



# August Forecast Update for Northwest Pacific Typhoon Activity in 2020

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## Forecast Summary

**TSR reduces its July outlook and predicts the 2020 Northwest Pacific typhoon season will be one of the least active typhoon seasons on record. An ACE value barely half of climatology is anticipated. There is a 96% certainty that the 2020 ACE value will be in the lowest one third of years historically.**

The TSR (Tropical Storm Risk) early August forecast update for Northwest Pacific typhoon activity in 2020 anticipates a season with an ACE (Accumulated Cyclone Energy) index that is nearly 50% below-norm. This would place 2020 in the lowest 10% of years for Northwest Pacific typhoon activity. It is nearly certain that the 2020 ACE value will lie in the lowest one third of years historically. The forecast spans the period from 1 January to 31 December 2020 (95% of typhoons occur historically after 1 May) and employs data through to early August 2020. 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 reduces its forecast from early July due to a strengthening during the past month of the signals for a well below norm activity season. These signals concern current ACE activity being 86% below norm and the June-July trade wind speed for the 2.5°N-12.5°N, 120°E-180°E region being unusually strong and thus inhibiting cyclonic vorticity. Forecast uncertainties remain but the precision of TSR's outlooks for upcoming Northwest Pacific typhoon activity issued in early August between 2003 and 2019 is good. We include robust forecast probability of exceedance information for the ACE index to quantify the forecast uncertainty.

## NW Pacific ACE Index and System Numbers in 2020

		ACE Index	Intense Typhoons	Typhoons	Tropical Storms
TSR Forecast ( $\pm$ FE)	2020	157 ( $\pm$ 73)	5 ( $\pm$ 2)	13 ( $\pm$ 3)	21 ( $\pm$ 4)
55yr Climate Norm ( $\pm$ SD)	1965-2019	294 ( $\pm$ 100)	9 ( $\pm$ 3)	16 ( $\pm$ 4)	26 ( $\pm$ 4)
Forecast Skill at this Lead	1965-2019	47%	42%	33%	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 =  $\times 10^4$  knots<sup>2</sup>.
- 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 1965-2019.  
 Forecast Skill = Percentage Improvement in Mean Square Error Afforded by Cross-Validated Hindcasts 1965-2019 over Hindcasts Made with the 1965-2019 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 0% chance that the 2020 NW Pacific typhoon season ACE index will be above-average (defined as an ACE index value in the upper tercile historically ( $>335$ )), a 4% likelihood it will be near-normal (defined as an ACE index value in the middle tercile historically (247 to 335)) and a 96% probability it

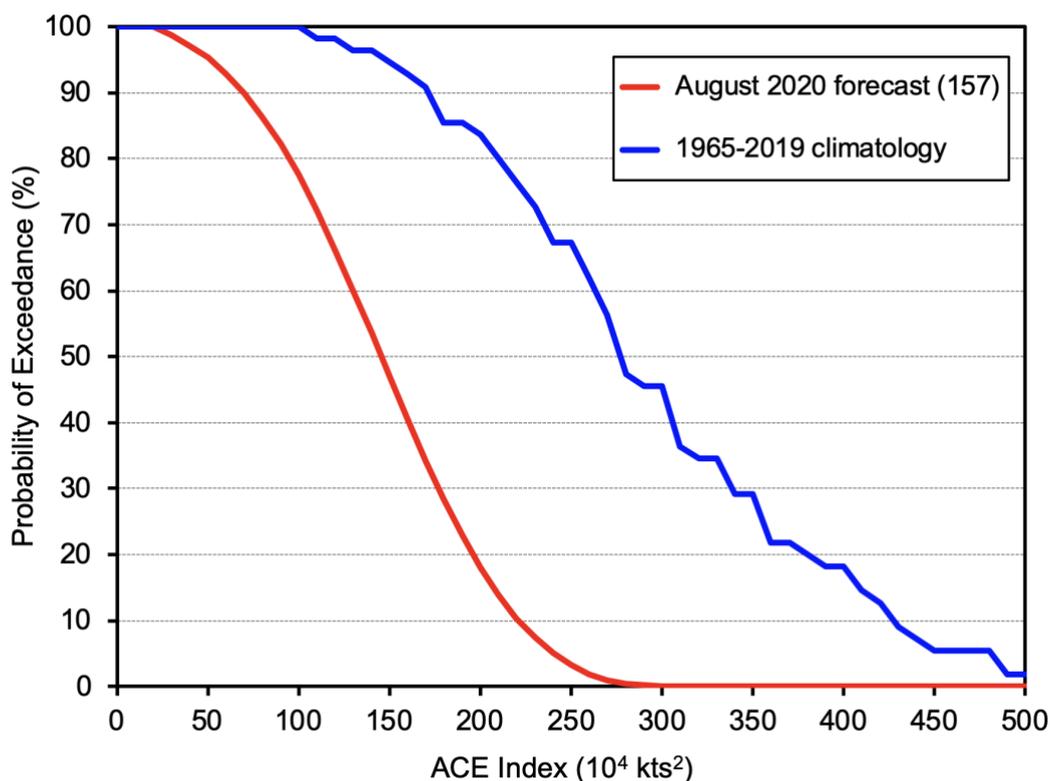
will be below-normal (defined as an ACE index value in the lower tercile historically (<247)). The 55-year period 1965-2019 is used for climatology.

Key: Terciles = Data groupings of equal (33.3%) probability corresponding to the upper, middle and lower one-third of values historically (1965-2019).

### Forecast Probability of Exceedance Plot for the 2020 Northwest Pacific Typhoon Season

Seasonal outlooks for Northwest Pacific typhoon activity contribute to the anticipation of risk for insurance companies, other weather-sensitive businesses, and local and national governments. However, the uncertainty associated with such forecasts is often unclear. This reduces their benefit and contributes to the perception of forecast ‘busts’. The robust assessment of risk requires a full and clear probabilistic quantification of forecast uncertainty with the forecast issued in terms of probability of exceedance (PoE). In this way the chance of each activity outcome occurring is clear for the benefit of users. Going forward TSR will be including robust forecast probability of exceedance (PoE) information based on the recommendation and methodology described in Saunders et al. (2020).

The figure below displays our current outlook for the Northwest Pacific ACE index in terms of PoE. The plot displays two PoE curves comprising the forecast PoE curve and the 1950-2019 climatology PoE curve. The forecast PoE curve is computed using a method similar to that described in section 3.3 of Saunders et al. (2020) while the climatology PoE curve is computed directly from observations. The figure specifies the current chance that a given ACE index will be reached in 2020 and how this chance compares to climatology.



TSR anticipates there is a 96% likelihood that the 2020 ACE Index will be in the lowest climatological tercile ( $ACE < 247 \times 10^4$  kts $^2$ ) and there is virtually no chance that the 2020 Northwest Pacific ACE Index will exceed its climatology value of  $294 \times 10^4$  kts $^2$ .

Reference: Saunders, M. A., Klotzbach, P. J., Lea, A. S. R., Schreck, C. J., & Bell, M. M. (2020). Quantifying the probability and causes of the surprisingly active 2018 North Atlantic hurricane season. *Earth and Space Science*, 7, e2019EA000852. <https://doi.org/10.1029/2019EA000852>

## Predictors for 2020

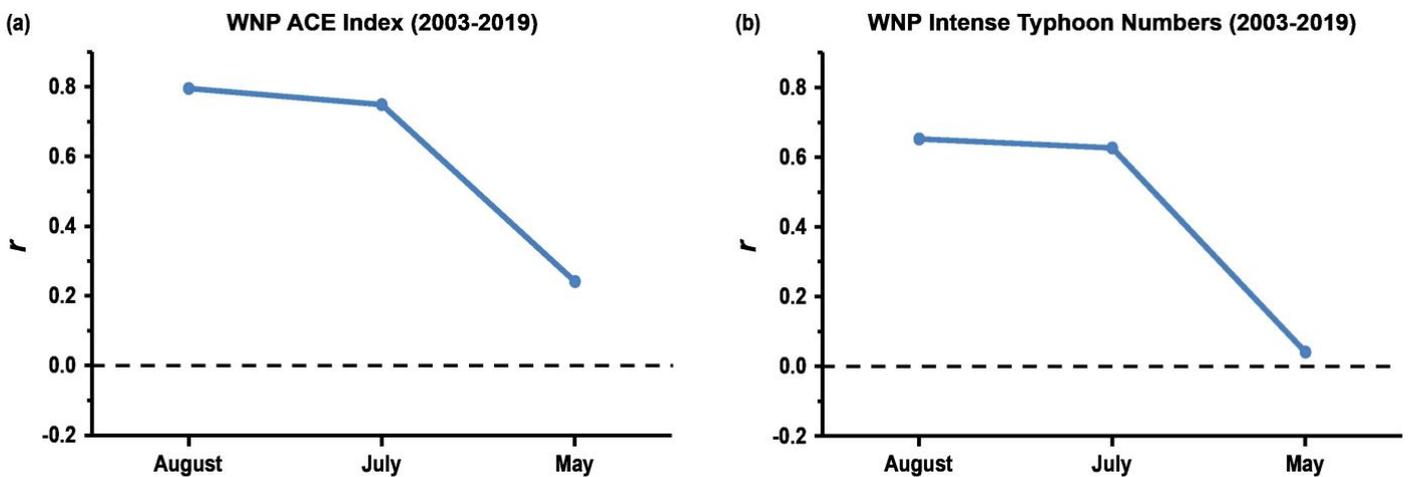
TSR uses two predictors in its August forecast update for Northwest Pacific typhoon activity. These are: (1) The observed ACE activity up to the date of forecast issue; (2) The June-July 925 hPa trade wind speed for the region 2.5°N-12.5°N, 120°E-180°E. These predictors are used to make forecasts for the ACE Index and intense typhoon numbers. Typhoon numbers and tropical storm numbers are forecast by using their observed regression with intense typhoon numbers.

The two TSR predictors both point to the Northwest Pacific typhoon season in 2020 being well below-normal and one of the least active typhoon seasons on record. The observed 2020 ACE activity up to today (6th August 2020) is 86% below-norm. Between 1965 and 2019 only the years 1975, 1998 and 2010 have had a similarly low ACE in early August. The final ACE values in these three years were 171, 153 and 121 respectively. Below-norm ACE activity through early August is linked to subsequent below-norm ACE activity. The June 2020 trade wind speed measured at 925 hPa is the third strongest since 1965. A stronger trade wind speed during June-July is linked to current and subsequent seasonal cyclonic vorticity over the Northwest Pacific region where intense typhoons form being below-norm, and thus to fewer intense typhoons and to a below-norm seasonal ACE.

Although uncertainties remain the precision of TSR’s seasonal typhoon outlooks issued in early August between 2003 and 2019 is good as shown below.

## The Precision of TSR Seasonal Forecasts 2003-2019

The figure below 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 17-year period 2003-2019. 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 ( $r = 0.63$  to  $0.75$ ) by early July. The correlation skill for typhoon numbers for the 2003-2019 period (not shown) is lower reaching 0.34 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](http://www.tropicalstormrisk.com/for_typh.html). This is the final TSR forecast update for the 2020 Northwest Pacific typhoon season. An extended range outlook for the 2021 Northwest Pacific typhoon season will be issued in early May 2021.

## Appendix – Predictions from Previous Months

### a) Deterministic forecast

<b>NW Pacific ACE Index and System Numbers 2020</b>					
		ACE Index (x10 <sup>4</sup> knots <sup>2</sup> )	Intense Typhoons	Typhoons	Tropical Storms
Average Number (±SD) (1965-2019)		294 (±100)	9 (±3)	16 (±4)	26 (±4)
TSR Forecasts (±FE)	6 August 2020	157 (±73)	5 (±2)	13 (±3)	21 (±4)
	9 July 2020	216 (±73)	7 (±2)	14 (±3)	25 (±4)
	21 May 2020	258 (±80)	8 (±2)	15 (±3)	26 (±4)

### b) Tercile probabilistic forecast

<b>NW Pacific ACE Index 2020</b>				
		Tercile Probabilities (%)		
		below normal	normal	above normal
Climatology 1965-2019		33.3	33.3	33.3
TSR Forecasts	6 August 2020	96	4	0
	9 July 2020	74	24	2
	21 May 2020	55	34	11