# Extended Range Forecast for Northwest Pacific Typhoon Activity in 2019

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## Forecast Summary

**TSR predicts the 2019 Northwest Pacific typhoon season will see activity above the 1965-2018 norm. However, the uncertainties associated with this outlook are large and the forecast skill at this extended range is historically low.**

The TSR (Tropical Storm Risk) extended range forecast for Northwest Pacific typhoon activity in 2019 anticipates a season with activity about 15% above norm. The forecast spans the period from 1st January to 31st December 2019 (95% of typhoons occur historically after 1st May) and employs data through to the end of April 2019. 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 0.58±0.5°C warmer than normal (1965-2018 climatology). A warm Niño 3.75 SST will have an enhancing effect on typhoon activity. However, sizeable uncertainties remain in the ENSO forecast for August-September 2019. Furthermore the precision of TSR's outlooks for upcoming Northwest Pacific typhoon activity issued in early May between 2003 and 2018 is low. Updated seasonal outlooks will be issued in early July and early August 2019 when forecast skill is historically good.

## NW Pacific ACE Index and System Numbers in 2019

| | | ACE Index | Intense Typhoons | Typhoons | Tropical Storms |
|---|---|---|---|---|---|
| TSR Forecast (±FE) | 2019 | 354 (±86) | 10 (±3) | 17 (±3) | 27 (±4) |
| 54yr Climate Norm (±SD) | 1965-2018 | 295 (±101) | 9 (±3) | 16 (±4) | 26 (±4) |
| Forecast Skill at this Lead | 1965-2018 | 26% | 25% | 14% | 6% |

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 1965-2018.
Forecast Skill = Percentage Improvement in Mean Square Error Afforded by Cross-Validated Hindcasts 1965-2018 over Hindcasts Made with the 1965-2018 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 59% probability that the 2019 NW Pacific typhoon season ACE index will be above-average (defined as an ACE index value in the upper tercile historically (>335)), a 31% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (245 to 335) and only a 10% chance it will be below-normal (defined as an ACE index value in the lower tercile historically (<245)). The 54-year period 1965-2018 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 (1965-2018).

## Predictors for 2019

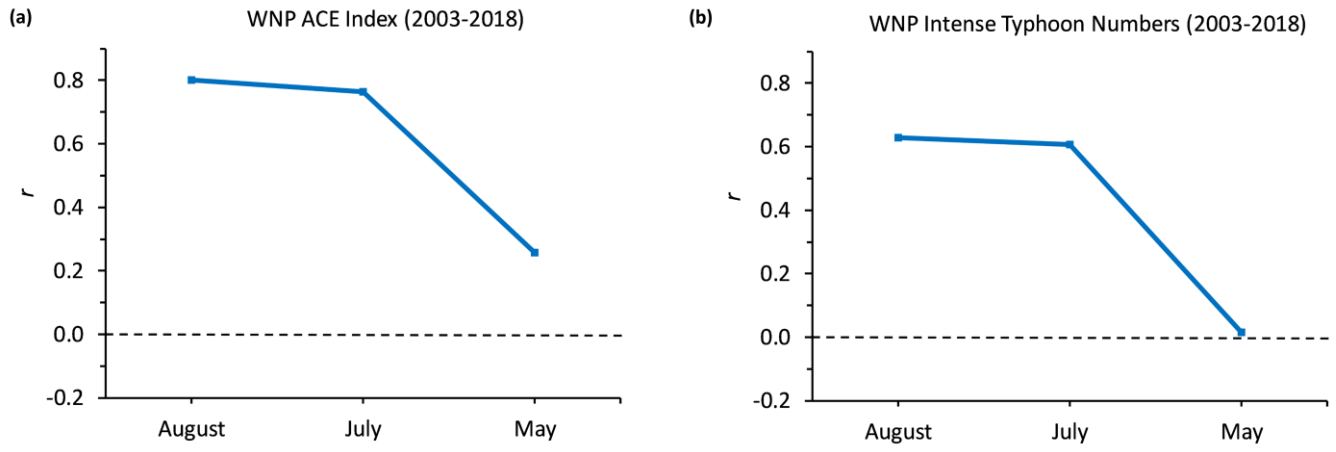
The TSR predictors are as follows. Intense typhoon numbers and the ACE index are predicted from the forecast value for the August-September Niño 3.75 index. Tropical storm and typhoon numbers are forecast using an ensemble of two models: the Niño 3 SST from the prior September and the forecast number of intense typhoons in 2019.

The main factor behind the TSR forecast for a slightly above-normal Northwest Pacific typhoon season in 2019 is the moderate positive Niño 3.75 SST anomaly anticipated in August-September 2019. A positive Niño 3.75 SST is associated with weaker trade wind strength over the region 2.5°N-12.5°N, 120°E-180°E. This in turn leads to higher cyclonic vorticity over the Northwest Pacific region where intense typhoons form.

It should be stressed that sizeable uncertainties remain in the August-September ENSO forecast and thus in the seasonal typhoon forecast. The precision of TSR's seasonal typhoon outlooks issued in early May is low as shown in the figure below.

## The Precision of TSR Seasonal Forecasts 2003-2018

The figure shows the skill of the TSR-publicly-released seasonal outlooks for Northwest Pacific ACE (left panel) and intense typhoon numbers (right panel) assessed for the 16-year period 2003-2018. Skill is shown as the Pearson correlation *r* between the forecast values (issued separately in early May, early July and early August) and the observed values. The figure shows low prediction skill from early May but good prediction skill ($r$ = 0.65 to 0.75) by early July. The correlation skill for typhoon numbers (not shown) is lower reaching 0.35 by early August.




## 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 first TSR forecast update for the 2019 Northwest Pacific typhoon season will be issued on Friday 5th July 2019.