



August Forecast Update for Northwest Pacific Typhoon Activity in 2016

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Forecast Summary

TSR maintains its previous outlooks and predicts the 2016 Northwest Pacific typhoon season will be quiet with activity well below the 1965-2015 climate norm.

The TSR (Tropical Storm Risk) August forecast update anticipates the 2016 Northwest Pacific typhoon season will have activity over 20% below the 1965-2015 norm. This maintains our earlier outlooks issued on the 7th May and 6th July 2016. The forecast spans the period from 1st January to 31st December 2016 (about 70% of NW Pacific typhoon activity occurs historically after the 8th August) and employs data through to the end of July 2016. The forecast includes deterministic and probabilistic projections for overall basin activity, and deterministic projections for the ACE index and numbers of intense typhoons, typhoons and tropical storms.

TSR's main predictor for overall activity is the forecast anomaly in August-September Niño 3.75 (region 5°S-5°N, 140°W-180°W) sea surface temperature (SST) which we anticipate being 0.4±0.2°C cooler than normal. This cool Niño 3.75 SST would suppress typhoon activity by 14%. However, on weighting with the current level of Northwest Pacific typhoon activity in 2016 - which is 60% below norm - our forecast falls further to over 20% below norm. This outlook is consistent with the activity in historical years similar to 2016, which have had either zero or one major typhoon by the 8th August. The mean total ACE for the eight such years 1970-2015 is 199. Our forecast is also supported by the July 2016 trade wind speed for the region 2.5°N-12.5°N, 130°E-180°E – which is a good indicator of seasonal typhoon activity – being stronger than normal.

NW Pacific ACE Index and System Numbers in 2016

		ACE Index	Intense Typhoons	Typhoons	Tropical Storms
TSR Forecast (±FE)	2016	231 (±79)	7 (±2)	13 (±3)	22 (±4)
51yr Climate Norm (±SD)	1965-2015	298 (±102)	9 (±3)	16 (±4)	26 (±4)
Forecast Skill at this Lead	1965-2015	40%	40%	21%	15%

- Key: ACE Index = Accumulated Cyclone Energy Index = Sum of the Squares of 6-hourly Maximum Sustained Wind Speeds (in units of knots) for all Systems while they are at least Tropical Storm Strength. ACE Unit = x10⁴ knots².
- Intense Typhoon = 1 Minute Sustained Wind > 95Kts = Hurricane Category 3 to 5.
 Typhoon = 1 Minute Sustained Wind > 63Kts = Hurricane Category 1 to 5.
 Tropical Storm = 1 Minute Sustained Winds > 33Kts.
 SD = Standard Deviation.
 FE (Forecast Error) = Standard Deviation of Errors in Cross-Validated Hindcasts 1965-2015.
 Forecast Skill = Percentage Improvement in Mean Square Error Afforded by Cross-Validated Hindcasts 1965-2015 over Hindcasts Made with the 1965-2015 Climate Norm.
 Northwest Pacific = Northern Hemisphere Region West of 180°W Including the South China Sea. Any Tropical Cyclone (Irrespective of Where it Forms) Which Reaches Tropical Storm Strength Within this Region Counts as an Event.

There is a 55% probability that the 2016 NW Pacific typhoon season ACE index will be below-normal (defined as an ACE index value in the lower tercile historically (<238)), a 42% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (238 to 335)) and only a 3%

chance it will be above-normal (defined as an ACE index value in the upper tercile historically (>335)). The 51-year period 1965-2015 is used for climatology.

Key: Terciles = Data groupings of equal (33.3%) probability corresponding to the upper, middle and lower one-third of values historically (1965-2015).

Predictors for 2016

The TSR predictors are as follows. Intense typhoon numbers and the ACE index are predicted from the forecast value for the August-September Niño 3.75 index. Tropical storm and typhoon numbers are forecast using an ensemble of two models: the Niño 3 SST from the prior September and the forecast number of intense typhoons in 2016. Our prediction of the August-September Niño 3.75 index includes the current (21st July 2016) consensus ENSO outlook for the August-September 2016 Niño 3.4 index issued by the International Research Institute for Climate and Society. The main factor behind the TSR forecast for a below-normal Northwest Pacific typhoon season in 2016 is the weak-to-moderate negative Niño 3.75 SST anomaly anticipated in August-September 2016. A negative Niño 3.75 SST is associated with stronger trade wind strength over the region 2.5°N-12.5°N, 130°E-180°E. This in turn leads to lower cyclonic vorticity over the Northwest Pacific region where most intense typhoons form. The July 2016 trade anomaly (1981-2010 climatology) for the region 2.5°N-12.5°N, 130°E-180°E was 0.9 ms⁻¹ stronger than normal. As the July and August-September trade wind anomalies for this region are linked strongly ($R^2 = 0.85$; 1986-2015) it is likely that the current stronger than normal trade wind strength (and current below norm typhoon activity) will persist through August-September 2016.

Further Information

For more information about the TSR forecasts and their verifications for Northwest Pacific typhoon activity please see http://www.tropicalstormrisk.com/for_typh.html. This is the final TSR forecast update for the 2016 Northwest Pacific typhoon season. An extended range outlook for the 2017 Northwest Pacific typhoon season will be issued in early May 2017.

Appendix – Predictions from Previous Months

a) Deterministic forecast

NW Pacific ACE Index and System Numbers 2016					
		ACE Index (x10 ⁴ knots ²)	Intense Typhoons	Typhoons	Tropical Storms
Average Number (±SD) (1965-2015)		298 (±102)	9 (±3)	16 (±4)	26 (±4)
TSR Forecast (±FE)	8 August 2016	231 (±79)	7 (±2)	13 (±3)	22 (±4)
	6 July 2016	239 (±82)	7 (±2)	13 (±3)	22 (±4)
	7 May 2016	217 (±80)	6 (±3)	13 (±3)	22 (±4)

b) Probabilistic forecast

NW Pacific ACE Index 2016				
		Tercile Probabilities		
		below normal	normal	above normal
Climatology 1965-2015		33.3	33.3	33.3
TSR Forecast	8 August 2016	55	42	3
	6 July 2016	48	38	14
	7 May 2016	60	32	8