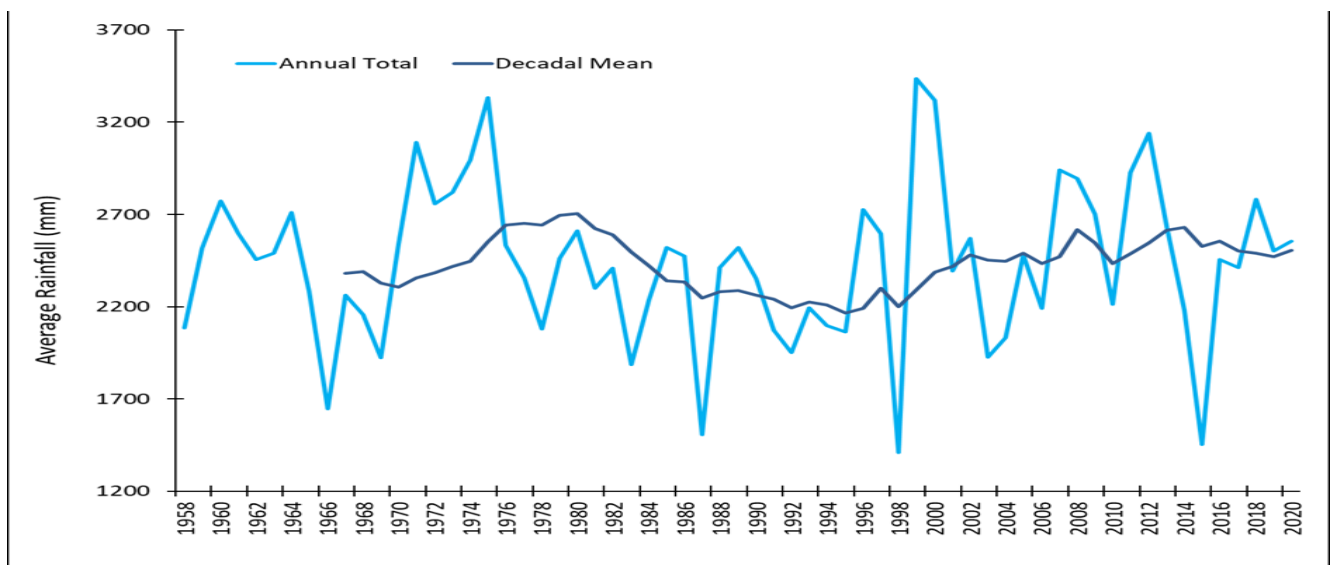


Figure 5: Time series of national average annual and decadal running mean rainfall from 1958 to 2020.

Rainfall (Cont.)

The annual total rainfall in 2020 at individual rainfall monitoring stations was near normal or above normal across the country. Out of the 23 rainfall monitoring sites, 6 registered above normal rainfall and 17 recorded near normal rainfall (Figure 6).

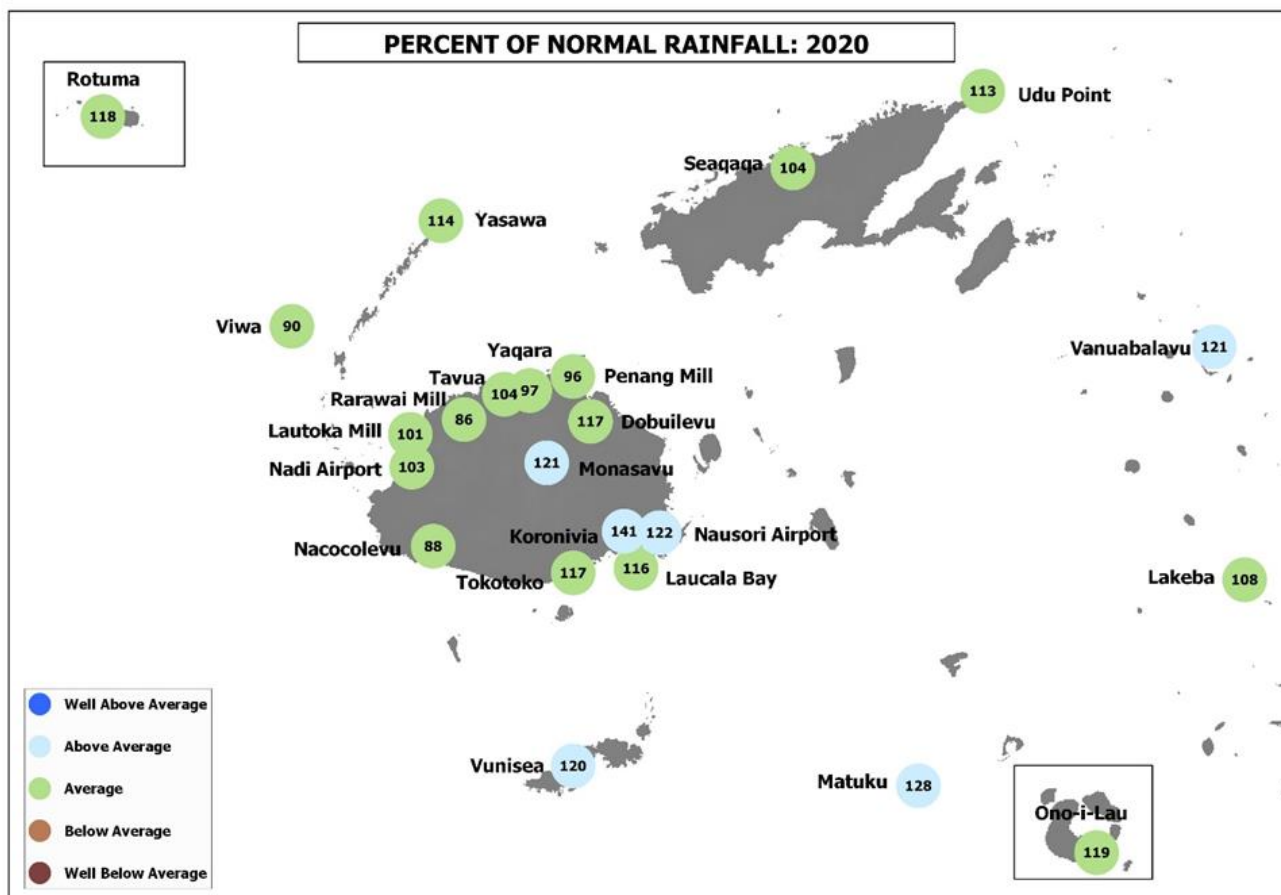


Figure 6: Percent of normal (1981 to 2010 mean) rainfall in 2020 at various rainfall monitoring stations across the country.

The rainfall was significantly wetter than usual in March, April and December, with severe tropical cyclone Harold and Yasa having a substantial contribution to the rainfall in the latter two months, respectively (Figure 7). A record high rainfall for March was set at Koronivia since observations began in 1950, with Vanuabalavu recording the wettest April on record since the beginning of observations in 1985.

Rainfall (Cont.)

In contrast, January, February and August were significantly drier than normal (Figure 7). In fact, a new low total monthly rainfall record for January was established at Viwa since observations began in 1978 and a record low rainfall for February was set at Nabouwalu since the beginning of observations in 1918. During August, extended period of dry days were recorded, especially in the Western Division and Northern half of Vanua Levu. The Momi to Lautoka corridor, Yasawa and Mamanuca Groups, and northern half of Vanua Levu recorded less than five rain days during August.

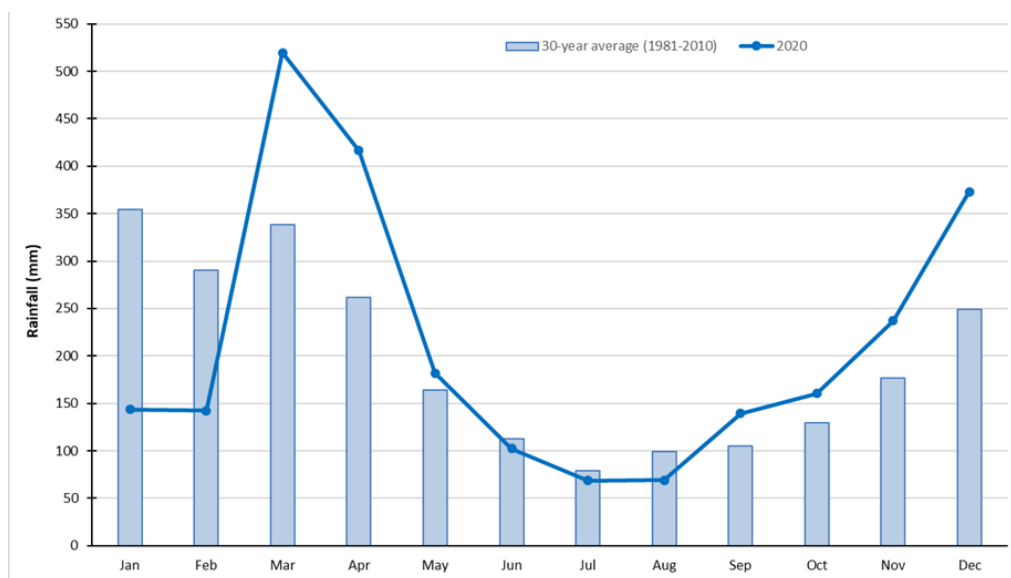


Figure 7: National average monthly rainfall during 2020 compared with the long-term average (1981-2010).

Overall, the wettest location during 2020 was Monasavu with 5867mm of the annual total rainfall, followed by Rotuma with 4161mm, Koronivia with 4063mm and Tokotoko (Navua) with 4047mm. On the other hand, Nacocolevu (Nadroga) was the driest site with 1469mm of rainfall, followed by Viwa with 1487mm, Sigatoka with 1577mm and Momi with 1715mm.

The highest daily rainfall during 2020 was recorded at Nabukaluka with 332mm on the March 18th, followed by Saqani with 277mm of rainfall on the October 4th, Koronivia with 269mm on the March 18th, and Naqali with 230mm on the March 18th. Furthermore, a very high intensity rainfall was registered at Sigatoka on the December 30th with 108mm of rainfall in 1 hour 10 minutes, between 4.00pm to 5.10pm (Fiji Standard Time).

Air Temperatures

Mean Air Temperature

The year 2020 was 2nd year warmest on record in Fiji with the national average mean air temperature of 26.3°C, which was 0.7°C warmer than the normal (Figure 8).

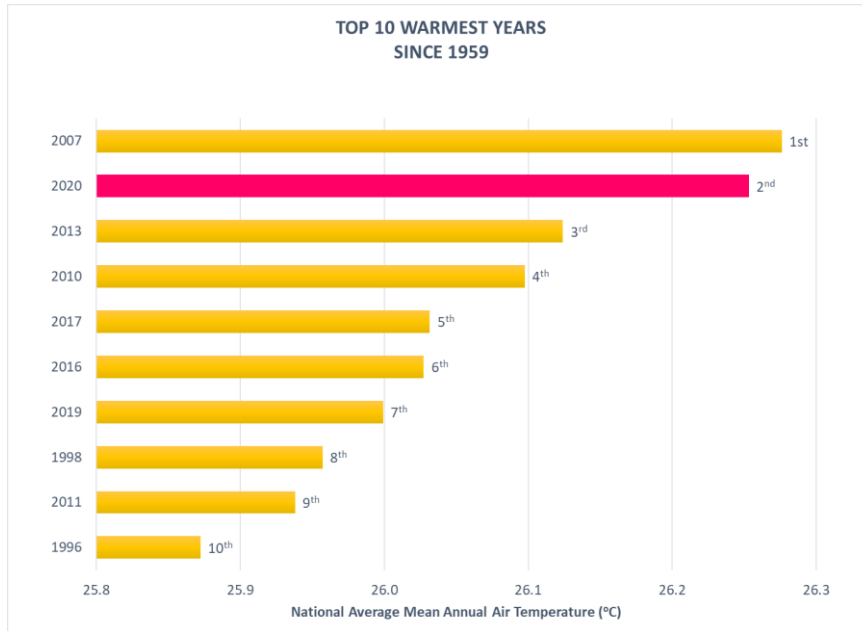


Figure 8: Top 10 warmest national average mean air temperatures for Fiji.

The most recent decade ending in 2020 was also warmest on record in Fiji. This pattern has continued with every new decade being warmer than all previous decades since 1960s (Figure 9).

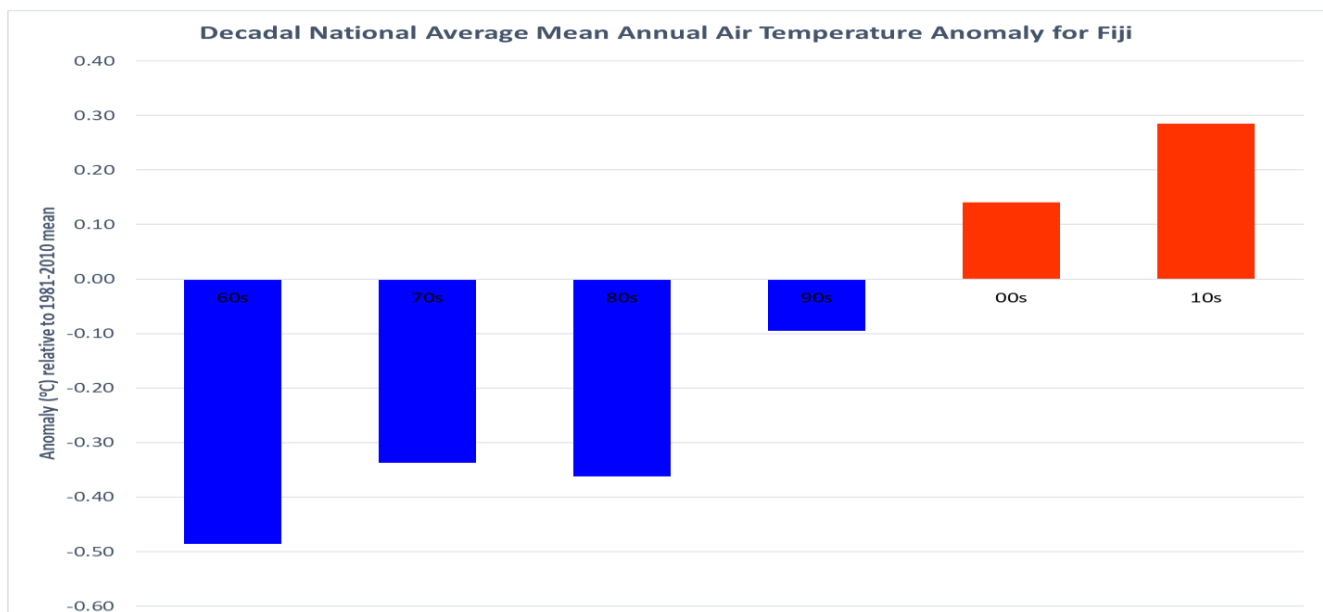


Figure 9: Decadal national average mean annual air temperature anomalies for Fiji.

Air Temperatures (Cont.)

The national mean annual air temperature has increased by 0.9°C between 1959 and 2020 (statistically significant rise at 95% confidence level) (Figure 10). This trend is consistent with the global pattern of rising air temperatures as greenhouse gas concentration increases in the atmosphere.

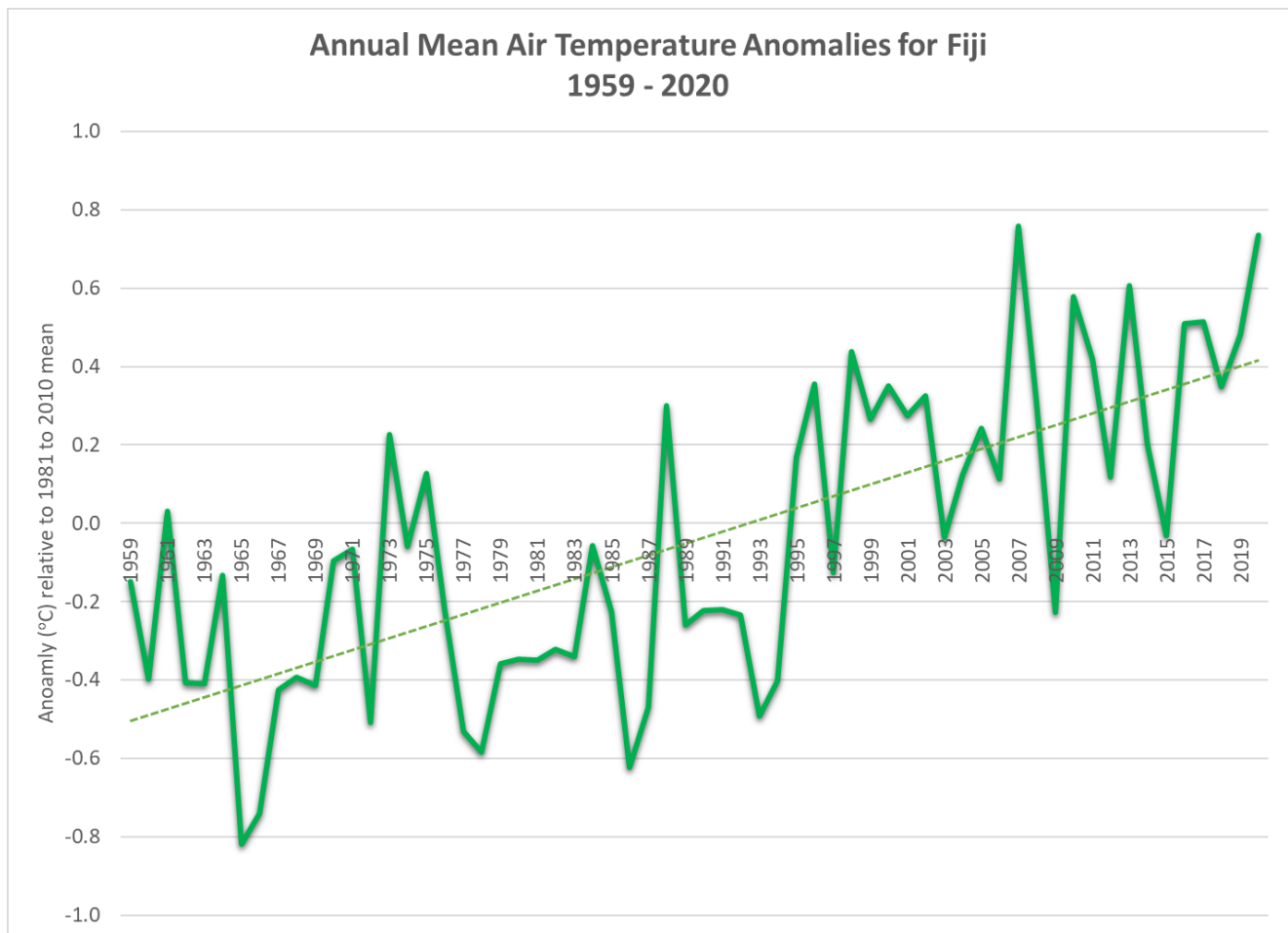


Figure 10: Time series of national average mean annual air temperature anomaly relative to 1981-2010 mean together with the associated trend.

Air Temperatures

(Cont.)

Maximum and Minimum Air Temperatures

The national average annual maximum air temperature during 2020 was 29.9°C, which was 0.4°C warmer than the normal. This ranks as the 5th warmest national annual maximum air temperature since 1959. The year 1998 is warmest on record, followed by 2007, 2017 and 2016.

The national average annual minimum air temperature during 2020 was 22.6°C, which was 1.0°C warmer than the normal. This ranks as the warmest annual minimum air temperature on record since 1959.

The national average maximum air temperature has increased by 0.8°C between 1959 and 2020 (statistically significant rise at 95% confidence level). Similarly, the national average minimum air temperature has increased by 1.0°C between 1959 and 2020 (statistically significant rise at 95% confidence level) (Figure 11).

The warmest location on average during 2020 was Seaqaqa and Vaturekuka (Labasa) both with the annual mean maximum air temperature of 32.2°C, followed by Keiyasi with 32.0°C, and Yasawa-i-Rara with 31.7°C. On the other hand, the coolest annual mean maximum air temperature was registered at Monasavu with 24.1°C, followed by Nadarivatu with 25.2°C, Ono-i-Lau with 28.1°C and Rakiraki with 28.6°C.

The highest daily maximum air temperature during the year was recorded at Yasawa-i-Rara with 37.2°C on the February 26th, followed by the same station with 37.1°C on the January 30th and as well as on the March 1st.

The coolest nights on average during 2020 was recorded at Nadarivatu with the annual minimum air temperature of 17.7°C, followed by Monasavu with 18.4°C, Keiyasi with 20.9°C and Rarawai Mill with 21.3°C. In contrast, the warmest nights on average was at Rotuma with annual minimum air temperature of 25.4°C, followed by Viwa with 24.7°C, Yasawa-i-Rara with 24.0°C, Udu Point with 23.9°C and Laucala Bay (Suva) with 23.7°C.

Air Temperatures (Cont.)

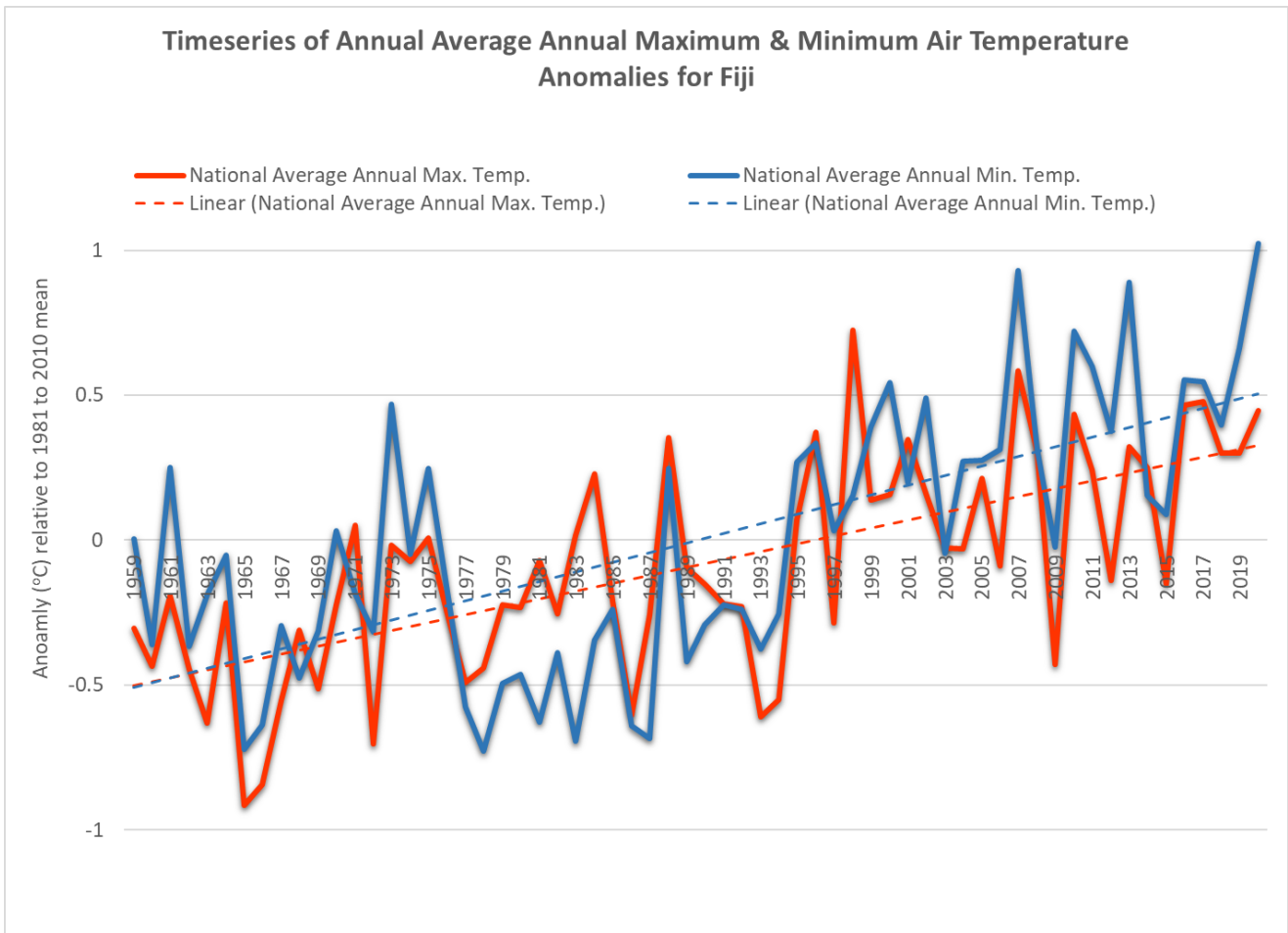


Figure 11: Time series of national average annual maximum and minimum air temperature anomalies of Fiji relative to 1981-2010 mean, together with the associated trends. The minimum air temperature is showing a slightly stronger warming trend the maximum air temperature.

The lowest daily minimum air temperature for the year was experienced at Keiyasi with 11.4°C on the August 16th, followed by Monasavu with 12.1°C on the on the same day, and Nadarivatu with 12.3°C on the July 22nd.

Note: The national average mean, maximum and minimum air temperatures have been calculated based on in-situ observations at 5 high quality meteorological stations, namely, Nadi Airport, Rarawai Mill, Laucala Bay, Nausori Airport and Vunisea.

Sunshine

The annual sunshine hours was near normal (within 10% of normal) at Nadi Airport, Laucala Bay (Suva), Doboilevu, Koronivia and Monasavu. The total annual bright sunshine hours at Nadi Airport, Laucala Bay, Doboilevu, Koronivia and Monasavu was 2478 hours, 1799 hours, 1780 hours, 1558 hours and 1370 hours, respectively (Table 1).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Nadi	244	266	118	165	213	140	233	250	225	215	212	197	2478
Doboilevu	168	178	110	133	149	116	147	189	121	187	174	108	1780
Suva	210	258	118	116	89	102	132	163	107	164	184	156	1799
Koronivia	175	240	109	69	84	105	81	173	107	139	129	147	1558
Monasavu	140	122	74	69	84	105	81	173	107	139	129	147	1370

Table 1: Total monthly and annual bright sunshine hours for 2020.

Nadi Airport registered 98% of normal annual bright sunshine hours during the year. The station's highest total monthly bright sunshine of 266 hours was registered in February, while the lowest of 118 hours was in March (Table 1).

Doboilevu recorded 101% of normal bright sunshine hours during 2020. The station's highest total monthly bright sunshine of 189 hours was registered in August, while the lowest of 108 hours was in December (Table 1).

The annual total bright sunshine at Laucala Bay was 93% of the normal. The sunniest month at Laucala Bay was February with 258 hours of total bright sunshine, while May recorded the least with 89 hours (Table 1).

Koronivia experienced 91% of the normal sunshine hours during 2020. The sunniest month at Koronivia was February with 240 hours of bright sunshine, while the minimum was recorded in April with 69 hours (Table 1).

The annual total bright sunshine at Monasavu was 108% of the normal. The sunniest month at Monasavu was August with 173 hours of total bright sunshine, while April recorded the least with 69 hours (Table 1).

Winds

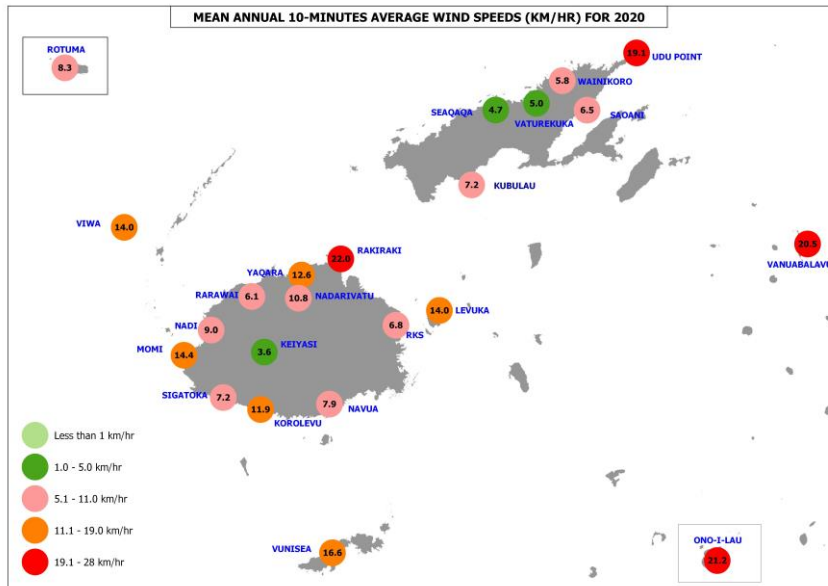


Figure 12: Mean annual 10-minute average wind speeds (km/hr) in 2020.

In 2020, the highest mean annual 10-minute wind speed was recorded at Rakiraki with 22.0km/hr, followed by Ono-i-Lau with 21.2km/hr and Vanuabalavu with 20.5km/hr. On the other hand, Keiyasi registered lightest winds with annual mean 10-minute wind of 3.6km/hr, followed by Seaqaqa with 4.7km/hr and Vaturekuka with 5.0km/hr.

The most extreme wind during the year was registered during the passage of severe tropical cyclone (TC) Yasa from 17th to 18th December. While many of the meteorological stations in the direct path of Yasa were not able to withstand destructive hurricane force winds, the highest recorded sustained wind was observed at Lakeba with 123km/hr, followed by Udu Point with 121km/hr. The highest observed wind gust with Yasa was at Lakeba with 162km/hr, followed by Udu Point with 161km/hr.

Severe TC Harold also brought hurricane force winds over the country, especially over the southern Viti Levu, Vatulele, Beqa, Kadavu and southern Lau Group, on the April 8th to 9th. During the passage of Harold, the highest sustained wind was recorded at Ono-i-Lau with 138km/hr, followed by Matuku with 112km/hr. The maximum recorded wind gust during Harold was at Ono-i-Lau with 191km/hr, followed by Momi with 147km/hr.

Furthermore, TC Tino resulted in gale force winds over the land areas of northeastern Vanua Levu and northern Lau Group on the January 17th. The highest observed sustained wind during Tino was at Udu Point with 77km/h, followed by Vanuabalavu with 69km/h. Tino's highest wind gust was at Udu Point with 117km/h, followed by Vanuabalavu with 103km/h.

Tropical Cyclones (TCs)

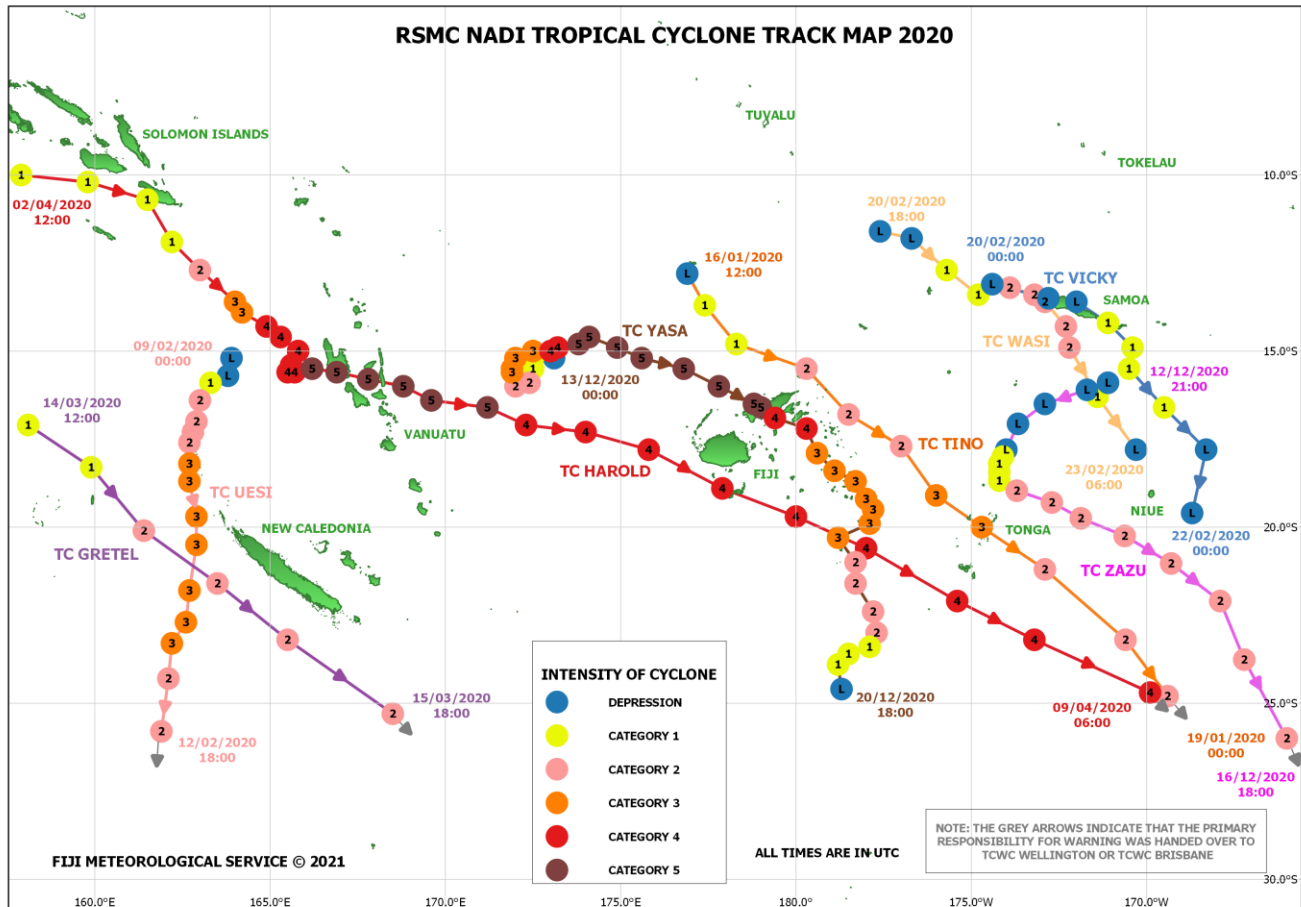


Figure 13: Track maps of TCs which occurred in the RSMC Nadi-TCC area of responsibility during 2020.

In 2020, eight TCs occurred in the Regional Specialised Meteorological Centre Nadi – Tropical Cyclone Centre (RSMC Nadi-TCC) area of responsibility (AoR) (Figure 13). Two TCs (Harold & Yasa) attained Category 5 intensity, two Category 3 (Tino and Uesi), three Category 2 (Wasi, Gretel and Zazu), while Vicky attained a maximum intensity of Category 1. Three TCs (Tino, Harold & Yasa) had a direct impact on Fiji.

Severe TC Tino was named when it was located 100km south of Rotuma on the January 17th. It took a general southeast track thereafter passing through Fiji and Tonga. It intensified to a Category 2 system the next day passing to the east of Vanua Levu. It continued to intensify and then later passed over Tonga as a severe Category 3 TC. Tino

Tropical Cyclones

(Cont.)

resulted in gale force winds over the land areas of northeastern Vanua Levu and northern Lau Group. There were also reports of flooding in the Central and Northern Divisions during the passage of Tino.

Severe TC Uesi formed on the February 10th to the far northwest of New Caledonia. Uesi took a general southerly track throughout its life due to subtropical ridge to its east. It passed to the west of New Caledonia on the 11th as a Category 3 system. Uesi resulted in heavy rainfall and strong winds over New Caledonia. There were reports of flooding and power outages on island.

TC Vicky was a short lived system which attained a maximum intensity of Category 1. It was named on February 20th, while to the southeast of Upolo, Samoa. It was declassified into an ex-tropical system early on the 22nd. Vicky resulted in strong winds and heavy rainfall on the Samoan islands. One buoy off Aunu'u measured 3.7–4.3m seas due to Vicky.

Just after Vicky, Samoan islands were affected by **TC Wasi**. It was named on the February 22nd, while centered west of Samoa. It took a general southeast track keeping to the west of Samoa. Wasi attained a maximum intensity of Category 2. It reportedly resulted in significant rainfall and strong winds on the Samoan islands.

TC Gretel moved from Australian region into the RSMC Nadi-TCC AoR on the March 15th. It took a general southeast direction, passing 150km south of New Caledonia as a Category 2 system, which was its maximum intensity. Gretel resulted in some damages on New Caledonia with reports of flooding in a number of areas, rough seas, broken trees and power outages.

Severe TC Harold was a long lived cyclone taking a general southeast direction from Solomon Islands to Vanuatu, Fiji and Tonga. It formed to the west of Solomon Islands on April 2nd. Tragically a ferry was washed overboard in Solomon Islands, claiming 27 lives. The system rapidly intensified on April 3rd, strengthening from Category 1 to 4 in 24-hours. It passed over Vanuatu islands as a Category 5 system, leaving a mayhem of destruction in its path. It was the strongest cyclone to affect Vanuatu since severe TC

Tropical Cyclones

(Cont.)

Pam in 2015. The system later affected Fiji as a Category 4 system, making a landfall on Kadavu and passing through the southern Lau Group. Hurricane force winds, heavy rainfall, storm surges and mini tornadoes were experienced in Fiji. A life was lost in Fiji. Harold then later passed through Tonga as a Category 4 system.

Globally, **severe TC Yasa** was the strongest cyclone in 2020, with a minimum central pressure of 899 hPa. It was named on December 14th, whilst it was in open waters between Fiji and Vanuatu. It rapidly intensified from a Category 2 to 5 system in close to 24-hours between 15th and 16th. Thereafter, it had its eye set on Fiji making a landfall over Vanua Levu as a Category 5 system with estimated sustained wind speed of up to 240km/hr and momentary gust of 345km/hr. It started to weaken a bit after making landfall on Vanua Levu, but still it was a strong Category 4 system as it passed over the southern tip of Taveuni and Category 3 during its journey through the Lau Group. Yasa was one of the strongest TCs to affect Fiji, only second to Winston in 2016. It left a trail of destruction in Fiji, especially on Vanua Levu. Yasa claimed 4 lives in Fiji.

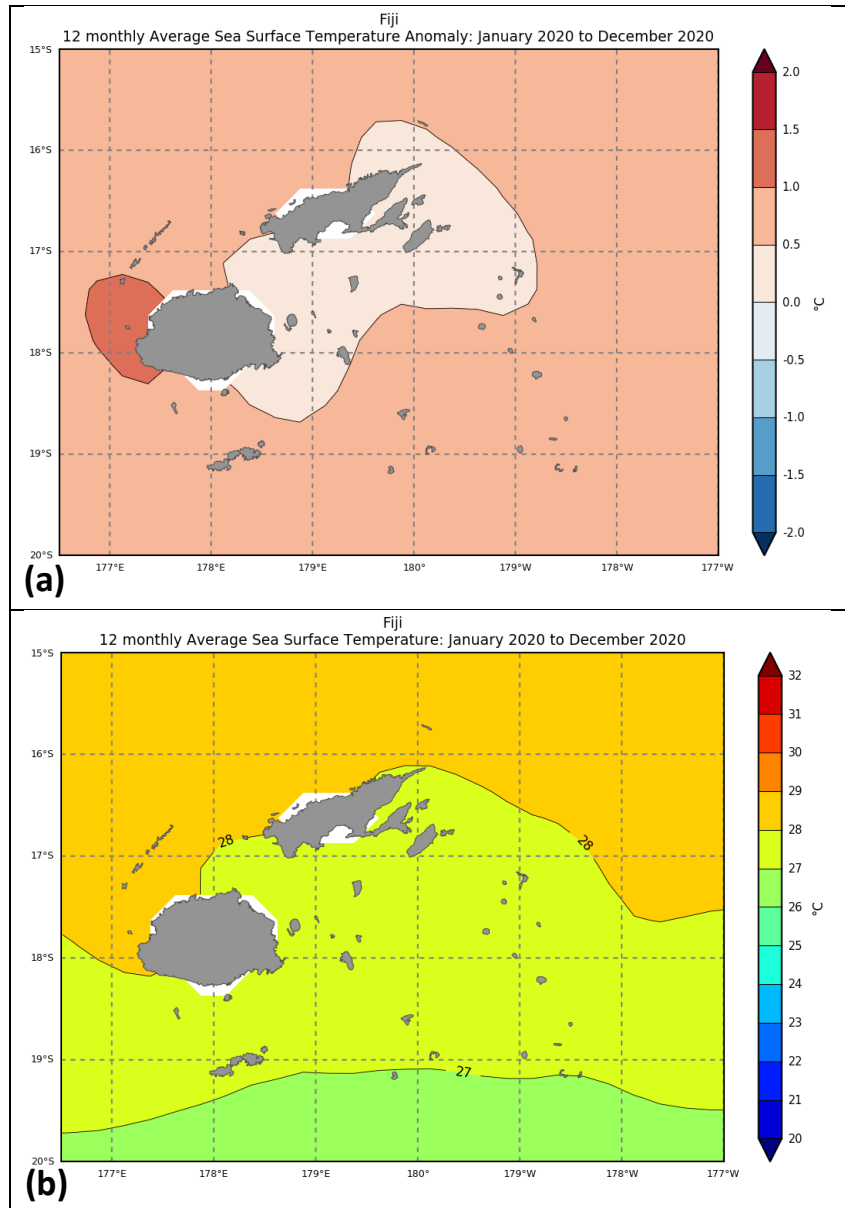
TC Zazu was named on December 14th while it was located to the north of Tonga. It took a general southeast track thereafter passing in between Tonga and Niue. It attained a maximum intensity of Category 2. Zazu resulted in some damages on Niue. While gusty winds were recorded on some islands of Tonga, the kingdom escaped major damages.

Note: All date in this report is in Fiji Standard Time.

Sea Surface Temperatures (SSTs)

The sea surface temperatures in Fiji's Exclusive Economic Zone (EEZ) were warmer than normal during the year, with anomalies of +0.5°C to +1.0°C in most of the Fiji region. However, anomalies of between +1.0°C to +1.5°C were recorded west of Viti Levu in the Yasawa & Mamanuca Groups (Figure 14(a)). The annual mean sea surface temperatures in the Fiji waters ranged from 24°C to 30°C during 2020 (Figure 14(b)).

Figure 14: (a) Mean annual sea surface temperature difference from the normal (1971 to 2000 average); and (b) Mean annual sea surface temperature for 2020. Source: Pacific Community.



Parts of Fiji recorded extreme sea surface temperatures during the year. In 2020, many of the areas in the northern half of Fiji's EEZ registered record high mean annual sea surface temperatures since 1982 (Figure 15).

SSTs (Cont.)

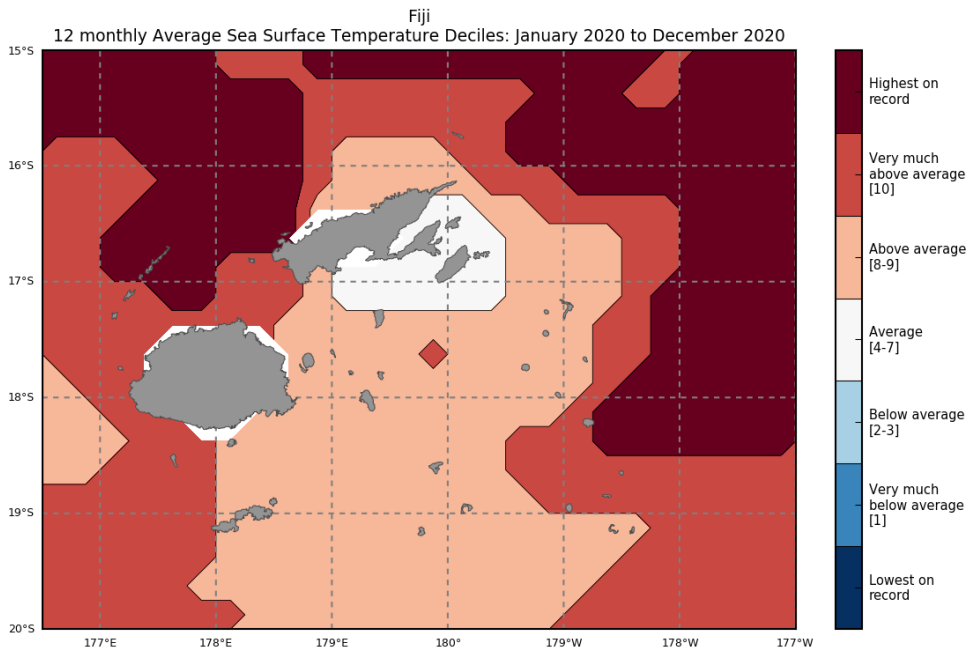


Figure 15: Ocean surface temperature ranking for 2020 since 1982. Source: Pacific Community.

The sea surface temperatures across the Fiji region is showing a positive trend since 1950, with rise of 0.0 to 0.1°C/decade in the most of Fiji’s EEZ and increase of 0.1 to 0.2°C/decade to the far north (Figure 16). The tidal gauge at Lautoka Wharf recorded an increase in the ocean waters of 0.04°C/decade between 1993 to 2020.

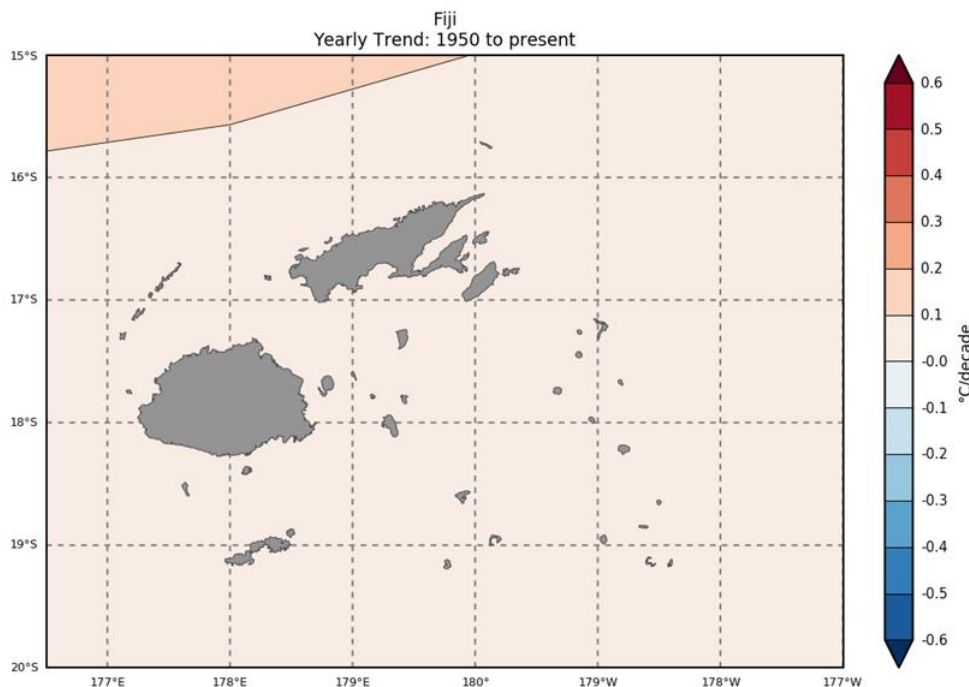
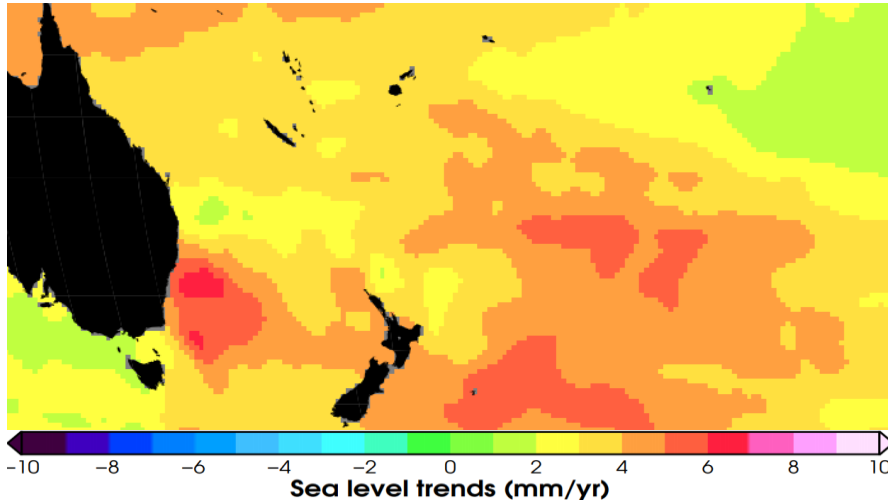


Figure 16: Average ocean surface temperature change since 1950. Source: Pacific Community.

Sea Level

The sea-level rise near Fiji measured by satellite altimeters (Figure 17) from 1992 to 2020 was between 3-4mm/year. A state of the art sea level monitoring station at the Lautoka



Wharf had a similar relative sea level trend with 3.5mm/year between 1993 to 2020, which is a statistically significant increasing trend at 95% confidence level (Figure 18). This rate of change near Fiji is comparable to the rate of global mean sea level rise of 3.3mm/year since 1993.

Figure 17: Sea level trend in the Pacific Island region between 1992 to 2020 as per the satellite measurement.

Source: NOAA/Laboratory for Satellite Altimetry

The monthly sea level analysis based on satellite altimetry show that positive sea level anomalies were present in most of the Fiji Waters throughout the year ranging from +5-15cm.

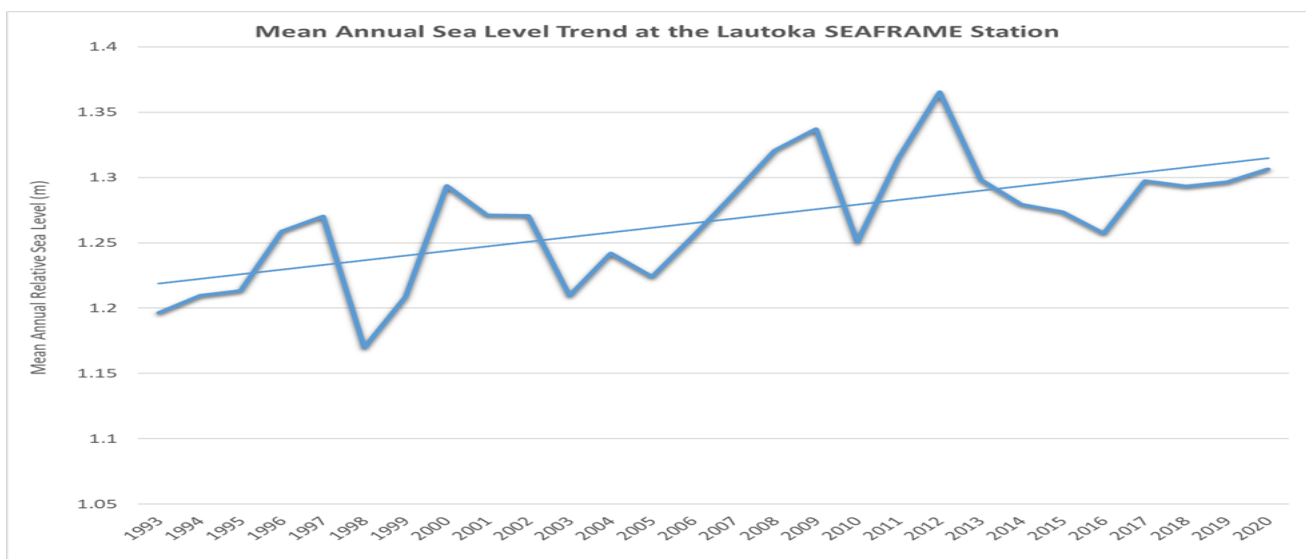


Figure 18: Mean annual relative sea level trend at the Lautoka SEAFRAME station. Data source: Pacific Community.

Notable Weather Events

Gale Force Winds, Flooding, Storm Surge & Landslide due to Tropical Cyclone (TC) Tino – January

The first notable weather event of the year in Fiji was TC Tino and its predecessor tropical depression, TD04F. It passed to the east of Vanua Levu and then traversed through the Lau Group on the January 17th. While it attained Category 2 intensity as it passed through the Fiji Group, gale force winds were recorded over the land areas of northeastern Vanua Levu and northern Lau Group. The highest observed sustained wind was at Udu Point with



Figure 19: Oinafa Jetty in Rotuma damaged as a result of storm surges and damaging winds on January 17th. Picture credit: Fijivillage.

77km/h, followed by Vanuabalavu with 69km/h and Ono-i-Lau with 52km/h. The highest wind gust was at Udu Point with 117km/h, followed by Vanuabalavu with 103km/h and Saqani with 87km/h. Tino and its predecessor tropical depression, TD04F, together with the associated trough of low pressure resulted in significant rainfall over the Central and Northern Divisions, including northern Lau group, between 15th and 17th. Sabata recorded a 24-hour rainfall of 171mm on the 16th, followed by Dewala with 149mm on the 17th. Consequently, there were reports of flooding in the Central and Northern Divisions. The devastating effects of TC Tino was observed at Rotuma as well, whereby storm surges, sea flooding, damaging winds and heavy rain did massive damages to the coastal infrastructure (Figure 19). Initial damage assessment report indicated that the Northern Division was most significantly affected, with damages amounting to F\$6.15 million. A father and daughter in Serua were reported missing after they were swept while crossing a flooded creek.

Notable Weather Events

(Cont.)

Flash Flooding & Landslide – March



(a)



(b)



(c)

Figure 20: (a) Flooding in parts of Rakiraki town on the March 17th; (b) Flash flooding in Waidamudamu, Nausori on the March 19th; and (c) Landslide at Namosi Quarry on the March 20th. Picture credit: Fiji Sun.

A number of places in Viti Levu recorded heavy rainfall and flash floods from March 17th to 21st. This was due to lingering trough of low pressure over the Group. Prior to this trough, wet weather prevailed across Fiji thus the soil was considerably saturated.

On the 16th, significant rainfall was received in Ba, Tavua and Ra which resulted in flash flooding with a number of low lying crossings and roads closed. An accumulated 24-hour rainfall (9am on 16th to 9am on 17th) of 176mm was recorded at Nadarivatu, followed by 146mm at Waikubukubu.

Intermittent rainfall continued to affect the Western Division with a second episode of significant falls experienced across the Western Division on the 20th and 21st. Accumulated 24-hour rainfall of 87mm was recorded at Tubenasolo, followed by 81mm at Natawa on the 20th, while Toge registered 89mm followed by Nagado with 74mm on the 21st. This also resulted in flash flooding in parts of Nadroga, Nadi, Lautoka, Ba, Tavua and Ra.

In the Central Division, rainfall slowly started to pick up from 18th with significant rainfall recorded on the 19th. Accumulated rainfall over the 24-hour period from 9am on the 18th to 9am on the 19th

Notable Weather Events (Cont.)

was 332mm at Nabukaluka, followed by 230mm at Naqali.

This resulted in flooding of low lying areas along and downstream of Rewa Catchment. A number of roads and low lying crossings were closed to traffic due to flooding.

Due to prolonged wet weather, a major landslide occurred at the Namosi Quarry towards Mau Road, Navua on the 20th, which resulted in the unfortunate loss of three lives. There were reports of loss of two more lives due to drowning in swollen creeks in separate incidents at Teidamu, Lautoka and Togovere, Tavua.

Hurricane Force Winds, Storm Surges & Mini Tornadoes due to Severe Tropical Cyclone (TC) Harold – April

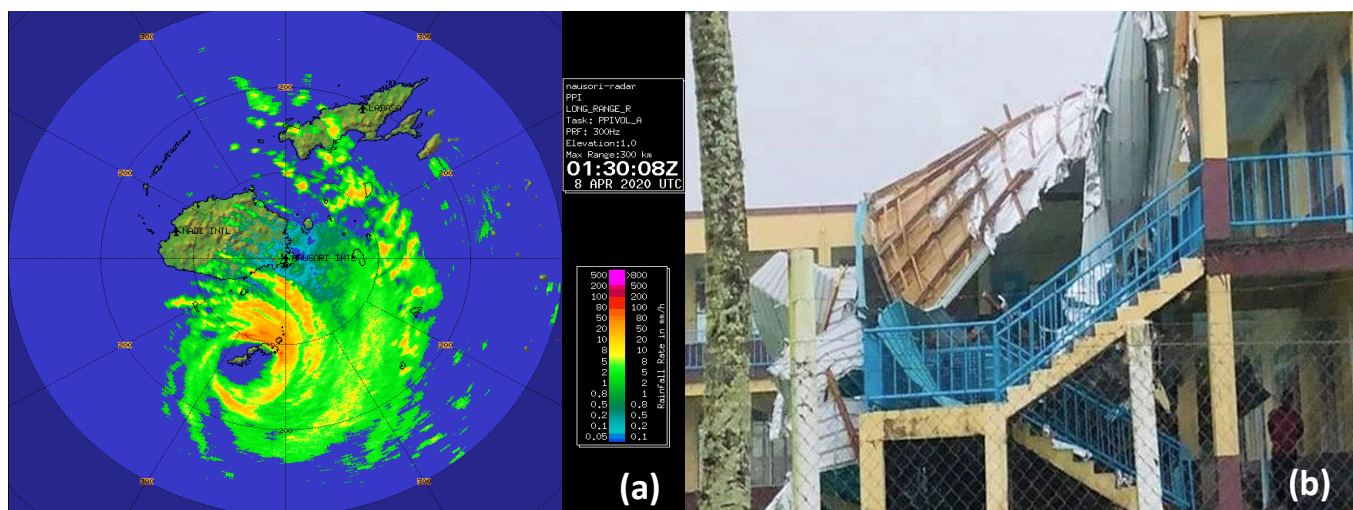


Figure 21: (a) The centre of TC Harold over Kadavu at 1.30pm on the April 8th captured on the RADAR network in Fiji; and (b) Impact of a mini tornado on Bhawani Dayal Arya College, Nausori. Picture credit for (b): Fiji Sun.

Severe TC Harold affected the Fiji Group as a Category 4 system. It made a direct landfall over Kadavu on the April 8th, with hurricane force winds also experienced over the Coral Coast on Viti Levu and southern Lau Group. The gale force winds extended to the rest of Viti Levu and Lomaiviti Group. During the passage of Harold, Ono-i-Lau recorded the highest sustained wind of 138km/hr, followed by Matuku with 112km/hr. The maximum recorded wind gust was at Ono-i-Lau with 191km/hr, followed by Momi with 147km/hr.

Notable Weather Events

(Cont.)

Matuku was severely impacted by high storm surges as the centre passed just to the south of the island during high tide. Damaging heavy swells were also experienced along western Viti Levu coasts, and Yasawa and Mamanuca Groups.

In association with severe TC Harold, there were reports of mini tornadoes in the Central Division in the early hours of April 8th. The mini tornadoes formed when Harold was approaching Fiji and its convective rain bands produced squall lines over the eastern parts of Viti Levu. Mini tornadoes damaged houses in Wainokavula, Vusuya and Momi village in Tailevu and also Bhawani Dayal Arya College in Nakasi (Figure 21(b)).

Harold also brought significant rainfall in parts of the Central, Western and Eastern Divisions. The highest 24-hour rainfall was at Monasavu with 213mm, followed by Nadarivatu with 209mm, both recorded on the April 7th. Very high intensity rainfall resulted in the inundation of Ba town with flood waters.

Hundreds of houses were destroyed by Harold. A life was also unfortunately lost in Kadavu. A state of natural disaster was declared for parts of Central, Eastern and Western Divisions. The cost of damage was estimated at F\$100 million.

Widespread Flood in the Central Division – 27-28 April



Figure 22: Flooding in Waidamudamu, Nausori on the April 28th. Picture credit: NDMO.

During the last week of April, an extended period of heavy rainfall was experienced in the Central Division due to active trough of low pressure and moist easterly wind flow. The highest 24-hour rainfall during this event was at Waimanu with 209mm, followed by Nasinu with 204mm, both on the April 28th. Over a 48-hour period between April 27th and 28th, Tokotoko (Navua), Koronivia and Nasinu received 346mm, 332mm and 320mm of rainfall, respectively. Consequently, widespread flooding in the Central Division were experienced.

Notable Weather Events

(Cont.)

Flooding due to active troughs – October, November

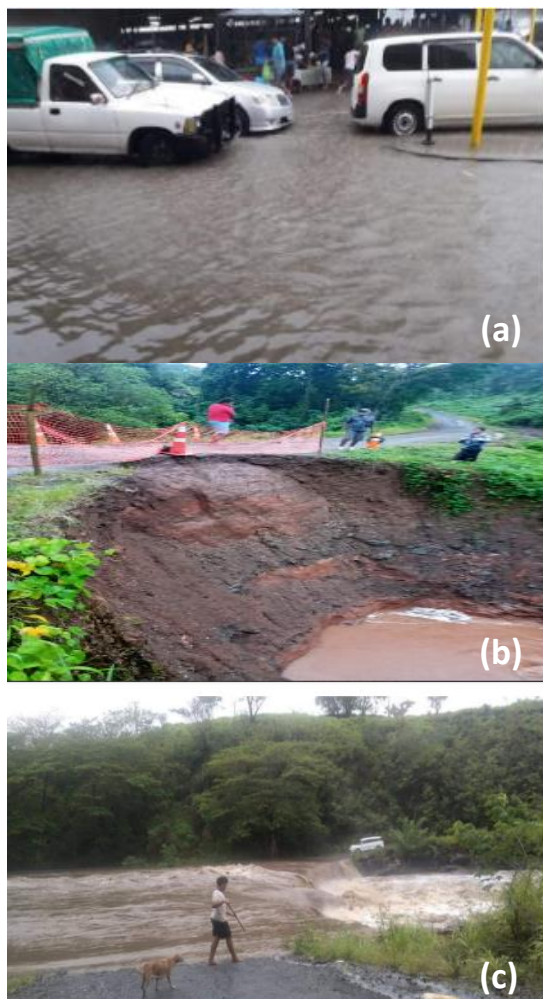


Figure 23: (a) Flash Flooding in Nadi Town on the October 17th; (b) Road slip in Natewa West Coast Road Town in Saqani on the October 17th; and (c) Flooded road at Vatukoula, Tavua on the November 18th. Picture credit: Fiji Times.

Series of trough of low pressure systems dominated the month of October and November whereby significant rainfall events led to flash flooding across the country. Some significant 24-hour rainfall was registered during October, with Saqani receiving 277mm of rainfall on the 4th, followed by Vunisea (Kadavu) with 136mm on the October 3rd, Doboilevu with 105mm on the 6th and Yaqara with 93mm on the 14th. Consequently, there were reports of a number of flash floods around the country during October: low lying areas and crossings in Bua, including Nabouwalu and Daria to Dawara along the West Coast Road on the October 3rd; areas around northern tip of Vanua Levu, low lying areas along Nairukuruku and Naqali in Rewa catchment, and low lying areas along Mead Road and Lawaki Road in Ra, all on the 15th; and Nadi town on the 17th.

The second half of November was quite active with rainfall activities across the country. On the 19th, an active trough of low pressure resulted in widespread rainfall across the country, with some significant rainfall registered in the Central Division. Over a 24-hour period on the 19th, Koronivia, Nausori Airport, Laucala Bay (Suva), Nasinu and RKS (Lodoni) recorded 133mm, 130mm, 108mm, 107mm and 103mm,

respectively. Consequently, a number of roads and crossings were inundated with flood

Notable Weather Events (Cont.)

waters in the Central Division. Later on the November 27th, another trough of low pressure resulted in widespread rainfall, but the rainfall activity was intense especially over the Western Division. Nadarivatu, Rarawai Mill (Ba), Penang Mill and Viwa, and Dobuilevu recorded 118mm, 112mm, 89mm and 88mm of rainfall, respectively. This resulted in flooding in parts of the Western Division particularly in low-lying areas of Lautoka, Ba, Tavua and Ra.

Hurricane Force Winds, Storm Surges and Flooding due to Severe Tropical Cyclone (TC) Yasa – December

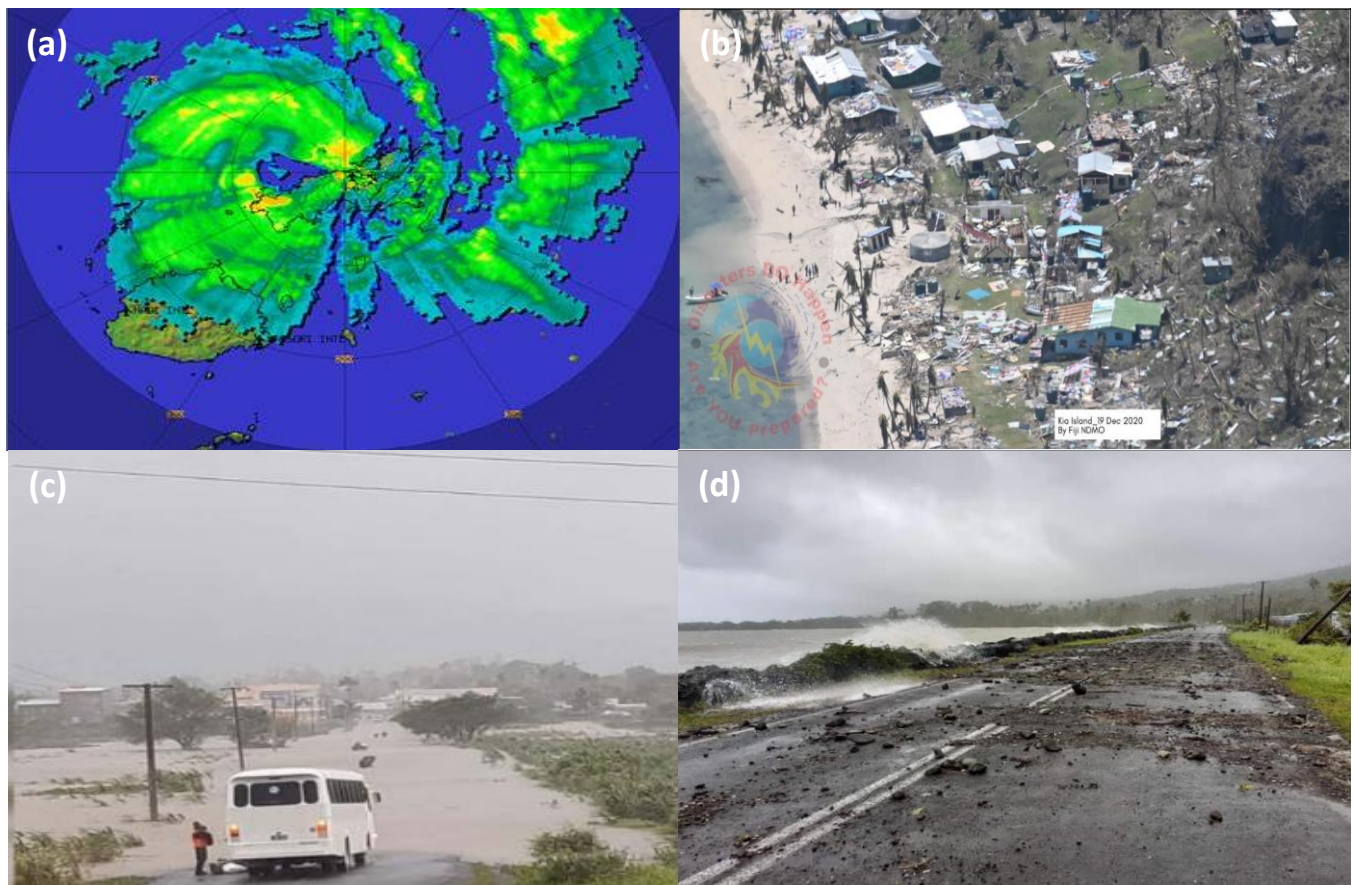


Figure 24 (a) Severe TC Yasa on the RADAR network in Fiji at 6.11pm on the December 17th making a landfall over Vanua Levu; (b) Aftermath of severe TC Yasa on Kia Island (Picture credit: NDMO); (c) Flooded Rakiraki town on the December 17th (Picture credit: FBC News); and (d) Debris on road in Taveuni due to storm surges and sea flooding.

Notable Weather Events

(Cont.)

Severe TC Yasa devastated the Fiji Group on the December 17th to 18th. It made a landfall over Bua province on Vanua Levu as a Category 5 system with estimated sustained wind of 240km/hr and momentary gust of 345km/hr. Yasa brought very destructive hurricane force winds over Vanua Levu, and then later on Taveuni and nearby smaller islands, Koro, and the Lau group. The highest recorded sustained wind was registered at Lakeba with 123km/hr, followed by Udu Point with 121km/hr. The highest observed wind gust was at Lakeba with 162km/hr, followed by Udu Point with 161km/hr. Yasa brought storm surges and damaging heavy swells at Yasawa-i-Rara, along the coastal areas of Vanua Levu, Taveuni and nearby smaller islands, eastern parts of Viti Levu, and the Lomaiviti and Lau groups. Yasa also resulted in very heavy rainfall, especially over Vanua Levu, northwestern Viti Levu and eastern half of Viti Levu. The highest 24-hour rainfall was registered at Nakawaqa with 221mm, followed by Monasavu with 211mm, both on the December 17th. Consequently, parts of the country were flooded, including severe flooding in Rakiraki town on the 17th (Figure 24(c)).

Yasa affected an estimated 139,000 people with the damage cost amounting to F\$500, million. It resulted in major damages to the infrastructure. It completely destroyed 2141 houses, with another 6184 partially damaged. It also caused major damages to electrical power lines on Vanua Levu. Communication was also severely affected. Transportations were disrupted as number of roads in the country were closed due to fallen trees, power lines, and flooding. There were four confirmed casualties of Yasa. A state of natural disaster was declared by the Fijian Government for the whole country.

Flash Flooding in Sigatoka town on the December 30th due to an intense thunderstorm

A very intense thunderstorm on the evening of December 30th resulted in a very high intensity localized rainfall around Sigatoka town. The rainfall station at Sigatoka town registered 108mm of rainfall in 1 hour 10 minutes, between 4.00pm to 5.10pm (Fiji Standard Time). Consequently, there were reports of significant flash flooding in Sigatoka town and in localities around it.

FIJI METEOROLOGICAL SERVICE Private Mail

Bag (NAP 0351)

Nadi Airport, Fiji.

Ph: +679 6724888, +679 9904395

Fax: +679 6724050

Email: climate@met.gov.fj

Also online at <http://www.met.gov.fj>