Extended Range Forecast for Northwest Pacific Typhoon Activity in 2016

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Forecast Summary

TSR predicts the 2016 Northwest Pacific typhoon season will be quiet with activity nearly one standard deviation below the 1965-2015 climate norm. However, forecast uncertainties remain sizeable.

The TSR (Tropical Storm Risk) extended range forecast for Northwest Pacific typhoon activity in 2016 anticipates a season with lower tercile activity to moderately high (60%) probability. The forecast spans the period from 1st January to 31st December 2016 (95% of typhoons occur historically after 1st May) and employs data through to the end of April 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 0.8±0.5°C cooler than normal. A cool Nino 3.75 SST would have a suppressing effect on typhoon activity. Although sizeable uncertainties remain in the ENSO forecast the prediction of below-norm activity season is supported by the current ACE value for 2016 being zero. ACE has been zero through the 6th May on only five occasions (1973, 1983, 1984, 1998 and 2011) since reliable records began in 1965. On each such occasion the subsequent annual ACE was well below-norm (the mean ACE in these years being 198). It is interesting to note that three of these five years (1973, 1983 and 1998) immediately follow a major El Niño year – as 2016 also does. Updated forecasts will be issued in early July and early August.

NW Pacific ACE Index and System Numbers in 2016

		ACE Index	Intense Typhoons	Typhoons	Tropical Storms
TSR Forecast (±FE)	2016	217 (±80)	6 (±3)	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	30%	28%	16%	13%

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 = $x10^4$ $knots^2$.

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 60% probability that the 2016 NW Pacific typhoon season ACE index it will be below-normal (defined as an ACE index value in the lower tercile historically (<238), a 32% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (238 to 335) and only an 8%

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.

The main factor behind the TSR forecast for a below-normal Northwest Pacific typhoon season in 2016 is the moderately 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 2.5N-12.5N, 120E-180E. This in turn leads to lower cyclonic vorticity over the Northwest Pacific region where most intense typhoons form.

It should be stressed that sizeable uncertainties remain in the August-September ENSO forecast and thus in the seasonal typhoon forecast. If a stronger-than-anticipated La Niña develops by August-September 2016 we would expect that Northwest Pacific typhoon activity will be lower than forecast.

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*. The next TSR forecast update for the 2016 Northwest Pacific typhoon season will be issued on the 6th July 2016.

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)	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	7 May 2016	60	32	8