

Annual Climate Summary 2014

Fiji Meteorological Service

Picture Source: The Fiji Times

Bukuya Hills during 2014 dry spell

Extremely dry conditions evident on hills of Bukuya during 2014 dry spell.

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HIGHLIGHTS OF 2014

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- The weather and climate of Fiji were generally influenced by the troughs of low pressure, tropical depressions and disturbances, frontal systems, ridges of high pressure and east to southeast wind flow;
- In 2014, tropical Pacific Ocean temperatures briefly reached El Niño levels, but only weakly coupled with the atmosphere, and hence the warmth in the Pacific Ocean could not be sustained. The Fiji Meteorological Service considers 2014 a near-miss El Niño event;
- The South Pacific Convergence Zone (SPCZ) fluctuated around its mean position through the year, with it being weaker than normal and shifted northeast of its climatological position during the peak dry season months;
- The outgoing long wave radiation suggests that below normal cloud cover was present in the Fiji region during most of the months;
- The Sea Surface Temperatures (SST) were near normal for most of the year in the Fiji region;
- A total of 56 new climate extremes (21 rainfall, 34 temperature and 1 sunshine) were established;
- Fiji's mean annual rainfall in 2014 was 15th driest year in the 58 years of record;
- The annual average mean temperature was 0.2°C warmer than normal;
- The annual average daytime (maximum) air temperature was 0.3°C warmer than normal;
- The annual average night-time (minimum) air temperature was 0.2°C warmer than normal;
- The Trade Winds over Fiji were near normal during the wet season and enhanced in the dry season, which are typically experienced during a neutral year;
- Bright sunshine hours were near normal around the country;
- There were no cyclones that directly affected Fiji in 2014, but indirectly, parts of the country experienced strong wind and heavy rain;
- Sea level anomalies ranged between -10cm to +10cm in the Fiji region for most of the months.

Note: All comparisons are with respect to "Climatic Normal". This is defined to be an average climate conditions over 30 year period. Fiji uses 1971-2000 period as its "climatic normal".

YEAR IN REVIEW

January's weather was dominated by the moist easterly wind flow, troughs of low pressure, transient ridges of high pressure and two episodes of heavy rain. The 1st episode was on the 15th, when Tokotoko, Laucala Bay, Nausori Airport and Koronivia received 151mm, 130mm, 95mm and 83mm of rainfall, respectively, over the 24-hour period. Then later in the month, an active trough caused widespread rain across Fiji from the 29th to 30th, resulting in flooding, particularly in the Western Division. A strong wind warning was issued for the Lau Group from the 7th to 10th as Tropical Cyclone (TC) Ian lingered to the east of the Group. Rotuma received most of its rainfall from SPCZ and moist easterly wind flow.

Tropical Depressions TD14F and TD15F were the most notable weather features during **February**. Both the systems affected the country in the last week of the month. More than 100mm of rainfall over the 24 hour period was recorded at several stations in the Central and Eastern Divisions between the 25th to 27th, with the highest of 311mm recorded at Matuku on the 26th. Over the three day period from the 25th to 27th, Laucala Bay, Matuku, Nausori Airport, Tokotoko and Koronivia received 437mm, 359mm, 329mm, and 319mm and 263mm of rainfall, respectively. As a result, parts of Fiji, in particular, the major river systems in the Central Division, experienced flood from the 26th to 27th. The SPCZ remained in the vicinity of Rotuma resulting in rainfall over the island on most of the days. The island experienced strong winds due to active SPCZ and TD15F.

March was influenced by troughs of low pressure, semi-permanent ridges of high pressure and TC Lusi. TC Lusi did not affect the Fiji Group directly; however, it resulted in damaging heavy swells between the 9th and 13th. During the last week of the month, heavy rainfall was experienced over the eastern and interior parts of the larger islands resulting from a trough of low pressure, which led to flooding in the Navua River and adjacent low lying areas downstream. Rotuma's weather was largely influenced by the SPCZ and associated moist easterly wind flow.

The weather in **April** was affected by the south-easterly trade winds, troughs of low pressure and a frontal system. However, these systems were weak and did not produce enough rainfall, resulting in the *below average* to *well below average* rainfall across the country. The only significant system, which passed over the group was a trough of low pressure on the last day of the month. It brought significant rainfall over the western parts of the country when Lautoka Mill, Nadi Airport and Rarawai Mill recorded 24 hour rainfall of 111mm, 81mm and 68mm, respectively. Rotuma recorded *below average* rainfall in April.

Following drier than *normal* weather pattern in April, the weather during **May** varied considerably across the country with stations recording rainfall from *well above average* to *below average*. An active trough of low pressure resulted in significant and widespread rainfall across the country on the 16th and 17th. Several stations recorded more than 100mm of rainfall over the 24 hour period during this rainfall episode. This provided

much needed relief from the dry conditions, in particular over the Western Division, which was experiencing *below average* to *well below average* rainfall since March 2014. Rotuma received most of its rainfall from SPCZ and moist easterly wind flow.

Dry weather conditions returned in **June**, with *below average* to *well below average* rainfall received at majority of the places. The SPCZ was weaker than *normal* and restricted to the far western Pacific. A large area in the South Pacific (including Fiji) consequently experienced anomalously low rainfall. No new climate record was established during the month, however, the total monthly rainfall at Yasawa-i-Rara, Nadi Airport, Savusavu Airfield and Dreketi ranked in the bottom 5 of the historical record. Cool nights, were experienced on occasions during the month, with Monasavu recording the lowest of 12.0°C on the 14th, followed by Rarawai Mill with 13.4°C on the 30th. Rotuma experienced wetter than *normal* conditions due to close vicinity of the SPCZ and moist easterly wind flow.

The SPCZ in **July** was weaker than *normal* and displaced to the north of its climatological position. Consequently, the trend of suppressed rainfall continued. This resulted in majority of the places receiving *below average* to *well below average* rainfall. Semi-permanent ridges of high pressure directed significantly cool air flow over the country on occasions. The daily nighttime temperatures fell as low as 9.1°C at Nadarivatu on the 5th, followed by 11.4°C at both Monasavu and Rarawai Mill on the 27th. Rotuma also experienced drier than *normal* conditions during the month.

Extremely dry conditions persisted during **August** due to the absence of any significant rainfall producing system. The SPCZ extended further east than usual for August, away from the Fiji Group. Dry spells of 15 to 25 consecutive days were experienced at most sites in the Western, Northern and Eastern Divisions. Subsequently, most parts of the country received *well below average* rainfall during the month. A new low total monthly rainfall record was established at Nadi Airport, Lautoka Mill, Rarawai Mill, Viwa and Vanuabalavu. Parts of the country were in meteorological drought conditions especially the Western Division and rain fed islands, while majority of the stations were in the warning stage for meteorological drought. The dry spell led to drinking water shortages in the maritime islands and rural areas. The dry spell also had an impact on shallow rooted crops and supply of crops. Rotuma received some rainfall on a number of days due to SPCZ and moist easterly wind flow.

The trend of extremely dry conditions continued into **September** with *well below average* to *below average* rainfall received across the country. This was the 4th consecutive month when majority of the places in Fiji received very little rainfall. The total monthly rainfall at Udu Point, Tokotoko, Penang Mill, Vatukoula and Dobeilevu ranked lowest in the historical record. The severity of the dry spell intensified and all the rainfall monitoring stations in Fiji's National Climate Monitoring Network were in meteorological drought on a 3 month timescale and 23 out of

the 26 stations on a 6 month timescale. It was also notably warmer than *normal* during the month, in particular, the daytime temperatures. A total of 5 new high daily and 5 new high mean monthly maximum temperature records were established. Rotuma was also significantly drier than *normal*. The impact of 2014 dry spell on hills of Bukuya are evident on the cover picture (picture taken on 10th September 2014).

Rainfall varied significantly in **October** with some parts of the country receiving *well above average*, while some recorded *well below average*. A large number of stations in the Western Division continued to experience drier than *normal* conditions, making this 5th consecutive month with such conditions. In contrast, more than twice or almost twice the *normal* rainfall was received at Monasavu, Dreketi, Tokotoko, Savusavu Airfield and Vunisea, elevating them out of meteorological drought on a 3 month timescale. However, majority of the stations continued to be in drought on a 6 month timescale. Heavy swells were experienced over the southern coastal areas of Viti Levu, Mamanuca Group, Kadavu and nearby islands on the 7th caused by an intense high pressure system to the far southwest of Fiji. Rotuma continued to experience drier than *normal* conditions during the month.

Fiji's weather in **November** was influenced by troughs of low pressure, interspersed by semi-permanent ridges of high pressure. The most significant of this trough affected the Group on the 7th that resulted in widespread rainfall across the country. A few isolated heavy falls were recorded on the day, with Tokotoko,

Udu Point and Monasavu recording, 115mm, 104mm and 101mm of rainfall, respectively. However, not much rainfall was received in the Western Division with *well below average* to *below average* rainfall continued for the 6th consecutive month. A large number of areas in Fiji continued to be in meteorological drought on a 3 and 6 month timescales. Rotuma's weather was influenced by SPCZ and moist easterly wind flow.

December's weather was affected by troughs of low pressure, convergence zones, moist easterly wind flow and ridges of high pressure. A frontal system over the southern parts and a trough of low pressure over the western parts of the country resulted in some significant 24 hour rainfall between 4th and 7th. An active convergence zone produced heavy rainfall over the eastern half of Viti Levu on the 6th, resulting in severe flooding in low lying areas. Then later in the month, an active convergence zone again produced heavy rainfall and thunderstorms over the Central Division and Lomaiviti Group on the 27th. Flash flooding was also reported in parts of the Central Division. Consequently, a number of stations in the Central, Eastern and Northern Divisions recovered from the meteorological drought. However, the trend of drier than usual conditions continued over the western parts of Viti Levu, with a number of stations still in the meteorological drought. The presence of SPCZ in the vicinity of Rotuma, together with the moist easterly winds, resulted in rainfall on a number of days.

LARGE SCALE CLIMATE INFLUENCES IN 2014

Neutral El Niño Southern Oscillation (ENSO) conditions (that is, neither El Niño nor La Niña) prevailed in 2014. However, the tropical Pacific Ocean warmed and primed for a developing El Niño with the Sea Surface Temperatures (SST) reaching weak El Niño thresholds in the last quarter of 2014.

Since March 2014, the tropical Pacific Ocean warmed significantly, primed the climate system favorable for an El Niño development. While some atmospheric features responded to the warmed ocean, others have been short lived or did not respond in the typical El Niño style. From June to August 2014, some cooling of the tropical Pacific occurred, which slowed down the El Niño development.

Despite the cooling of SSTs in the tropical Pacific, a renewed warming of the tropical SST was observed from September through October and reached weak El Niño thresholds in November, peaking in late December 2014.

Although some of the atmospheric indicators (for example the Southern Oscillation Index (SOI)) responded to the oceanic changes, the other indicators (for example the cloudiness and rainfall) did not respond positively, thus coupling of the ocean and the atmosphere could not be sustained long enough for a basin-wide El Niño. As a result, ENSO neutral conditions continued to persist in the tropical Pacific, but remained on the warmer side of neutral.

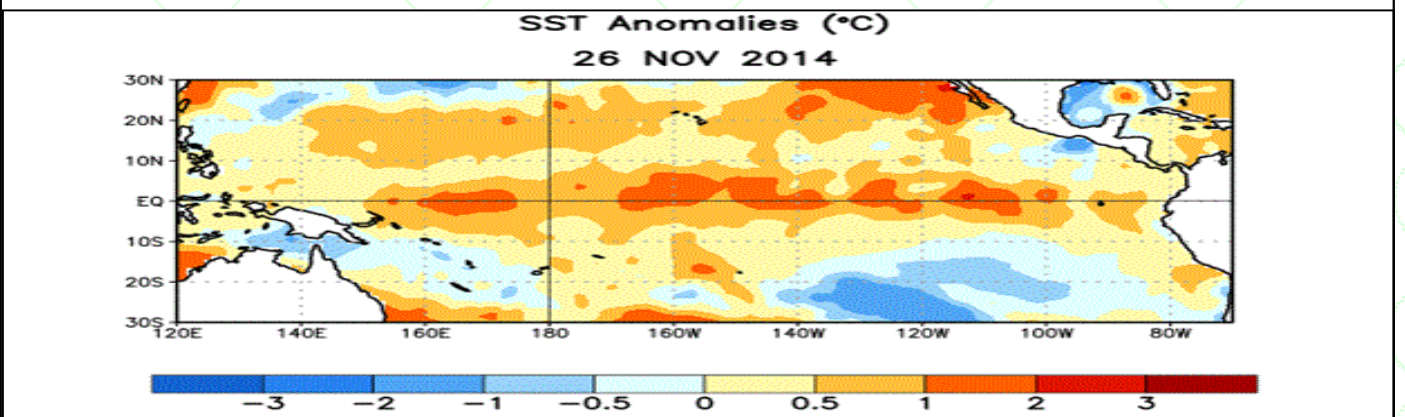


Figure 1: Average SST anomalies for the week centered on 26 November 2014. Above normal SSTs were present across the equatorial Pacific Ocean. Graphic Source: National Oceanic and Atmospheric Administration (NOAA).

RAINFALL IN 2014

Despite El Niño not fully being established in the Pacific Ocean, Fiji's rainfall showed some El Niño-like pattern in 2014. The annual total rainfall was *average to below average* across the country during the year. Out of the 26 rainfall monitoring sites (Figure 2a), 16 received *below average* rainfall and 10 *average*. The nationally averaged rainfall was 2035.2mm, which was 336.4mm below the long term average of 2371.6mm. This places 2014 at 15th driest year in 58 years of record (Figure 2b).

Monasavu, Seaqaga, Doboilevu, Viwa Savusavu, Koronivia and Vatukoula observed near-record dry years. It was the second driest year on record for Seaqaga and Monasavu, while it was third driest at Doboilevu and Viwa. The annual total rainfall at Savusavu ranked 4th lowest on record and 5th lowest at both

Koronivia and Vatukoula.

The wettest location during the year was Monasavu with 3733mm of rainfall, followed by Tokotoko with 3637mm and Rotuma with 3352mm. On the other hand, the driest was Viwa with 919mm of annual total rainfall, followed by Ono-i-lau with 1138mm and Lautoka Mill with 1199mm.

The top three 1 day rainfall in 2014 were 311mm at Matuku on February 26th, followed by 207mm at Laucala Bay on February 26th and 198mm at Laucala Bay on December 27th.

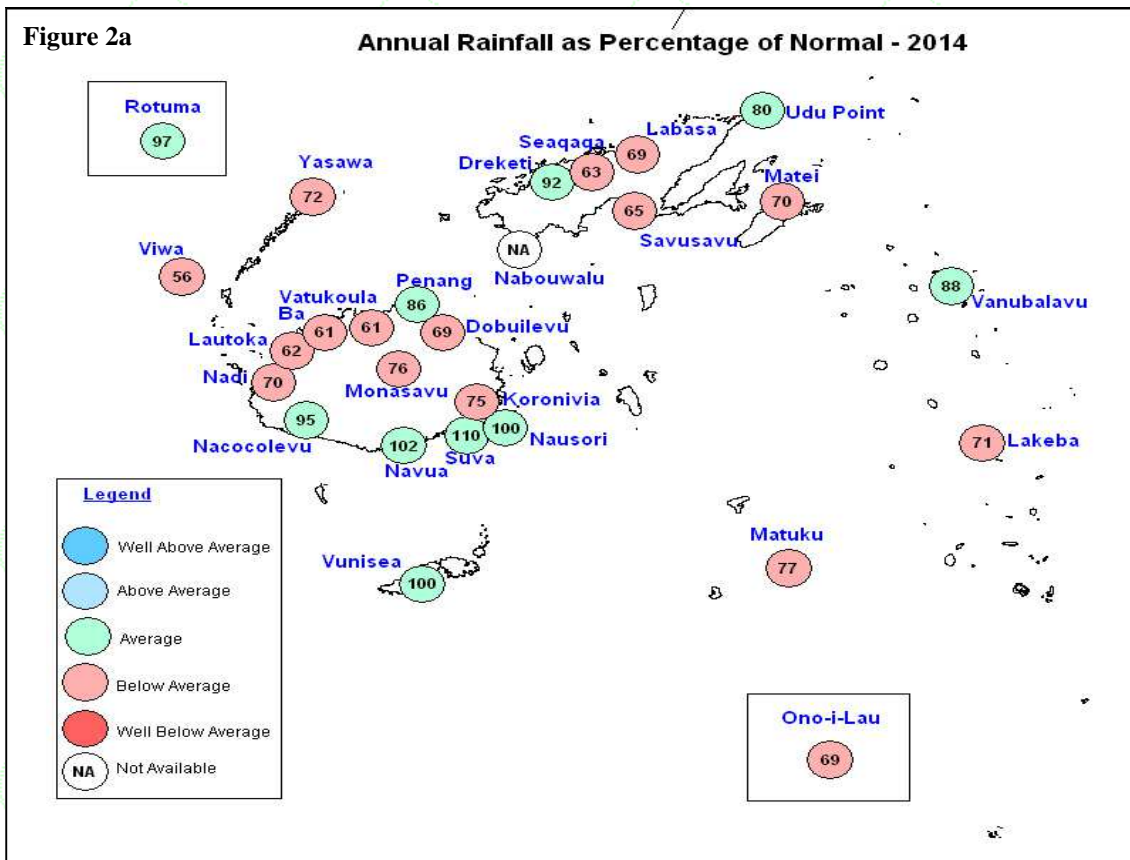
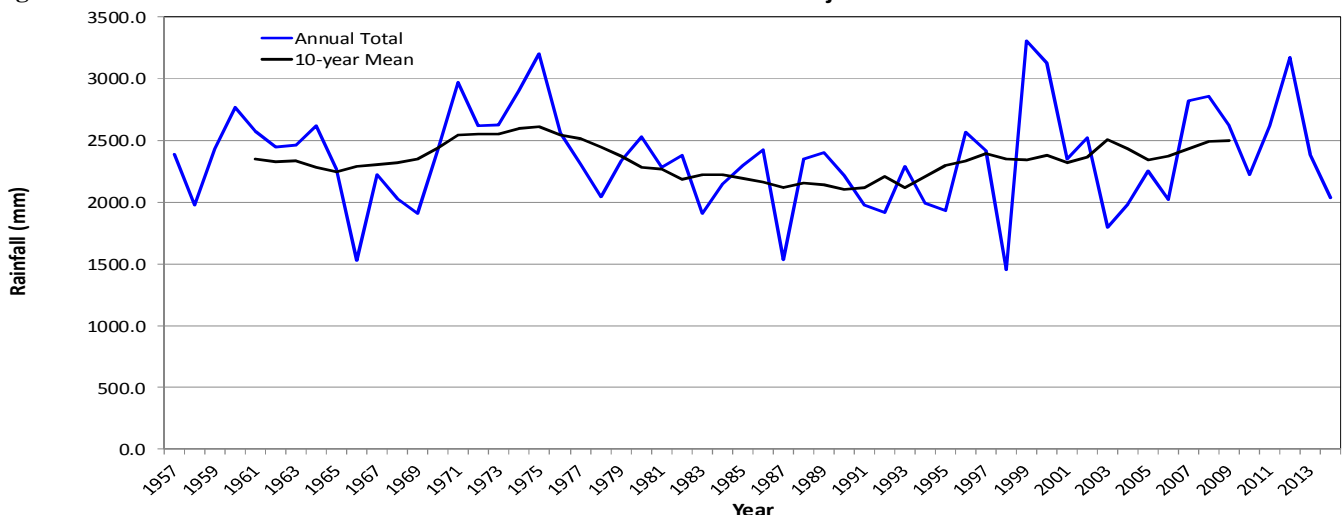


Figure 2b

Annual Mean Rainfall for Fiji



MEAN AIR TEMPERATURE

The annual mean air temperature was 25.8°C, which was 0.2°C warmer than normal. The 2013 annual mean air temperature remains the 2nd warmest year on record while the warmest annual mean air temperature was observed in 2007.

The annual mean air temperatures in 2014 were generally *normal* in most parts of the country. On monthly mean temperatures, July was the only month with cooler than *normal* temperature (Figure 3).

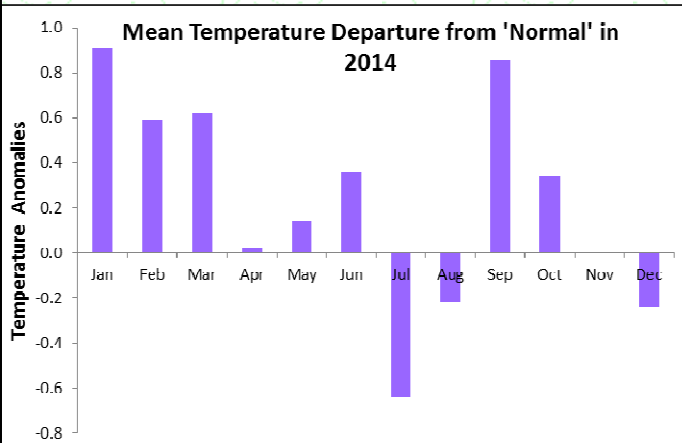


Figure 3: Monthly average mean temperature departure from normal.

At **Laulala Bay (Suva)**, the annual mean air temperature was 26.1°C which was 0.3°C warmer than *normal*. Significant positive departures from *normal* ($\geq 1.0^\circ\text{C}$) of +1.2°C was recorded in January and +1.0°C in September and there were no significant negative departures recorded at the station.

At **Labasa Airfield**, the annual mean air temperature was 26.1°C, which was 0.4°C warmer than the *normal*. Apart from August (-0.6°C), the monthly mean temperatures were *normal*

to *above normal* during the year. Notable significant positive departures ($\geq 1.0^\circ\text{C}$) were recorded in March (+1.1°C), May (+1.4°C) and June (+1.1°C), followed by January, February and September. Other positive departures ($\geq +0.5^\circ\text{C}$) were recorded in April, July and October. Other negative departures ($\leq -0.5^\circ\text{C}$) were recorded in November and December.

The annual mean air temperature at **Nadi Airport** was 25.9°C, which recorded 0.3°C warmer than *normal*. Positive departures from *normal* were recorded for most of the months, with significant positive ($\geq 1.0^\circ\text{C}$) departures recorded in September (+1.3°C), followed by January, March and October, with anomalies ranging between +0.6°C to +0.8°C. Negative departure of -0.8°C was recorded in July, followed by -0.3°C in April and May.

The annual mean temperature at **Lakeba Island (Lau Group)** was 26.0°C, which was 0.3°C *above normal*. The monthly mean temperatures at Lakeba were *normal* to *above normal* except for July, which recorded departures within the *below normal* range. Notable significant positive departures of +1.0°C were recorded in January and February, followed by +0.9°C in October and +0.8°C in May.

At **Vunisea (Kadavu)**, the annual mean air temperature was 25.7°C, which was 0.2°C *above normal*. The station recorded *normal* ($\pm 0.5^\circ\text{C}$) temperatures during 75% of the year, while *above normal* temperatures were recorded during the remaining 25%. Notable significant positive departure of +1.1°C was recorded in September, followed by +1.0°C in January and +0.6°C recorded in February (Appendix 1E).

MINIMUM AIR TEMPERATURE

The annual average night-time (minimum) air temperature was 22.1°C, which was 0.2°C warmer than the *normal*. In comparison to the other years, 2007 and 2013 are still the warmest years with 0.9°C and the coolest nights were observed in 1978 (-0.6°C) followed by 1968 (-0.4°C).

The monthly average night-time air temperatures ranged from 19.0°C to 24.2°C across the country. With the exception of July, recording -1.0°C, *normal* to *above normal* night-time air temperatures were recorded persistently throughout the year. There were no significant ($> +1.0^\circ\text{C}$) positive departures recorded during the year but the highest positive departure of +0.8°C was recorded in January, followed by +0.6°C in October (Figure 4).

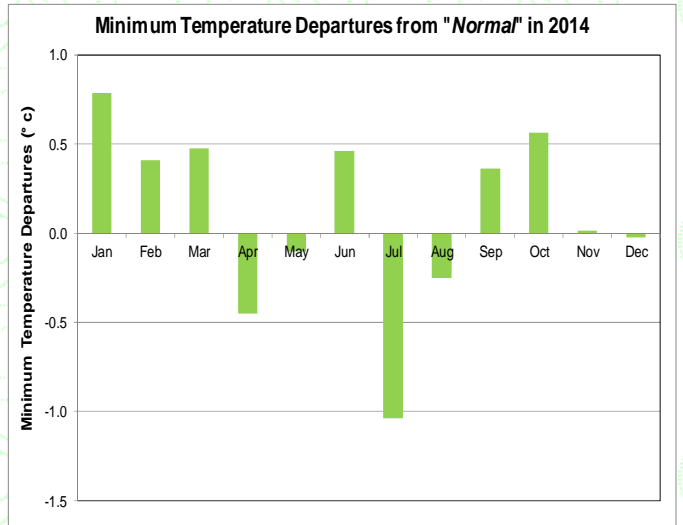


Figure 4: Monthly average night-time (minimum) temperature departure from normal.

Note: All comparisons are done against a "Climatic Normal". This is defined to be an average climate condition over a 30-year period. Fiji uses 1971-2000 as its "climatic normal" period.

MINIMUM AIR TEMPERATURE cont'd

One (1) daily and ten (6) new mean monthly night-time air temperature records were established around the country during the year (Table 2). The only daily minimum temperature recorded was at Ono-i-Lau, on the 26th January.

The annual average night-time temperature at **Laucala Bay (Suva)** was 23.0°C, which was 0.6°C warmer than *normal*. *Normal to above normal* temperatures were recorded throughout the year at the station. Significant positive departures ($\geq 1.0^\circ\text{C}$) were recorded in January (+1.4°C), February (+1.0°C) and March (+1.1°C) (Table 4).

The **Labasa Airfield** annual average night-time temperature was *normal* in 2014. Significant positive departures from *normal* were recorded from May to June, with +1.1°C, followed by +0.9°C in February, +0.7°C in March and +0.6°C in January. However, significant negative departure of -1.7°C was recorded in August, followed by -0.7°C in July and -0.6°C recorded in September (Table 4).

At **Nadi Airport**, the annual average night-time temperature was 21.5°C, which was 0.6°C *above normal*. Significant positive departures ($\geq 1.0^\circ\text{C}$) were recorded in September (+1.6°C), Octo-

ber (+1.3°C), March and June (+1.0°C), followed by January (+0.9°C), February and December (+0.8°C). In contrast, negative departure was recorded in July (-0.7°C) (Table 4).

The annual average night-time temperature at **Lakeba (Lau Group)** was 23.1°C, which was 0.4°C *above normal*. Significant ($\geq 1.0^\circ\text{C}$) positive anomaly was recorded in October (+1.1°C), followed by June (+0.9°C), January and February (+0.8°C). Notably, negative departures were recorded in July (-0.9°C) and April (-0.8°C) (Table 4).

Vunisea (Kadavu) recorded annual average night-time temperature of 22.4°C, which was 0.8°C *above normal*. *Normal to above normal* night-time air temperatures were recorded at the station. Notable significant positive departures were recorded in January (+1.3°C), +1.2°C in February and September, +1.1°C in June and +1.0°C in March and August, followed by +0.9°C in October and November and +0.7°C in December. There were no notable negative departures recorded during the year (Table 4).

MAXIMUM AIR TEMPERATURE

The annual average daytime (maximum) air temperature was 29.5°C, which was 0.3°C *above normal*. The country experienced relatively warmer daytime temperatures during January, February, March, April and September, with departures from *normal* between +0.6°C to +1.4°C (Figure 5). In contrast, the rest of the months recorded *normal* to cooler than *normal* departures at the rest of the stations. Significantly warmer than *normal* ($\geq 1.0^\circ\text{C}$) monthly mean maximum temperature were recorded in January (+1.2°C) and September (+1.4°C).

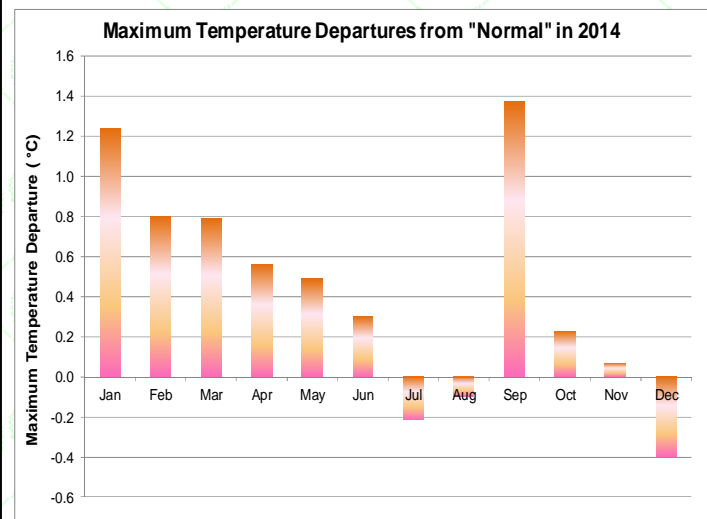


Figure 5: Monthly average day-time (maximum) temperature departure from normal with warmer than normal period from April to August and November to December.

There were ten (10) new daily high daytime (maximum) temperature recorded, with seventeen (17) new mean monthly high maximum temperatures (Table 2). The highest daily maximum temperature of 35.3°C was recorded at Viwa on 21st November, which replaced a previous record of 35.0°C, which was established in 1998.

The annual average daytime temperature at **Laucala Bay (Suva)** was 29.1°C, which was 0.1°C warmer than *normal*. The monthly temperatures ranged from 26.3°C to 31.9°C. With the exception of December, the station recorded *normal* to warmer than *normal* daytime temperatures. Notable significant positive departures ($\geq 1.0^\circ\text{C}$) from *normal* were recorded in January and September (+1.1°C) and followed by February (+0.7°C). The rest of the months recorded *normal* anomalies (Table 3).

The annual daytime temperature at **Labasa Airfield** was 31.6°C, which was 0.9°C warmer than *normal*. The mean monthly temperatures ranged from 30.0°C to 33.0°C, with the highest of 32.5°C recorded in March. Notable significant positive departures from *normal* were recorded in September (+1.9°C), May (+1.8°C), March (+1.5°C), April and June (+1.2°C) and July (+1.0°C). The rest of the months recorded *normal* ($\pm 0.5^\circ\text{C}$) anomalies (Table 3).

At **Nadi Airport**, the annual average daytime temperature was 30.3°C, which was in the *normal* category. The monthly temperatures ranged from 27.7°C to 32.0°C. Notable positive departure of +1.0°C was recorded in September, followed by +0.7°C in March. Negative departures from *normal*

MAXIMUM AIR TEMPERATURE cont'd

was recorded in May (-0.6°C), while the rest of the stations recorded *normal* temperatures (Table 3).

Annual average daytime temperature on **Lakeba Island** was 29.0°C, which was 0.5°C above *normal*. The monthly daytime temperatures ranged from 26.0°C to 31.7°C at the station. Apart from November, which recorded *below normal* anomaly, *normal* to warmer than *normal* temperatures were recorded during the rest of the months. Notable significant positive departure of +1.3°C was recorded in January, +1.2°C in February and +1.1°C in May, while other *above normal* (<1.0>0.5) departures were recorded in March (+0.6°C), April (+0.8°C), September (+0.9°C) and October (+0.8°C) (Table 3).

The annual average daytime temperature at **Vunisea** (Kadavu) was 0.9°C warmer than *normal*. The temperatures fluctuated between 26.1°C to 31.9°C. Temperatures were *normal* to *above normal* during the year. Notable significant positive departure ($\geq +1.0^\circ\text{C}$) from *normal* were recorded in September (+2.3°C), January and April (+2.0°C), followed by February (+1.3°C), March (+1.2°C) and May (+1.1°C). There were no notable significant negative departures recorded during any of the months (Table 3).

SUNSHINE IN 2014

The annual total sunshine was *near normal* (within 10% of annual *normal*) at Nadi Airport, Koronivia and Laucala Bay. Of the three stations, Nadi Airport was the sunniest location in 2014, recording 2587 hours of sunshine, followed by Laucala Bay (1994 hours) and Koronivia (1811 hours) (Table 1).

The annual total bright sunshine at Laucala Bay was 104% of *normal*. The station recorded *well above normal* bright sunshine in September, with 142% of *normal* hours recorded. On the other hand, almost half the *normal* (54% of *normal*) hours was received in October. The highest total bright sunshine was recorded in January (220 hours), while the lowest was in October (88 hours).

Nadi Airport received 102% of *normal* bright sunshine during the year. It was significantly cloudier than *normal* in October with 71% of *normal* sunshine hours recorded. The sunniest month was August (264 hours), while October recorded the least hours of sunshine (168 hours).

The total annual bright sunshine at Koronivia was 103% of *normal*. It was significantly brighter than *normal* during September, with *well above normal* sunshine recorded (148% of *normal*). On the other hand, like Nadi and Laucala Bay, Koronivia also received *well below normal* sunshine in October (51% of *normal*). The highest total bright sunshine hours was experienced in March (187 hours), while the lowest was in October (75 hours).

Table 1: Annual sunshine hours in 2014

Location	Sunshine (hours)	% of Normal	Comments
Laucala Bay	1994	104	Near Normal
Nadi Airport	2587	102	Near normal
Koronivia	1811	103	Near normal

Note: All comparisons are made against a “Climatic Normal”. This is defined to be an average climate condition over a 30 -year period. Fiji uses 1971-2000 as its “climatic normal” period.

WIND SUMMARY - Mean Wind (10 minutes average)

The 10-minute average wind statistics recorded at every three hourly intervals at Nadi and Nausori Airports, showed that east to southeast winds were the predominant wind directions during 2014. The mean annual wind speed at Nadi and Nausori Airports were 5.8 knots and 3.4 knots, respectively.

Nadi Airport experienced calm conditions on 10.6% of the instances during the year. Easterly winds were predominant and accounted for 27.9% of the observations, followed by southeasterly winds with 23.3%, and westerly winds with 14.6% (Figure 6(a)). The winds at Nadi Airport were generally light to moderate in strength (Figure 6(b)).

Calm conditions were predominant at Nausori Airport, accounting for a little over half of the three hourly statistics. Southeast-erly wind direction was the most common and accounted for 18.3% of the observations, followed by easterly winds with 17.0% and southerly winds with 6.0% (Figure 7(a)). The wind speed at the station were generally slight to moderate in strength (Figure 7(b)).

light air: 1-3 knots, slight breeze: 4-6 knots, gentle breeze: 7-10 knots, moderate breeze: 11-16 knots, fresh breeze: 17-21 knots, strong breeze: 22-27 knots, near gale: 28-33 knots, gale: 34-40 knots

ANNUAL FREQUENCY OF WIND DIRECTIONS AND SPEEDS AT NADI AND NAUSORI AIRPORTS

Figure 6(a) Surface Wind Direction for Nadi Airport, Fiji. (WMO 91680, Latitude 17°45'35"South, Longitude 177°26'42"East, Height above MSL 22 meters)

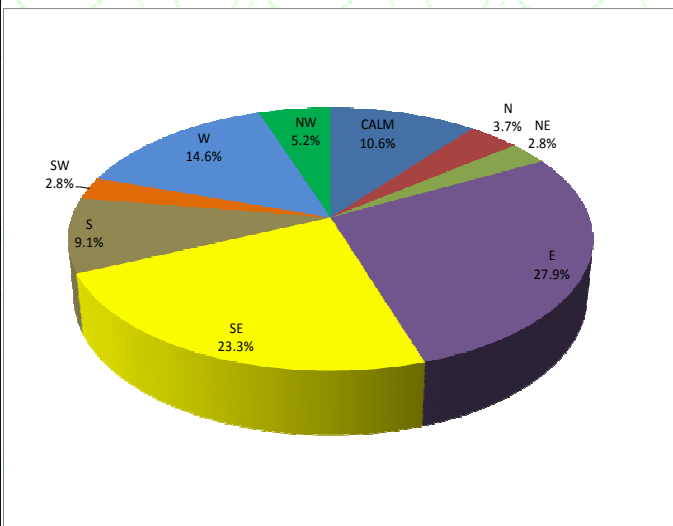


Figure 6(b) Surface Wind Speed for Nadi Airport, Fiji. (WMO 91680, Latitude 17°45'35"South, Longitude 177°26'42"East, Height above MSL 22 meters)

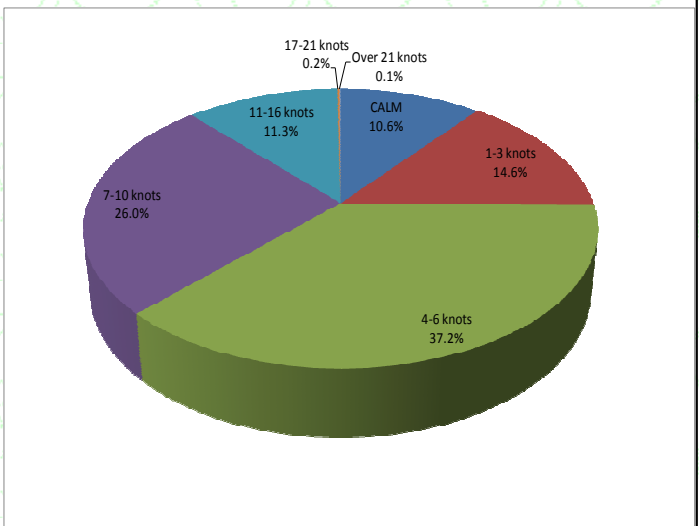


Figure 7(a) Surface Wind Direction for Nausori Airport, Fiji. (WMO 91683, Latitude 18°02'47"South, Longitude 178°33'33"East, Height above MSL 3 meters)

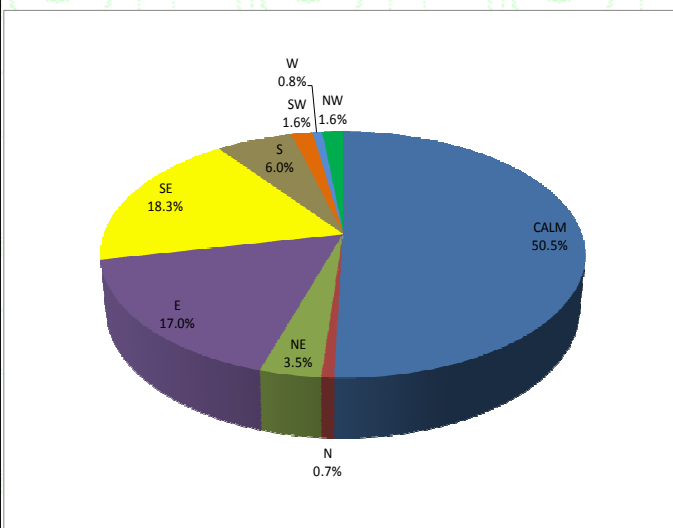
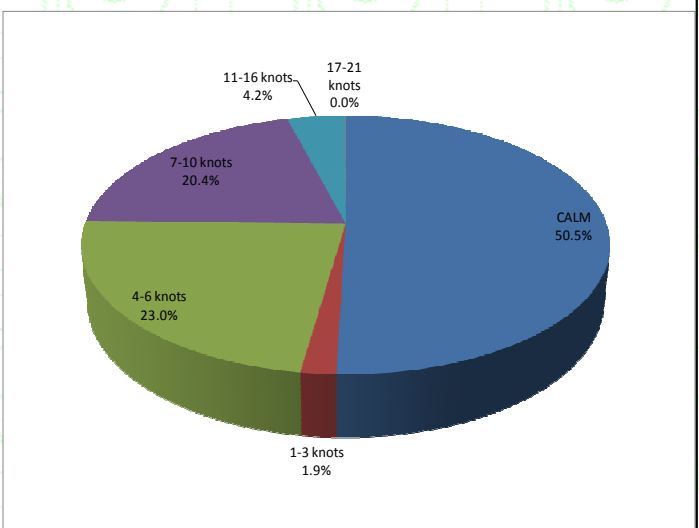


Figure 7(b) Surface Wind Speed for Nausori Airport, Fiji. (WMO 91683, Latitude 18°02'47"South, Longitude 178°33'33"East, Height above MSL 3 meters)



NEW RECORDS

A total of fifty six (56) new climate extremes were established in 2014, which included sixteen (16) daily and forty (40) monthly records. In total, thirty-four (34) were temperature, one (1) sunshine and twenty-one (21) rainfall new records. In contrast, there were thirty nine (39) and twenty seven (27) new records established in 2013 and 2012, respectively.

On monthly basis, out of forty new records, seventeen(17) were maximum air temperature, six (6) minimum air temperature, one (1) sunshine and sixteen (16) rainfall records. On daily basis, there were sixteen (16) new daily records, which included five (5) rainfall (new highs), ten (10) maximum temperatures (all new highs) and one (1) minimum temperature (all new highs) (Table 2). Majority of the new records were set in the months of September (15), followed by February (9) and January & August (7).

Table 2: Summary of new rainfall and temperature records established across the country in 2014.

Table 2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Daily Rainfall	-	2	-	-	1	-	-	-	-	-	-	2	5
Daily Maximum Temperature	-	-	2	-	1	-	-	-	5	1	1	-	10
Daily Minimum Temperature	1	-	-	-	-	-	-	-	-	-	-	-	1
Monthly Total Rainfall	-	2	-	-	-	-	-	6	5	-	-	3	16
Monthly Maximum Temperature	5	5	-	1	1	-	-	-	5	-	-	-	17
Monthly Minimum Temperature	1	-	-	2	-	-	2	1	-	-	-	-	6
Total Monthly Sunshine	-	-	-	-	-	-	-	-	-	1	-	-	1
Total	7	9	2	3	3	0	2	7	15	2	1	5	56

SEA LEVELS IN 2014 (LAUTOKA AND SUVA SEAFRAME STATIONS)

The mean sea level during the year at Lautoka SEAFRAME station was 1.30 meters, with a maximum of 2.52 meters in January and a minimum of 0.079 meters in August (Figure 8).

The mean sea level at Suva SEAFRAME station was 1.21 meters, with a maximum of 2.29 meters in January and a minimum of 0.18 meters in August.

The sea level trend at the Lautoka SEAFRAME station for the period 1993 to 2014 is +5.6mm/year. However, the observational record is relatively short in climate terms and therefore it is still prone to the effects of shorter-term ocean variability (such as El Niño and decadal oscillations). As the data sets increase in length, the linear trend estimates will become increasingly indicative of the longer-term changes and less sensitive to large annual and decadal fluctuations. Nevertheless, similar trend values are being observed across the region.

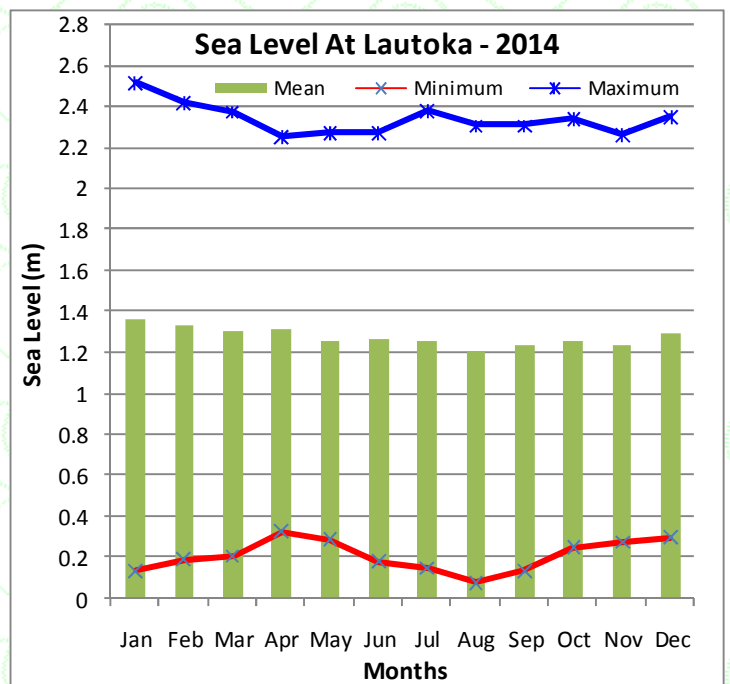


Figure 8: Sea level observed in 2014 at Lautoka tide gauge.

SEASONAL CLIMATE FORECAST VERIFICATION

Fiji Meteorological Service used data from twenty six (26) sites around the country to monitor the climate of Fiji in 2014. The national, divisional and locality forecasts were issued seasonally (3month periods) and verified for individual locations. There were 29% of consistent forecasts or had the total observed rainfall in the predicted category, 41% near consistent forecasts, 25% inconsistent forecasts and 5% of the forecasts could not be verified (due to missing observations).

The results for consistent, near consistent and inconsistent forecast for each station is presented in Figure 9. There was a high success rate in the seasonal predictions for the Eastern Division (38%), followed by the Western (29%), Central (25%) and Northern Divisions (24%).

The overall assessment of the model performance in 2014 is rated as good to very good compared to the total variance explained by the predictor (SST) in the Fiji region. It needs to be noted that there are other factors that drives Fiji's rainfall and the skill in the prediction can be significantly improved with dynamical modelling coupled with the skill and experience.

In total, three hundred and twelve (312) individual seasonal climate predictions were issued. Of these, eighty-nine (89) of the forecasts were consistent, one hundred and twenty-eight (128) near consistent and seventy nine (79) inconsistent forecasts, while sixteen (16) forecasts could not be verified due to unavailability of the data or missing records.

During wet season, there were 28% consistent forecasts, 44% near consistent forecasts, 24% inconsistent forecasts and 4% unverified forecasts. Similarly, during dry season, 30% consistent forecasts, 38% near consistent, 26% inconsistent and 6% unverified forecasts.

In the **Western Division**, 29% of the forecasts were consistent, 49% near consistent and 22% inconsistent. The wet season had a higher consistency rate (32%) compared to the dry season (26%).

In the **Central Division**, there were 25% consistent forecasts, 48% near consistent forecasts and 27% inconsistent forecast. For Central Division, there was high consistency in the dry season prediction (38%) compared to the wet season prediction (12%).

For the **Eastern Division**, 38% of forecasts were consistent, 22% near consistent, 20% inconsistent and 20% unverified forecasts. The Eastern Division had higher consistency rate during dry season (40%) compared to wet season (37%).

In the **Northern Division**, 24% of forecasts were consistent, 39% near consistent, 32% inconsistent and 5% unverified forecasts. The Northern Division has the same consistency rate for dry and wet season (24%).

For **Rotuma**, 42% of the forecast were consistent, 50% near-consistent and 8% inconsistent. Higher consistency rate during wet season (50%) compared to dry season (33%).

2014/15 TROPICAL CYCLONE OUTLOOK VERIFICATION

Fiji Meteorological Service in its 2014/2015 Seasonal Tropical Cyclone Outlook predicted six to ten (6-10) tropical cyclones to occur within the RSMC Nadi AOR. Two to four (2-4) of these were anticipated to reach category 3, with 1 to 2 reaching category 4 or 5.

During 2014/15 Tropical Cyclones season, 16 systems developed but only 5 managed to advanced to a tropical cyclone stage while rest of the systems remained in either in a tropical disturbance or tropical depression stage. The 5 named Tropical Cyclones in RSMC Nadi's AOR are namely; Niko, Ola, Pam, Reuben and Solo.

As predicted, two tropical cyclones did reach category three and above and one reached category 5. Over all, TC Rueben managed to reach maximum intensity of Category one cyclone, TC Niko and Solo reached Category two status, TC Ola was able to sustain up to category three, while TC Pam attained a maximum intensity of Category 5.

SEASONAL CLIMATE FORECAST VERIFICATION

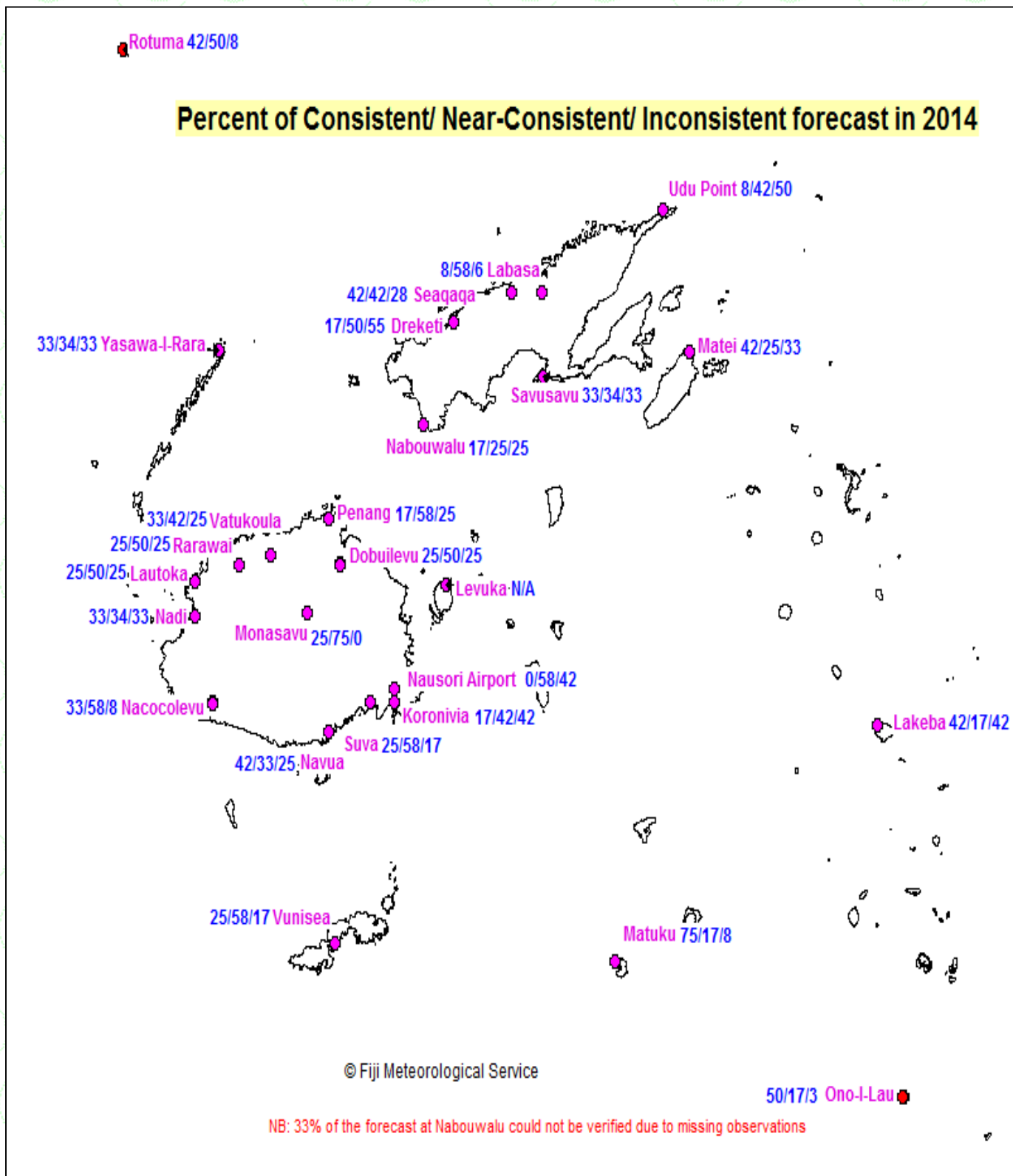


Figure 9: Percentage of consistent /near consistent and inconsistent forecasts at individual locations in 2014.

Forecast is consistent when observed and predicted (tercile with the highest probability) categories coincide (are in the same tercile). Forecast is near-consistent when observed and predicted (tercile with the highest probability) differ by only one category (i.e. terciles 1 and 2 or terciles 2 and 3). Forecast is inconsistent when observed and predicted (tercile with the highest probability) differ by two categories (i.e. terciles 1 and 3). Forecast is unverified when forecast could not be verified due to data gap in the forecast period.

TROPICAL CYCLONES ACTIVITY IN FIJI AND THE SOUTHWEST PACIFIC REGION

The Regional Specialized Meteorological Centre (RSMC) - Tropical Cyclone Centre (TCC) Nadi Area of Responsibility (AoR) extends from the equator to 25°S and 160°E to 120°W. Six (6) tropical cyclones occurred within the RSMC Nadi - TCC AoR in 2014. These tropical cyclones were namely; Ian, Lusi, June, Edna, Kofi and Mike. (Figure 10). None of these tropical cyclones directly affected Fiji, however, associated outer rain bands affected some parts of the country.

Tropical Cyclone (TC) **IAN** was the first cyclone to form in Fiji's Area of Responsibility (AOR) in 2014. Ian was named over open waters between Fiji and Tonga on Jan 6th, 2014. It continued to move northwards till January 9th before tracking southeastwards over central Tonga and moved further south, away from the group on the 11th January. TC Ian left Fiji's AOR later on the 12th of Jan as a category 4 system. Ian reached a maximum intensity of a category 5 system with maximum sustained winds about 110 knots and gusts up to 155 knots .

TC **JUNE** was named by RSMC Nadi at 170400UTC, with estimated sustained winds of 35 knots close to its centre. June reached a maximum intensity of a category 1 system with maximum sustained winds estimated to be 40 knots and gusts to 55 knots. TC June passed over the island of Belep and just near or very close to Surprise Island and to the west of New Caledonia as category 1 system. It weakened into an extra-tropical low pressure system southwest of New Caledonia on the 18th.

TC **EDNA** was named on the 4th February 2014 as a category 1 system. It passed as a category 2 cyclone off the western coast of New Caledonia's largest island, Grande Terre on the 4th and 5th of February, 2014. Edna reached a maximum intensity of a category 2 system with maximum sustained winds estimated to be 50 knots and gusts up to 70 knots with minimum central pressure of 996hPa . TC Edna moved out of RSMC Nadi's AoR at approximately 1500UTC on the 5th February.

TC **KOFI** originated from TD15F located about 270km west of Nadi on 22nd February 2014. The system developed rapidly and it was named as TC KOFI at 0000UTC on the 1st March. Kofi gradually intensified and became a category 2 system on the 2nd March, 2014 with estimated sustained winds close to the centre about 50 knots. Kofi exited the Fiji's AoR and into the Wellington AoR in the early morning of the 3rd March, 2014 as a category 2 system.

TC **LUSI** originated from TD18F and was named at 092200UTC March 2014. On the 11th, it strengthened into a category 2 system and continued to intensify under favorable condition and advanced into category 3 system on 12th. By 13th, TC Lusi started to gradually weaken and exited RSMC Nadi's AoR as Category 2 system.

TC **MIKE** was named in RSMC Nadi's AoR at 190100UTC March 2014. It passed through the Southern Cooks as a category 1 cyclone approximately between 0000 and 2000UTC on the 19th March. Mike eventually weakened into an extra-tropical low pressure system south of 25°S.

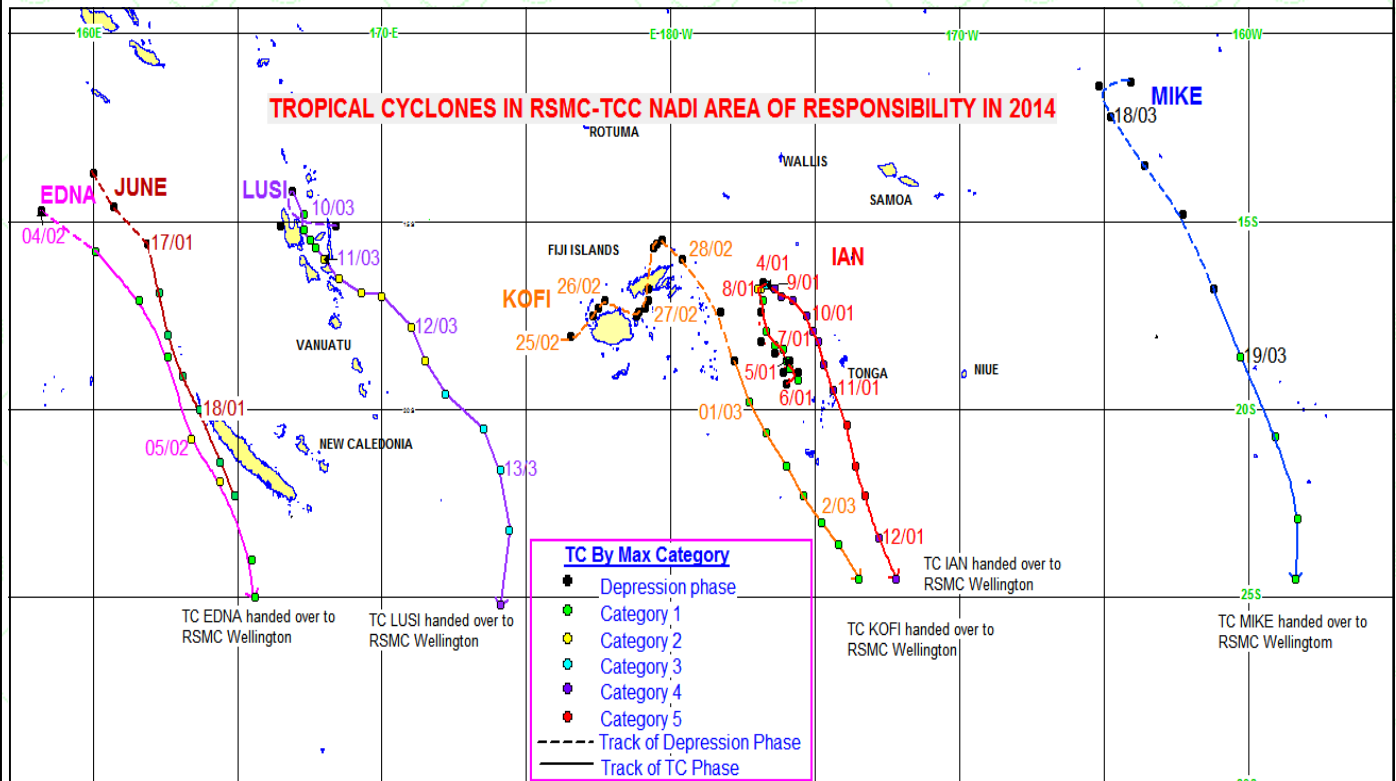


Figure 10: Tracks of TC's within the RSMC Nadi AoR in 2014.

TABLE 3: MAXIMUM AIR TEMPERATURE

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Labasa Airfield	Max	32.5	31.8	30.9	32.2	31.8	31.3	30.6	30.8	30.6	30.7	32.0	32.1	31.4
	Dep	0.8	0.2	-0.6	1.2	1.6	1.5	1.4	1.4	0.5	-0.1	0.6	0.4	0.7
Savusavu	Max	31.2	30.8	30.3	29.6	29.3	28.6	27.0	27.5	27.6	27.9	30.7	31.2	29.3
	Dep	0.6	0.1	-0.3	-0.2	0.8	0.7	0.0	0.4	0.2	-0.3	1.3	1.0	0.4
Penang Mill	Max	31.6	30.6	30.6	30.6	29.5	29.2	27.9	29.0	28.9	29.5	31.4	31.5	30.0
	Dep	1.3	0.1	0.1	1.0	1.0	1.5	0.5	1.6	0.9	0.6	1.7	1.2	0.9
Nadi Airport	Max	31.8	30.6	30.4	30.9	29.8	29.3	28.5	29.3	29.3	29.5	31.0	30.9	30.1
	Dep	0.3	-1.0	-0.9	0.2	0.1	0.3	-0.1	0.6	0.0	-0.8	-0.1	-0.6	-0.2
Lauca Bay, Suva	Max	31.2	30.8	30.9	30.8	29.5	28.6	27.8	27.9	27.9	28.2	30.9	31.2	29.6
	Dep	0.4	-0.4	0.0	0.9	1.0	0.9	1.0	1.2	0.7	0.0	1.6	0.9	0.7
Nausori Airport	Max	30.8	30.8	30.5	30.1	28.9	27.9	26.7	26.9	27.1	27.5	30.3	30.8	29.0
	Dep	0.4	0.0	0.0	0.8	1.1	0.7	0.4	0.7	0.5	-0.1	1.5	1.1	0.6
Matuku, Lau	Max	30.1	29.1	28.7	29.6	29.2	27.7	26.7	27.2	26.7	27.2	29.4	29.8	28.5
	Dep	-0.1	-1.6	-1.7	0.4	1.6	0.8	0.7	1.4	0.3	-0.2	0.7	0.1	0.2
Lakeba	Max	30.6	31.3	30.4	30.1	29.4	28.1	27.0	27.2	27.3	28.2	30.4	30.6	29.2
	Dep	0.5	0.8	0.1	0.8	1.4	0.9	0.6	0.8	0.5	0.5	1.6	0.9	0.8

TABLE 4: MINIMUM AIR TEMPERATURE

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Labasa Airfield	Min	22.5	22.0	21.7	21.2	19.5	20.2	19.5	19.9	20.5	21.2	22.5	21.7	21.0
	Dep	0.3	-0.4	-0.6	-0.1	-0.4	1.3	1.4	1.2	1.2	1.4	1.3	0.0	0.6
Savusavu	Min	24.2	23.6	23.3	24.0	23.1	23.0	21.9	22.7	22.2	22.2	22.7	23.3	23.0
	Dep	0.7	-0.1	-0.3	0.8	0.8	1.4	0.9	1.9	1.0	0.3	0.1	0.3	0.6
Penang Mill	Min	24.2	23.1	23.9	24.0	21.9	22.5	21.2	21.6	21.7	22.4	23.6	23.5	22.8
	Dep	0.2	-0.8	0.1	0.8	-0.2	1.1	0.8	0.9	0.5	0.2	0.6	0.0	0.3
Nadi Airport	Min	23.9	23.2	23.7	23.0	21.7	21.3	19.8	20.6	20.3	21.8	23.2	23.3	22.3
	Dep	1.1	0.3	0.9	1.2	1.5	2.1	1.4	2.0	1.0	1.3	1.4	0.9	1.3
Lauca Bay, Suva	Min	25.2	24.6	24.9	25.0	24.1	23.7	22.9	23.0	23.2	24.1	24.6	24.8	24.2
	Dep	1.3	0.6	1.0	1.7	1.9	2.3	2.2	2.3	2.2	2.2	1.8	1.3	1.7
Nausori Airport	Min	23.2	23.2	23.3	22.8	22.0	21.6	20.5	20.5	20.9	21.0	23.1	23.0	22.1
	Dep	0.1	-0.1	0.1	0.3	0.9	1.1	0.9	0.9	0.9	0.1	1.3	0.4	0.6
Matuku, Lau	Min	23.9	23.5	23.5	23.6	23.3	22.3	20.9	21.4	21.9	22.5	24.3	24.3	23.0
	Dep	-0.5	-1.2	-1.1	-0.3	0.8	0.6	0.1	0.9	1.1	0.7	1.4	0.5	0.3
Lakeba, Lau	Min	24.8	24.6	24.6	24.5	24.1	23.6	22.3	22.4	22.9	23.4	24.1	24.4	23.8
	Dep	1.7	0.5	0.6	0.7	1.4	1.6	1.3	1.4	1.5	1.3	1.0	0.7	1.1

TABLE 5: SUNSHINE HOURS AND PERCENTAGE OF NORMAL

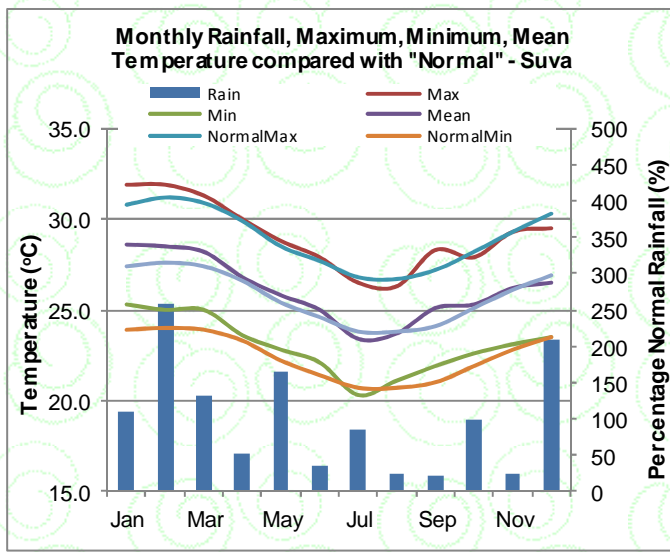
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Koronivia	Actual	209.7	173.3	186.9	168.8	134.5	123.6	141.5	128.6	183.1	74.8	163.7	122.9	1811.4
	%	124	106	114	114	98	96	116	93	148	51	111	73	103
Nadi Airport	Actual	253.7	179.2	221.5	192.9	231.3	219.3	224	263.9	216.8	168.4	231.2	184.9	2587.1
	%	120	96	115	97	111	107	102	115	103	71	104	81	102
Laucala Bay, Suva	Actual	220	175.1	187.5	186.2	158.6	136.1	149.2	151.8	192.2	87.7	202.6	146.7	1993.7
	%	114	99	111	121	109	97	111	106	142	54	121	75	104

TABLE 6: TOTAL MONTHLY RAINFALL (MM) AND PERCENTAGE OF NORMAL RAINFALL

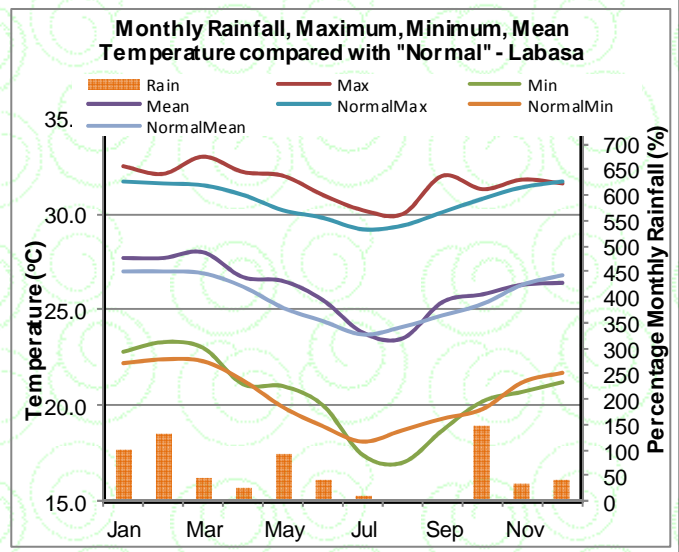
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Labasa Airfield	Actual (mm)	172.0	238.5	714.4	21.8	77.7	82.4	33.2	131.4	131.7	90.9	283.3	211.0	2188.3
	%	45	69	192	9	68	124	61	276	184	74	155	88	98
Savusavu Airfield	Actual (mm)	213.9	343.6	256.9	93.1	262.3	41.0	67.4	97.1	161.3	94.5	122.1	145.0	1898.2
	%	78	141	91	36	133	34	70	84	121	55	65	56	81
Penang Mill	Actual (mm)	311.4	462.4	414.2	289.6	139.5	102.6	61.5	30.9	37.2	124.9	115.1	253.4	2342.7
	%	79	138	97	108	86	103	111	42	39	109	72	96	96
Nadi Airport	Actual (mm)	87.9	464.8	341.7	104.1	116.5	124.9	6.3	10.7	159.3	118.7	239.2	257.6	2031.7
	%	26	159	100	65	130	195	14	17	228	117	181	144	108
Laucala Bay, Suva	Actual (mm)	188.5	434.5	444.4	240.3	143.7	140.9	238.3	155.4	173.7	248.3	155.3	449.2	3012.5
	%	51	164	119	66	53	86	176	98	98	113	63	162	100
Nausori Airport	Actual (mm)	347.7	588.1	402.6	232.4	132.2	229.5	284.5	149.3	140.8	290.4	113.6	312.9	3224.0
	%	95	220	105	64	53	152	244	102	85	149	46	117	111
Matuku Lau	Actual (mm)	83.4	445.8	440.2	104.3	48.5	114	182.0	85.4	61.6	149.4	167.7	305.1	2187.4
	%	29	193	145	45	26	90	160	66	45	105	115	166	99
Lakeba	Actual (mm)	123.0	340.8	503.0	109.4	52.5	78.8	188.4	148.2	111.3	145.6	100.9	358.2	2260.1
	%	51	151	172	53	39	98	234	145	110	118	71	200	118

APPENDIX

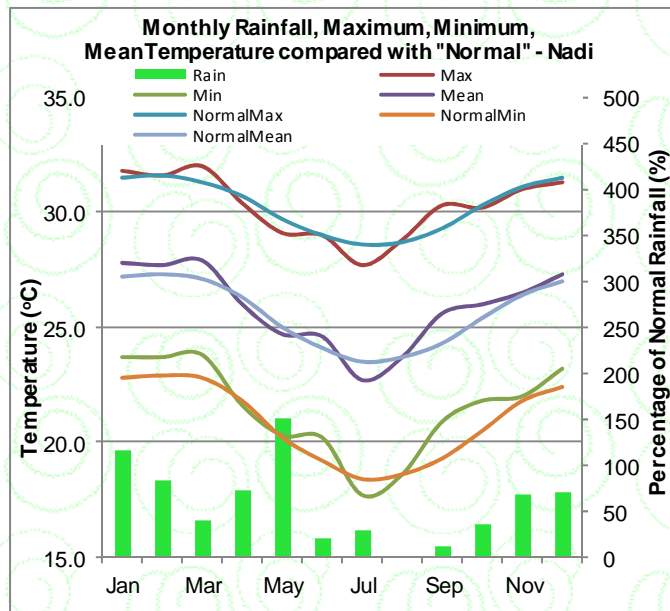
APPENDIX 1A : LAUCALA BAY, SUVA



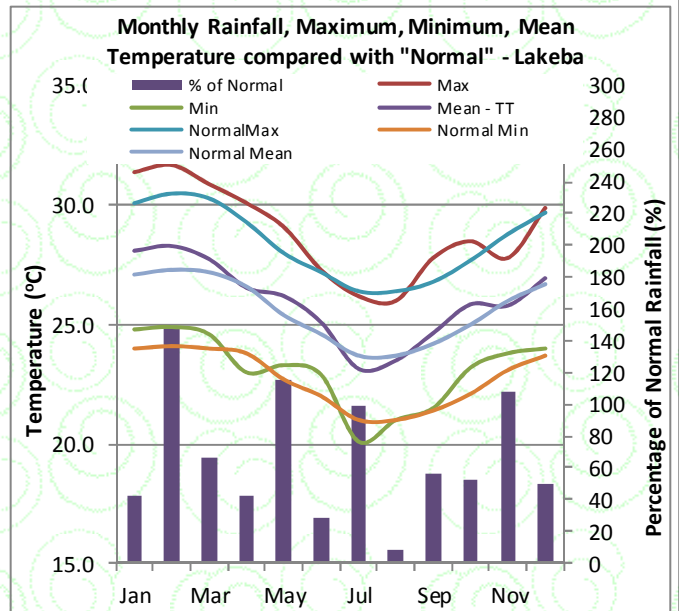
APPENDIX 1B : LABASA AIRFIELD



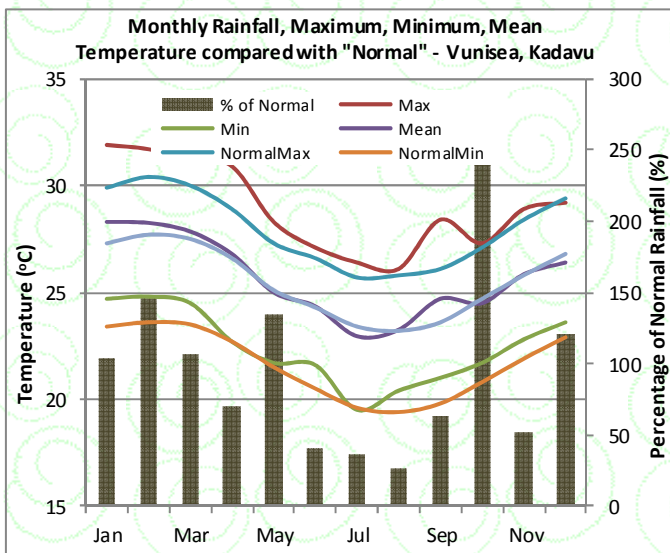
APPENDIX 1C : NADI AIRPORT



APPENDIX 1D : LAKEBA, LAU GROUP



APPENDIX 1E : VUNISEA, KADAVU



APPENDIX 1F : ROTUMA

