

## 2010 Predictions of Seasonal Tropical Cyclone Activity over the Western North Pacific

26 April 2010

### 1. Introduction

Real-time predictions of the annual number of tropical cyclones (TCs) affecting the western North Pacific (WNP) and the South China Sea (SCS) were first issued in 2000 by the Laboratory for Atmospheric Research (LAR) at City University of Hong Kong (CityU) and annually thereafter until 2008 when such predictions were issued by the Guy Carpenter Asia-Pacific Climate Impact Centre, also at CityU. Verifications of the predictions for the past ten years 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 in the previous year up to the spring of the current year. The most prominent ones include the proxies for El Niño/Southern Oscillation (ENSO), the extent of the subtropical ridge, and the intensity of the India-Burma trough. Details can be found in Chan et al. (1998, 2001) and Liu and Chan (2003).

### 2. ENSO conditions in 2010

As an important determinant is the status of the ENSO condition, it is useful to have a discussion on the possible ENSO situation in 2010. A moderate El Niño event has developed in the summer of 2009.

MODEL / GROUP	1-4 MONTHS (Apr-Aug)	4-7 MONTHS (Aug-Oct)
POAMA Australian Bureau of Meteorology	Neutral	Neutral
System 3 ECMWF (EU)	Neutral	Neutral
GloSea UK Met Office	Warm / Neutral	Neutral
CFS NCEP (US)	Warm / Neutral	Neutral
CGCMv1 NASA Goddard GMAO (US)	Neutral	Neutral
JMA-CGCM02 Japan Met. Agency	Warm / Neutral	Neutral
KMA-SNU Korean Met. Administration	Warm / Neutral	Neutral

**Table 1.** Summary of model forecasts extracted from the Australian Bureau of Meteorology homepage.

In March, SSTs remain warmer than normal in the central and east equatorial Pacific Ocean. The Niño3.4 and Niño4 index in March are 1.14 and 1.12 respectively. A summary of the various ENSO model forecasts from different climate centres suggests that El Niño is likely to continue through the spring and a transition to ENSO-neutral condition is expected during the summer (Table. 1). Based on these results, it appears that 2010 will likely be an ENSO-neutral year.

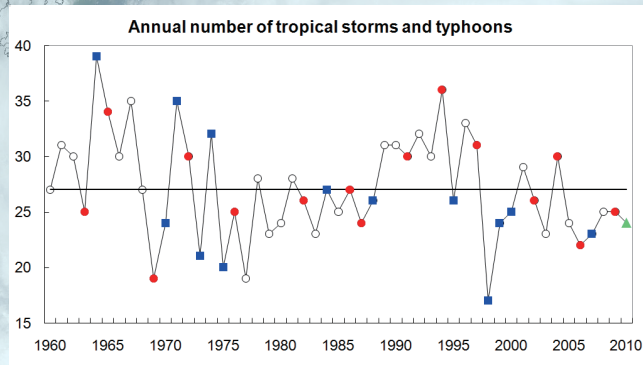
### 3. The predictions for 2010

The ENSO predictor (NINO4 index) suggests a below-normal overall TC activity while the other predictors give a below-normal or a near-normal activity (Table 2). The final forecast is therefore for a below-normal overall TC activity (28 tropical cyclones).

Entire western North Pacific							
All TC							
	HWNP	HIB	NINO4		Final forecast	Normal	
Prediction	30	28	25		28	31	
Weight	0.65	0.68	0.70				
Tropical storms and typhoons							
	HWNP	HIB	WP	NINO3.4	Final forecast	Normal	
Prediction	24	26	24	24	24	27	
Weight	0.68	0.64	0.49	0.68			
Typhoons							
	HWNP	HIB	WP	NINO3.4	ESOI	Final forecast	Normal
Prediction	14	17	15	17	18	16	17
Weight	0.64	0.58	0.59	0.77	0.67		
HWNP	Index of the westward extent of the subtropical high over the western North Pacific						
HIB	Index of the strength of the India-Burma trough (15°-20°N, 80°-120°E)						
WP	Primary mode of low-frequency variability over the North Pacific						
NINO3.4	Sea surface temperature (SST) anomalies in the NINO3.4 region (5°S-5°N, 170°-120°W)						
NINO4	Sea surface temperature (SST) anomalies in the NINO4 region (5°S-5°N, 160°E-150°W)						
ESOI	Equatorial Southern Oscillation Index (Equatorial SOI) Equatorial Eastern Pacific SLP—Indonesia SLP (standardized anomalies)						

**Table 2.** Forecasts from various predictors and the weighted average of the forecasts.

For the number of tropical storms and typhoons, most of the predictors consistently forecast a below-normal activity (ranging from 24 to 26) and therefore a below-normal TC activity (24 tropical storms and typhoons) is expected for this category (Fig. 1).



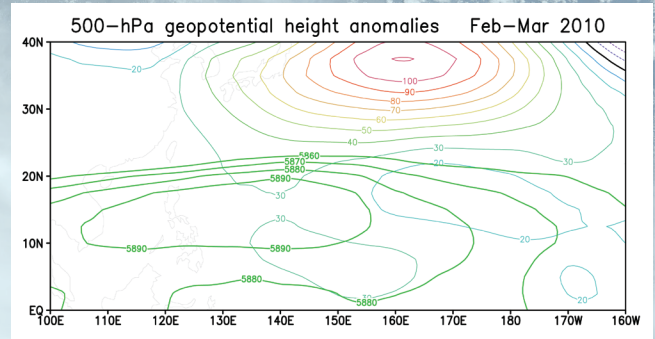
**Fig. 1.** Time series of the annual number of tropical storms and typhoons. Red circle and blue squares indicate the El Niño and La Niña years respectively. The green triangle indicated the predicted number in 2010.

A slightly difference between non-ENSO and ENSO predictors is found for the number of typhoons. The ENSO predictors (NINO3.4 index and equatorial SOI index) suggest a near-normal TC activity (predicted numbers being 17 and 18 respectively) while the other predictors forecast a below-normal to near-normal TC activity, with predicted numbers ranging from 14 to 17. Therefore, the final forecast is 16 typhoons, which is near the normal number.

Thus, it is expected that the overall TC activity as well as the number of tropical storms and typhoons are likely to be below-normal while the number of typhoons is likely to be near-normal. The quantitative predictions are given in Table 2.

The predictor related to the subtropical high (HWP) suggests a below-normal TC activity. Such forecasts are partly based on the stronger-than-normal subtropical high observed between February and March in 2010 (Fig. 2). If this situation continues, the atmospheric condition will be less favorable for tropical cyclone formation. This is consistent with the predicted less active TC season in 2010.

The possible error in the current predictions is given by an envelope of the possible errors, which are based on the predictions from individual predictors. The smallest and largest numbers among the individual predictions



**Fig. 2.** 500-hPa geopotential height anomalies between February and March in 2010. Thick contours indicate the geopotential height (contour interval = 10 m)  $\geq$  5860 m.

may be considered as the lower and upper bound of the final predictions. A larger (smaller) difference between the lower and upper bound might then indicate lower (higher) predictability. Based on this concept, we could see that for this year, prediction for the number of tropical storms and typhoons has the smallest spread and thus the highest predictability.

As discussed in Chan et al. (2001), we will provide an updated forecast sometime in June.

### Summary of predictions

<i>Entire western North Pacific</i>	Forecast	Normal
All TC	<b>28</b> (below normal)	31
Tropical storms and typhoons	<b>24</b> (below normal)	27
Typhoons	<b>16</b> (near normal)	17

### References

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