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Fiji Climate Summary

March 2018



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1. IN BRIEF

The 2017/2018 weak La Niña event has ended, however, rainfall continued to reflect La Niña like pattern. This is not unusual as typically La Niña effect on Fiji continues for another 2-6 months following its demise.

Troughs of low pressure systems, ridges of high pressure and Tropical Cyclone Josie was the main weather phenomenon during the month. This contributed to the generally *average to above average* rainfall recorded at most of the stations (Figure 1).

Out of the twenty four stations, twelve stations recorded *average* rainfall, 8 recorded *above average* rainfall, 3 recorded *below average* rainfall, while Viwa was the lone station with *well above average* rainfall.

The highest total monthly rainfall of 1005.5mm was recorded at Nadarivatu, followed by 678.3mm at Monasavu, 609.5mm at Dobuilevu, 572.4mm at Viwa, 539.0mm at Yaqara, 508.0mm at Seaqaqa and 506.1mm at Yasawa-i-Rara. Viwa's total monthly rainfall was also its new highest March rainfall, replacing a previous record established in 1985.

2. WEATHER PATTERNS

The month began with a trough of low pressure with cloud and rain over the western parts of the group. The trough affected Fiji from the 1st to the 6th with the highest rainfall recorded during this period was at Penang Mill of about 87mm on the 2nd. The trough later on the 6th drifted back west as a ridge of high pressure pushed in over the group from the southeast.

An easterly to north-easterly wind flow dominated the group as the ridge established itself thereafter till the 15th. The ridge of high pressure then drifted to the southwest of Fiji and the south-easterlies became dominant over the group.

The southeasterly lasted till the 21st when a trough of low pressure approached the group from the west. The trough of low pressure moistened the northerlies from the 22nd to 25th before moving onto the group on the 26th and affected Fiji till the 28th. Highest rainfall recorded was at Laucala Bay with 119mm on the 27th.

The trough then drifted to the north of Fiji on the 29th and the moist easterlies dominated the group. Monasavu Dam recorded 105.2mm of rainfall on the 29th.

The mean maximum air temperatures varied from *normal* to *above normal* during the month, with fourteen out of the 23 stations recording anomalies within $\pm 0.5^{\circ}\text{C}$, while nine stations recorded anomalies $\geq 0.6^{\circ}\text{C}$.

New high daily maximum temperature records for March were set at Levuka and Tokotoko, while new high mean monthly maximum temperature records were set at Levuka, Tokotoko and Vanuabalavu (Table 1).

The minimum air temperatures were generally *normal* over the Fiji Group, with 15 out of 21 sites registering anomalies within $\pm 0.5^{\circ}\text{C}$, $4 \leq 0.6^{\circ}\text{C}$ and $3 \geq 0.6^{\circ}\text{C}$.

A new daily high minimum temperature and a new high mean monthly temperature for March was set at Vanuabalavu during the month (Table 1).

The trough intensified and drifted back onto the group on the 30th as Tropical depression TD12F later named Tropical cyclone Josie developed along the trough and drifted towards Fiji from the west on the 31st. Strong and gusty winds were experienced over the western parts of Fiji including Yasawa and Mamanuca Groups with heavy rain which later flooded most parts of the Western Division. Highest rainfall recorded was 228.7mm at Viwa on the 30th and Nadarivatu recorded 151mm on the 31st. Strongest winds of 40km/hr with gusts of up to 65km/hr was recorded later on Saturday the 31st at the Nadi Airport. The month ended with cyclone Josie continuing to affect Fiji.

The island Rotuma was affected by series of troughs of low pressure in the 1st quarter of the month before an easterly to northeasterly wind flow dominated the island till the 18th. Another series of troughs then affected the island till the end of the month.

*Previously known as the Fiji Islands Weather Summary and Monthly Weather Summary

3. RAINFALL

The presence of Tropical Cyclone Josie within the Fiji Group resulted in the generally *average* to *above average* rainfall during the month. Apart from this, troughs of low pressure and a ridge of high pressure also regulated the weather experienced in March.

Tropical Cyclone Josie was accompanied by heavy rain bands, resulting in flooding in most of the Western Division.

Out of the twenty four stations, twelve stations recorded *average* rainfall, 8 recorded *above average* rainfall, 3 recorded *below average* rainfall, while Viwa was the lone station with *well above average* rainfall. (Table 2 & Figure 1).

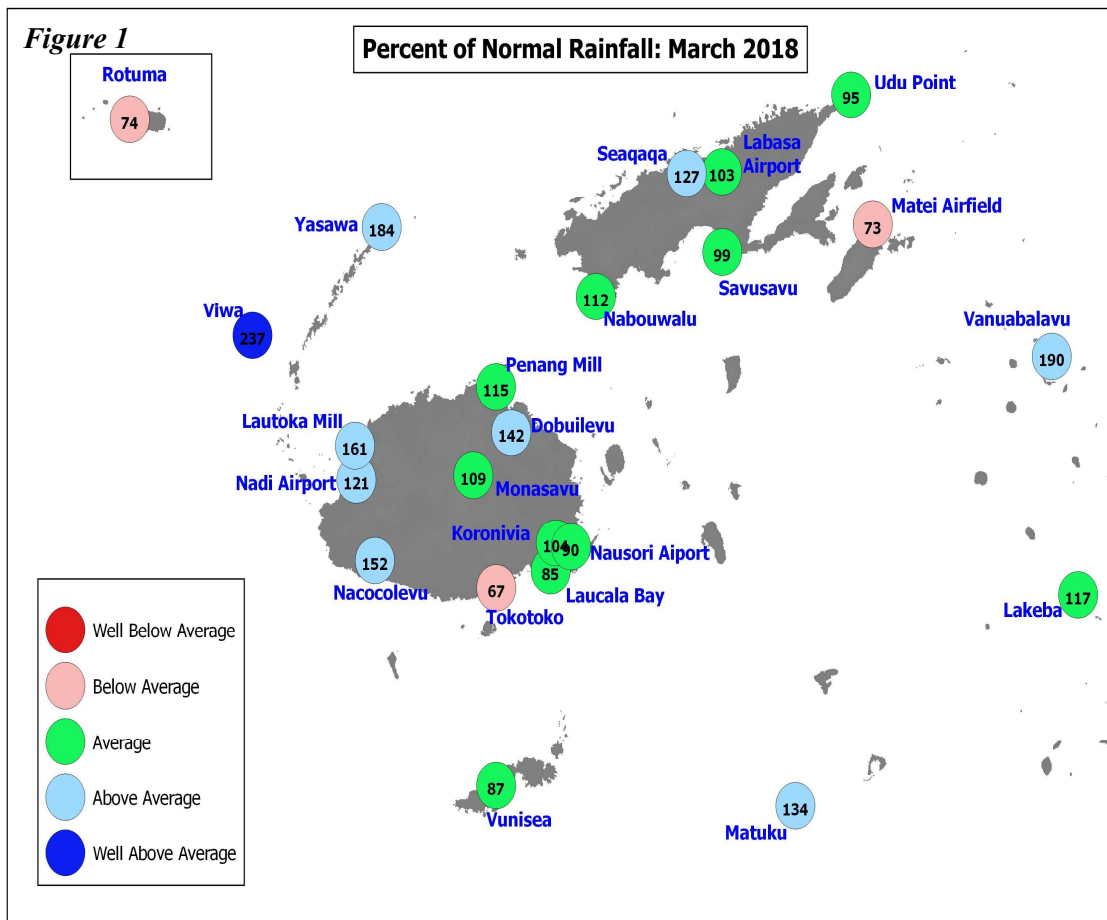
The highest total monthly rainfall of 1005.5mm was recorded at Nadarivatu, followed by 678.3mm at Monasavu, 609.5mm at Dobuilevu, 572.4mm at Viwa, 539.0mm at Yaqara, 508.0mm at Seaqaqa and 506.1mm at Yasawa-i-Rara. Viwa's total monthly rainfall was also its new highest March rainfall, replacing a previous record established in 1985.

Significant twenty four hour rainfall of 255.5mm was recorded at Nadarivatu on the 29th, followed by 228.7mm at

Viwa on the 29th, 187.5mm at Lautoka Mill on the 31st, 165.5mm at Keiyasi on the 31st, 152.8mm at Nadi Airport on the 31st and 139.5mm at Levuka on the 29th.

Nadarivatu recorded the highest number of rain days (rainfall $\geq 0.1\text{mm}$) with 29 days, followed by Nacocolevu, Dobuilevu and RKS Lodoni with 27, Penang Mill with 26, Nadi Airport and Laucala Bay with both 25 and Laucala Bay and Seaqaqa, Nabouwalu, Koronivia, Vanuabalavu, Levuka and Vunisea with all 24.

On the other hand, the least number of rain days of 17 was recorded at Savusavu Airfield, followed by Lautoka Mill, Yaqara and Momi with 18, Viwa with 20 and Matuku, Tokotoko, Udu Point and Rotuma with all 21.



Normal: Long term average from 1971 to 2000
Well Below Average: Rainfall less than 40% of normal
Below Average: Rainfall between 40 to 79%
Rain Day: Rainfall $\geq 0.1\text{mm}$

Average: Rainfall between 80 to 119%
Above Average: Rainfall between 120 to 199%
Well Above Average: Rainfall greater than or equal to 200% of normal

4. AIR TEMPERATURES

A. Maximum Daytime Air Temperatures

The maximum air temperatures were generally *normal* to *above normal* over the country with 14 out of the 23 stations recording anomalies within $\pm 0.5^{\circ}\text{C}$ and 9 sites recording anomalies $\geq +0.6^{\circ}\text{C}$ (Table 2 & Figures 2-5).

The warmest days on average was experienced at Levuka with 32.7°C , followed by Keiyasi with 32.6°C , Rarawai Mill with 32.3°C and Nacocolevu, Vanuabalavu and Lomaivuna with all 32.1°C . On the other hand, the coolest site on average was at Nadarivatu with 25.3°C , followed by Monasavu with 25.8°C .

The highest daily maximum temperature of 35.8°C was recorded at Levuka on the 10th and 22nd, followed by 35.4°C at Keiyasi on the 14th, 35.2°C at Lomaivuna on the 1st and 12th, 35.0°C at Nacocolevu on the 11th, 34.7°C at Rarawai Mill on the 14th and 34.5°C at Tokotoko on the 10th. On the other hand, the lowest daily maximum temperature of 21.0°C was recorded at Nadarivatu on the 31st and 21.1°C on the 30th, followed by 21.5°C at Monasavu on the 31st and 21.6°C on the 29th.

The highest mean monthly maximum temperature departure from the *normal* of $+2.3^{\circ}\text{C}$ was recorded at Ono-i-Lau, followed by $+2.0^{\circ}\text{C}$ at Levuka and $+1.6^{\circ}\text{C}$ at Vanuabalavu (Table 2).

New high daily maximum temperature records for March were set at Levuka and Tokotoko, while new high mean monthly maximum temperature records were set at Levuka, Tokotoko and Vanuabalavu (Table 1).

B. Minimum Night-time Air Temperatures

The minimum air temperatures were generally *normal* over the Fiji Group, with 15 out of 21 sites registering anomalies within $\pm 0.5^{\circ}\text{C}$, $4 \leq 0.6^{\circ}\text{C}$ and $3 \geq 0.6^{\circ}\text{C}$ (Table 2 & Figures 2-5).

The coolest nights on average was experienced at Nadarivatu with 18.7°C , followed by 19.5°C at Monasavu and 22.1°C at Keiyasi. On the other hand, Vanuabalavu recorded the warmest night on average with 26.2°C , followed by 24.8°C at Ono-i-Lau, 24.6°C at Udu Point, 24.5°C at Viwa, Matuku and Lakeba and 24.4°C at Rotuma, Nabouwalu and Vunisea.

The lowest daily minimum temperature of 16.2°C was recorded at Nadarivatu on the 21st, followed by 17.8°C at Monasavu on the 21st, 19.4°C at Rarawai Mill on the 9th, 19.5°C at Nacocolevu on the 20th and 19.7°C at Keiyasi on the 21st. On the other hand, the warmest night time was observed at Vanuabalavu with 28.1°C on the 14th, 27.0°C at Nabouwalu on the 15th and 26.5°C at Matuku on the 11th.

The highest positive mean monthly minimum temperature departure from *normal* of $+1.4^{\circ}\text{C}$ was recorded at Vanuabalavu, followed by $+1.3^{\circ}\text{C}$ at Tokotoko.

A new daily high minimum temperature and a new high mean monthly temperature for March was set at Vanuabalavu during the month.

TABLE 1. CLIMATE RECORDS ESTABLISHED IN MARCH 2018

<u>Element</u>	<u>Station</u>	<u>Observed (record)</u>	<u>On</u>	<u>Rank</u>	<u>Previous (record)</u>	<u>Year</u>	<u>Records Began</u>
Daily Maximum Rainfall	Viwa	228.7mm	29 th	New High	199.4mm	1990	1978
Daily Maximum Rainfall	Levuka	139.5mm	23 rd	New High	135.5mm	1986	1970
Total Monthly Rainfall	Viwa	572.4mm	-	New High	562.6mm	1985	1978
Daily Maximum Temperature	Levuka	35.8°C	10 th	New High	34.0°C	1989	1970
Daily Maximum Temperature	Tokotoko	34.5°C	10 th	New High	34.0°C	2003	1992
Mean Monthly Max Temperature	Levuka	32.7°C	-	New High	31.4°C	2002	1970
Mean Monthly Max Temperature	Tokotoko	31.3°C	-	New High	31.2°C	2006/ 2009	1992
Mean Monthly Max Temperature	Vanuabalavu	32.1°C	-	New High	31.8°C	2006	1985
Daily Minimum Temperature	Vanuabalavu	26.2°C	14 th	New High	27.2°C	1996	1985
Mean Monthly Min Temperature	Vanuabalavu	28.1°C	-	New High	28.0°C	2010	1985

Note: All comparisons in this summary are with respect to "Climatic Normals". This is defined to be the average climate condition over a 30-year period. Fiji uses 1971-2000 period as its "climatic normal" period, unless otherwise stated.

TABLE 2. DAILY CLIMATE REPORTING SITES: SUMMARY FOR MARCH 2018

	RAINFALL					AIR TEMPERATURES								SUNSHINE	
	TOTAL	RAIN	MAX.	FALL		AVERAGE DAILY				EXTREME				TOTAL	*
	MM	%	+	MM	ON	MAX.	#	MIN.	#	MAX.	ON	MIN.	ON	HRS	%
NADI AIRPORT	413	121	25	153	31	31.2	-0.1	23.3	0.5	33.6	15	21.7	22	176	92
SUVA/LAUCALA BAY	317	85	25	55	20	31.1	0.2	24.3	0.4	33.2	11	23.0	7	182	107
NACOCOLEVU	403	152	27	89	31	32.1	1.0	21.2	-1.3	35.0	11	19.5	20	154	101
ROTUMA	270	74	21	60	4	31.5	0.9	24.4	-0.3	33.1	23	23.0	5	145	88
VIWA	572	237	20	229	29	31.1	0.1	24.5	-0.7	32.6	15	22.5	7		
UDU POINT	304	95	21	57	30	30.3	-0.4	24.6	0.2	31.5	11	22.5	7		
SAVUSAVU AIRFIELD	281	99	17	82	27	30.4	-0.2	23.9	0.3	32.6	10	22.0	6		
LABASA AIRFIELD	383	103	22	61	31	31.9	0.4	22.0	-0.3	34.0	17	20.6	18		
NABOUWALU	377	112	24	55	1	31.2	1.1	24.4	0.1	33.6	22	22.0	6		
KORONIVIA	401	104	24	68	23	31.0	0.5	23.3	0.4	32.4	22	22.0	7		
NAUSORI AIRPORT	347	90	22	87	31	31.3	0.8	23.4	0.2	32.9	22	22.0	7		
NAVUA/TOKOTOKO	276	67	21	75	26	31.3	0.3	22.9	1.3	34.5	10	21.1	7		
MONASAVU	678	109	31	124	31	25.8	0.4	19.5	0.3	27.9	2	17.8	21		
LAUTOKA AES	496	161	18	188	31	30.9	-0.1			33.0	13				
BA/RARAWAI MILL						32.3	0.3	22.3	0.0	34.7	14	19.4	11		
PENANG MILL	487	115	26	127	28	31.1	0.6	23.7	-0.1	32.9	15	21.7	21		
MATEI AIRFIELD	278	73	27	54	31	30.3	-0.0	23.6	-0.6	31.5	12	22.0	3		
VANUABALAVU	411	190	24	89	31	32.1	1.6	26.2	1.4	33.4	11	23.9	6		
LAKEBA	342	117	23	64	3	30.8	0.5	24.5	0.5	32.6	13	22.8	4		
LEVUKA	433	143	24	140	23	32.7	2.0	23.9	-0.6	35.8	10	22.1	24		
VUNISEA	264	87	24	62	30	31.1	1.1	24.4	0.9	33.6	22	22.6	23		
MATUKU	341	134	21	117	30	30.4	0.0	24.5	-0.1	31.5	2	22.5	6		
ONO-I-LAU	74	29	5	32	4	31.6	2.3	U/S		33.5	9				
YASAWA	506	184	23	62	29										
SEAQAQA	508	127	24	70	3										

	TEMPERATURE(C)		HUMIDITY		WIND	SUN RAD	
	DRY WET		RH% VP			%OF MJ/	
	MEAN	(AVERAGE AT 9AM)	KT	POS		SQ.M	
NADI AIRPORT	27.2	28.0	24.9	77	29.1	5.5	45 15.6
SUVA/LAUCALA BAY	27.7	28.0	25.4	81	30.4		46 20.7\$
NACOCOLEVU	26.6	28.0	25.5	81	30.6		39 19.4\$
ROTUMA	28.0	28.7	25.5	77	30.1		38 18.5\$
VIWA	27.8	29.2	26.6	81	32.8		
UDU POINT	27.4	28.4	25.9	81	31.4		
SAVUSAVU AIRFIELD	27.2	28.2	25.5	80	30.5		
LABASA AIRFIELD	27.0	28.7	25.7	78	30.6		
NABOUWALU	27.8	28.7	25.9	80	31.2		
KORONIVIA	27.1	28.2	25.7	81	30.9		
NAUSORI AIRPORT	27.4	27.6	25.4	84	30.8	3.3	
NAVUA/TOKOTOKO	27.1	27.9	25.6	83	31.2		
MONASAVU	22.7	22.6	21.0	87	23.6		
LAUTOKA AES		28.7	25.5	78	30.2		
BA/RARAWAI MILL	27.3	27.7	25.1	81	29.8		
PENANG MILL	27.4	27.4	25.0	82	29.7		
MATEI AIRFIELD	26.9	28.3	25.7	81	30.9		
VANUABALAVU	29.2	30.0					
LAKEBA	27.6	28.8	26.1	80	31.7		
LEVUKA	28.3	28.2					
VUNISEA	27.8	28.5	25.9	81	31.5		
MATUKU	27.4	28.2	25.4	79	30.2		
ONO-I-LAU	28.2	28.1					

MEAN TEMPERATURE IS (MAX+MIN)/2; WIND IS MEAN SPEED AT 06,12,18,24 HOURS.
 \$:SOLAR RADIATION CALCULATED FROM SUNSHINE DURATION. # :DEPARTURE FROM LONG-TERM AVERAGES (1971-2000). + :NUMBER OF DAYS WITH 0.1 MM OR MORE RAIN. * :PERCENT OF LONG-TERM AVERAGES. BLUE FONT: MISSING RECORDS OF LESS THAN OR EQUAL TO 5 DAYS.

Figure 2

**Nadi Airport - Temperature & Rainfall for the last 13 Months
(March, 2017 - March, 2018)**

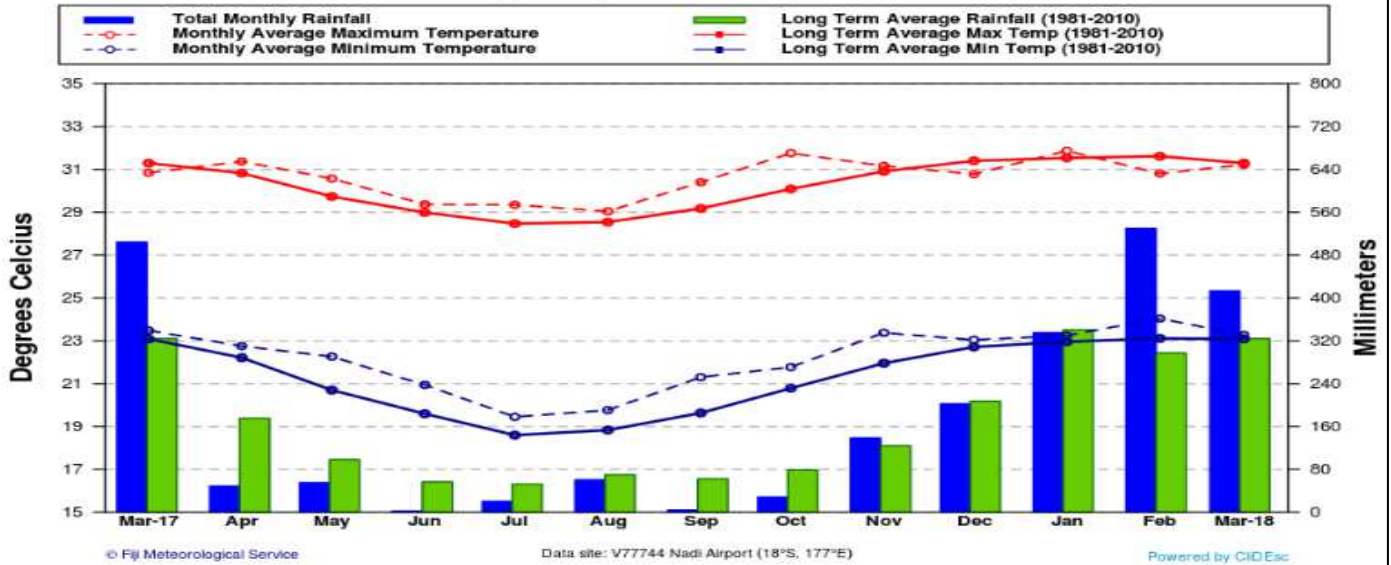


Figure 3

**Laucala Bay - Temperature & Rainfall for the last 13 Months
(March, 2017 - March, 2018)**

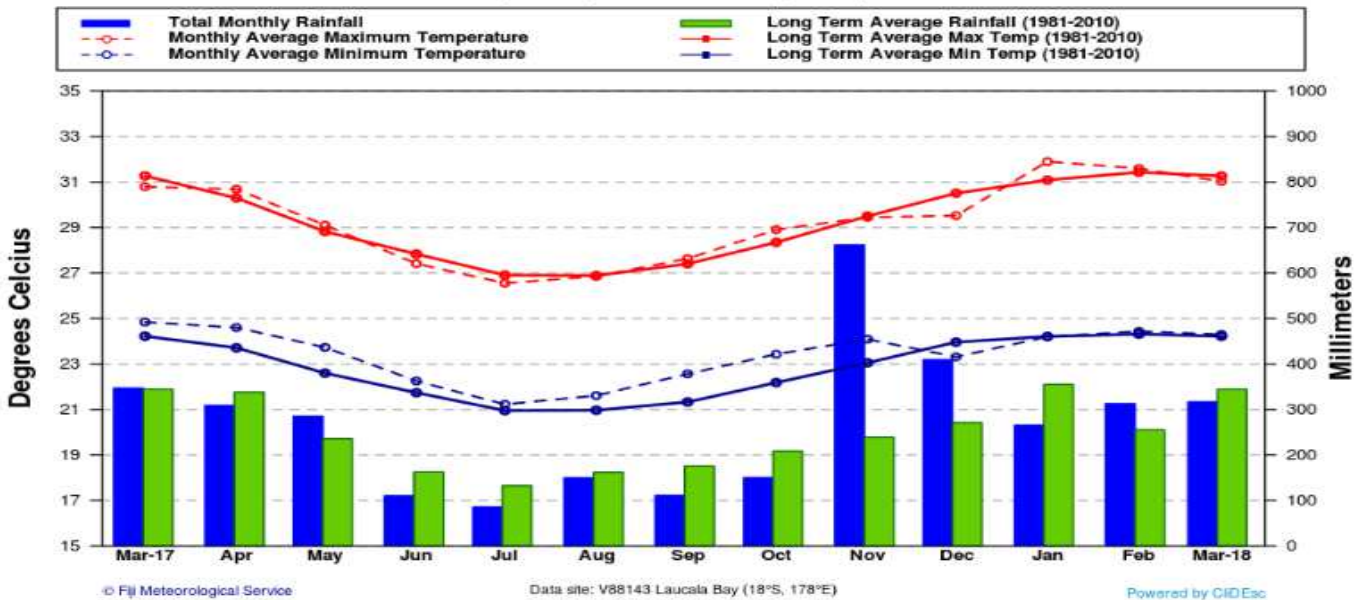


Figure 4

**Labasa Airfield - Temperature & Rainfall for the last 13 Months
(March, 2017 - March, 2018)**

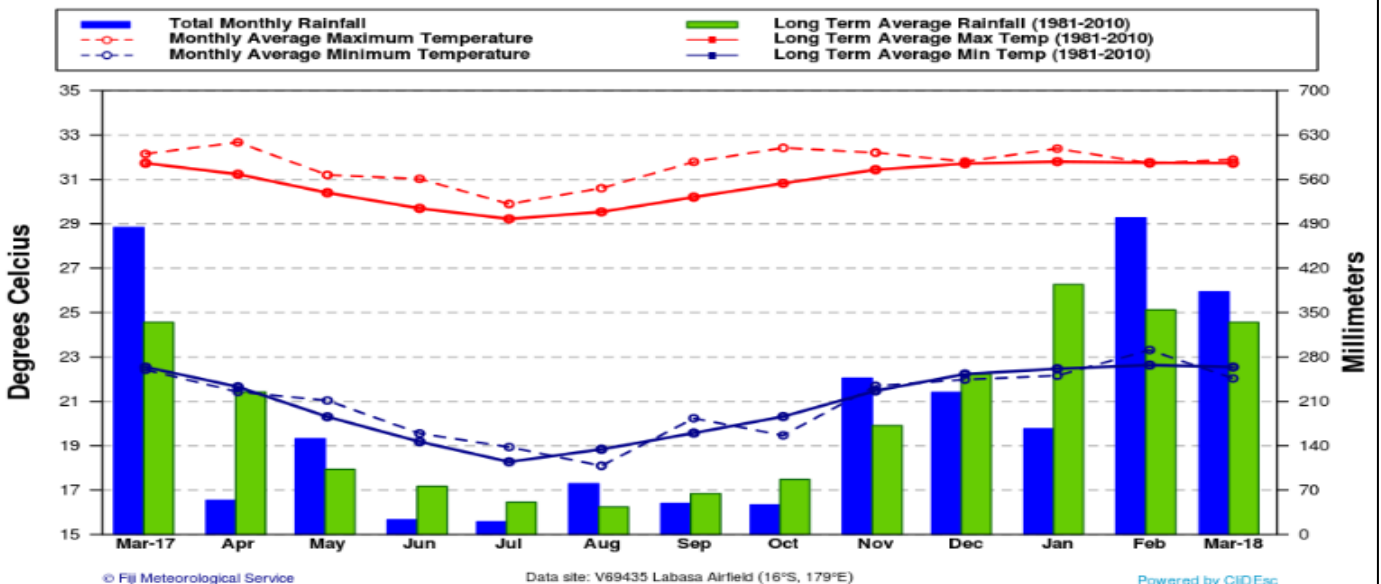
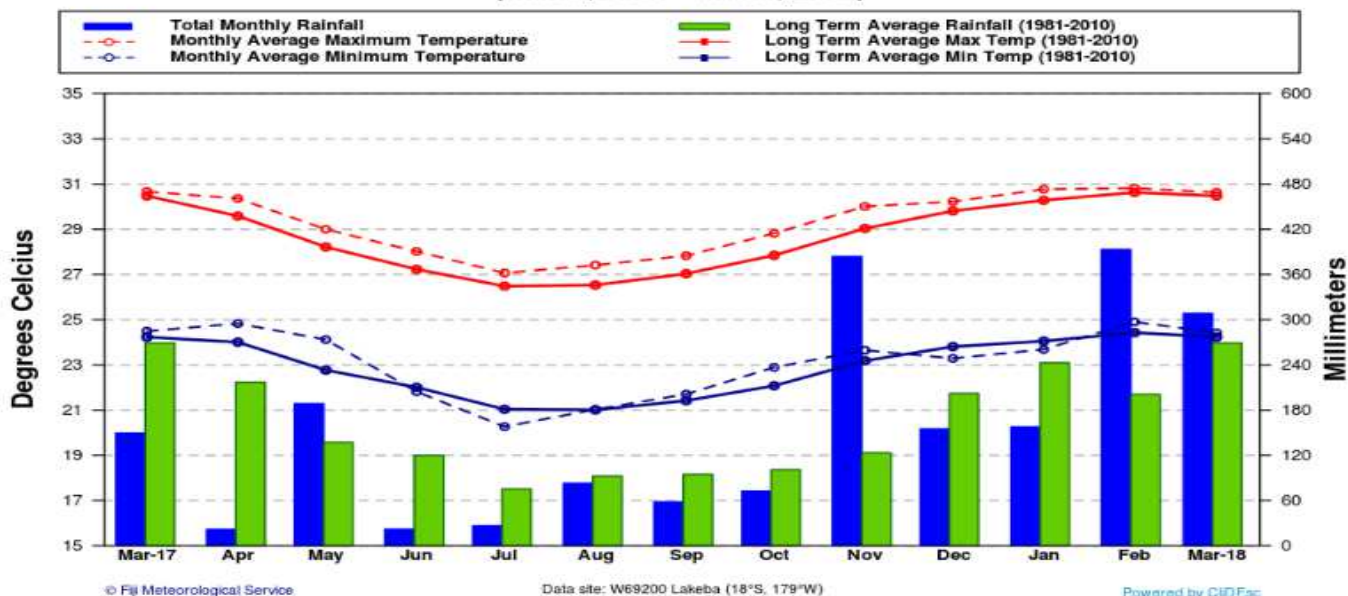


Figure 5

Lakeba - Temperature & Rainfall for the last 13 Months
(March, 2017 - March, 2018)



6. RELATIVE HUMIDITY AT 0900HOURS

The 9am average relative humidity (RH) ranged from 77% to 87% during the month (Table 2).

The monthly average RH in the **Western Division** ranged between 77% and 87%, while the daily values were between 63% to 100%. Nadi Airport and Viwa registered +2% departure from the *normal* monthly RH, while Lautoka Mill and Monasavu recorded +1% anomaly. The lone negative departure of -5% was recorded at Penang Mill, while Nacocolevu and Rarawai Mill recorded 0% departures.

The monthly average RH in the **Central Division** ranged between 82% and 84%, with the daily values between 66% to 99%. *Normal* RH was recorded across the Central Division as all stations recorded anomalies within ± 5% of the *normal*. Koronivia recorded anomaly of -2%, Laucala Bay

and Tokotoko recorded -1% anomalies and Nausori Airport registered +1%.

The monthly average RH in the **Northern Division** ranged from 78% to 81%, with daily values from 65% to 97%. The RH departures in the Northern Division were -4% at Labasa Airport, -1% at Matei and Savusavu Airfields and 0% at Nabouwalu and Udu Point..

In the **Eastern Division**, the mean monthly average RH ranged from 79% and 81%, while the daily values ranged from 66% to 99%. Lakeba recorded +1% anomaly from the *normal*, while Vunisea and Matuku recorded 0% anomalies.

The mean monthly RH at **Rotuma** was 77%, while the daily values ranged between 65% to 97%.

7. SUNSHINE

Normal to below normal bright sunshine hours were recorded at the 4 sunshine recording stations. Laucala Bay, Nacocolevu, Nadi Airport and Laucala Bay registered 107%, 101%, 92% and 88% of the *normal* bright sunshine hours, respectively (Table 2).

Nadi Airport recorded 175.7 hours of total bright sunshine, with a mean of 5.7 hours/day. The highest sunshine hours of 10.7 hours was recorded on the 14th, followed by 10.2 hours on the 16th and the 21st and 10.0 hours on the 17th. On the other hand, overcast condition was recorded on the 30th, followed by 0.2 hours on the 31st and 0.3 hours on the 26th.

Laucala Bay recorded 181.5 hours of total monthly bright sunshine, with a mean of 5.9 hours/day. The longest duration of bright sunshine of 11.1 hours was recorded on the 14th, followed by 10.4 hours on the 15th and 9.7 hours on the 8th. Overcast conditions with no bright sunshine was

recorded on the 31st, followed by 0.8 hours on both 28th and 30th.

The total monthly bright sunshine at Nacocolevu was 153.9 hours, with a daily mean of 5.0 hours/day. The longest duration of 10.5 hours was recorded on the 16th, followed by 10.0 hours on the 19th. On the other hand, overcast conditions with no bright sunshine hours was recorded on the 29th to 31st.

Rotuma recorded 144.7 hours of sunshine during the month, with the mean of 4.7 hours. The longest sunshine hours of 9.8 hours was recorded on the 23rd, followed by 8.4 hours on the 24th and 8.1 hours on the 17th. Overcast conditions with no bright sunshine hours were recorded on the 3rd, 5th and 28th.

8. WIND SUMMARY

The 10-minute average wind statistics recorded every three hours at Nadi Airport during the month showed that the easterly winds were dominant, accounting for 30.6% of the total observations. This was followed by westerly winds with 12.9% of the observations (Figure 6(a)). Calm conditions were recorded on 15.3% of the instances. The wind strengths were generally *light* to *gentle*, with *moderate* breeze recorded on certain times of the day (Figure 6a & 6b).

Satellite data showed variable wind anomalies were present in the Fiji region during the month (Figure 13).

At Nausori Airport, calm winds dominated with 37.5% of the observations, followed by easterly winds accounting for 17.3% of the observations. Northwesterly winds accounted for 12.1% of the observations, while north to northeasterly winds accounted for 17% of the observations. Wind strengths at Nausori Airport were mostly *light* to *gentle*.

Note:
light air: 1-3 knots, *light 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; *strong gale:* 41-47 knots

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

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

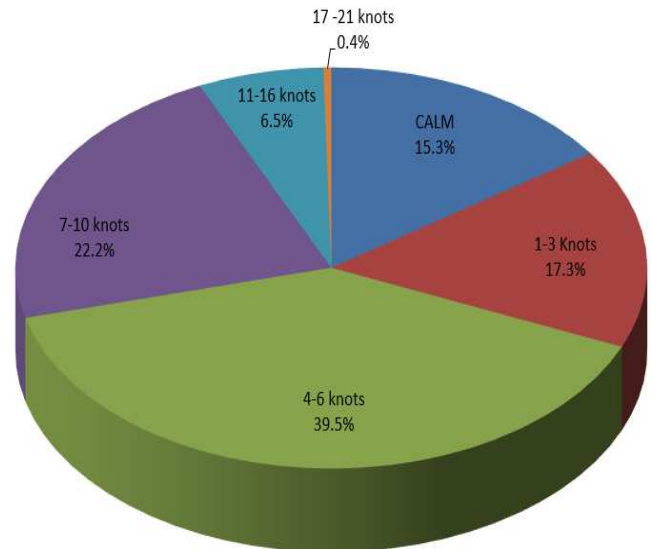
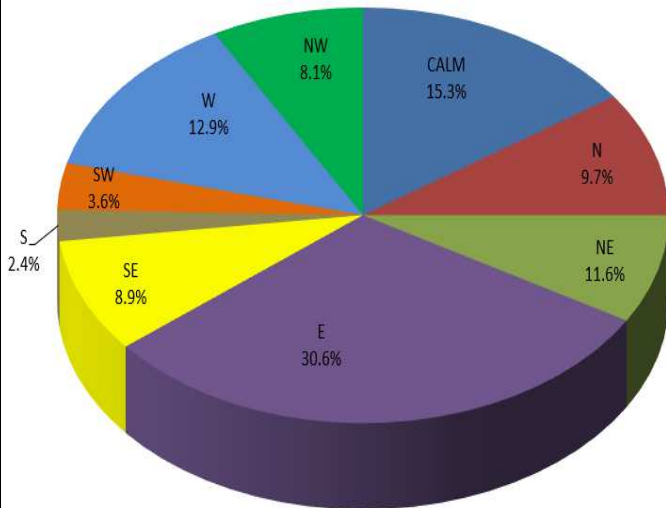
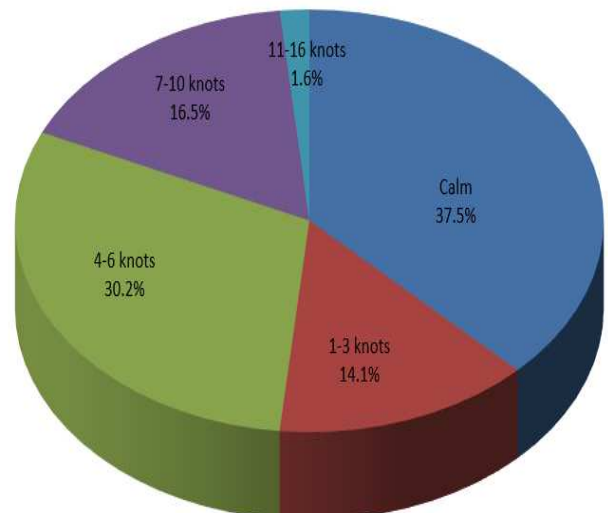
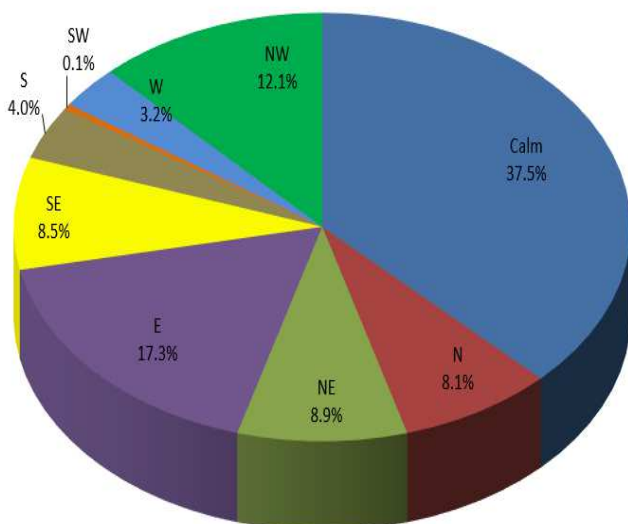
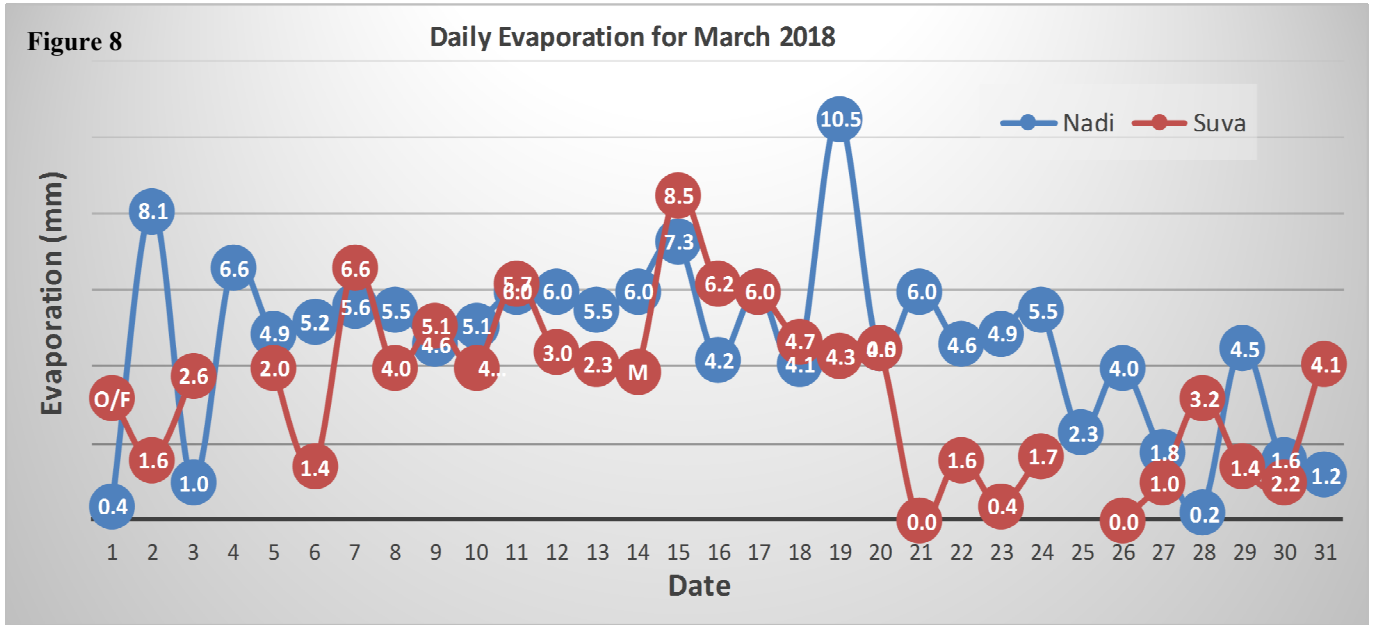


Figure 7(a) Surface Wind Direction for Nausori Airport, Fiji. (WMO 91683 Lat 18°02'47"South Long 178°33'33"East Height above MSL 3m)

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



9. EVAPORATION



The total monthly raised pan evaporation at Nadi Airport was 143.7mm, with the highest of 10.5mm recorded on the 19th. Laucala Bay recorded total monthly evaporation of 100.9mm, with the highest daily evaporation of 8.5mm on the 15th.

10. RADIATION

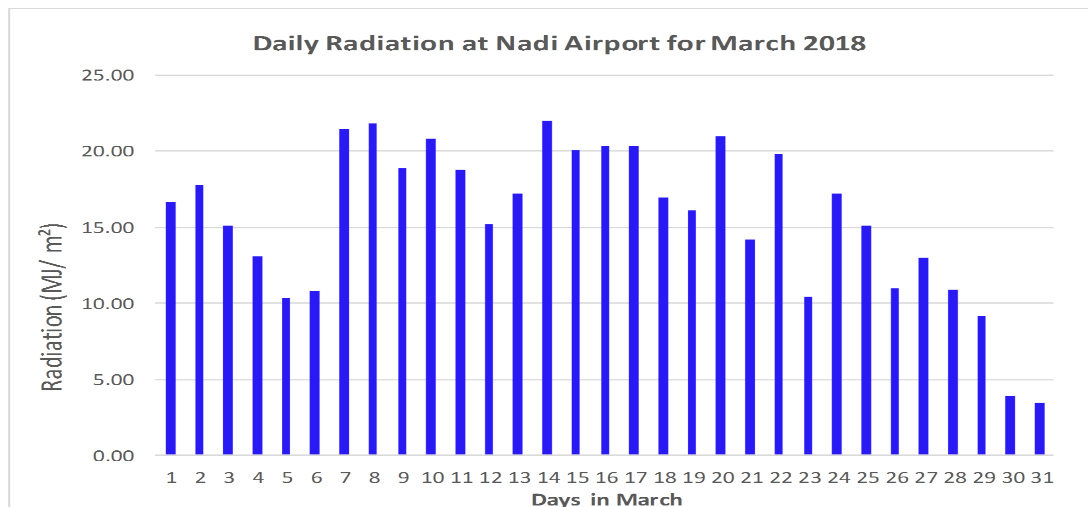


Figure 9:

The mean daily solar radiation at Nadi Airport was 15.6MJ/m², compared to 18.9MJ/m² over 30 year average (1971-2000).

11. SEA SURFACE TEMPERATURE (SST)

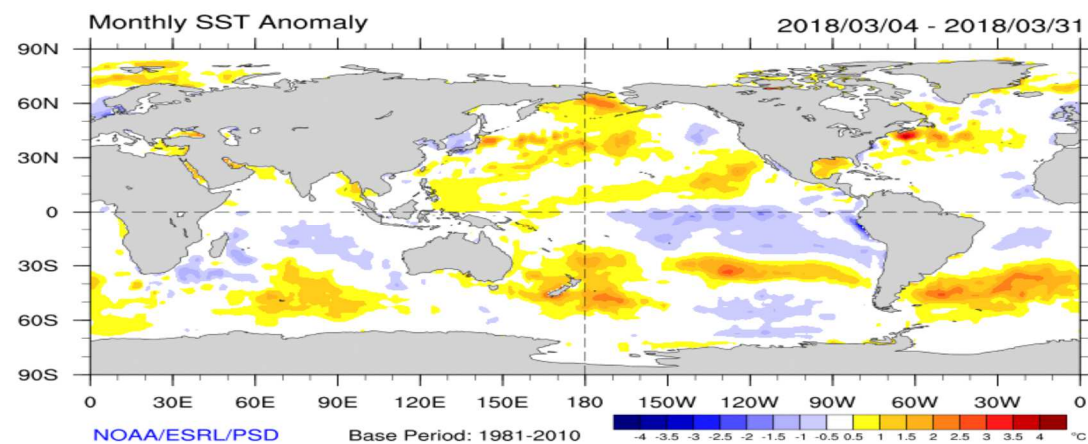


Figure 10:

Normal SSTs were present in the northern parts of Fiji Waters during March 2018, while above normal waters were present on the south (base period: 1981-2010).

Source: <http://www.esrl.noaa.gov/psd/map/clim/>

12. CLOUD COVER

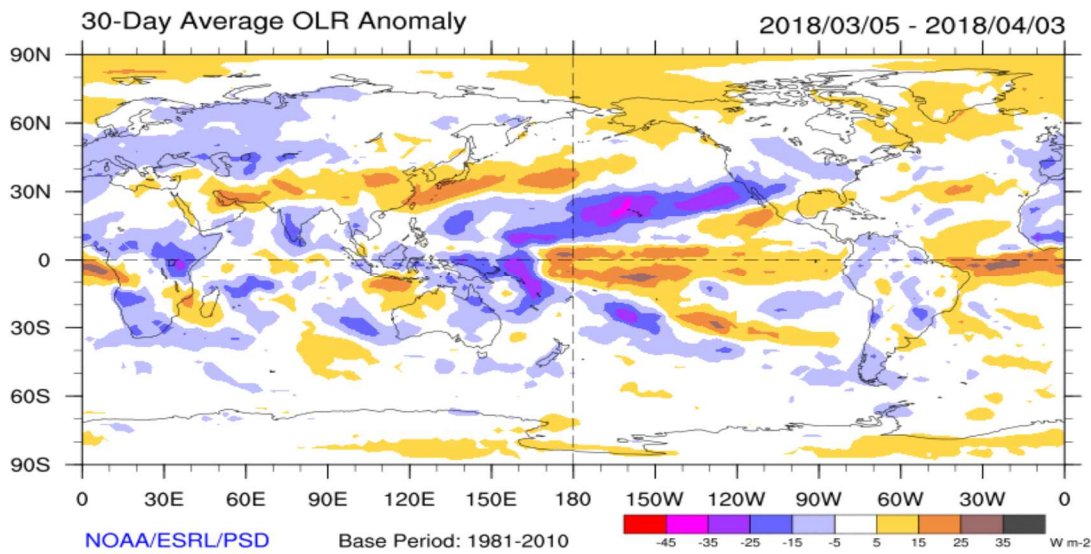


Figure 11:

OLR anomalies indicate presence of slightly above normal cloud cover in the Fiji region during March 2018 (Fiji: ~17°S, 180°) (base period: 1981-2010).

Source: <http://www.esrl.noaa.gov/psd/map/clim/olr.shtml>

13. SEA LEVEL

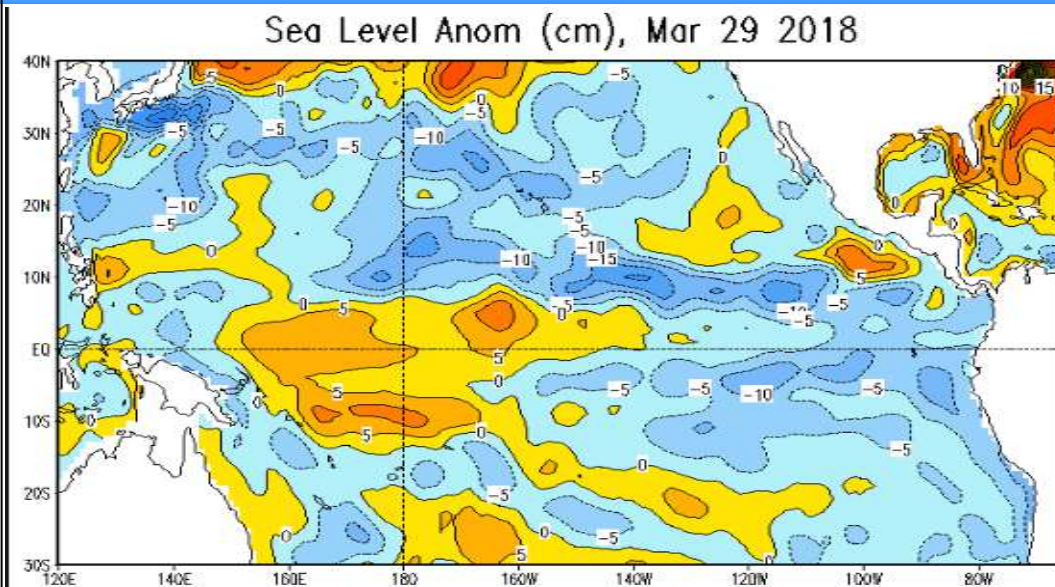


Figure 12:

Normal sea level anomalies persisted in the Fiji Waters during the month of March 2018 (base period: 1981-2010).

Source: http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ocean/weeklyenso_clim_81-10/wksl_anm.gif

14. WIND ANOMALIES

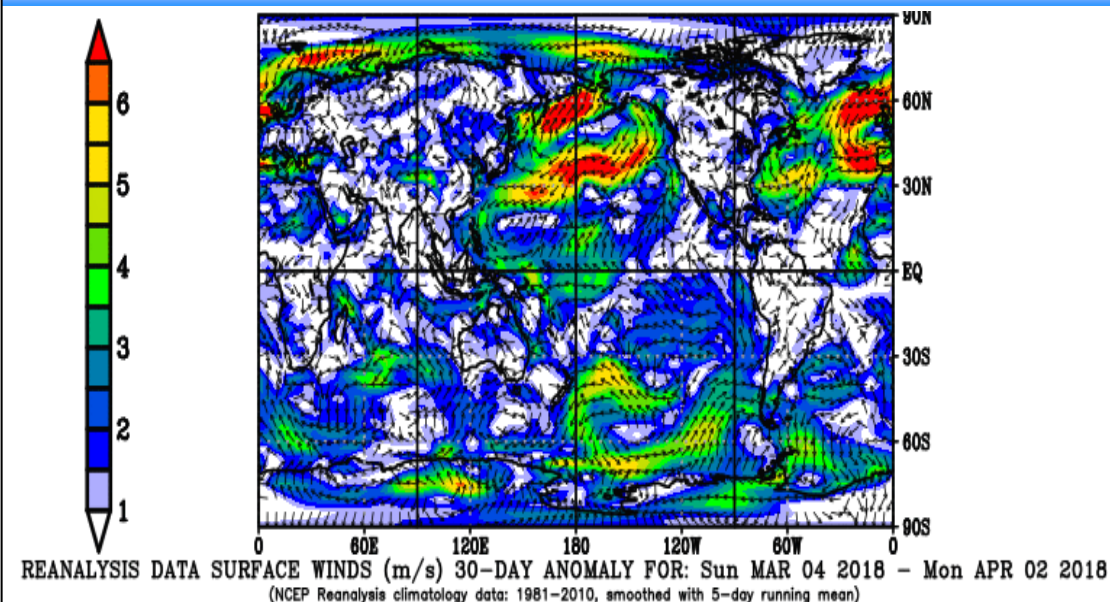


Figure 13:

Reanalysis data show variable winds were present in the Fiji region during March 2018 (Fiji: ~17°S, 180°) (base period: 1981-2010).

Source: https://www.esrl.noaa.gov/psd/map/images/rnl/sfcwnd_30b.rnl.html