

2013/14 Predictions of Seasonal Tropical Cyclone Activity in the Australian Region

18 November 2013

1. Introduction

Since the 2009/10 season, the Guy Carpenter Asia-Pacific Climate Impact Centre (GCACIC) at City University of Hong Kong has been issuing real-time predictions of the annual number of tropical cyclones (TCs) affecting the Australian region (90°E-160°E, 40°S-0°N) and its sub-regions (eastern Australian region, 135°E-160°E, 40°S-0°N and western Australian region, 90°E-135°E, 40°S-0°N). Hindcasts for the period of 1970-2008 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. The most prominent ones include the proxies for El Niño/Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD). These should be considered to be experimental forecasts and verifications will be made after each season.

2. ENSO and IOD conditions in 2013/14

As an important determinant is the status of the ENSO condition, it is useful to have a discussion on the possible ENSO situation in 2013/14. The tropical Pacific Ocean is neutral in the summer of 2013. SSTs remain near-normal in the central and eastern equatorial Pacific Ocean in October. The Niño3.4 and Niño4 indices in October are -0.22 and -0.08 respectively.

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

Annual number of tropical cyclones		
Entire Australian Region		
Predictor	Prediction	Weight
NINO4	11	0.82
TW	15	0.81
DMI	11	0.74
OLR	15	0.77
Final forecast	13	
Normal	12-15	
Western Australian Region		
Predictor	Prediction	Weight
NINO4	7	0.64
TW	11	0.72
DMI	8	0.56
OLR	9	0.71
Final forecast	9	
Normal	9-10	
Eastern Australian Region		
Predictor	Prediction	Weight
NINO4	5	0.58
TW	5	0.62
DMI	4	0.60
Final forecast	5	
Normal	5-6	
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°)	

A summary of the various ENSO model forecasts from different climate centres ¹ suggests that neutral condition may persist in the next 4 to 6 months. Based on observations and model forecasts, the neutral ENSO condition 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) in the last few months.

Since the ENSO is currently in its neutral status and is expected to remain neutral during the TC season, it may not be the major factor affecting the TC activity in the Australian region.

3. The predictions for 2013/14

For the entire Australian region, the NINO4 index (an ENSO predictor) forecasts a slightly below-normal TC activity (predicted number being 11). The other ENSO predictors (trade wind index and OLR index) give a predicted number of 15, which is within the normal range (Table 1). On the other hand, the IOD predictor suggests a slightly below-normal TC activity (predicted number being 11). The final forecast is 13 tropical cyclones, which is near the normal number. Since there are two predictors consistently suggesting a slightly below-normal TC activity, and the fact that the TC activity has consistently been below normal (see Figure 1), it is possible that the activity will continue to be below normal. Therefore, the TC activity for the entire Australian region is forecast to be near-normal, with the possibility of a slightly below-normal TC activity.

A larger discrepancy in the predicted numbers is found for the western Australian region. The predicted numbers from the ENSO predictors range from 7 to 11.

The NINO4 index suggests a below-normal TC activity (predicted number being 7) but the trade wind index gives a slightly above-normal TC activity (predicted number being 11). The predicted number from the IOD predictor is 8, which is slightly below the normal number. Therefore, the final forecast is 9 tropical cyclones, which is near the normal number. Since the spread of the predictions from individual predictors is larger, the predictability for this region is relatively lower.

For the eastern Australian region, the two ENSO predictors (NINO4 index and trade wind index) consistently give a near-normal TC activity (predicted number being 5) while the IOD predictor suggests a slightly below-normal TC activity (predicted number being 4). The final forecast is 5 tropical cyclones affecting this region, which is near the normal number.

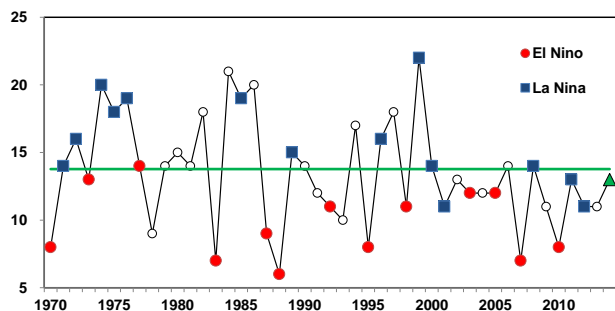
It should be noted that the sum of the TC numbers in the western and eastern Australian regions may not be equal to the TC number in the entire Australian region because some TCs may move through both the western and eastern Australian regions.

Thus, it is expected that the TC activity in the entire Australian region, the western Australian region and the eastern Australian region is likely to be near-normal. The quantitative predictions are given in Table 1.

The TC activity in the Australian region shows a decline in the recent decade and an inactive period appears to occur in 2000 (Figure 1). In the last 14 years, all the TC seasons had near-normal or below-normal TC activity. For the five TC seasons associated with ENSO-neutral condition (2001/02, 2003/04, 2005/06, 2008/09 and 2012/2013), the numbers of TCs in the Australian region range from 11 to 14. Our prediction for the 2013/14 season is therefore consistent with the TC activity during previous ENSO-neutral years.

¹ <http://www.bom.gov.au/climate/ahead/ENSO-summary.shtml>

Fig. 1. Annual number of tropical cyclones in the entire Australian region between 1970 and 2013. The year 1970 denotes the TC season spanning from July 1969 to June 1970. The horizontal line indicates the climatological mean. Red circle and blue squares indicate the El Niño and La Niña years respectively. The green triangle indicated the predicted number in 2013/14.



Summary of predictions

	Annual number of tropical cyclones (with at least tropical depression intensity)	
	Forecast	Normal
Entire Australian region (90°E-160°E, 40°S-0°N)	13 (normal to slightly below-normal)	12 - 15
Western Australian region (90°E-135°E, 40°S-0°N)	9 (normal to slightly below-normal)	9 - 10
Eastern Australian region (135°E-160°E, 40°S-0°N)	5 (normal to slightly below-normal)	5 - 6

References

Liu, K. S. and J. C. L. Chan, 2010: Interannual variation of Southern Hemisphere tropical cyclone activity and seasonal forecast of tropical cyclone number in the Australian region. *Int'l J. Climatology*, DOI: 10.1002/joc.2259