Early July Forecast for Northwest Pacific Typhoon Activity in 2024

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TSR continues to predict below-average Northwest Pacific typhoon activity in 2024 with activity forecast to be around 25% below the 1991-2020 30-year norm.

Summary: The TSR (Tropical Storm Risk) early July forecast for Northwest Pacific typhoon activity in 2024 anticipates a season with below-norm activity. TSR uses the strong link (R^2 = 0.82; 1993-2022) between the annual Northwest Pacific ACE index and August-September-October (ASO) ENSO combined with the expectation that a transition to weak La Niña conditions will continue and persist through August-October 2024, combined with the low NW Pacific typhoon activity to date. Although some uncertainty remains in the strength of the developing La Niña and the forecast skill at this range is historically low to moderate, all climate factors known to influence NWP typhoon activity are implying the 2024 NW Pacific typhoon season will be well below average with confidence being higher than normal. TSR anticipates there is a 94% likelihood that Northwest Pacific ACE in 2024 will be below the 1991-2020 30-year norm and anticipates there is an 81% chance Northwest Pacific ACE in 2024 will be in the lower tercile of years 1991-2020.

1. TSR July 2024 Northwest Pacific Seasonal Typhoon Activity Forecast

Further information on the TSR statistical prediction models and adjustments that are used to generate the forecasts below can be found in Section 2 of Supplementary Information.

1.1 Forecast Northwest Pacific ACE Index and System Numbers in 2024:

		ACE Index	Intense Typhoons	Typhoons	Tropical Storms
TSR Forecast	2024	211	7	14	24
30-yr Climate Norm	1991-2020	301	9.3	16.0	25.5
10-yr Climate Norm	2014-2023	257	8.2	13.9	23.7
Forecast Skill at this Lead	2014-2023	23%	9%	0%	0%

The forecast tercile probabilities (1991-2020 data) for the 2024 Northwest Pacific typhoon season ACE index are as follows: only a 3% probability of being upper tercile, a 16% likelihood of being middle tercile and an 81% chance of being lower tercile.

1.2 Forecast Probability of Exceedance Plot for the Northwest Pacific ACE index in 2024:

See Section 3 in the Supplementary Information for motivation behind probability of exceedance charts. Figure 1 displays our current forecast for the 2024 Northwest Pacific ACE index in terms of PoE. The forecast PoE curve is computed using the robust method described in Section 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 2024 and how this chance compares to climatology.

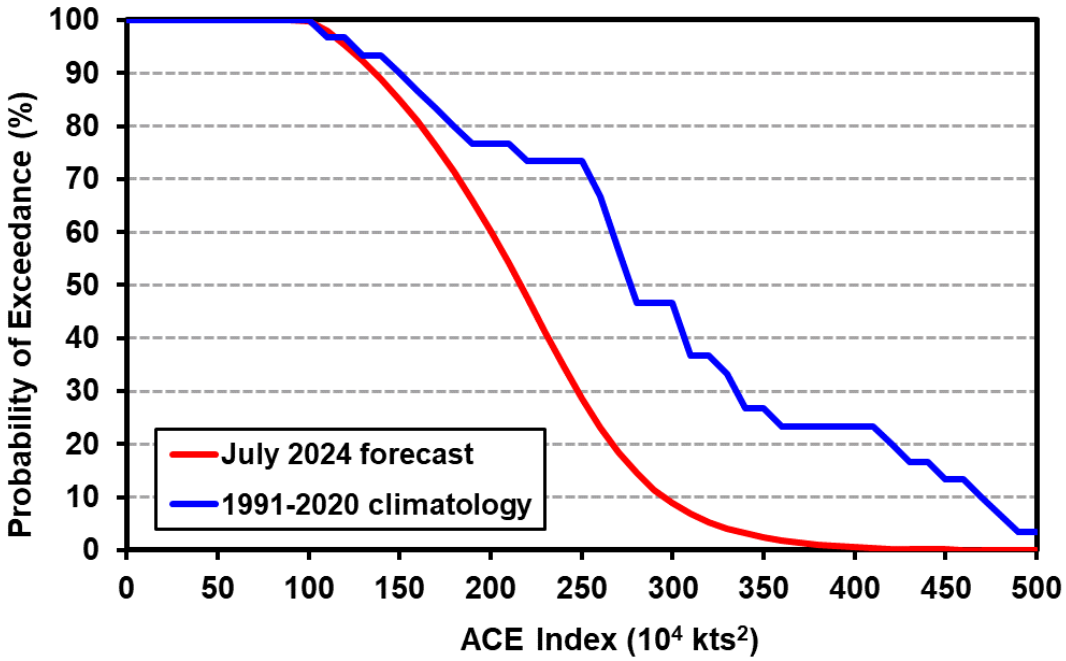

Figure 1. Forecast probability of exceedance (PoE) plot for the Northwest Pacific ACE index in 2024. The plot displays two sets of PoE data comprising the TSR forecast PoE curve issued in early July and the 1991-2020 climatology PoE curve.

2. Factors Influencing the July 2024 TSR Forecast

ENSO: The consensus forecast value for August-October ENSO ONI that we employ is -0.6°C. When La Niña is present during August-October the anomalous Walker circulation that occurs in tandem with La Niña leads to strengthened easterly trade winds over the Northwest Pacific region where tropical cyclones form and track. These strengthened easterly trades in turn weaken the local cyclonic vorticity and increase the local vertical wind shear, thereby giving environmental conditions that lead to a lower number of intense typhoons and to a reduced seasonal ACE index.

June Trade Wind Anomaly: Trade wind speed anomaly in June between 120°E and the dateline is correlated with NW Pacific ACE index, with stronger than average trade winds (negative wind anomalies) usually leading to below-average ACE index. The trade wind anomaly in June 2024 was strongly negative and the ninth strongest in magnitude over the 60-year period 1965-2024, implying a below-average typhoon season in 2024.

Activity to-date: There is a moderate correlation (Pearson r^2 ~ 0.34) between ACE index up to early July and the total ACE index. The ACE index to date in 2024 is 10 (10^4 kts^2) which is ranked 13th lowest over the 60-year period 1965-2024. The average total ACE index for all years with ACE to-date of 15 or less is 214, implying a below-average typhoon season in 2024.

Pacific Decadal Oscillation: The Pacific Decadal Oscillation (PDO) is often described as a long-lived El Niño pattern of Pacific climate variability. Warm phases of the PDO are linked to enhanced typhoon activity and vice-versa through a westward (eastward) shift in tropical cyclone genesis and storm tracks during the negative (positive) PDO phase. Through 2024 the PDO has been in a strongly negative phase implying tropical cyclones will tend to form further west closer to land, reducing the storm lifetime on average and consequently the total ACE index. The correlation between Spring/early summer PDO and NW Pacific ACE index is low, so this is expected to be a small factor relative to the others described above.

3. Confidence and Uncertainties

ENSO: Our expectation for La Niña conditions through August-October 2024 has high confidence. There has been a small decrease in the forecast strength of La Niña conditions from the IRI (International Research Institute) in the June update with all models predicting a weak La Niña or cold neutral conditions. Although there is a greater than 70% chance of La Niña conditions developing through ASO, if do they not develop this could result in a more active typhoon season.

June Trade Wind Anomaly: Seven out of eight years over the period 1965-2023 had a June trade wind anomaly at least as strongly negative as in June 2024 and saw well below-average NW Pacific ACE index, implying a quiet typhoon season is likely in 2024.

Activity to-date: Nine out of the twelve years over the period 1965-2023 which had a lower ACE index to-date than 2024 had a below-average total ACE index with the other three years around-average. The low ACE index to-date in 2024 increases the likelihood of a below-average 2024 typhoon season.

Skill: Historically the skill from early July forecasts for Northwest Pacific typhoon activity is moderate (see Section 4b in the Supplementary Information). Uncertainties remain in the forecast strength of La Niña and because even if the strength of La Niña is anticipated correctly a spread in ACE levels can still ensue. For the 14 years over the period 1965-2023 where the Niño 3.4 sea surface temperature anomaly was between -0.5 and -1C (weak La Niña), nine of those years were below average for ACE index, two were around-average and two were above average, illustrating that with a likely La Niña in place during summer and autumn, below-average typhoon activity is most likely.

4. Forecast Archive and Next Forecast

The archive of all the TSR publicly released Northwest Pacific seasonal typhoon forecasts (from 2000 to 2024) may be viewed at *https://www.tropicalstormrisk.com/for_typh.html*. The final TSR forecast update for the 2024 Northwest Pacific typhoon season will be issued on Wednesday 7th August, 2024.

Appendix: List of Predictions Issued for the 2024 NW Pacific Typhoon Season

NW Pacific ACE Index and Numbers 2024					
		ACE Index	Named Tropical Storms	Typhoons	Intense Typhoons
Average Number (1991-2020)		301	25.5	16.0	9.3
Average Number (2014-2023)		257	23.7	13.9	8.2
TSR Forecasts	5 July 2024	211	24	14	7
	7 May 2024	225	25	15	7