Volume 4: Issue: 2
February 2004

Fiji Islands Weather Summary
February 2004
Rainfall Outlook till May 2004

FIJI METEOROLOGICAL SERVICE

In Brief

Inside this issue:

February was considerably wetter and in some cases warmer especially at night than January. From the end of the first week there were frequent periods of rainfall and occasional thunderstorms in the late afternoon especially about the interior and western parts of the main islands. Most of the country received either average or above rainfall except Savusavu Airport, Monasavu and Vunisea which received below average.

Heavy afternoon rainfall in the Western Division from the 6-14th caused flooding in the Qeleloa, Nadi, Navula and Saru, Lautoka and at Toge and Balevutu, Ba areas. Strong and gusty winds also caused crop damage in the Western Division. The change in weather in recent weeks after a long period of below average rainfall in the Northern Division also seems to have led to a dengue outbreak in the Northern Division.

Day-time and night-time air temperatures were average to above average. Two new day-time temperature record were set this month at Vatukoula (new low of 25.1°C) and Vunisea (new high of 34.4°C). Relative humidity varied around average across the country.

Total sunshine hours were around average at all the recording stations.

Rainfall in Fiji Islands in the next three months is expected to vary around average. The amount of rainfall received at this time of the year is very much dependant on the number of and effect tropical disturbances (cyclones, depressions etc.) have on the Fiji Group.

Weather Patterns

During the first five days of the month, a ridge of high pressure dominated the weather over the country bringing in fine conditions over most places. The moist easterlies eventually settled in and on the 6th, a weak trough developed over the group causing heavy afternoon showers and thunderstorms about the interior and western parts of the main islands. Nadi Airport reported 127.5 mm on the 6th between 2-9p.m. Trade showers continued about the eastern parts of the main islands and afternoon showers dominated the western parts for the next few days.

On 10th, an active trough to the north of the Group drifted south, and brought heavy rain and thunderstorms across the country on the 11th. A series of disturbances formed within this trough but did not develop into a cyclone, it however caused strong and gusty northwesterly winds. A tropical depression was analysed within the trough to the west of Nadi on the 12th which later moved southwards. Associated strong northwesterly winds and heavy rain dominated the Group till the 15th. The trough then moved further westwards and a weak ridge developed over the Group on the 15th and brought settled weather by 16th February.
Another trough developed to the east of the group on the 17th bringing further rain about the eastern parts of the main islands. The trough moved across the country on the 18th and caused scattered rain till the 20th before moving away to the west. As it did, a tropical depression along it, briefly enhancing the associated northerly winds and showers over Fiji. The depression eventually intensified in a tropical cyclone on the 23rd and was subsequently named TC *Ivy* whilst located 330 miles northwest of Nadi and moving steadily away from Fiji. *Ivy* initially moved towards the northwest while intensifying rapidly, before turning southward to pass over the central parts of Vanuatu on the 26th. The cyclone attained a peak intensity of 90 knots on the 26th, while located 30 miles north of Port Vila.

The trough remained to the west while another trough extended over the eastern parts of the Group. Afternoons showers continued about the mains islands till the 28th and on the 29th a ridge extended over the group from the southeast, bringing fine weather.

In the case of Rotuma a trough of low pressure remained slow moving in the vicinity of the island from the 9th to the 13th and from the 17th to the 29th causing some significant rainfall.

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TABLE 1: Rainfall from December to February 2004

Station	Actual Rainfall (mm)	Has rainfall in the last three months been below average, average or above average?	No. of Rain days in December (% of total rain)	No. of Rain days in January (% of total rain)	No. of Rain days in February (% of total rain)
Penang Mill	722.0	Below Average	20 (41)	13 (8)	21 (51)
Monasavu Dam	1381.6	Below Average	31 (59)	16 (13)	23 (28)
Vatukoula Mine	871.2	Average	14 (29)	9 (10)	19 (61)
Rarawai Mill, Ba	957.9	Average	18 (44)	8 (6)	18 (50)
Yasawa-I-Rara	-	-	-	-	-
Viwa Is.	449.0	Average	10 (19)	5 (3)	17 (78)
Lautoka Mill(Research)	585.3	Below Average	18 (32)	10 (6)	18 (62)
Nadi Airport	848.4	Average	22 (25)	9 (15)	18 (60)
Nacocolevu, Sigatoka	643.3	Average	13 (36)	7 (11)	21 (53)
Tokotoko, Navua	935.7	Average	27 (46)	15 (22)	20 (32)
Laucala Bay, Suva	702.7	Below Average	24 (47)	20 (16)	24 (37)
Nausori Airport	714.0	Below Average	26 (43)	16 (15)	23 (42)
Nabouwalu	656.6	Below Average	31 (48)	15 (12)	26 (40)
Labasa Airport	600.5	Below Average	19 (30)	10 (15)	15 (55)
Savusavu Airport	468.8	Below Average	23 (37)	9 (27)	14 (36)
Udu Point	1011.9	Above Average	25 (32)	14 (16)	19 (52)
Matei Airport	913.2	Average	27 (55)	20 (13)	19 (32)
Lakeba Is.	510.5	Average	14 (41)	15 (14)	16 (45)
Matuku Is.	-	-	-	-	-
Ono-I-Lau Is.	232.1	Below Average	6 (13)	7 (11)	12 (76)
Vunisea, Kadavu	382.3	Below Average	19 (52)	17 (10)	17 (38)
Rotuma	765.5	Below Average	22 (37)	16 (20)	16 (43)

Rainfall in the last three months

Rainfall in February

Most of the country received either average or above rainfall except Savusavu Airport, Monasavu and Vunisea which received below average rainfall (<80% of normal). Udu Point received well above average rainfall (211%). In the Western Division rainfall ranged from (74-175%), Northern Division (70-211%), Eastern Division (62-101%) and Central Division (99-115%) of normal.

Rainfall in the 3-months from December to February

The Rainfall forecast for the period December to February in the November Fiji Islands Weather Summary was for rainfall vary around average. The confidence level of the forecast was moderate.

Of the twenty sites that reported in time for this summary, eleven sites reported below average, eight average and one above average.

A number of sites especially those in the Northern Division may still be in a rainfall deficiency situation however rainfall has improved considerably in the last month. Below average rainfall in the last three months was generally received in the northern parts of the Western Division, parts of the Central Division, western and central Vanua Levu, Vunisea, Ono-I-Lau and Rotuma.

Figure A

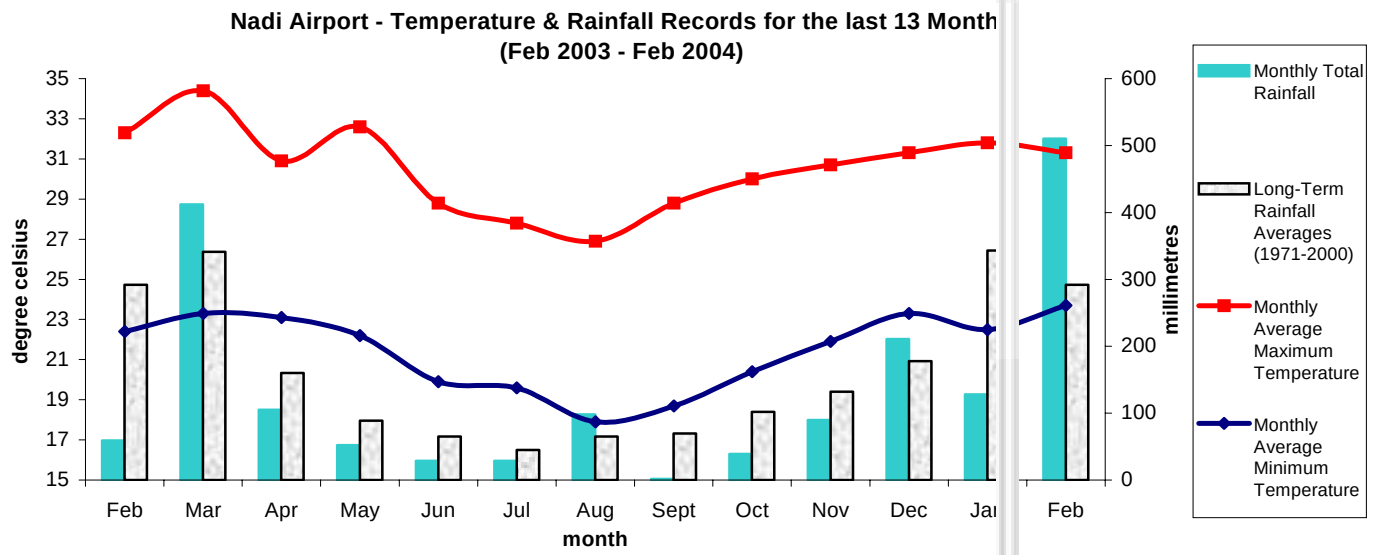


Figure B

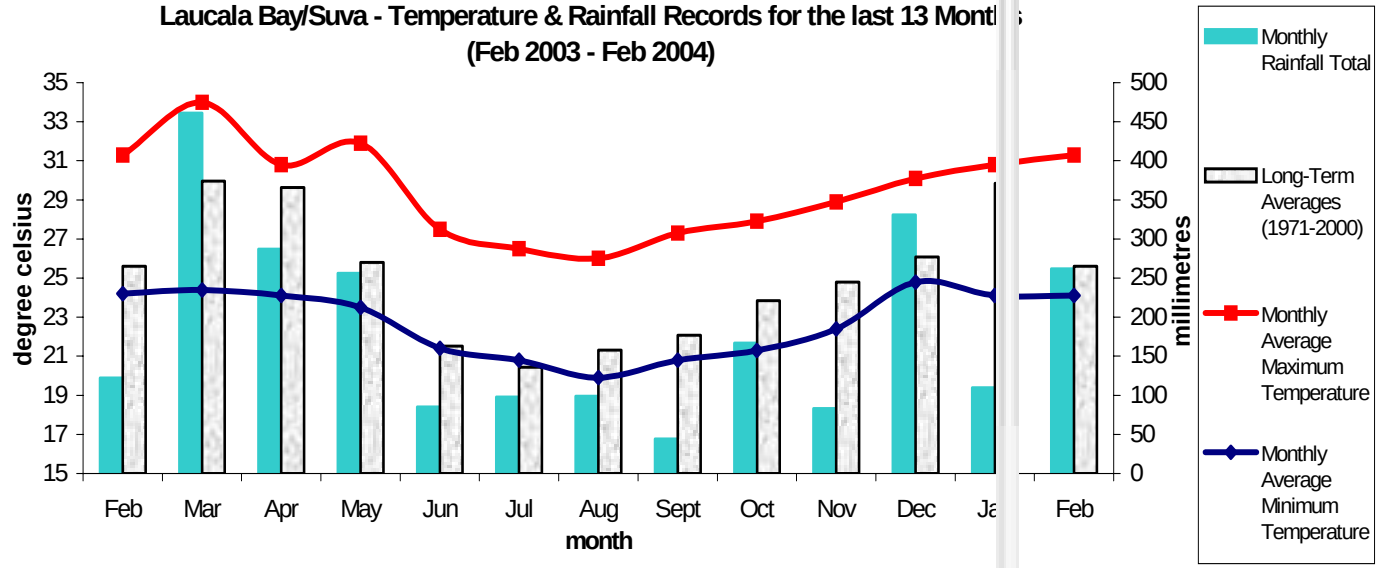
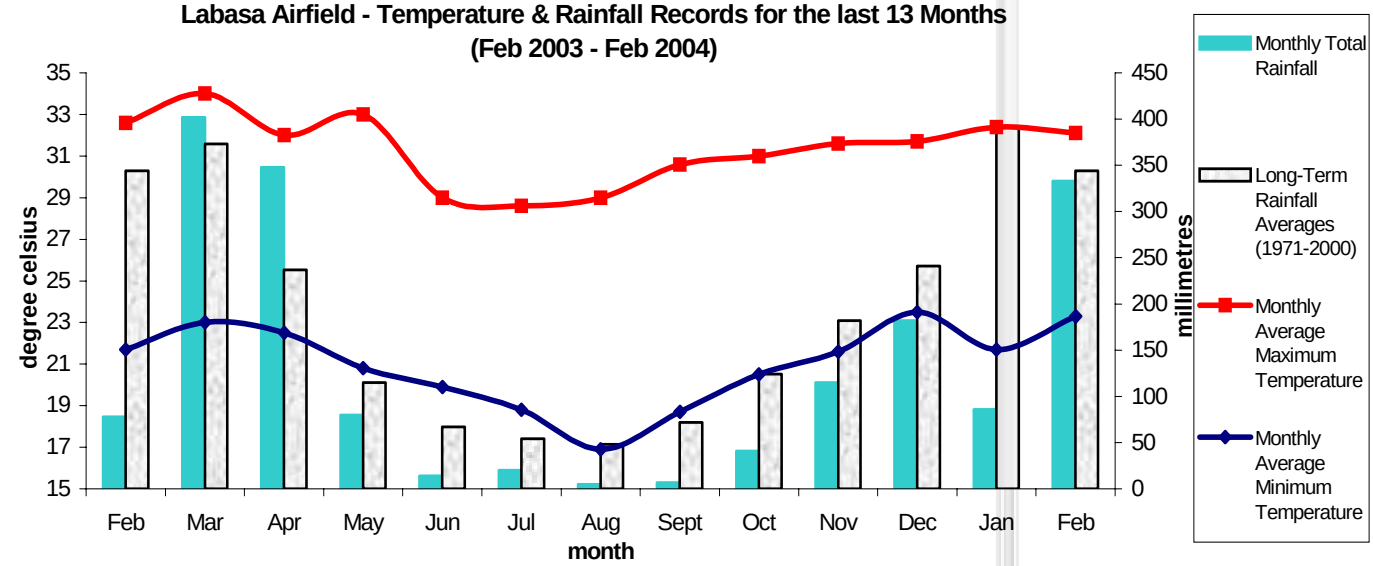


Figure C



Climate in February

Mean Day-time and Night-time Air Temperatures and Relative Humidity at 0900hrs.

Day-time temperatures were generally average to above average across the country. The greatest positive departures were recorded at Ono-I-Lau and Nabouwalu which recorded 1.6 and 1.1°C respectively above normal. There were only two negative departures that were recorded at Vatukoula and Nadi Airport, 0.5 and 0.3°C below normal. A new high temperature was recorded at Vunisea and a new low at Vatukoula.

Night-time temperatures were generally average to above average. The greatest positive departures from normal were recorded at Vatukoula and Savusavu/Labasa Airfields which both recorded 1.0 and 0.9°C respectively above normal. The greatest negative departures were recorded at Penang Mill and Udu Point which recorded 0.7 and 0.2°C respectively below normal.

Relative Humidity (RH) at 0900hrs varied around average across the country. The greatest positive departures were recorded at Laucala Bay and Nacocolevu (+3%). The greatest negative departures were recorded at Rarawai Mill and Labasa Airfield (-4%).

Soil Moisture and Runoffs

Soil moisture conditions varied considerably throughout the month. The second half of the month was much wetter then the first.

In the Western Division conditions generally ranged from moderate to dry during the first week of the month then moderate to excessive during the remaining three weeks.

In the Central Division conditions were moderate to ample during the first week then excessive to ample during the remaining three weeks.

In the Northern and Eastern Divisions conditions were ample to dry during the first week then moderate to excessive during the remaining three weeks.

Rotuma recorded ample to moderate during the first week and excessive to ample conditions the remaining three weeks.

Significant runoffs were recorded at Udu Point (375.5mm), Vatukoula (358.0mm), Nadi Airport (344.4mm), Rarawai Mill (320.3mm) and Monasavu (276.5mm).

Sunshine, Radiation & Winds

Total sunshine hours were average to above average. Nadi Airport recorded 81%, Laucala Bay/Suva, 97%, Nacocolevu 85% and Rotuma 91% of normal.

Global Solar Radiation (average per day) recorded at Nadi Airport was 16.3MJ/ M^2.

Monthly average wind speed was above average at Nadi Airport and Nabouwalu and below average at Rotuma, Nausori Airport, Lakeba, Vunisea and Ono-I-Lau.

Records set in February 2004

Element	Station	Observed (record)	On	Rank	Previous (record)	Year	Records Began
Max Temp	Vatukoula	25.1°C	13th	New Low	27.5°C	1996	1984
Max Temp	Vunisea	34.4°C	5th	New High	34.1°C	1997	1947

November to April 2003/04 Tropical Cyclone Season

The South West Pacific Tropical Cyclone Season officially began on 1st November and will continue till 30th April 2004.

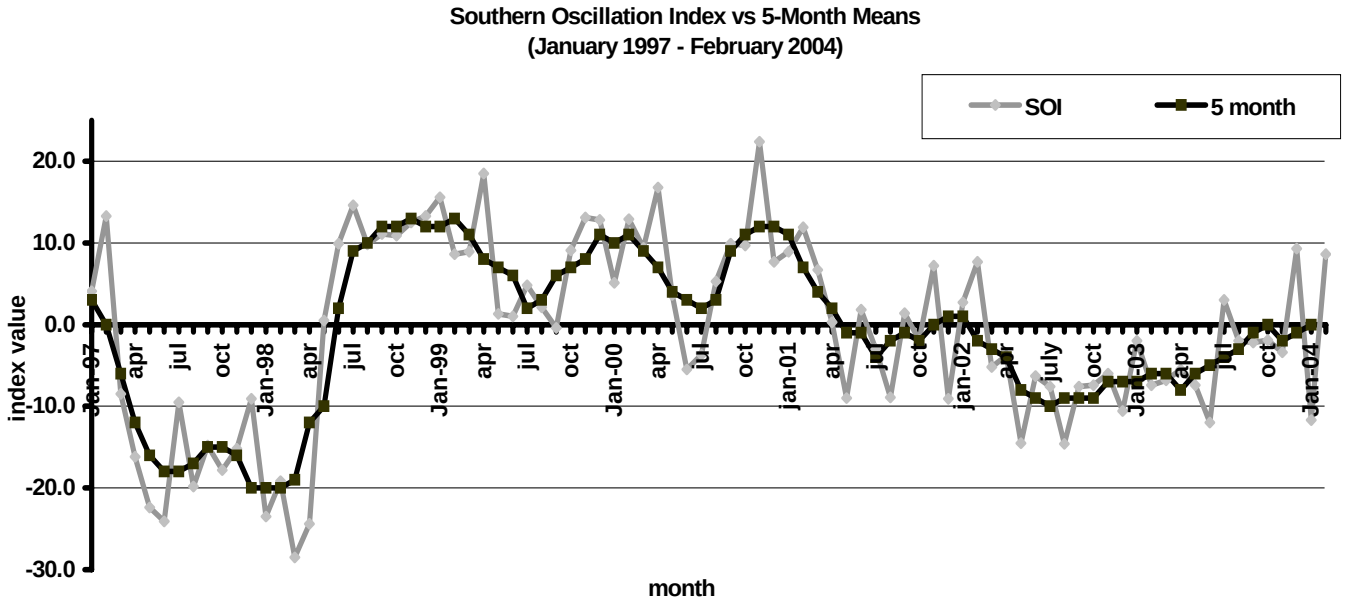
The chances of cyclone activity in the Fiji region this season are slightly higher than normal based on the prediction that *Neutral* conditions will continue through the season. The average number of cyclones that have affected Fiji (including pre-season events) since 1969/70 is between 1 and 2. However, there have been as many as six events such as in 1996/97.

Historical records of tropical cyclones affecting Fiji since the 1969/70 show that 13 cyclones have affected Fiji in March with four of them causing severe damage. The years were 1971, 79, 80, 83, 84, 85 (2 events), 89, 92, 94, 97 (3 events).

There have been only two cyclones (TC *Heta* and *Ivy*), develop in Fiji's RSMC region this season.

Prior to and during a cyclone information on the event and regular updates will be provided on the Fiji Met Service *http://www.met.gov.fj* website, via *Poll fax* and the media.

Figure D



ENSO status and Rainfall Outlook to April 2004

The Southern Oscillation Index (SOI) for February was 8.6 (January was -11.7) with the five-month running mean of 0 centred on December (November was -1) (Figure D).

The current El Niño-Southern Oscillation status remains neutral. The surface of the equatorial Pacific is generally slightly warmer than average having cooled marginally in most areas over the past fortnight.

The Kelvin wave of sub-surface warming, noted in previous weeks, has dissipated with little or no effect on eastern Pacific temperatures. In fact, subsurface temperatures are cooler than average in the central and eastern Pacific.

The SOI has see-sawed dramatically over the past three months as air pressure has alternately risen and fallen across northern Australia and the central Pacific. The Bureau's Ocean forecast model indicates about a 20 to 25% chance of El Niño by winter or spring. This is about the same as the natural or historical frequency of occurrence. 7 of 12 computer models surveyed by the Bureau indicate a persistence of neutral conditions to July 2004, with the other five indicating a possible El Niño. A majority of models are also in favour of neutral conditions in October 2004.

The March to June period is known as the "predictability barrier" and model skill is at its lowest when predicting across this span of months. Users should therefore be cautious when interpreting model forecasts for the middle of 2004. March to June is also the key time of year for El Niño events to be aided or triggered into development by westerly wind bursts (weakening or reversal of the Trade Winds).

(The ENSO Update and SOI are provided by of the National Climate Centre, Australian Bureau of Meteorology and can be found at http://www.bom.gov.au)

FMS Rainfall Prediction Model: *This model is based on schemes, which have run successfully at the Australian Bureau of Meteorology's National Climate Centre. These a statistical scheme based on the relationship between SOI and subsequent three-month rainfall totals. In each case the probability of low, medium or high rainfall in the oncoming three-month period is provided. The scheme uses the SOI averaged over the most recent three-month period. <u>The reliability of the model is high during the wet season (Nov-Mar) but decreases during the dry season (May-Sept) and during the transitions months, April and October.</u>*

Below average rainfall is predicted for the whole of Viti Levu and Vanua Levu except for Suva, Nausori Airport and Udu Point. Below average is also predicted for the Eastern Division and Rotuma except Ono-I-Lau and Matuku. For the remaining areas near average or equal chances of below, average or above average rainfall is predicted (Figure E).

Australian Rainman: *This is a Rainfall Prediction Model was created from joint efforts between Australia Meteorological and Agricultural Agencies. The model incorporates the use of SOI to test its effects on the probability of rainfall in upcoming months. It shows the relationship between ENSO (El Niño - Southern Oscillation) events and rainfall. Due to public demand this model is currently used to present the probability of receiving rainfall in the coming individual months over a three-month period. Please note that the reliability of forecast for one month is lower than for a combined three month period.*

The model predicts a 36-68% chance (depending on location) of receiving average rainfall across Fiji in next three months (Table. 2).

<u>Outlook for March to May 2004:</u>

Based on the model predictions and 'neutral' conditions, Fiji's rainfall is expected to vary considerably around average in the next three months (some parts of the country may receive below average rainfall and others above average rainfall).

The amount of rainfall received at this time of the year is very much dependant on the number of and effect tropical disturbances (cyclones, depressions etc.) have on the Fiji Group.

NOTE: The confidence level in the outlook is 'low' due to the outlook period including the transition period from Wet to Dry Season.

Preliminary Climatological Summary for February 2004

PRELIMINARY CLIMATOLOGICAL DATA FOR MONTH 2 , 2004 : SUMMARY FOR DAYS 1 TO 29

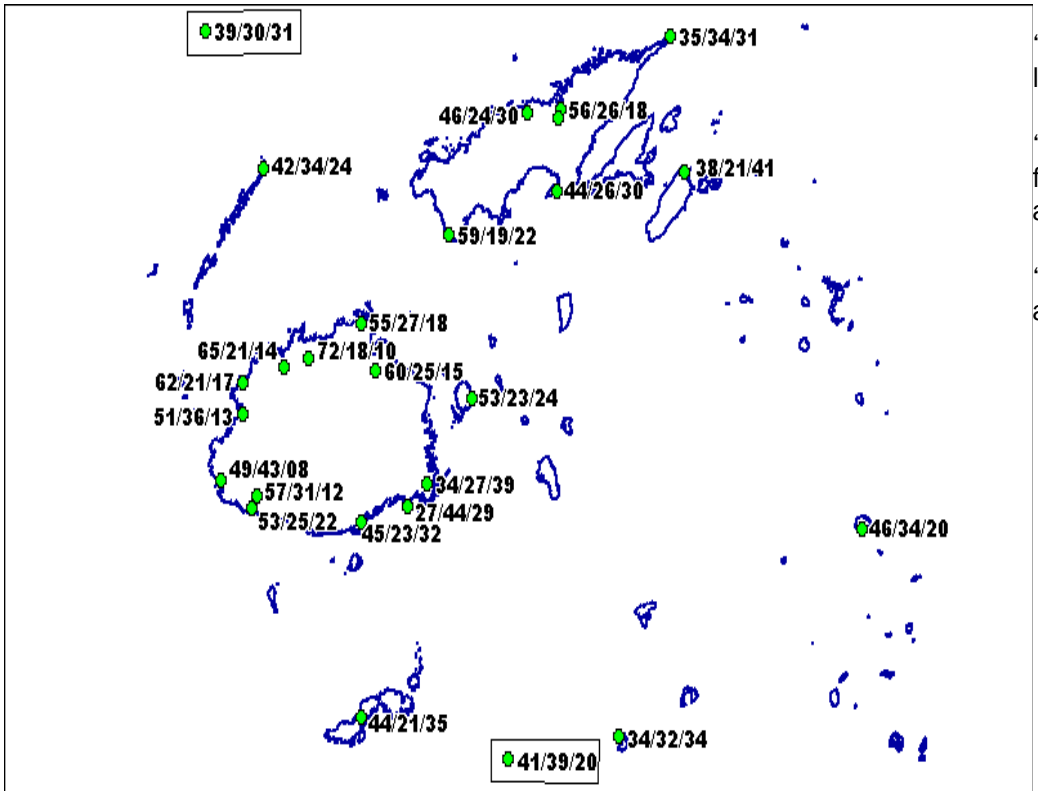
	RAINFALL					AIR TEMPERATURES								SUNSHINE	
	TOTAL	*	RAIN DAYS +	MAX. FALL MM	ON	AVERAGE DAILY MAX.	#	MIN.	#	EXTREME MAX.	ON	EXTREME MIN.	ON	TOTAL HRS	* %
	MM	%				C	C	C	C	C		C			
NADI AIRPORT	510	175	18	128	6	31.3	-0.3	23.7	0.8	33.6	5	22.1	9	153	81
SUVA/LAUCALA BAY	262	99	24	45	12	31.3	0.1	24.1	0.1	33.2	23	21.6	14	171	97
NACOCOLEVU	340	145	21	61	19	31.7	0.2	23.2	0.6	33.8	28	21.2	4	138	85
ROTUMA	329	101	16	75	12	31.3	0.7	25.0	0.3	33.3	7	22.8	25	146	91
VIWA	349	144	17	98	13	31.8	0.5	25.6	0.3	34.6	6	23.5	14		
UDU POINT	526	211	19	136	3	30.8	-0.0	24.3	-0.2	32.4	10	21.5	14		
LABASA AIRFIELD	333	98	15	138	20	32.1	0.5	23.3	0.9	34.5	6	20.2	2		
NABOUWALU	260	94	26	65	13	31.5	1.1	24.9	0.5	33.3	15	22.3	14		
SAVUSAVU AIRFIELD	171	70	14	46	12	31.1	0.3	24.6	0.9	34.4	16	21.5	14		
MATEI AIRFIELD	294	103	19	75	7	30.7	0.3	24.3	0.1	32.5	5	23.0	4		
*YASAWA-I-RARA	Faulty AWS														
VATUKOULA	538	139	19	139	13	31.3	-0.5	23.1	1.0	34.3	7	21.0	14		
MONASAVU	392	74	23	71	13	26.0	0.3	19.8	0.5	28.3	24	16.1	17		
NAUSORI AIRPORT	301	112	23	52	12	31.1	0.3	23.3	-0.0	33.4	5	20.1	2		
NAVUA/TOKOTOKO	293	115	20	47	8	30.1	0.1	23.1	0.1	32.0	5	21.0	3		
LAKEBA	228	101	16	46	26	31.2	0.7	24.6	0.5	32.7	19	21.1	3		
*MATUKU	Faulty AWS														
VUNISEA	144	62	15	28	13	30.8	0.4	24.3	0.7	34.4	5	22.1	3		
ONO-I-LAU	177	91	12	38	13	31.4	1.6	25.4	0.8	33.0	23	20.9	15		
BA/RARAWAI MILL	473	136	18	135	13	32.1	-0.0	22.5	0.2	34.0	4	20.5	3		
LAUTOKA AES	366	122	18	123	13	31.4	0.3	24.4	0.5	33.5	4	22.8	14		
PENANG MILL	371	111	21	114	13	31.2	0.7	23.2	-0.7	33.0	4	21.5	14		

	PE	WATER BALANCE(MM)						TEMPERATURE(C)			HUMIDITY	WIND	SUN	RAD
	MAX.	LAST	DEF	NO	RO	NO	DLY	DRY	WET	RH%	VP		%OF	MJ/
	.1MM	DS	ON	DS	DYS		DYS	MEAN	(AVERAGE AT 9AM)			KT	POS	SQ.M
NADI AIRPORT	51	44	5	4	0	0	344	13	27.5	28.5	25.5	78	30.3	6.0	42	16.3
SUVA/LAUCALA BAY	48	48	7	10	0	0	113	5	27.7	27.6	25.6	85	31.4		47	u/s
NACOCOLEVU	49	50	4	5	0	0	172	13	27.5	27.6	25.4	84	30.8		42	20
ROTUMA	50	57	8	4	0	0	167	8	28.2	28.9	25.9	78	31.1	2.7	42	19
VIWA	53	75	4	14	6	2	150	5	28.7	29.1	26.2	79	31.8			
UDU POINT	48	25	2	5	0	0	376	11	27.5	28.2	25.9	83	31.5			
LABASA AIRFIELD	49	63	7	6	0	0	155	2	27.7	28.5	25.4	78	30.1			
NABOUWALU	48	22	4	4	0	0	120	11	28.2	28.6	25.9	80	31.4	2.3		
SAVUSAVU AIRFIELD	48	74	11	10	0	0	6	1	27.9	28.6	25.6	78	30.5			
MATEI AIRFIELD	48	20	23	7	0	0	157	9	27.5	28.8	26.2	81	31.9			
*YASAWA-I-RARA	Faulty AWS															
VATUKOULA	51	75	9	8	2	1	358	7	27.2	28.2	24.9	77	29.0			
MONASAVU	38	24	5	0	0	0	277	15	22.9	22.6	21.2	88	24.0			
NAUSORI AIRPORT	47	38	5	5	0	0	153	13	27.2	27.7	25.6	84	31.2	3.8		
NAVUA/TOKOTOKO	46	26	4	16	0	0	167	14	26.6	27.7	25.2	82	30.3			
LAKEBA	48	69	9	9	0	0	60	5	27.9	29.0	25.9	78	31.1			
*MATUKU	Faulty AWS															
VUNISEA	48	75	7	34	11	4	0	0	27.5	28.7	25.8	79	30.9	3.4		
ONO-I-LAU	48	75	1	50	38	9	50	3	28.4	28.7	26.1	81	31.9	1.8		
BA/RARAWAI MILL	52	31	5	5	0	0	320	9	27.3	28.5	25.2	77	29.6			
LAUTOKA AES	51	59	9	5	0	0	189	8	27.9	28.7	25.3	76	29.7			
PENANG MILL	51	55	6	5	0	0	202	10	27.2	27.0	25.3	87	30.9			

DS IS SOIL MOISTURE DEFICIT,LIMIT 75 MM; RO IS WATER SURPLUS (INDEX OF RUNOFF)
DEF (AE-PE) IS EVAPOTRANSPIRATION DEFICIT (INDEX OF IRRIGATION WATER NEEDED.
PE IS LONG TERM MEAN PENMAN POTENTIAL EVAPOTRANSPIRATION (CALCULATED OR ESTIMATED).
MEAN TEMPERATURE IS (MAX+MIN)/2; WIND IS MEAN SPEED AT 06,12,18,24 HOURS.
$:SOLAR RADIATION CALCULATED FROM SUNSHINE DURATION. # :DEPARTURE FROM NORMAL.
+ :NUMBER OF DAYS WITH 0.1 MM OR MORE RAIN. * :PERCENT OF NORMAL.

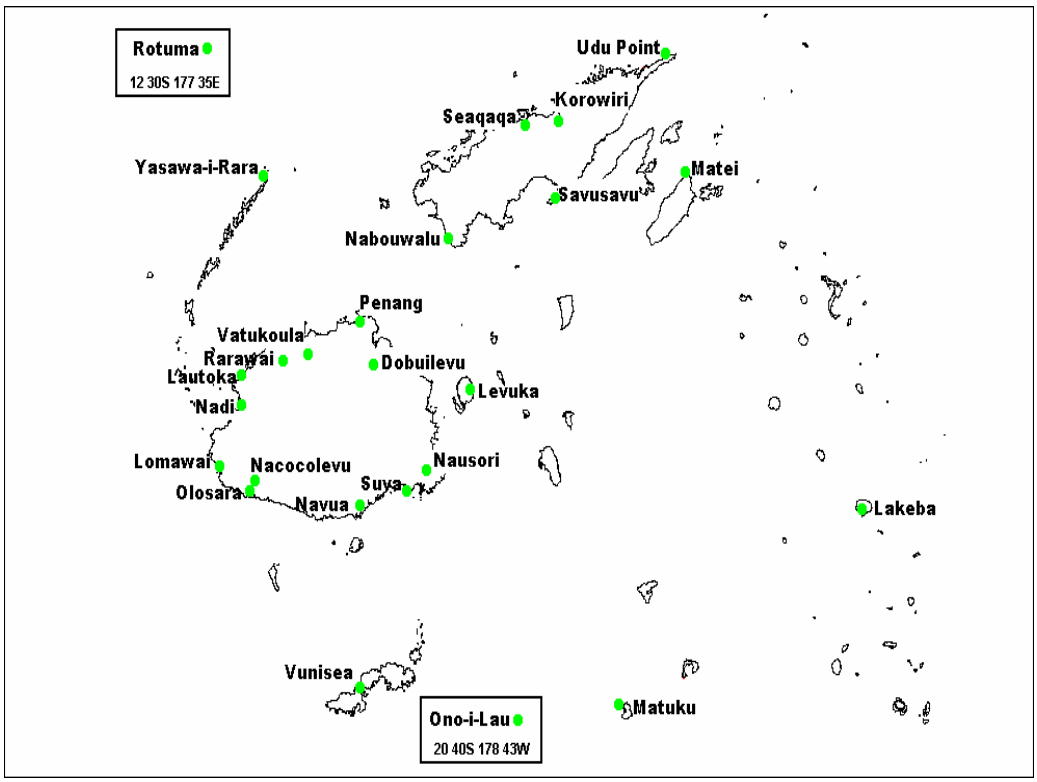
Three Month Rainfall Outlook Probabilities for March to May 2004

FIGURE E*:* Three Month Forecast for Selected Stations in Fiji using the Fiji Meteorological Services Rainfall Prediction Model



Please note that the probabilities are listed beside of the corresponding station marker or dot.

FIGURE F*:* Reference Map of selected Climate/Rainfall sites in Fiji



The forecast probabilities are presented as

DRY/NORMAL/WET

'DRY' range refers to rainfall less than 33rd percentile.

'NORMAL' (average) range refers to rainfall between 33rd and 67th percentiles.

'WET' range refers to rainfall above 67th percentile.

Reference Table for 33rd and 67th Percentile

Station	33% (mm)	67% (mm)
Western Division		
Dobuilevu	692	903
Vatukoula	513	826
Rarawai	519	784
Penang	591	873
Lautoka	506	691
Nadi	501	665
Lomawai	449	660
Nacocolevu	445	646
Olosara	480	613
Yasawa	458	643
Central Division		
Navua	1004	1258
Suva	829	1066
Nausori	803	1048
Eastern Division		
Levuka	710	951
Lakeba	538	722
Matuku	483	641
Ono-I-Lau	425	663
Vunisea	594	752
Northern Division		
Labasa Mill	556	810
Seaqaqa	606	847
Nabouwalu	669	897
Savusavu	601	833
Udu Point	590	811
Matei	709	987
Rotuma	840	1041

TABLE 3: Monthly Rainfall Outlook Probabilities for March to May 2004

	March 2004		April 2004		May 2004		Mar to May 2004 combined	
Station Name	**Average***	**Probability#**	**Average***	**Probability#**	**Average***	**Probability#**	**Average***	**Probability#**
Western Division								
Dobuilevu	429	**41**	286	**43**	130	**42**	845	**36**
Vatukoula	382	**23**	221	**68**	78	**46**	681	**53**
Rarawai	365	**53**	207	**71**	95	**33**	667	**51**
Penang	425	**45**	269	**53**	161	**32**	855	**36**
Lautoka	308	**46**	187	**70**	84	**56**	579	**56**
Nadi	341	**32**	160	**75**	89	**41**	590	**46**
Lomawai	294	**52**	169	**57**	90	**44**	553	**51**
Olosara	258	**36**	166	**69**	99	**53**	523	**68**
Nacocolevu	275	**43**	155	**70**	85	**58**	515	**59**
Yasawa-I-Rara	276	**27**	209	**51**	85	**46**	570	**56**
Central Division								
Navua - Tamanoa	413	**59**	448	**14**	287	**55**	1148	**51**
Suva	374	**45**	366	**18**	270	**41**	1010	**54**
Nausori	382	**46**	356	**19**	248	**48**	986	**42**
Eastern Division								
Lakeba	293	**27**	206	**26**	136	**50**	635	**53**
Ono-I-Lau	253	**20**	157	**78**	103	**54**	513	**49**
Northern Division								
Korowiri	378	**28**	251	**68**	116	**46**	745	**42**
Seaqaqa	392	**15**	269	**62**	125	**43**	786	**43**
Nabouwalu	335	**48**	300	**53**	171	**51**	806	**45**
Savusavu	283	**33**	261	**44**	196	**35**	740	**46**
Udu Point	320	**30**	276	**29**	167	**38**	763	**40**
Rotuma	369	**42**	294	**65**	296	**54**	959	**60**

Please note that the above figures should be used with caution, as there is some degree of uncertainty associated with them, and particularly the reliability of the model is low during the transition months and the dry season.

The probabilities in the three-month combined column are not an average of the three individual months. The model in this case has been re-run for three combined months. There is a higher degree of skill association with predicting rainfall for three combined months compared to three individual months.

** 'Long-term Average' for the 30 year period from 1971-2000.*
 # Probability of expecting at least normal rainfall.