

## Seasonal Tropical Cyclone Activity Forecast North West Pacific Ocean and South China Sea August 2019

### Forecast Summary

Based on current climatic conditions and activity in 2019 to date, this report forecasts:

- The formation of 23-25 Tropical Storms<sup>1</sup> (TS) in the North West Pacific and South China Sea in 2019 which is below the Long Term Climate Average (LTCA).
- 12-13 Tropical Cyclones<sup>2</sup> (TC) are forecast to impact China in 2019 which is below Long Term Climate Average, of which;
  - Eight to nine are forecast to impact South China;
  - Eight to nine are forecast to impact East China;
- Seven to eight are forecast to make landfall in China which is in line with the Long Term Climate Average.

	TS Formation	TS Landfall	TC Impact China		
			Entire China	South China	East China
1981-2010 LTCA±SD	26±4.8	7±2	14±3	9±2.5	9±2.6
2019 Forecast	23-25	7-8	12-13	8-9	8-9

Table 1. 2019 seasonal forecasting of TC activity

El Nino conditions have existed in the Eastern Pacific Ocean since the winter of 2019 and are forecast to persist for a minimum of three further months. During those years in which El Nino conditions have been observed, Tropical Storm formation over the North West Pacific and South China Sea has been at average or below average levels in every instance excepting 1951, 1970 and 2015.

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<sup>1</sup> Tropical cyclone with tropical storm or higher scale

<sup>2</sup> Tropical cyclone with tropical depression or higher scale

## Forecast Result

El Nino conditions have existed in the Eastern Pacific Ocean since the winter of 2019.

An annual total of 23-25 Tropical Storms are forecast to form over the North West Pacific and South China Sea in 2019 which is below the Long Term Climate Average. An annual total of seven to eight Tropical Storms are forecast to make landfall in China which is in line with the Long Term Climate Average.

An annual total of 12-13 Tropical Cyclones are forecast to impact China which is below the Long Term Climate Average. Eight to nine Tropical Cyclones are forecast to impact South and East China respectively which is in line with the Long Term Climate Average.

As of the eighth of August 2019, ten Tropical Cyclones have formed over the North West Pacific and South China Sea, of which four made landfall in Japan, three made landfall in China, two made landfall in South Korea and one made landfall in Thailand.

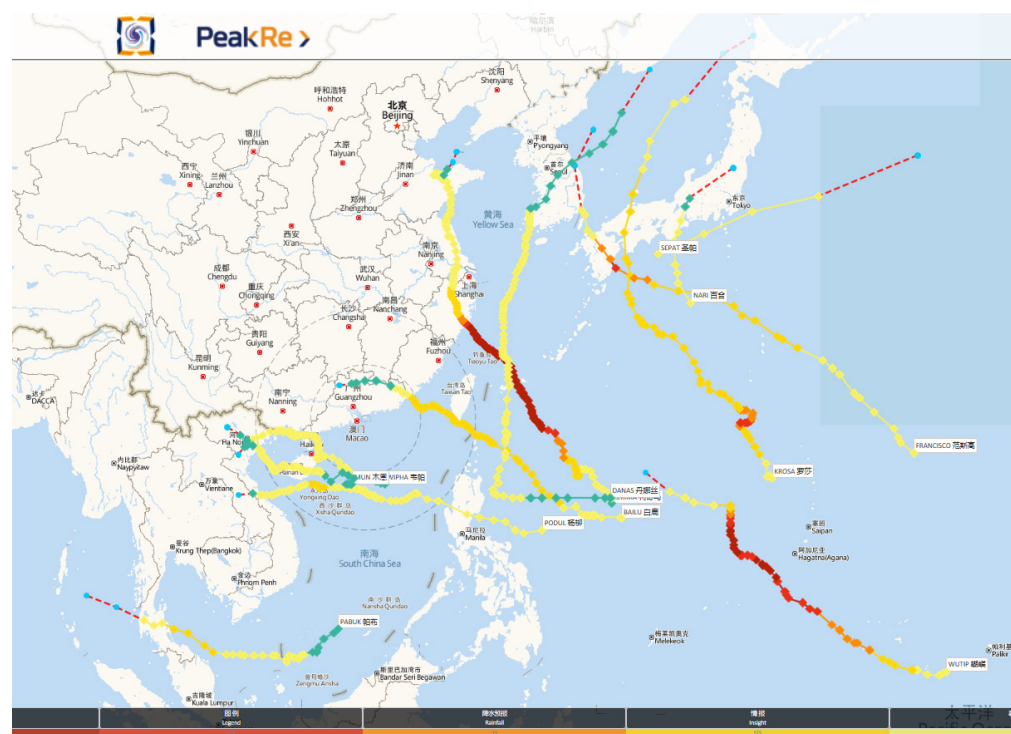


Fig 1. TC activity over North West Pacific and South China Sea, as at 18/8/2019

## Prediction Factors

### Pre-season Condition of Inter-Ocean and Atmospheric System

El Nino conditions have existed in the Eastern Pacific Ocean since the winter of 2019 and are forecast to persist for a minimum of three further months.

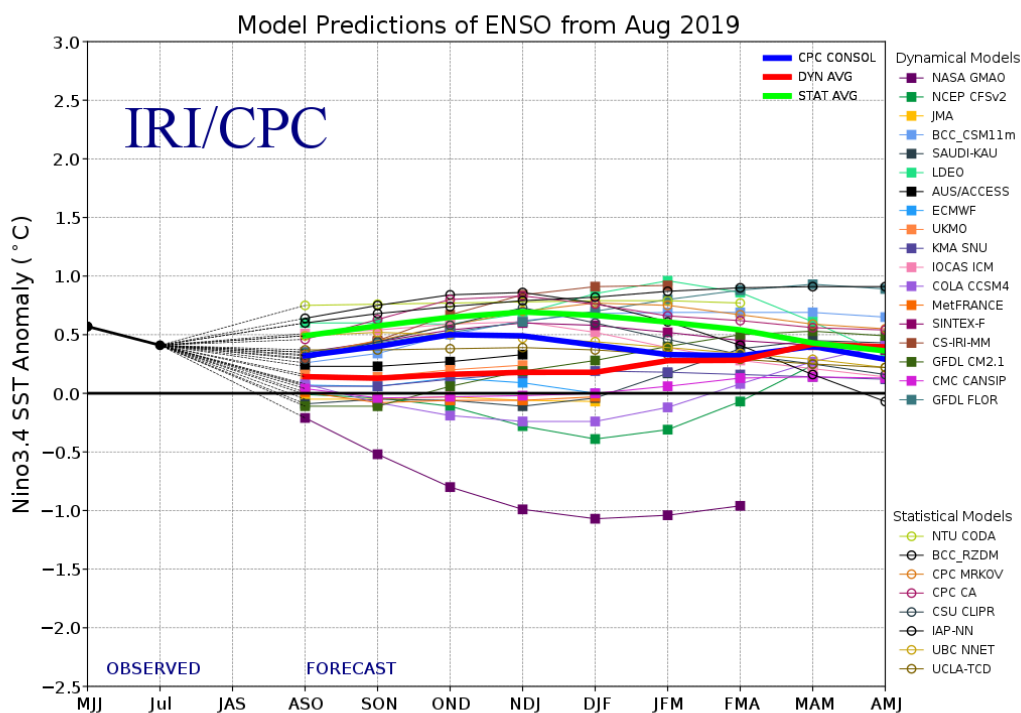


Fig 2. Model predictions on the current El Nino

Progression (or not) from a phase of El Nino conditions may be categorized into three distinct scenarios. EN-EN denotes no change is expected in El Nino conditions. EN-LN denotes a change from El Nino to La Nina conditions. EN-NE denotes a change from El Nino to neutral conditions.

The historical record shows no discernable difference between these different sub-categories of El Nino conditions on the likelihood of formation of Tropical Storms. In all three scenarios, El Nino conditions have coincided with average or below average levels of Tropical Storm formation over the North West Pacific and South China Sea in every instance excepting 1951, 1970 and 2015.

Type	Similar Year	TS Formation		TS landfall China	TC Impact China
		Jun to Oct	Annual		
Maintain El Nino (EN-EN)	1968/69	15	22	5	9
	1976/77	18	22	5	11
	2014/15	18	27	5	10
	Avg.	17	24	5	10
Turn to La Nina (EN-LN)	1953/54	17	23	5	14
	1969/70	22	27	5	19
	1994/95	20	23	9	13
	1997/98	10	14	4	10
	2004/05	17	23	8	11
	Avg.	19	24	6	13
Turn to Neutral (EN-NE)	1951/52	23	31	9	19
	1958/59	16	24	6	16
	1979/80	19	26	9	17
	2002/03	15	21	7	11
	Avg.	18.2	25.5	8	16
LTCA		20	26	7	14

Table 2. Historical El Nino year developing trends with TS/TC activity summary

A clustering analysis of the pre-Tropical Cyclone seasonal seas surface temperatures (SST) indicates that 2019 conditions are most similar to those of 1983 and 1987 (Figure 3).

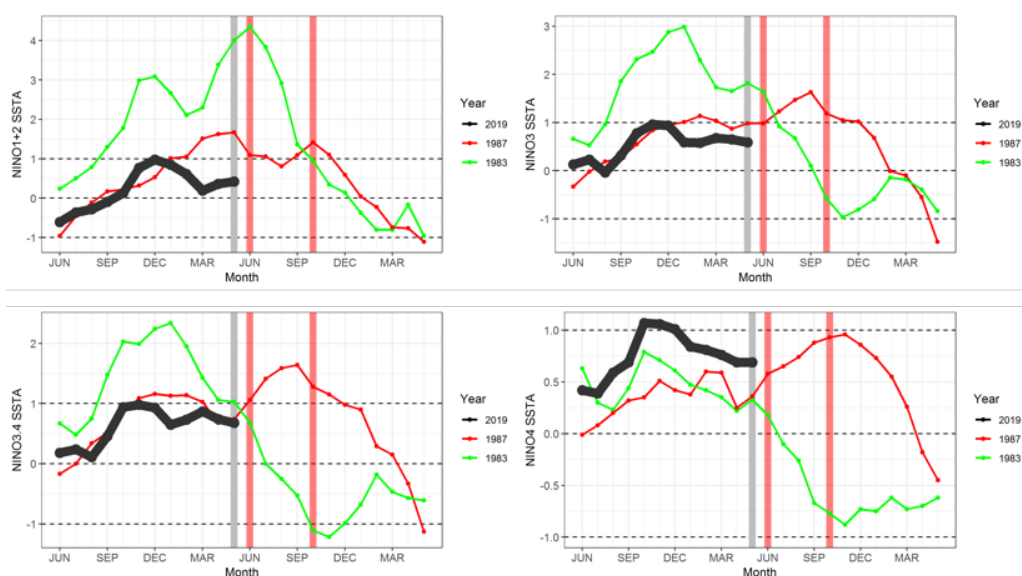


Fig 3. Developing trends of SST indicator in El Nino regions in 1983, 1987 and 2019 (YTD)

The Tropical Cyclone activity of those two years are summarized below:

	TS Formation	TS landfall	TC impact China		
			Entire China	South China	East China
1983	23	5	12	10	6
1987	23	5	11	6	6
LTCA 1981-2010	26	7	14	9	9

Table 3. TC activities in 1983 and 1987



## Statistical Models Outputs

Forecast results for both statistical models and physical methods are similar with both predicting the number of Tropical Storms likely to be formed in the North West Pacific and South China Sea to be below the Long Term Climate Average.

Both forecast average levels of Tropical Storms making landfall in China. The Long Term Climate Average rate of formation and the forecasts of various models for 2019 are shown below:

	TS Formation	TS landfall	TC Impact China		
			Entire China	South China	East China
LTCA±SD 1981-2010	26±4.8	7±2	14±3	9±2.5	9±2.6
SWR Model	26.1	7.5	15.1	8.8	11.5
PLS Model	24.5	7.4	12.2	9.3	8.7
SVM Model	26.1	7.7	14	9.6	9.3
GBM Model	26.5	7.3	12.1	8.7	9.9
CB Model	25.2	7.3	13.1	9.6	8.9

Table 4. Statistical model outputs

## APPENDIX

Landfall Count	Landfall count means the count of Tropical Cyclones with minimal strength reach Tropical Storm level when making landfall in China																											
Major Impact	<p>A TC with Major Impact should satisfy at least one of the three following conditions</p> <ul style="list-style-type: none"><li>• Aggregate precipitation in the given area of over 50 mm or</li><li>• Average wind level <math>\geq 7</math> (or a gust<math>1 \geq 8</math>) in given area or</li><li>• Aggregate precipitation of over 30 mm and an average wind scale <math>\geq 6</math> (or a gust <math>\geq 7</math>) in given area</li></ul>																											
Subtropical High	An atmospheric high pressure system located on average between latitude 20° to 40° in both hemispheres																											
Tropical Cyclone Scale	<p>According to China Meteorological Administration, “Classification of tropical cyclones on the implementation of national standards” GBT 19201-2006 notice, tropical cyclone maximum wind speed at ground level near the center is divided into six levels:</p> <table><tr><th>Name</th><th>Wind Speed</th><th>Beaufort</th><th>Saffir-Simpson</th></tr><tr><td>Super Typhoon</td><td><math>\geq 51.0</math> m/s</td><td>Scale 16</td><td>CAT 4-5</td></tr><tr><td>Strong Typhoon</td><td>41.5 - 50.9 m/s</td><td>Scale 14 - 15</td><td>CAT 2-3</td></tr><tr><td>Typhoon</td><td>32.7 - 41.4 m/s</td><td>Scale 12 - 13</td><td>CAT 1</td></tr><tr><td>Strong Tropical Storm</td><td>24.5 - 32.6 m/s</td><td>Scale 10 - 11</td><td rowspan="2">Tropical Storm</td></tr><tr><td>Tropical Storm</td><td>17.2 - 24.4 m/s</td><td>Scale 8 - 9</td></tr><tr><td>Tropical Depression</td><td>10.8 - 17.1 m/s</td><td>Scale 6 - 7</td><td>Tropical Depression</td></tr></table>	Name	Wind Speed	Beaufort	Saffir-Simpson	Super Typhoon	$\geq 51.0$ m/s	Scale 16	CAT 4-5	Strong Typhoon	41.5 - 50.9 m/s	Scale 14 - 15	CAT 2-3	Typhoon	32.7 - 41.4 m/s	Scale 12 - 13	CAT 1	Strong Tropical Storm	24.5 - 32.6 m/s	Scale 10 - 11	Tropical Storm	Tropical Storm	17.2 - 24.4 m/s	Scale 8 - 9	Tropical Depression	10.8 - 17.1 m/s	Scale 6 - 7	Tropical Depression
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Climate Mean	In accordance with the provisions of the World Meteorological Organization, using the average value of climate elements for 30 consecutive years as the standard climate value, generally updated once every 10 years, 2011 to 2020 period uses the average value from 1981-2010.																											
Wind Speed	Average maximum wind speed within 2 minutes near the eye wall of the tropical cyclone																											
El Niño	A climate pattern that occurs when sea surface temperatures in the east-central equatorial Pacific Ocean rise to above-normal levels for an extended period of time.																											
La Niña	A climate pattern that occurs when sea surface temperatures in the east-central equatorial Pacific Ocean stays below normal levels for an extended period of time.																											
South China	Guangdong, Guangxi, Hainan																											
East China	Fujian, Jiangxi, Zhejiang, Anhui, Shanghai, Jiangsu, Shandong																											



## About Peak Re

Peak Reinsurance Company Limited (“Peak Re”), authorised by the Insurance Authority of Hong Kong, is the only privately owned global reinsurance company headquartered in Hong Kong.

With a shareholder equity of over US\$1 billion as of 30 June 2019, it enjoys an “A-” rating by A.M. Best, a leading international insurance industry credit rating agency, and ranks among the top 34 global reinsurance groups in terms of gross written premiums\*.

Fosun International Limited (00656.HK) and Prudential Financial, Inc. hold approximately 87% and 13% of Peak Re via Peak Reinsurance Holdings Limited, respectively.

Peak Re offers reinsurance services covering a range of lines across Asia Pacific, Europe, the Middle East and Africa, and the Americas, tailor-making risk transfer and capital management solutions to best fit clients’ needs.

*\* Source: A.M. Best Top 50 Global Reinsurance Groups 2019*

## About STI

Shanghai Typhoon Institute (STI) is a state-level institution founded with the approval of the Ministry of Science and Technology, the Ministry of Finance and the State Commission Office for Public Sector Reform. Its mission is to undertake basic and applied research related to tropical cyclones. As one of the research units providing the best route predication for tropical cyclones in East Asia, STI has developed and maintained a database of meteorological information specific to cyclone activities in China.

Since 2015, Peak Re has partnered with the Shanghai Typhoon Institute (STI) on research projects related to North-West Pacific basin and South China Sea tropical cyclones.



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