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Research Brief 2012/03

2012/13 Predictions of Seasonal Tropical Cyclone Activity in the Australian Region

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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 2012/13

As an important determinant is the status of the ENSO condition, it is useful to have a discussion on the possible ENSO situation in 2012/13. The tropical Pacific Ocean is neutral in the summer of 2012. SSTs remain near-normal in the central and eastern equatorial Pacific Ocean in October. The Niño3.4 and Niño4 indices in October are 0.47 and 0.43 respectively. 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.

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	14	0.82
TW	14	0.74
DMI	11	0.74
OLR	11	0.77
Final forecast	***12***	
Normal	***12-15***	
Western Australian Region		
Predictor	Prediction	Weight
NINO4	10	0.64
TW	11	0.69
DMI	7	0.57
OLR	8	0.71
Final forecast	***9***	
Normal	***9-10***	
Eastern Australian Region		
Predictor	Prediction	Weight
NINO4	5	
TW	5	0.68
DMI	3	0.60
Final forecast	***4***	
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°)

[1] http://www.bom.gov.au/climate/ahead/ENSO-summary.shtml

A weak positive IOD event has developed, as suggested by the positive 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 2012/13

For the entire Australian region, the ENSO predictors (NINO4 index and trade wind index) forecast a near-normal activity (predicted number being 14) but another ENSO predictor (OLR index) gives a slightly below-normal activity (predicted number being 11) (Table 1). On the other hand, the IOD predictor suggests a slightly below-normal TC activity (predicted number being 11), which is related to the observed weak positive IOD event in August and September (Liu and Chan 2010). The final forecast is therefore for a near-normal TC activity (12 tropical cyclones) for this region.

A larger discrepancy in the predicted numbers is found for the western Australian region. The predicted numbers from the ENSO predictors range from 8 to 11 and the IOD predictor gives a below-normal TC activity (predicted number being 7). Therefore, the final forecast is 9 tropical cyclones, which is near the normal number.

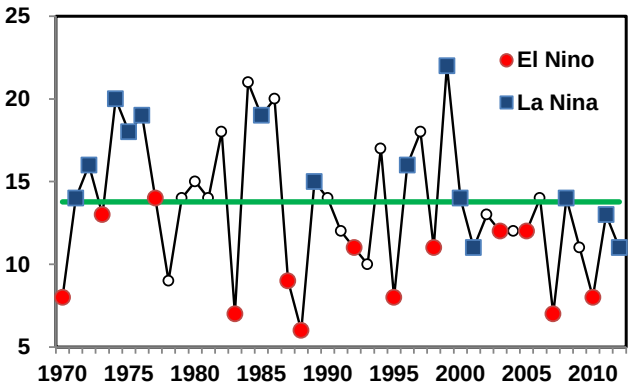
For the eastern Australian region, the two ENSO predictors (trade wind index and NINO4 index) consistently give a near-normal TC activity (predicted number being 5) while the IOD predictor suggests a below-normal TC activity (predicted number being 3). The final forecast is 4 tropical cyclones affecting this region, which is slightly below 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 and the western Australian region is likely to be near-normal while a slightly below-normal activity is expected for the eastern Australian region. 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 (Fig. 1). In the last 13 years, all the TC seasons had near-normal or below-normal TC activity. For the four TC seasons associated with ENSO-neutral condition (2001/02, 2003/04, 2005/06 and 2008/09), the numbers of TCs in the Australian region range from 11 to 14. Our prediction for the 2012/13 season is therefore consistent with the TC activity during previous ENSO-neutral years.

Fig. 1. Annual number of tropical cyclones in the entire Australian region between 1970 and 2012. 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.



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)	**12** (near-normal)	12 - 15
Western Australian region (90°E-135°E, 40°S-0°N)	**9** (near-normal)	9 - 10
Eastern Australian region (135°E-160°E, 40°S-0°N)	**4** (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