



August Forecast Update for Northwest Pacific Typhoon Activity in 2019

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by Dr Adam Lea and Professor Mark Saunders
 Dept. of Space and Climate Physics, UCL (University College London), UK

Forecast Summary

TSR maintains its outlook issued in early July and anticipates the 2019 Northwest Pacific typhoon season will see activity slightly below the 1965-2018 climate norm.

The TSR (Tropical Storm Risk) July forecast update anticipates the 2019 Northwest Pacific typhoon season will have activity slightly below the 1965-2018 norm. The forecast spans the period from 1st January to 31st December 2019 (about 70% of annual Northwest Pacific typhoon activity occurs after the 7th August) and employs data through to the end of July 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. The current ENSO conditions over the central and western equatorial Pacific show an anomalous zonal gradient in sea surface temperature (SST) that increases from east to west. This anomalous SST gradient implies stronger easterly trade winds (via anomalous Walker circulation) which in turn implies decreased typhoon activity due to less cyclonic vorticity being available where storm form. Indeed the 2019 June-July trade wind speed for the region 0°N-10°N, 130°E-170°E – a good indicator of seasonal typhoon activity – was slightly stronger than normal. Our prediction of a slightly below-normal activity season is supported by the current 2019 ACE being only 60% of climatology through the 7th August 2019.

NW Pacific ACE Index and System Numbers in 2019

| | | ACE Index | Intense Typhoons | Typhoons | Tropical Storms |
|-----------------------------|-----------|--------------|---------------------|----------|--------------------|
| TSR Forecast (±FE) | 2019 | 270 (±71) | 8 (±2) | 16 (±3) | 26 (±4) |
| 54yr Climate Norm (±SD) | 1965-2018 | 295 (±101) | 9 (±3) | 16 (±4) | 26 (±4) |
| Forecast Skill at this Lead | 1965-2018 | 51% | 52% | 29% | 7% |

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 = $\times 10^4$ 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 1965-2018.

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 an 20% 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 46% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (245 to 335) and a 34% 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

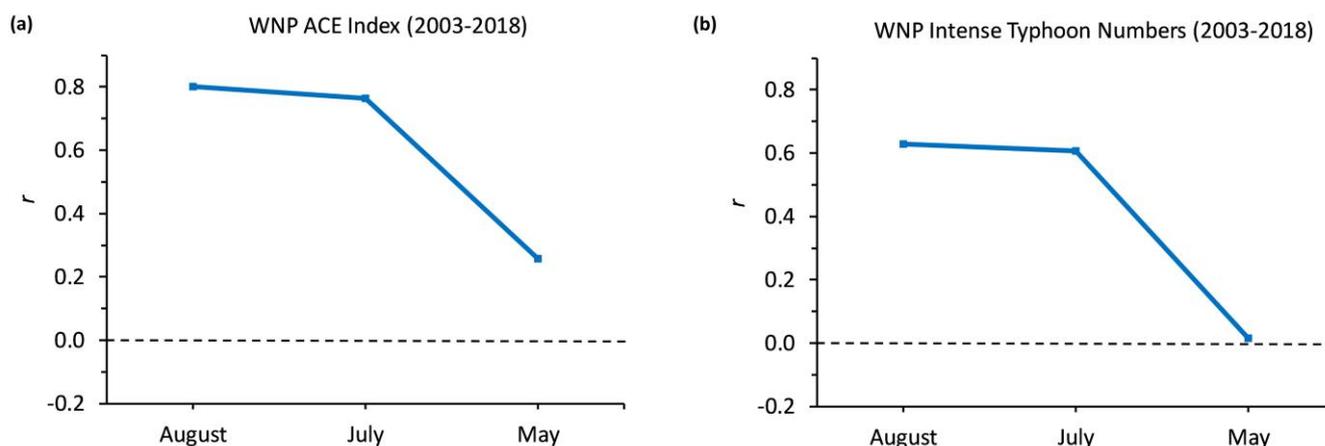
The TSR predictors are as follows. Intense typhoon numbers and the ACE index are predicted from the forecast value for the August-September Niño 3.75 index. Tropical storm and typhoon numbers are forecast using an ensemble of two models: the Niño 3 SST from the prior September and the forecast number of intense typhoons in 2019. Our prediction of the August-September Niño 3.75 index includes the current (19th July 2019) consensus ENSO outlook for the August-September 2017 Niño 3.4 index issued by the International Research Institute for Climate and Society.

The TSR forecasts are weighted by the recent prior trade wind speed over the region 2.5°N-12.5°N, 120°E-180°E and by the observed ACE activity up to the date of forecast issue. A stronger trade wind speed leads to lower cyclonic vorticity and to fewer intense typhoons over the Northwest Pacific.

Although the precision of TSR's seasonal typhoon outlooks issued in real-time in early August is good as shown in the Figure below, uncertainties remain in the seasonal typhoon forecast for 2019. About 50% of the variance in ACE between 1965 and 2018 is not replicated in our early August statistical outlooks. This level of unexplained variance means that one must expect sizeable discrepancies to occur at times between the early August forecast and observed levels of typhoon activity.

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. This is the final TSR forecast update for the 2019 Northwest Pacific typhoon season. An extended range outlook for the 2020 Northwest Pacific typhoon season will be issued in early May 2020.

Appendix – Predictions from Previous Months

a) Deterministic forecast

| NW Pacific ACE Index and System Numbers 2019 | | | | | |
|---|---------------|---|---------------------|---------------|--------------------|
| | | ACE Index ($\times 10^4$ knots ²) | Intense Typhoons | Typhoons | Tropical Storms |
| Average Number (\pm SD) (1965-2018) | | 295 (\pm 101) | 9 (\pm 3) | 16 (\pm 4) | 26 (\pm 4) |
| TSR Forecasts | 7 August 2019 | 270 (\pm 71) | 8 (\pm 2) | 16 (\pm 3) | 26 (\pm 4) |
| | 5 July 2019 | 260 (\pm 76) | 8 (\pm 2) | 15 (\pm 3) | 25 (\pm 4) |
| | 7 May 2019 | 354 (\pm 86) | 10 (\pm 3) | 17 (\pm 3) | 27 (\pm 4) |

b) Probabilistic forecast

| NW Pacific ACE Index 2019 | | | | |
|----------------------------------|---------------|-----------------------|--------|--------------|
| | | Tercile Probabilities | | |
| | | below normal | normal | above normal |
| Climatology 1965-2018 | | 33.3 | 33.3 | 33.3 |
| TSR Forecasts | 7 August 2019 | 34 | 46 | 20 |
| | 5 July 2019 | 45 | 35 | 20 |
| | 7 May 2019 | 10 | 31 | 59 |