Research Brief 2009/02

2009 Updated Predictions of (1) Seasonal Tropical Cyclone Activity over the Western North Pacific, and (2) Number of Tropical Cyclones Making Landfall in South China

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1. Introduction

This is an update of the predictions of the annual number of tropical cyclones (TCs) in the western North Pacific (WNP) and the number of TCs making landfall in South China for 2009 that we issued on 20 April 2009. These updates are made based on new information for the months of April and May 2009.

2. ENSO conditions in 2009

The oceanic and atmospheric conditions in the Pacific are now in neutral status. The Niño3.4 and Niño4 indices in May are 0.27 and 0.32 respectively. At the same time, warming of the central and east equatorial Pacific Ocean observed and may continue into the summer. A summary of the various ENSO model forecasts from different climate centres suggests that most of them predict a warm condition in 5 to 7 months time (Table 1). Out of the 7 forecasts, 5 suggest the possible development of an El Niño event. It therefore appears that for the rest of 2009, a development of El Niño conditions is possible. In other words, 2009 will likely be an El Niño year.

3. Predictions for the WNP

For the total number of TCs, the prediction from the index of India-Burma trough gives an decrease in TC number (from 30 to 28) compared with 30 in the April forecast (cf. Tables 2a and 2b). No change occurs using the other predictors and the final predicted number therefore decreases from 31 to 30.

No significant change is found on the predicted number of tropical storms and typhoons (Table 2). All the predictors give numbers similar to those in the April forecast and therefore the final predicted number is still 27.

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

MODEL / GROUP	2-4 MONTHS (Jul to Sep 09)	5-7 MONTHS (Oct to Dec 09)
POAMA (run at Bureau of Met)	Warm	Warm
System 3 ECMWF	Warm	Warm
GloSea UK Met Office	Neutral	Not Available
CSF NCEP	Warm	Warm
CGCMv1 GMAO/NASA	Warm	Warm
BCC CGCM BCC/CMA	Neutral	Warm
JMA-CGCM02 Japan Met. Agency	Neutral	Neutral

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

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Table 2. Forecasts from various predictors and the weighted average of the forecasts issued in (a) April and (b) June.

(a) April Forecast

All TC		
Predictor	Prediction	Weight
HWNP	30	0.66
HIB	30	0.66
NINO4	33	0.70
Final forecast	***31***	
Normal	***31***	

Tropical storms and typhoons		
Predictor	Prediction	Weight
HWNP	27	0.68
HIB	26	0.67
WP	26	0.62
NINO3.4	27	0.67
Final forecast	***27***	
Normal	***27***	

Typhoons		
Predictor	Prediction	Weight
HWNP	16	0.57
HIB	17	0.59
WP	19	0.52
NINO3.4	20	0.73
ESOI	19	0.64
Final forecast	***18***	
Normal	***17***	

(b) June Forecast

All TC		
Predictor	Prediction	Weight
HWNP	30	0.74
HIB	28	0.69
NINO4	33	0.70
Final forecast	***30***	
Normal	***31***	

Tropical storms and typhoons		
Predictor	Prediction	Weight
HWNP	27	0.68
HIB	26	0.67
WP	26	0.62
NINO3.4	27	0.67
Final forecast	***27***	
Normal	***27***	

Typhoons		
Predictor	Prediction	Weight
HWNP	16	0.61
HIB	18	0.71
WP	19	0.66
NINO3.4	22	0.75
ESOI	19	0.64
Final forecast	***19***	
Normal	***17***	

WNP	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)

For the number of typhoons, the prediction from the Niño3.4 predictor gives an increase in TC number (from 20 to 22). This is probably related to the recent warming of the equatorial North Pacific. An increase (from 17 to 18) is also found based on the index of India-Burma trough and no change occurs using other predictors. The final predicted number therefore increases from 18 to 19.

As an El Niño event could occur in 2009 as suggested in section 2, it is useful to discuss the TC activity during El Niño years. During the past five decades, the TC activity exhibited a significant interdecadal variation, with the active periods of 1960–76 and 1989–97 and the inactive periods of 1977–1988 and 1998–2008 (Fig. 1). The variations of the TC activity during El Niño years are quite different in the active and inactive periods (Table 3). Since the inactive TC period 1998–2008 will likely to continue into 2009, it is more appropriate to discuss the TC activity during El Niño years occurring in the inactive periods. The number of tropical storms and typhoons tends to be normal or below-normal except for 2004 (Table 3). However, the number of typhoons tends to be normal or above-normal except for 2006 (Table 3). Therefore, the 2009 TC season will likely to be normal, with the possibility of a slightly below-normal number of tropical storms and typhoons and a slightly above-normal number of typhoons, which is consistent with our forecast.

The predictor related to the subtropical high (HWNP) continues to suggest a near-normal to slightly below-normal TC activity, which is probably related to the stronger-than-normal subtropical high over the eastern part of the WNP (Fig. 2).

4. Predictions for the number of landfalling TCs over South China

The number of TCs making landfall on the coast of Southern China between July and December is forecast to be 3, slightly below the normal number of 4. The ENSO forecast calls for El Niño conditions in the latter part of this year, which, as suggested in section 2, would cause fewer TCs to form or be steered into the SCS, especially during the late season. This would explain the slightly below-normal forecast for July to December landfalling TCs.

Summary of Predictions

With these changes, it is expected that the overall TC activity and the number of tropical storms and typhoons are likely to be near-normal but the number of typhoons is likely to be slightly above-normal (See Table 4). The number of TCs making landfall on the coast of Southern China between July and December tends to be slightly below-normal.

Table 3. Number of tropical storms and typhoons and number of typhoons in an El Niño year. Green and blue shadings indicate the above-normal and below-normal TC activity respectively.

	El Niño Year	Number of tropical storms and typhoons	Number of typhoons
Active period	1963	25	19
	1965	34	21
	1969	19	13
	1972	30	22
	1976	25	14
	1991	30	20
	1994	36	21
	1997	31	23
Inactive period	1982	26	19
	1986	27	19
	1987	24	18
	2002	26	18
	2004	30	21
	2006	22	14

Table 4. Summary of all the forecasts.

	Forecast	*Normal*
Entire western North Pacific		
All TC	**30** (near-normal)	31
Tropical storms and typhoons	**27** (near-normal)	27
Typhoons	**19** (slightly above-normal)	17
Landfall in South China		
Main season (July to December)	**3** (slightly below-normal)	4

Fig. 1. Time series of (a) the annual number of tropical storms and typhoons and (b) the annual number of typhoons. Red circle and blue squares indicate the El Niño and La Niña years respectively. The green triangle indicated the predicted number in 2009. The thick horizontal line indicates the normal number of tropical storms and typhoons. The green vertical lines divide the years 1960–2008 into the active and inactive periods.

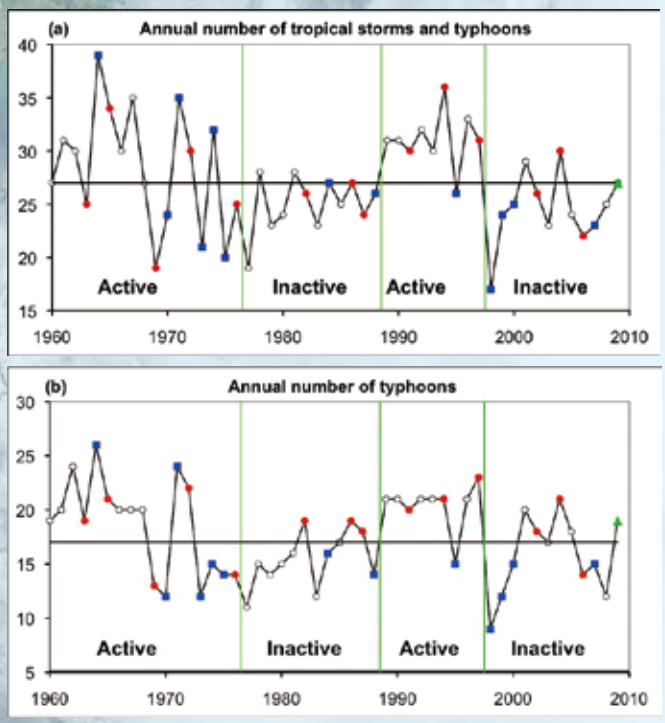

Fig. 2. 500-hPa geopotential height anomalies between April and May in 2009. Thick contour indicates the geopotential height (contour interval = 10 m) ≥ 5860 m.