

2009/10 Predictions of Seasonal Tropical Cyclone Activity in the Australian Region

10 December 2009

1. Introduction

The Guy Carpenter Asia-Pacific Climate Impact Centre (GCACIC) at City University of Hong Kong has embarked on the development of real-time predictions of the annual number of tropical cyclones (TCs) affecting the Australian region (90°E-160°E, 40°S-0°N) (N_A) and its subregion (western Australian region, 90°E-135°E, 40°S-0°N) (N_{WA}). Hindcasts for the period of 1983–2008 have shown that the predictions are mostly correct within the error bars. These are all statistical predictions with predictors drawn from a large group of indices that represent the atmospheric and oceanographic conditions during the pre-season. The most prominent ones include the proxies for the El Niño/Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD). These results are currently being written up (Liu and Chan 2009). It should also be noted that predictions for the eastern Australian region are not made at this point because of the difficulty in identifying significant predictors. Further investigation will be necessary in this area and results will be reported in the future.

Starting from the 2009/10 season, we will attempt to issue real-time forecasts of N_A and N_{WA} . These should be considered as experimental forecasts and verifications will be made after each season. A more thorough evaluation of the performance of the prediction equation will be made in a few years.

2. ENSO and IOD conditions in 2009/10

As an important determinant is the status of the ENSO condition, it is useful to have a discussion on the possible ENSO situation in 2009/10. An El Niño event has developed in the summer. In October, SSTs remain warmer than normal in the

central and eastern equatorial Pacific Ocean. The Niño3.4 and Niño4 indices in October are 0.99 and 1.12 respectively. A summary of the various ENSO model forecasts from different climate centres suggests that warm conditions will persist in the next 5 to 7 months. Based on observations and model forecasts, the El Niño is expected to continue into the Southern Hemisphere summer.

The IOD is currently in its neutral condition, as suggested by the small values of the Dipole Mode Index (DMI) during the last few months.

Thus, ENSO tends to be the dominant factor affecting the TC activity in the Australian region during the 2009/10 season and the effect of IOD appears to be less significant.

3. Predictions for 2009/10

For the entire Australian region, all the ENSO predictors (NINO4 index, trade wind index and OLR index) consistently forecast a below-normal activity (ranging from 7 to 9). The IOD predictor suggests a near-normal TC activity (predicted number being 10). Therefore, a below-normal TC activity (8 TCs with tropical storm intensity or above) is expected for this region.

A similar forecast is obtained for the western Australian region. The ENSO predictors suggest a below-normal TC activity, with the predicted numbers ranging from 4 to 6 while the IOD predictor gives a near-normal TC number. Therefore, the final forecast is 5 TCs with tropical storm intensity or above, which is below the normal number.

Thus, it is expected that the TC activities in both the entire Australian and the western Australian regions are likely to be below-normal. See the quantitative predictions in Table 1.

As an El Niño event has developed in 2009 (see section 2), it is useful to discuss the TC activity during previous El Niño years. Out of the 9 TC seasons associated with El Niño, 6 are associated with below-normal TC activity (TC number ≤ 9) and 3 are associated with normal TC activity (TC number between 10 and 12) in the Australian region (Table 2). Thus, the annual number of TCs with tropical storm intensity or above tends to be normal or below-normal in the Australian region during El Niño years. The effect of ENSO appears to be more significant for the western Australian region. Most of the TC seasons have the below-normal TC activity (TC number ≤ 6) except for the 2004/05 season (Table 2). Therefore, the TC activity in the 2009/10 season will likely to be below normal, with the possibility of a near-normal TC number, which is consistent with our forecast.

Summary of predictions

	Forecast	Normal
Entire Australian region (90°E-160°E, 40°S-0°N)	8 (below-normal)	11
Western Australian region (90°E-135°E, 40°S-0°N)	5 (below-normal)	8

Reference:

Liu, K. S. and J. C. L. Chan, 2009: Interannual variation of Southern Hemisphere tropical cyclone activity and seasonal forecast of tropical cyclone number in the Australian region. *Manuscript under preparation*.

Table 1. Forecasts from various predictors and the weighted average of the forecasts.

Annual number of tropical storms and typhoons						
Entire Australian region						
	NINO4	TW	OLR	DMI	Final forecast	Normal
Prediction	7	8	9	10	8	11
Weight	0.75	0.70	0.75	0.64		
Western Australian region						
	NINO4	TW	OLR	DMI	Final forecast	Normal
Prediction	4	6	5	7	5	8
Weight	0.70	0.78	0.77	0.64		
NINO4	Sea surface temperature anomalies in the NINO4 region (5°S-5°N, 160°E-150°W)					
TW	Trade wind index: mean 850-hPa zonal wind anomaly index over the West Pacific (5°S-5°N, 135°E-180°E)					
OLR	Outgoing long wave radiation (OLR) index near equator (160°E-160°W)					
DMI	Dipole mode index: difference in SST anomaly between tropical western Indian Ocean (60°E-80°E, 10°S-10°N) and tropical south-eastern Indian Ocean (90°E-110°E, 10°S-0°)					

Table 2. Annual number of TCs with tropical storm intensity or above in the entire Australian region and the western Australian region in an El Niño year. Red and blue shadings indicate the above-normal and below-normal TC activity respectively.

TC season with El Niño event	Entire Australian region (90°-160°E)	Western Australian region (90°-135°E)
1982/83	7	5
1986/87	7	5
1987/88	5	3
1991/92	11	5
1994/95	6	4
1997/98	11	6
2002/03	6	5
2004/05	11	10
2006/07	5	4