

Fiji Meteorological Service (FMS) Tropical Cyclone Guidance for Season 2010/11 for the Fiji and the Southwest Pacific RSMC Region 160E to 120W Equator to 25 South

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GENERAL STATEMENT

The Southwest Pacific region, in the Fiji Meteorological Service (FMS) Regional Specialized Meteorological Center (RSMC) area of responsibility covering the area bounded by longitudes 160 East and 120 West and latitudes Equator to 25 South, is expected to have below average to average (7 to 9 tropical cyclones) this 2010/11 Tropical Cyclone (TC) Season, beginning on 1 November 2010 and ending on 30 April 2011. The Fiji Islands, inclusive of its Exclusive Economic Zone (EEZ), is expected to be affected by 1 to 2 tropical cyclones this season. It is expected that systems will be relatively weaker this La Niña season, compared to last year's El Niño season. Risks are elevated for tropical cyclones to approach Fiji from the northwest quadrant and reduced risks for systems approaching from the northeast quadrant.

It should be noted that the information provided in this paper is only to be used as a guidance and that in La Niña years like the present, Fiji has had no cyclones in three seasons viz., 1971/72, 1975/76 and 2008/09 and a maximum of three tropical cyclones in 1973/74 and 1988/89. The likely number of tropical cyclones is indicative only. It is expected that the total number of tropical cyclones will be in the vicinity of the values listed, and not necessarily within the given range. The values are the most likely number of tropical cyclones based on statistical and scientific evidence including the influences by larger regional and global weather and climate variability indices.

A: Summary

1.0 SW Pacific (160 E to 120 W Equator to 25 South) Nadi RSMC Region

The expectation for the 2010/11 TC Season is 7 to 9 tropical cyclones in the Southwest Pacific region; that is average to just below average. The regional average is 8.9 over the 1969/70 to 2009/10, 40+ year period, with La Niña years having only 8.7 tropical cyclones in the region. In El Niño years, however, an average of 9.3 tropical cyclones is expected in the region. In the 2010/11 Season, the main area of formation will shift to the Coral Sea region from last year's Fiji-Samoa region, due to the shift in the ENSO indices as well as the sea surface and sub-surface temperature warm anomalies. Subsequently, there will be higher risks for the Coral Sea region between New Caledonia and Solomon Islands as well as Vanuatu and Fiji. There is reduced risk for communities east of the Dateline but as historical data indicated, some communities east of the Dateline had been affected in La Niña years. It is therefore critical that all communities remain alert and prepared throughout the 2010/11 TC Season.

2.0 Fiji Islands

Fiji during the 2010/11 season is expected to have 1.5 or less number of cyclones. The conditions will be like near neutral average conditions with normal or reduced level of threat. Due to the genesis of the majority of the 8.7 tropical cyclones in the region of the Coral Sea, there is a marked level of risk in those 1.5 tropical cyclones to impact Fiji from the west, leading to a high degree of risk to the Western Division. There is a high probability that any tropical cyclone affecting or passing in the vicinity of the country will approach from the west. These systems can either pass through from the west or keep to the southwest of Fiji. For those tropical cyclones passing further to the southwest of the country, associated active cloud and rain bands may occasionally affect Fiji with marked rainfall and possible flooding, including sea flooding of low-lying coastal areas.

3.0 Madden-Julian Oscillation (MJO)

The MJO can not be used for seasonal predictions of TC activity despite concrete evidence of MJO attributing to the modulation of TC activity, due to its short time scale of variability and any predictions can only be made within 2-3 weeks in advance on an intra-seasonal basis. Often this will only be on a qualitative basis and a guide as to either of a suppression or enhancement during different phases of the MJO.

For the MJO, vorticity and shear fields appear to be most important. For Equatorial Rossby (ER) Waves, the OLR and vorticity fields appear most important. The Kelvin and mixed Rossby-Gravity waves have also shown consistency between their TC modulation and vorticity and OLR fields. Thus there appears to be no single factor that controls all intra-Seasonal TC variability. Leroy and Wheeler (2008) were the first to show the feasibility of intra-seasonal TC activity prediction using the MJO and try to apply it in real time.

It should be noted that just showing that there is a contemporaneous relationship between the Waves and TC activity is not enough for TC prediction. A definite relationship does exist however in phases of time when TC activity is either enhanced and/or suppressed, effects on intensity and even tracks. The problem is the predictability of the waves themselves, so it is not easy to build a synchronous relationship.

The predictability limits suggested are: MJO 20 days, ER 7 days, Kelvin 4 days. Thus it has been noted that the MJO and the ER waves are worthy of further examination on the weekly time scale. However this does not preclude the operational synoptic meteorologist from making qualitative judgments as to either of an increased/decreased TC modulation risk, depending on the phase of the MJO and judgments may be made to increase the synoptic skills up to 2-3 weeks in advance.

Thus advance seasonal predictions of the TC modulation and MJO on a time scale even within the 2010/11 season in the SW Pacific and Fiji can not be made due to the nature of the scale problem at hand. However once the TC season proper starts the meteorologist at RSMC Nadi will fully utilize the MJO index as a guide also, and amongst all other parameters, this feature will also be on the back of his mind during decision making within a 2-3 week cycle.

B: Overview

The areal distribution, number and frequency of tropical cyclone activity in Fiji and the Southwest Pacific region is often associated with much larger scale system happening over the globe than that the normal person is aware of.

Climate drivers like the South Pacific Convergence Zone (SPCZ) which has no clear demarcation, but persists in well defined regions depending on the low level convergence of the trade winds, bringing moisture to great heights and contributing to an environment conducive to low pressure, depression and tropical cyclone development.

Phenomenon like ENSO (El Nino-Southern Oscillation), La Niña and even neutral condition indices have a huge impact on the region of genesis, the number and even likely initial movement, due to marked reversals in the Walker Circulation leading to easterly or westerly wind bursts which further leads to favorable or unfavorable conditions for tropical cyclone development. This ENSO cycle has often a 3 to 5 years cycle which drives this natural variability of the regions of tropical genesis and the degree of threat associated with it.

These indices are also fully responsible for the degree of regional risk to each island nation due to their proximity to the cool/warm ocean pool, ascending/descending side of the walker circulation, vicinity to the Equator or zonal/latitudinal location. Theoretically, no

cyclones should form about 5 degrees either side of the Equator and countries within this region are generally not under threat from tropical cyclones. However, recently, a few systems have been observed to develop into tropical cyclones within this region. An initial movement of TC's in our region at low latitudes is generally a west to southwest course, significant intensification and often slow movement at 3-5 knots. However, once systems have moved further south to higher latitudes around 15-20 degree south, systems quickly come not only under a westerly steering field, but often a westerly wind shear which often has significant future impacts on its intensity and direction. Systems almost invariably move to the south and then in a southeasterly direction, before transitioning to extra-tropical systems, some earlier than others.

C: Conclusion

In the 40+ year 1969/70 to 2009/10 period the Southwest Pacific had only 8.9 tropical cyclones in the region per season, on average with 2.4, 2.9 and 4.3 reaching gale, storm and hurricane force respectively. These figures are not double counted and only the maximum strength attained is counted in the enclosed tables.

In this period 40+ year period 1.5 tropical cyclones affected Fiji per season on average, with 0.9, 0.3 and 0.5 reaching gale, storm and hurricane strength.

In La Nina years we note that the Southwest Pacific average drops from 8.9 in normal years to 8.7 and the number of tropical cyclones affecting Fiji remains similar at 1.5; a figure similar to neutral/average and/or La Niña conditions also. During El Niño conditions the Southwest Pacific has 9.3 on average with 1.6 tropical cyclones on average affecting Fiji; an increased activity. During neutral years the Southwest Pacific has 8.8 tropical cyclones in the region with 1.5 expected in Fiji.

It is estimated from all scientific evidence that there will be 7 to 9 tropical cyclones only for the SW Pacific region this 2010/11 TC Season with Fiji having 1.5 or less. Last year the threats were more confined to the Eastern Division; however this 2010/11 season this will be confined more to the Western Division. However, all communities should be alert and prepared for the worst, to mitigate the impact on life and property.

Table 1: All TC's by Strength in the SW Pacific and Fiji from (1969/71 to 2009/10)

Season	No: of TC's in SW Pacific	Maximum Strength Attained			No: of TC's Affecting Fiji	Maximum Strength Attained		
		Gale	Storm	Hurricane		Gale	Storm	Hurricane
1969/1970	7	2	2	3	1	1	0	0
1970/1971	8	4	4	0	2	2	0	0
1971/1972	15	3	1	11	0	0	0	0
1972/1973	10	6	2	2	3	0	2	1
1973/1974	11	5	4	2	3	2	0	1
1974/1975	5	0	2	3	2	0	1	1
1975/1976	10	2	3	5	0	0	0	0
1976/1977	10	2	6	2	0	0	0	0
1977/1978	10	3	4	3	3	1	2	1
1978/1979	6	0	3	3	2	0	1	1
1979/1980	11	3	5	3	3	2	1	0
1980/1981	14	6	4	4	1	0	0	1
1981/1982	7	2	0	5	1	1	0	0
1982/1983	16	2	4	10	2	0	0	2
1983/1984	10	5	2	3	1	1	0	0
1984/1985	9	2	2	5	4	1	1	2
1985/1986	10	3	3	4	2	1	1	0
1986/1987	12	2	3	7	1	0	0	0
1987/1988	6	0	3	3	2	1	0	1
1988/1989	14	4	4	6	3	3	0	0
1989/1990	7	0	4	3	1	1	0	0
1990/1991	5	1	2	2	1	0	0	1
1991/1992	12	1	4	7	1	1	0	0
1992/1993	12	3	1	8	5	3	0	2
1993/1994	5	0	1	4	0	0	0	0
1994/1995	4	0	2	2	0	0	0	0
1995/1996	7	4	1	2	0	0	0	0
1996/1997	15	4	4	7	3	2	0	1
1997/1998	17	4	6	7	2	2	0	0
1998/1999	9	2	2	5	1	1	0	0
1999/2000	9	1	5	3	2	2	0	0
2000/2001	5	0	3	2	1	1	0	0
2001/2002	6	3	1	2	0	0	0	0
2002/2003	10	3	0	7	2	1	0	1
2003/2004	3				1			
2004/2005	9				1			
2005/2006	5				0			
2006/2007	6				1			
2007/2008	4				2			
2008/2009	6				0			
2009/2010	8				2			
Average	8.9	2.4	2.9	4.3	1.5	0.9	0.3	0.5

Table 2: TC's by Strength in the SW Pacific and Fiji for La-Nina Years (1969/71 to 2009/10)

Season	No: of TC's in SW Pacific	Maximum Strength Attained			No: of TC's Affecting Fiji	Maximum Strength Attained		
		Gale	Storm	Hurricane		Gale	Storm	Hurricane
1970/1971	8	4	4	0	2	2	0	0
1971/1972	15	3	1	11	0	0	0	0
1973/1974	11	5	4	2	3	2	0	1
1974/1975	5	0	2	3	2	0	1	1
1975/1976	10	2	3	5	0	0	0	0
1988/1989	14	4	4	6	3	3	0	0
1998/1999	9	2	2	5	1	1	0	0
1999/2000	9	1	5	3	2	2	0	0
2000/2001	5	0	3	2	1	1	0	0
2007/2008	4				2			
2008/2009	6				0			
Average	8.7	2.3	3.1	4.1	1.5	1.2	0.1	0.2

Table 3: TC's by Strength in the SW Pacific and Fiji for El-Nino Years (1969/71 to 2009/10)

Season	No: of TC's in SW Pacific	Maximum Strength Attained			No: of TC's Affecting Fiji	Maximum Strength Attained		
		Gale	Storm	Hurricane		Gale	Storm	Hurricane
1969/1970	7	2	2	3	1	1	0	0
1972/1973	10	6	2	2	3	0	2	1
1977/1978	10	3	4	3	3	1	2	1
1982/1983	16	2	4	10	2	0	0	2
1987/1988	6	0	3	3	2	1	0	1
1991/1992	12	1	4	7	1	1	0	0
1993/1994	5	0	1	4	0	0	0	0
1994/1995	4	0	2	2	0	0	0	0
1997/1998	17	4	6	7	2	2	0	0
2002/2003	10	3	0	7	2	1	0	1
2006/2007	6				1			
2009/2010	8				2			
Average	9.3	2.1	2.8	4.8	1.6	0.7	0.4	0.6

Table 4: TC's by Strength in the SW Pacific and Fiji for Neutral Years (1969/71 to 2009/10)

Season	No: of TC's in SW Pacific	Maximum Strength Attained			No: of TC's Affecting Fiji	Maximum Strength Attained		
		Gale	Storm	Hurricane		Gale	Storm	Hurricane
1976/1977	10	2	6	2	0	0	0	
1978/1979	6	0	3	3	2	0	1	
1979/1980	11	3	5	3	3	2	1	
1980/1981	14	6	4	4	1	0	0	
1981/1982	7	2	0	5	1	1	0	
1983/1984	10	5	2	3	1	1	0	
1984/1985	9	2	2	5	4	1	1	
1985/1986	10	3	3	4	2	1	1	
1986/1987	12	2	3	7	1	0	0	
1989/1990	7	0	4	3	1	1	0	
1990/1991	5	1	2	2	1	0	0	
1992/1993	12	3	1	8	5	3	0	
1995/1996	7	4	1	2	0	0	0	
1996/1997	15	4	4	7	3	2	0	
2001/2002	6	3	1	2	0	0	0	
2003/2004	3				1			
2004/2005	9				1			
2005/2006	5				0			
Average	8.8	2.7	2.7	4.0	1.5	0.7	0.3	

Table 5: TC's of the SW Pacific and Fiji (1969/70 – 2009/10)

Seasons	SW Pacific TC's –all season	SW Pacific TC's El-Nino Years	SW Pacific TC's La-Nino Years	SW Pacific TC's Neutral Years	TC's Affecting Fiji El-Nino Years	TC's Affecting Fiji La-Nino Years	TC's Affecting Fiji Neutral Years
1969/1970	7	7			1		
1970/1971	8		8			2	
1971/1972	15		15			0	
1972/1973	10	10			3		
1973/1974	11		11			3	
1974/1975	5		5			2	
1975/1976	10		10			0	
1976/1977	10			10			0
1977/1978	10	10			3		
1978/1979	6			6			2
1979/1980	11			11			3
1980/1981	14			14			1
1981/1982	7			7			1
1982/1983	16	16			2		
1983/1984	10			10			1
1984/1985	9			9			4
1985/1986	10			10			2
1986/1987	12			12			1
1987/1988	6	6			2		
1988/1989	14		14			3	
1989/1990	7			7			1
1990/1991	5			5			1
1991/1992	12	12			1		
1992/1993	12			12			5
1993/1994	5	5			0		
1994/1995	4	4			0		
1995/1996	7			7			0
1996/1997	15			15			3
1997/1998	17	17			2		
1998/1999	9		9			1	
1999/2000	9		9			2	
2000/2001	5		5			1	
2001/2002	6			6			0
2002/2003	10	10			2		
2003/2004	3			3			1
2004/2005	9			9			1
2005/2006	5			5			0
2006/2007	6	6			1		
2007/2008	4		4			2	
2008/2009	6		6			0	
2009/2010	8	8			2		
Total (X)	365	111	96	158	19	16	27
Seasons (N)	41	12	11	18	12	11	18
Average (X̄)	8.9	9.3	8.7	8.8	1.6	1.5	1.5

Table 6: TC's in the SW Pacific and Fiji during La-Nina Years (1969/71 – 2009/10)

La-Nina Years	No: of Tropical Cyclones Occurring in the South West Pacific	No: of Tropical Cyclones Affecting Fiji
1970/1971	8	2
1971/1972	15	0
1973/1974	11	3
1974/1975	5	2
1975/1976	10	0
1988/1989	14	3
1998/1999	9	1
1999/2000	9	2
2000/2001	5	1
2007/2008	4	2
2008/2009	6	0
Total (X)	96	16
Seasons (N)	11	11
Average TC's in La-Nina Years (X)	8.7	1.5

Table 7: TC's in the SW Pacific and Fiji during El-Nino Years (1969/71 – 2009/10)

El-Nino Years	No: of Tropical Cyclones Occurring in the South West Pacific	No: of Tropical Cyclones Affecting Fiji
1969/1970	7	1
1972/1973	10	3
1977/1978	10	3
1982/1983	16	2
1987/1988	6	2
1991/1992	12	1
1993/1994	5	0
1994/1995	4	0
1997/1998	17	2
2002/2003	10	2
2006/2007	6	1
2009/2010	8	2
Total (X)	111	19
Seasons (N)	12	12
Average TC's in El-Nino Years (X)	9.3	1.6

Table 8: TC's in the SW Pacific and Fiji during El-Nino Years (1969/71 – 2009/10)

Neural Years	No: of Tropical Cyclones Occurring in the South West Pacific	No: of Tropical Cyclones Affecting Fiji
1976/1977	10	0
1978/1979	6	2
1979/1980	11	3
1980/1981	14	1
1981/1982	7	1
1983/1984	10	1
1984/1985	9	4
1985/1986	10	2
1986/1987	12	1
1989/1990	7	1
1990/1991	5	1
1992/1993	12	5
1995/1996	7	0
1996/1997	15	3
2001/2002	6	0
2003/2004	3	1
2004/2005	9	1
2005/2006	5	0
Total (X)	158	27
Seasons (N)	18	18
Average TC's in Neural Years (X)	8.8	1.5

Further Information, please contact the:

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