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Fiji Climate Summary

September 2012

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1.0 IN BRIEF

The country's weather in September was influenced by troughs of low pressure, frontal systems and transient ridges of high pressure.

Rainfall during September varied from *average* to *well above average* over the country. Well above average rainfall were recorded at Levuka (372% of *normal*), Lautoka (352%), Rarawai (247%) and Nadi Airport (206%). Out of the 25 reporting stations, 92% recorded *above average* to *well above average* rainfall, and 8%, *average*.

The average maximum air temperatures were generally *normal* to *above normal* over the country, with 55% of the stations recording anomalies greater than 0.5°C, 41% within ±0.5°C and 4% less than -0.5°C.

The average minimum temperatures were also generally *above normal*, with 71% of the stations recording anomalies greater than 0.5°C and 29% within ±0.5°C.

The El Niño Southern Oscillation (ENSO) conditions in the equatorial Pacific continued to linger around El Niño thresholds. During September, the trend towards El Niño slowed in several key oceanic and atmospheric indicators, with some aspects of the tropical atmosphere displaying signatures inconsistent with El Niño conditions.

Current observations and the majority of the climate models favour El Niño during the remaining months of this year. On the other hand, a few of the climate models favour the maintenance of ENSO-neutral conditions until the end of 2012. Re-development of La Niña is highly unlikely in 2012.

FMS will continue to closely monitor the progress of the anticipated development of ENSO conditions over the coming months and provide developments through subsequent updates.

2.0 WEATHER PATTERNS

September weather was influenced by troughs of low pressure, frontal systems and transient sub-tropical ridges of high pressure.

From the 1st to 3rd, a prevailing southeast wind flow brought showers over the eastern parts of the country. On the 4th, a trough gradually moved onto the group from the west. It finally cleared the country on the 6th. Rain was observed over most places until the 5th, after which, the trade southeast winds prevailed, until the 9th.

On the 10th, another trough slowly moved over the country from the west, causing rain, with isolated heavy falls, over most places till the 13th. Behind this trough, an intensifying area of high pressure to the far south of Fiji directed a southeast wind flow across the group till the 16th. This set-up brought some showers especially over the eastern parts of the larger islands.

A weak frontal system moved over the southern parts of Fiji on the 17th bringing heavy showers over these areas until the 18th. The Trade flow returned until the 20th.

On the 21st, a trough to the west of Fiji was moving towards the group. An intense band of cloud and rain associated with this trough caused rain over most places with isolated heavy falls till the 23rd. The highest 24-hour rainfall of 187mm was recorded at Levuka on the 22nd. As the trough moved onto Fiji, it intensified rapidly overnight of the 25th. This system was responsible for the intense, heavy and widespread rain and squally thunderstorms across the country on the 25th. Much of these rain fell within 2 to 3 hours over a particular location, with Lautoka recording 177mm, Ba 133mm and Nadi 90mm. The intense downpour also caused flash floods especially in the Western Division on the 25th. On the 27th, another trough moved onto the group with further rain that eventually cleared from the west late on the 29th. This trough cleared the group on the 30th.

Rotuma recorded showers in the month largely from the SPCZ and prevailing moist easterly wind flow.

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

3.0 RAINFALL

September rainfall varied greatly between *average to well above average* (Table 2 & Figures 2-5). Of the 25 reporting stations, 92% recorded *above average to well above average* rainfall, and 8%, *average*.

Above average to well above average rainfall were recorded at the Western, Central and Eastern Divisions as well as most of the Northern Division. *Average* rainfall were recorded at Monasavu in the Western Division and Udu Point in the Northern Division. Rotuma also recorded *above average* rainfall during the month.

Rainfall ranged from 149% to 412% of the *normal* in the Western Division, 132% to 171% in the Central Division, 108% to 182% in the Northern Division and 137% to 422% in the Eastern Division. Monasavu and Rotuma received 104% and 146% of the *normal* rainfall, respectively.

St. John's College, Levuka, recorded the highest total monthly rainfall of 413.3mm, followed by Matuku with 405.1mm, Tokotoko (Navua) with 394.3mm and Ono-i-Lau with 386.9mm. On the other hand, the lowest total monthly rainfall of 113.6mm was recorded at Yasawa-i-rara, Udu Point with 122.1mm, Lakeba with 138.6mm and Nabouwalu with 163.0mm (Figure 1).

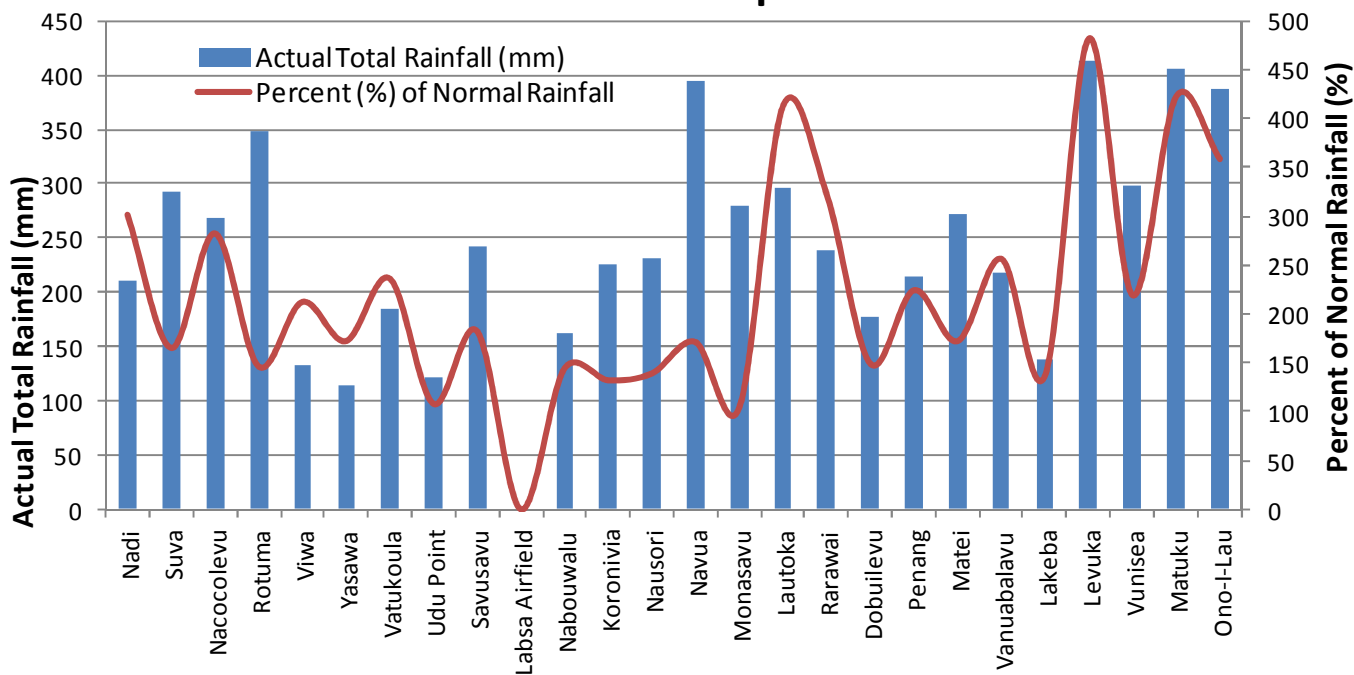
Ono-i-Lau and Matei Airport recorded the highest number of rain days (rainfall ≥ 0.1 mm), with 25 days, followed by Nausori Airport with 24, and Monasavu with 23. On the other hand, the least number of rain days was observed at Nacocolevu (Sigatoka) with 10 days, followed by Yasawa-i-rara with 11, Lautoka, Penang and Vatukoula with 12 and Nadi, Savusavu Airport and Rarawai Mill (Ba) with 13.

The highest 24-hour rainfall was recorded at St. John's College (Levuka) with 187.1mm on the 22nd, followed by Lautoka Mill with 177.0mm on the 25th, Tokotoko (Navua) with 136.5mm on the 11th and Vatukoula Gold Mine with 114.0mm on the 25th.

Using the 3 months Standardised Precipitation Index (SPI) method of drought monitoring, Udu Point is the lone station that is currently on drought warning stage. For further information on SPI method, refer to ENSO Update at http://www.met.gov.fj/ENSO_Update.pdf.

Figure 1

Rainfall Distribution in September 2012



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 ≥ 0.1 mm.

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

4.0 AIR TEMPERATURES

A. Maximum Daytime Air Temperatures

The average maximum temperatures were generally *normal* to *above normal* across the country, with 55% of the stations recording anomalies greater than 0.5°C, 41% within $\pm 0.5^\circ\text{C}$ and 4% less than -0.5°C (Table 2 & Figures 2-5).

The highest monthly average temperature was recorded at Rarawai Mill (Ba) with 30.5°C, followed by 30.0°C at Lautoka Mill, 29.9°C at Rotuma and 29.1 at Nadi Airport. Conversely, the coolest days on average was at Monasavu with 23.1°C, followed by Ono-i-Lau with 25.2°C, and Tokotoko (Navua) with 26.5°C.

The daily maximum temperatures occasionally rose above 30.0°C, with Nadi Airport recording 32.8°C on the 20th, followed by Nacocolevu (Sigatoka) recording 32.1°C on the 19th, 31.7°C at Viwa and Rarawai Mill (Ba) on the 10th and 22nd. On the other hand, daily maximum temperatures below 24°C were measured at several locations. Monasavu recorded maximum temperatures below 20°C on few instances, with the lowest of 19.4°C observed on the 5th. Other notable low daily maximum temperatures below 24°C were recorded at Savusavu (24.0°C) on the 8th, 23.9°C at Lakeba, 23.6°C at Nausori Airport, 23.5°C at Koronivia and 22.0°C at Suva and Nacocolevu. Notable low daily maximum temperatures at Lakeba, Nausori, Suva, Koronivia and Nacocolevu were all observed on the 5th.

The average maximum temperatures were generally *above normal* over the country, with the highest departure from the *normal* of +1.5°C recorded at Matuku and Nabouwalu, followed by +1.3°C at Lautoka Mill and Viwa, 1.0°C at Savusavu Airfield and +0.9°C at Penang Mill (Rakiraki). On the other hand, Tokotoko (Navua), with -0.9°C, was the lone station that recorded negative departures.

No new maximum temperature record was established during the month.

B. Minimum Night-time Air Temperatures

Consistent with the maximum air temperatures, the average minimum temperatures were also generally *above normal*, with 71% of the stations recording anomalies greater than 0.5°C and 29% within $\pm 0.5^\circ\text{C}$ (Table 2 & Figures 2-5).

The lowest average monthly minimum temperature was recorded at Monasavu (17.2°C), followed by Rarawai Mill (Ba) (19.6°C), Ono-i-Lau (20.1°C) and Lautoka (20.5°C). Conversely, the warmest nights on average was experienced at Rotuma with 25.2°C, followed by Viwa with 23.5°C and Udu Point with 23.4°C.

The extreme minimum temperatures at some of the locations fell below 17.0°C, with Monasavu recording 13.0°C on the 6th, Rarawai Mill (Ba) recording 13.2°C on the 8th, 15.3°C on the 7th at Navua and 15.5°C at Lautoka.

The average minimum temperatures were generally *above normal* over the Fiji Group, with the highest departure from the *normal* of +1.61°C recorded at Nadi Airport and Laucala Bay (Suva), followed by +1.4°C at Koronivia and Rarawai Mill (Ba) and +1.3°C at Monasavu. Ono-i-Lau, with -1.3°C, was the lone station with negative departure.

No new minimum temperature record was established during the month.

TABLE 1. CLIMATE RECORDS ESTABLISHED IN SEPTEMBER 2012

<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 Max Rainfall	St. John's College, Levuka	187.1mm	22nd	New High	90.0mm	2007	1980
Total Monthly Rainfall	St. John's College, Levuka	413.3mm	-	New High	264.5mm	2007	1984

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

TABLE 2. DAILY CLIMATE REPORTING SITES: SUMMARY FOR SEPTEMBER 2012

	RAINFALL					AIR TEMPERATURES							SUNSHINE		
	TOTAL	RAIN	MAX.	FALL		AVERAGE DAILY			EXTREME				TOTAL	*	
	MM	%	+	MM	ON	MAX.	#	MIN.	#	MAX.	MIN.	ON	C	ON	HRS
NADI AIRPORT	211	301	13	91	25	29.1	-0.2	20.9	1.6	32.8	20	16.3	8	178	84
SUVA/LAUCALA BAY	292	165	20	49	4	27.6	0.4	22.6	1.6	30.5	20	19.5	6	109	80
NACOCOLEVU	268	282	10	63	4	28.4	0.5	18.8	0.4	32.1	19	13.0	8	125	73
ROTUMA	349	146	17	121	12	29.9	0.6	25.2	1.1	31.4	28	23.6	13	188	105
VIWA	133	212	10	43	25	29.5	1.3	23.5	0.8	31.7	10	20.6	6		
UDU POINT	122	108	16	63	21	28.7	0.1	23.4	0.9	30.7	5	21.3	6		
SAVUSAVU AIRFIELD	243	182	13	60	28	28.4	1.0	21.9	0.7	32.0	20	19.0	6		
NABOUWALU	163	144	18	62	22	28.3	1.5	22.4	0.4	30.7	20	19.1	8		
KORONIVIA	226	132	15	43	27	27.4	0.5	21.1	1.4	30.4	22	17.7	9		
NAUSORI AIRPORT	231	139	24	42	22	27.1	0.5	21.2	1.2	30.0	22	17.4	8		
NAVUA/TOKOTOKO	394	171	14	137	11	26.5	-0.9	18.9	0.5	30.7	6	15.3	7		
MONASAVU	280	104	23	60	25	23.1	0.8	17.2	1.3	26.3	17	13.0	6		
LAUTOKA AES	296	412	12	177	25	30.0	1.3	20.5	-0.2	31.7	22	15.5	8		
BA/RARAWAI MILL	238	322	13	134	25	30.5	0.1	19.6	1.4	32.8	19	13.2	8		
PENANG MILL	215	224	12	71	25	28.9	0.9	22.0	0.8	31.5	21	19.5	7		
MATEI AIRFIELD	273	172	25	98	26	28.0	0.5	22.9	1.1	29.4	11	20.3	6		
VANUABALAVU	218	256	14	59	4	27.9	0.6	22.6	0.3	29.7	24	19.2	8		
LAKEBA	139	137	21	36	4	27.5	0.6	22.5	1.1	30.4	22	19.0	7		
ST. JOHNS COLLEGE	413	481	20	187	22	28.5	1.4	21.3	-0.5	30.1	17	19.0	25		
VUNISEA	298	219	22	66	12	26.8	0.7	20.5	0.7			14.4	6		
MATUKU	405	422	14	85	13	27.9	1.5	21.9	1.1	30.0	3	20.0	14		
ONO-I-LAU	387	358	25	63	13	25.2	-0.2	20.1	-0.3	28.6	27	16.6	14		
YASAWA -I-RARA	114	172	11	31	4										
VATUKOULA	184	236	12	114	25										
DOBUILEVU	178	149	18	62	25										

	TEMPERATURE(C)				HUMIDITY	WIND	SUN RAD		
	MEAN	DRY	WET	RH%			VP	%OF	MJ/
		(AVERAGE AT 9AM)	KT	POS					
NADI AIRPORT	25.0	25.1	22.3	78	24.7	5.3	52	15.9	
SUVA/LAUCALA BAY	25.1	24.9	22.5	81	25.6		32	16.6	
NACOCOLEVU	23.6	24.4	23.0	89	27.0		44	17	
ROTUMA	27.5	27.9	25.5	82	30.8	5.0	54	19	
VIWA	26.5	26.8	24.1	79	28.0				
UDU POINT	26.1	26.2	23.8	81	27.6	9.7			
SAVUSAVU AIRFIELD	25.1	25.7	23.3	81	26.7				
LABASA AIRFIELD	25.4	26.5	23.3	76	26.1				
NABOUWALU	25.4	25.7	23.1	80	26.3	9.6			
KORONIVIA	24.3	25.0	22.5	80	25.3				
NAUSORI AIRPORT	24.1	24.3	22.5	85	25.8	3.0			
NAVUA/TOKOTOKO	22.7	23.3	21.1	82	23.5				
MONASAVU	20.1	19.7	18.5	89	20.5				
LAUTOKA AES	25.3	26.8	23.1	73	25.5				
BA/RARAWAI MILL	25.1	25.6	22.5	76	25.0				
PENANG MILL	25.5	26.0	22.8	76	25.5				
MATEI AIRFIELD	25.5	26.0	23.5	80	27.1				
VANUABALAVU	25.2	26.0	23.7	82	27.6				
LAKEBA	25.0	25.6	23.3	82	27.0	9.3			
ST. JOHNS COLLEGE	24.9	24.6	22.9	87	26.8				
VUNISEA	23.6	23.9	21.5	80	23.8	3.0			
MATUKU	24.9	25.7	21.9	70	23.2				
ONO-I-LAU	22.6	23.1	20.9	81	23.1	7.6			

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.

Figure 2

Nadi Airport (Western Division) - Temperature & Rainfall Records for the last 13 Months (September 2011 - September 2012)

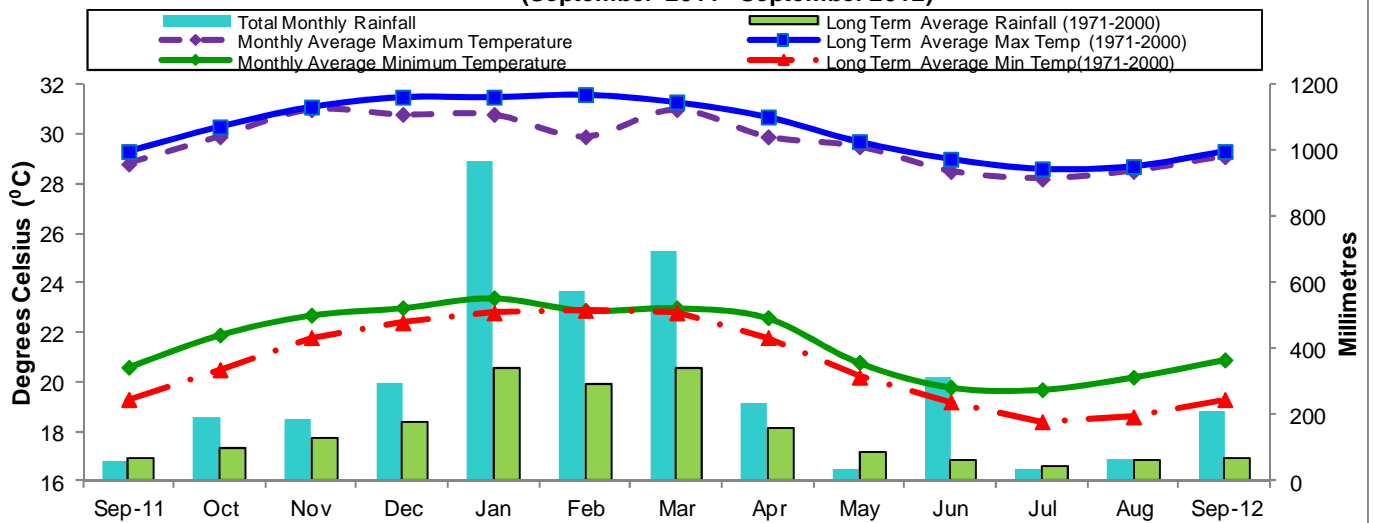


Figure 3

Laula Bay - (Suva) (Central Division) - Temperature & Rainfall Records for the last 13 Months (September 2011 - September 2012)

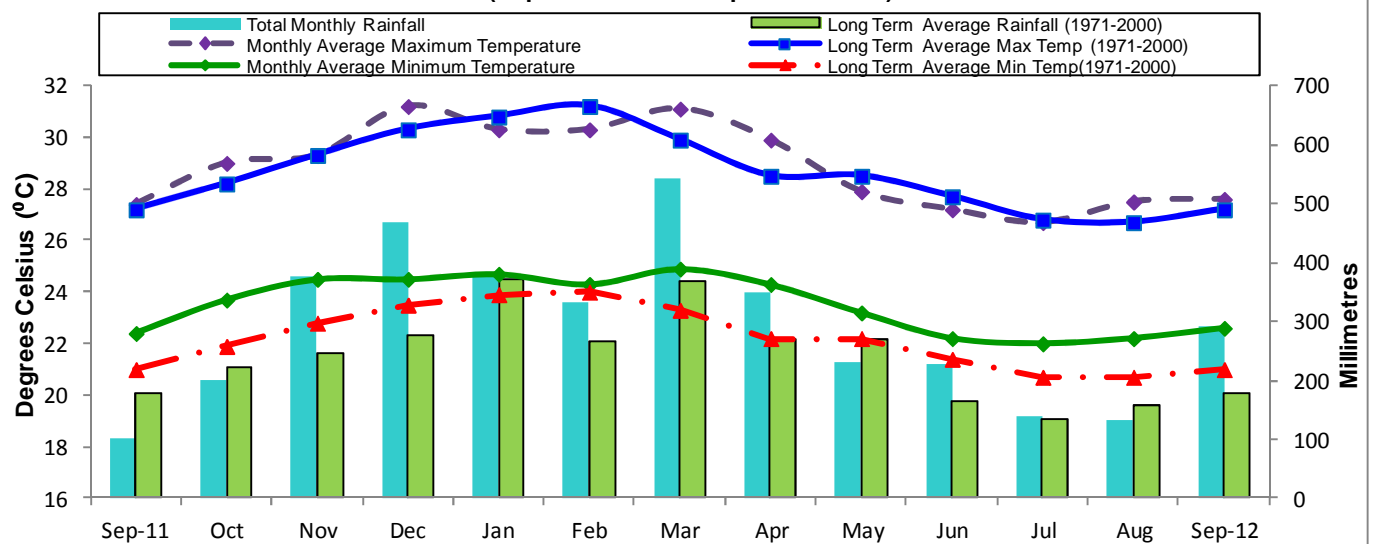
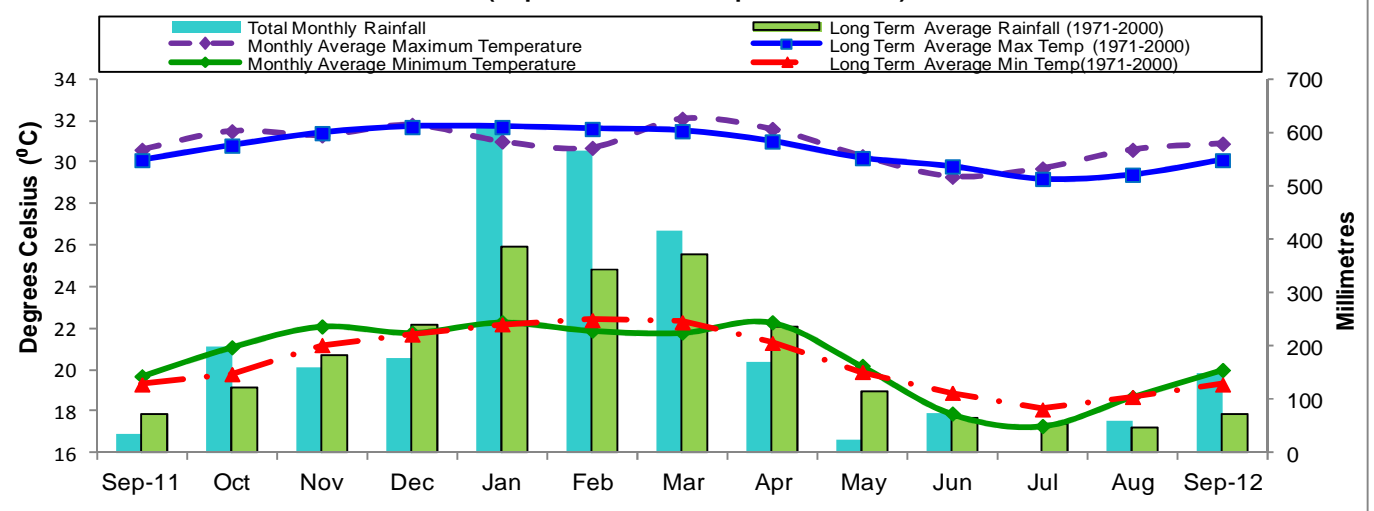


Figure 4

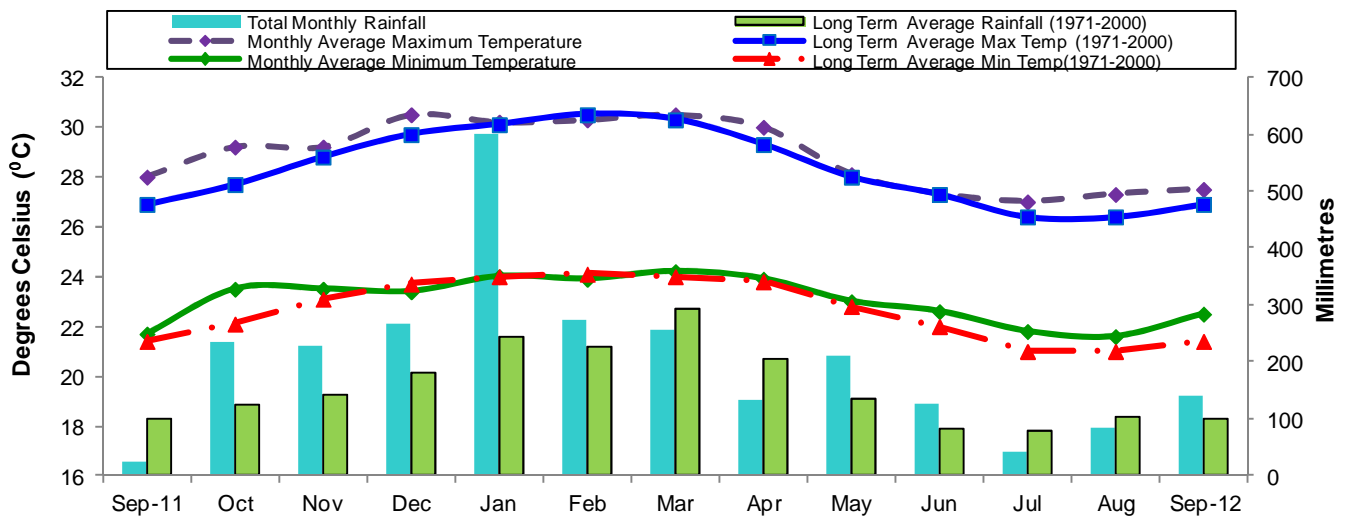
Labasa Airport (Northern Division) - Temperature & Rainfall Records for the last 13 Months (September 2011 - September 2012)



Labasa Airport observation consists of considerable number of days of observation missing therefore data are to be used with caution.

Figure 5

Lakeba - (Eastern Division) - Temperature & Rainfall Records for the last 13 Months (September 2011 - September 2012)



5.0 RELATIVE HUMIDITY AT 0900HOURS

The 0900am average relative humidity at different stations were generally *above normal* during the month. The average relative humidity ranged from 70% to 89% (Table 2), with the daily range expanding from 43% to 100%.

The stations in the Western Division recorded daily relative humidity in the range of 43% to 99%. Most of the stations recorded *above normal* relative humidity with the highest positive departure from *normal* of +13.0% observed at Nadi, followed by Nacocolevu (Sigatoka) with +12.0%, +6.0% at Viwa and Rarawai and 4% at Lautoka. Penang (Rakiraki) was the lone site that recorded a negative departure of -5.0% .

The Central Division stations recorded daily relative humidity in the range of 56% to 99%. Nausori Airport, Laucala Bay (Suva), Koronivia and Tokotoko (Navua) recorded departures of +6.0%, +2.0%, +1.0% and -2.0% respectively.

The daily relative humidity in the Northern Division ranged from 58% to 98%. All the stations recorded positive anomalies, with the highest positive departure of +6.0% observed at Udu Point, followed by +3% at Nabowalu and +2.0% at Savusavu and Matei.

The Eastern Division stations recorded daily relative humidity in the range of 53% to 99%. Significant positive departures from the *normal* were recorded at Lakeba (+8.0%), Ono-i-Lau (+7.0%) and Vanuabalavu (+6.0%), while St. John’s College (Levuka) and Matuku recorded negative departure of -3.0%.

The daily relative humidity at Monasavu ranged from 74% to 97% , with an average of 82%. Rotuma also recorded a positive departure from normal, with +3.0%.

6.0 SUNSHINE

Nadi Airport, Laucala Bay (Suva), Nacocolevu and Rotuma recorded 84%, 80%, 73% and 105% of *normal* bright sunshine hours during the month (Table 2).

Nadi Airport received 178 hours of bright sunshine, with a mean of 5.9 hours per day. More than 10 hours of bright sunshine were recorded on a number of days, with the highest of 12.4 hours observed on the 19th , followed by 11.2 hours and 11.1 hours on the 1st and 2nd respectively. On the other hand, the 4th , 5th , 23rd and 29th were overcast days, with 0.0 hour of bright sunshine recorded.

Laucala Bay (Suva) recorded 108.9 hours of bright sunshine during the month. The mean daily bright sunshine hours for the month was 3.6 hours. The longest duration

of 8.7 hours was recorded on the 17th, while the 4th, 5th, 23rd, 28th and 29th were overcast days, with 0.0 hour of sunshine.

Nacocolevu recorded 125.4 hours of sunshine, with a mean of 5.0 hours. The longest duration of sunshine hours of 10.2 hours was recorded on the 2nd, while overcast days was recorded on the 5th.

Rotuma received 187.8 hours of bright sunshine during the month, with the mean daily sunshine of 6.3 hours. The longest duration of bright sunshine of 9.7 hours was recorded on the 25th, while 0.0 hours was recorded on the 13th and the 29th.

7.0 WIND SUMMARY

The 10-minute average wind statistics recorded at three hourly intervals at Nadi Airport show that southeast winds were common during September, accounting for 20.0% of the total observations, followed by easterly winds with 12.9%, and southerly and westerly winds with 9.6% (Figure 6(a)). Calm conditions were recorded on 28.7% of the occasions. The mean wind speed was 4.9 knots, which was 1.3 knots below the *normal* of 6.2 knots. The wind speeds were light to moderate in strength (Figure 6(b)).

Calm conditions accounted for 54.6% of the three hourly observations at Nausori Airport. The predominant wind direction was east (16.3%), followed by southeast (12.9%), and northeast (12.1%) (Figure 7(a)). The mean wind speed

was 3.2 knots, below the *normal* of 4.8 knots. The wind strengths were in the range of light to moderate (Figure 7 (b)).

The wind anomalies map on the NOAA website shows northwesterly wind anomalies of 1-2m/s persisted in the Fiji region during the month (Figure 12).

light breeze: 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

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)

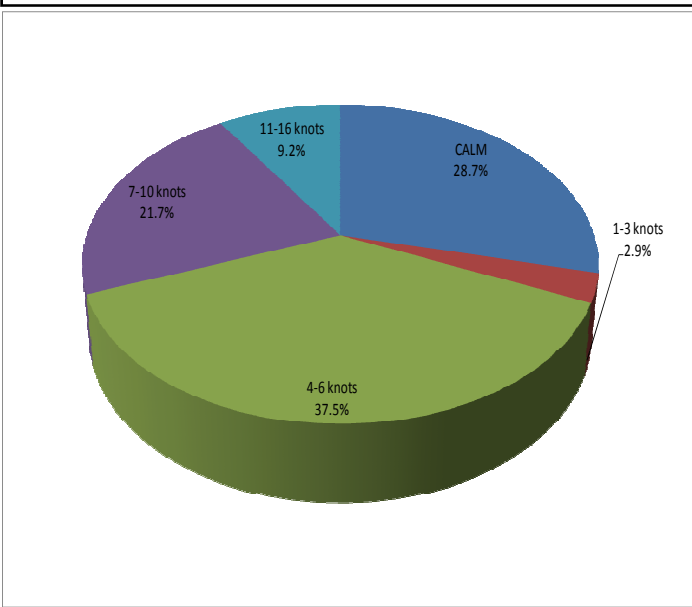
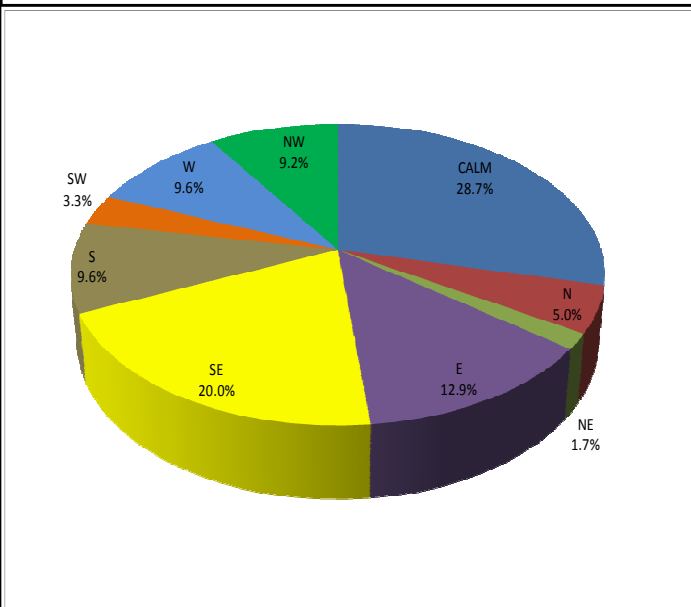
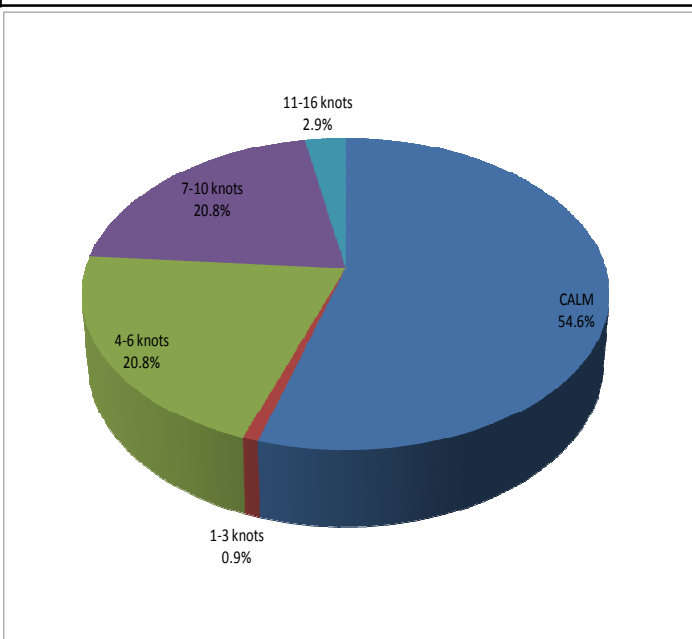
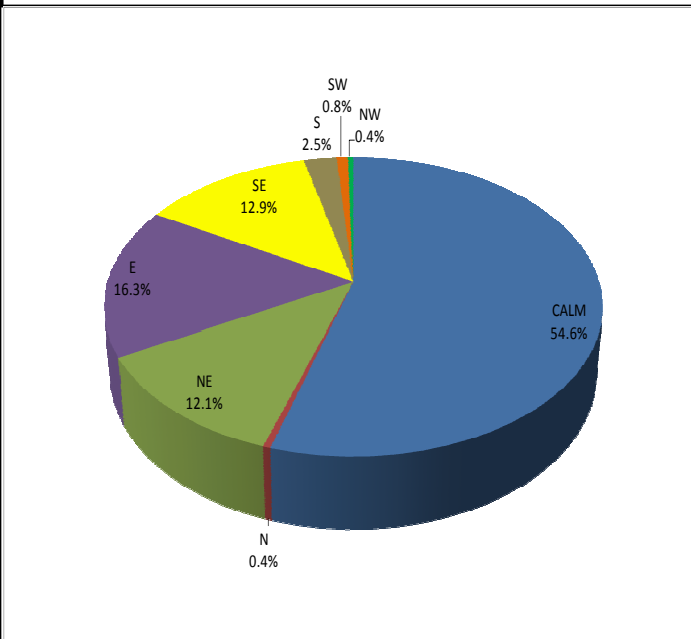


Figure 7(a) Surface Wind Direction for Nausori Airport, Fiji. (WMO 91683 Lat 18°02'47"South Long 178°33'33"East Height above MSL 3m)

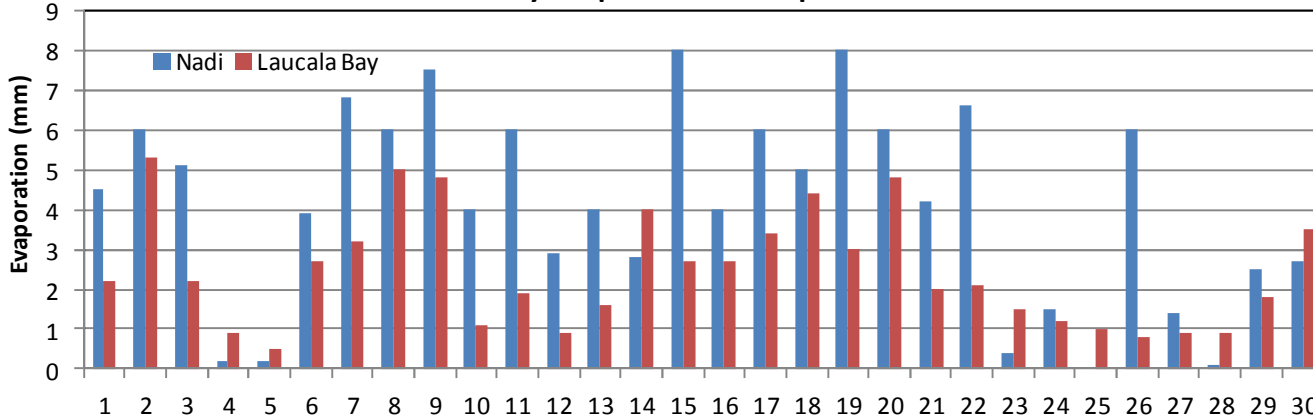
Figure 7(b) Surface Wind Speed for Nausori Airport, Fiji. (WMO 91683 Lat 18°02'47"South Long 178°33'33"East Height above MSL 3m)



8.0 EVAPORATION

Figure 8

Daily Evaporation for September 2012



Nadi Airport recorded more evaporation than Laucala Bay (Suva) on most of the days (Figure 8). The total monthly evaporation at Nadi Airport was 122.3mm, while Suva recorded 73.0mm. Nadi Airport’s highest evaporation of 7.5mm was recorded on the 9th, while Suva’s highest evaporation of 4.8mm were recorded on the 9th and the 20th.

SEA SURFACE TEMPERATURE (SST)

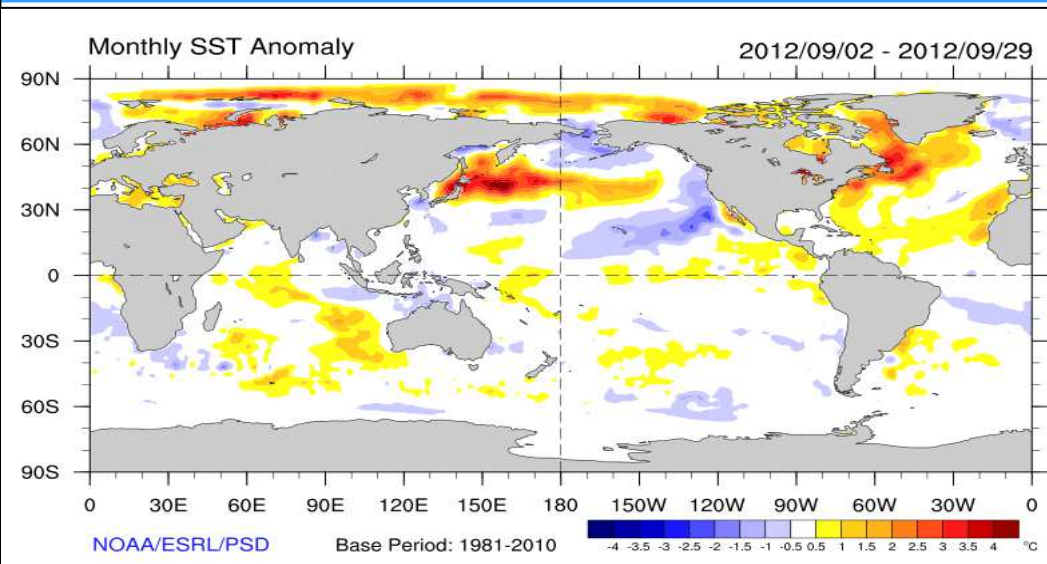


Figure 9:

SST anomalies (°C) from 2nd to 29th September 2012. SST were near normal (-0.5°C-1.0°C)(1981-2010 base period) in the Fiji region (Fiji: ~17°S, 180°), with anomalies of (-0.5°C-1.0°C).

<http://www.cdc.noaa.gov/map/images/sst/sst.anom.month.gif>

CLOUD COVER

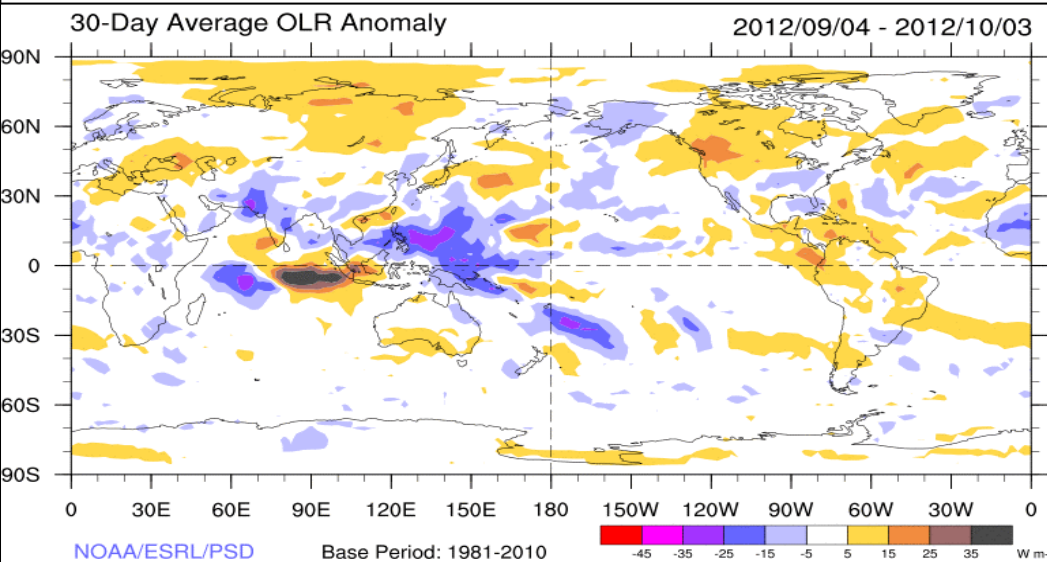


Figure 10:

Outgoing Longwave anomalies (Wm²) from 4th September to 3rd October, 2012. The map suggests near normal (1979 - 2010 base period) cloud cover over most parts of the country.

<http://www.cawcr.gov.au/staff/mwheeler/maproom/OLR/m.lm.html>

SEA LEVEL

Sea Level Anom (cm), Sep 30 2012

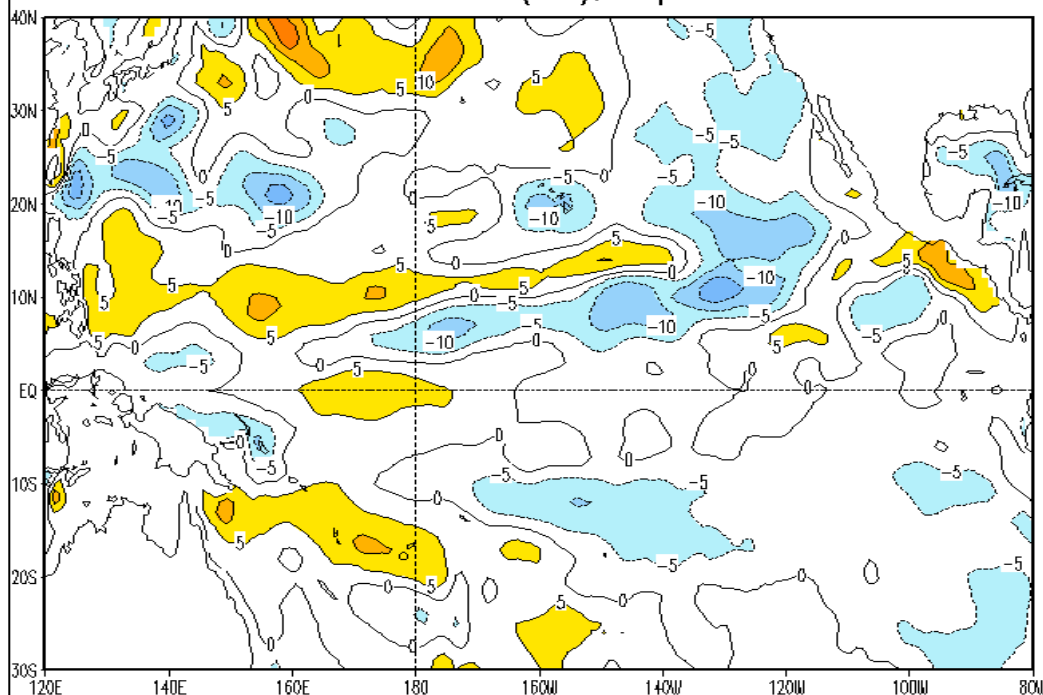


Figure 11:

Sea Level anomalies (cm) for 30 days until September 30th, 2012. Sea level was near *normal* in the Fiji region (Fiji: ~17°S, 180°), through the period.

http://www.cpc.noaa.gov/products/analysis_monitoring/enso_update/sealev.gif

WIND ANOMALIES

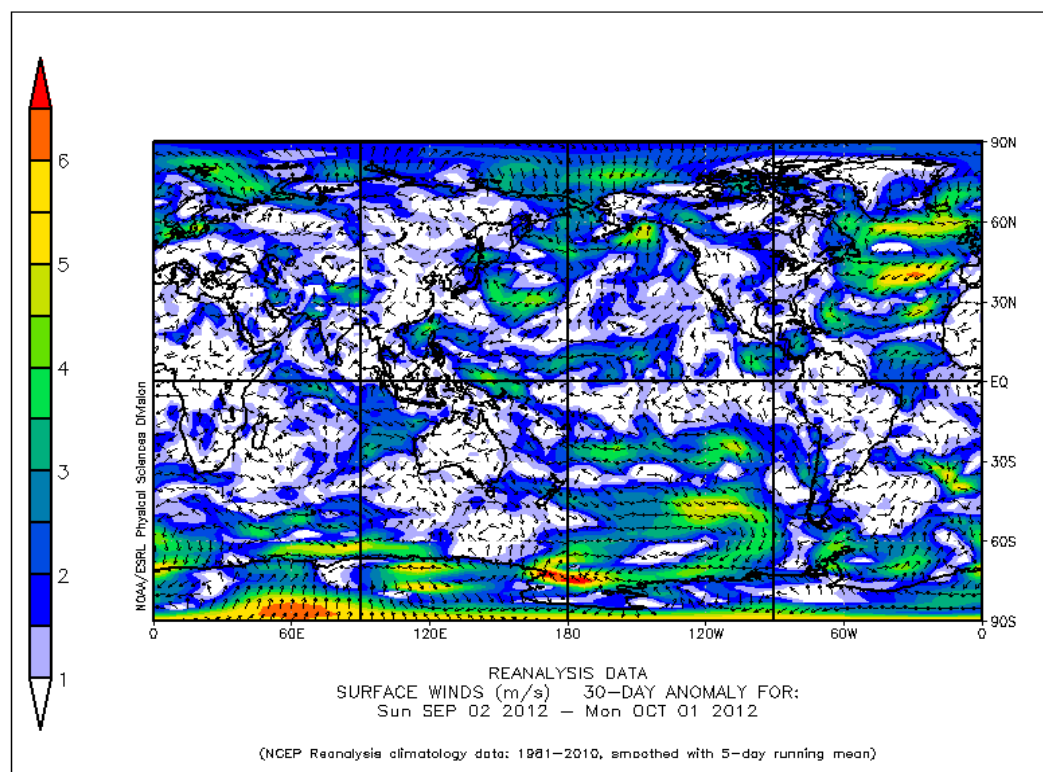


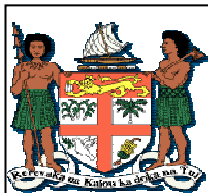
Figure 12:

Variable winds, at near normal anomalies were recorded in the Fiji region (Fiji: ~17°S, 180°) during 2nd September to 1st October, 2012.

http://www.esrl.noaa.gov/psd/map/images/rnl/sfcwnd_30a.rnl.gif

This Summary is prepared as soon as ENSO, climate and oceanographic data is received from recording stations around Fiji and Meteorological Agencies around the World. Delays in data collection, communication and processing occasionally arise. While every effort is made to verify observational data, the Fiji Meteorological Service does not guarantee the accuracy and reliability of the analyses presented, and accepts no liability for any losses incurred through the use of this information and its contents. The information may be freely disseminated provided the source is acknowledged.

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Quality Management System
Customer Products and Services
Survey Form

As part of our ongoing commitment to meet our customer needs for climate products and services, the Climate Services Division (CSD) maintains a Quality Management System to meet World Meteorological Organisation (WMO) standards.

In this effort, customer feedback will assist us to ensure that your needs are addressed and continual improvements to our systems are maintained. Please take this opportunity to make your say in this Customer Feedback Survey.

CUSTOMER SATISFACTION FEEDBACK FORM

File Ref:

FULL NAME: _____

FULL CONTACT ADDRESS:

PHONE NO: _____

FAX NO: _____

EMAIL: _____

