Early August Forecast for Northwest Pacific Typhoon Activity in 2024

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TSR lowers its forecast from early July and predicts that Northwest Pacific typhoon activity in 2024 will be in the lowest quintile of years 1965-2023.

Summary: The TSR (Tropical Storm Risk) early August forecast for Northwest Pacific typhoon activity in 2024 anticipates a season with activity comparable to the average of the 20% quietest seasons over the period 1965-2023. TSR uses the strong link ($R^2 = 0.82$; 1993-2023) between the annual Northwest Pacific ACE index and August-September-October (ASO) ENSO, tropical cyclone activity-to-date, and the expectation that cold-neutral or weak La Niña conditions will develop and persist through ASO 2024. Although some uncertainties remain and the forecast skill at this range is moderate, TSR anticipates there is a 92% likelihood that Northwest Pacific ACE in 2024 will be in the lower tercile of years 1991-2020 and a 6% chance the 2024 NW Pacific ACE index will be the lowest on record over the period of reliable records 1965-2023.

1. TSR August 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	177	6	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	70%	40%	0%	0%

The forecast tercile probabilities (1991-2020 data) for the 2024 Northwest Pacific typhoon season ACE index are as follows: only a 1% probability of being upper tercile, only a 7% likelihood of being middle tercile and a 92% 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.
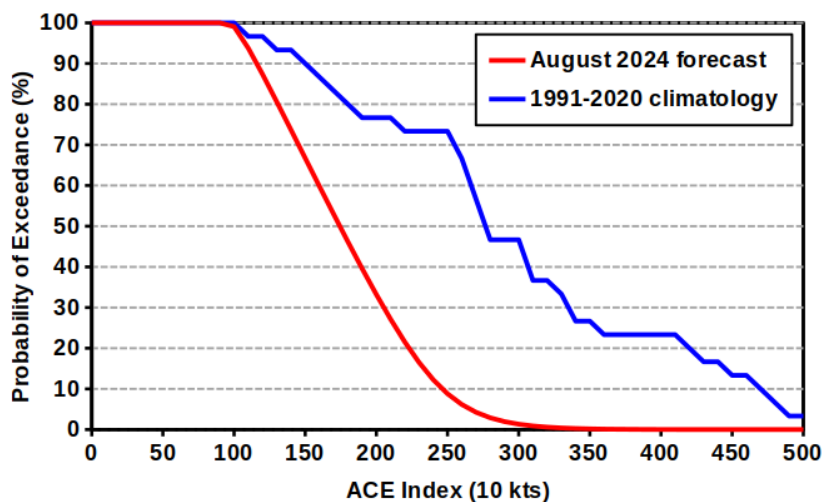
Figure 1. Forecast probability of exceedance (PoE) plot for the Northwest Pacific ACE index in 2024. The plot displays two sets of PoE data comprising the TSR forecast PoE curve issued in early August and the 1991-2020 climatology PoE curve.

2. Factors Influencing the August 2024 TSR Forecast

ENSO: The consensus forecast value for ASO ENSO ONI that we employ is -0.5°C. When La Niña is present during ASO 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-July Trade Wind Speed Anomaly: The June-July zonal wind anomaly across the region 2.5°N – 12.5°N, 120°E – 180° was 1.58 ms-1 stronger than normal (1991-2020 climatology). Trade wind anomalies across this region in early summer are moderately correlated with NW Pacific ACE index over the period 1965-2023 ($r^2 \sim 0.5$), with stronger trade winds correlated with lower NW Pacific typhoon activity. Stronger than normal trade winds are related to the developing cold-neutral or weak La Niña conditions and are forecast to largely persist through the rest of summer and into early autumn.

Activity-to-date: Current activity-to-date in terms of ACE index is the sixth lowest over the period 1965-2024. The ACE index up to early August is moderately correlated with total seasonal ACE index over the period 1965-2023 ($r^2 \sim 0.5$). The very low activity so far indicates the 2024 NW Pacific typhoon season will be likely be well below the 1991-2020 average.

Current Tropical Cyclone Activity: A tropical depression has recently formed in the sub-tropics south-east of Japan and is forecast to strengthen to a tropical storm as it moves north before becoming extra-tropical sometime over the next week. This storm will contribute very little to the total ACE index. Tropical cyclone development is not anticipated over the next week or so; however, some of the available dynamical models are predicting a tropical storm or typhoon to form in the sub-tropics south-east of Japan around mid-August.

Climate Model Outlooks: There are mixed signals for monthly precipitation anomalies across the available models; however, indications are that there will be periods of above-average and below average monthly rainfall in places across the basin through August-October. Periods of above-average rainfall may be more conducive for tropical cyclone development. Other factors such as vertical wind shear

anomalies, low-level trade wind speed anomalies and surface pressure anomalies are likely to be unfavourable across much of the basin during this period.

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 on decadal timescales and vice-versa. Since January 2020 the PDO has been in a negative phase which tends to suppress typhoon activity, however the correlation between the prior-monthly PDO and upcoming typhoon activity over the period 1965-2023 is weak (Pearson $r^2 \sim 0.05$).

3. Confidence and Uncertainties

ENSO: Our forecast for La Niña conditions through ASO 2024 has moderate confidence. Most of the model forecasts provided by IRI earlier this year have persistently forecast weak or moderate La Niña conditions during ASO 2024. In the most recent forecast there has been a decrease in the strength and a delay in the onset of La Niña conditions in the consensus compared to previous model runs, with more models predicting cold-neutral rather than La Niña conditions. There is a possibility that La Niña conditions will not develop although it is very likely at least cold-neutral conditions will develop through the rest of summer and autumn. If La Niña conditions fail to fully develop, this may allow for more favourable conditions for typhoon activity during peak season during August-October and a more active season than is predicted here.

Low activity to-date: The 2024 ACE index up to the 6th August inclusive is 25. Over the period 1965-2023 this is the sixth quietest start to the season. The average total seasonal ACE index for the fourteen years where the ACE index to-date was less than 50 is 193. It should be noted that although eight of those fourteen years saw a NW Pacific ACE index less than 200, four years saw an ACE index over 250 although still below the 1991-2020 climate norm. This means that a more active season than being predicted here cannot be ruled out despite the very low activity to-date; however, considering the other factors which also indicate a quiet season ahead, the likelihood of this scenario is very low.

Intra-seasonal factors: Other factors which can vary through the season and cannot be predicted in advance contribute to the uncertainty of seasonal NW Pacific typhoon activity. These factors include the strength of the monsoon trough and the phase and magnitude of the Madden-Julian Oscillation through August-October. For example, the 2016 typhoon season was around-average for activity despite the primary climate factors all indicating a quiet season. The first half of the 2016 season was fairly quiet; however, several powerful category four and five typhoons formed during the second half of September and through October, bringing total activity to around-average by the end of the year.

Skill: Historically the skill from early August forecasts for Northwest Pacific typhoon activity is moderate (see Section 4b in the Supplementary Information). Some uncertainties exist in the strength of ENSO at this lead time combined with influential intra-seasonal factors which cannot be predicted in advance, and because even if the ASO ONI value is anticipated correctly a spread in ACE levels can still ensue.

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*. This is the final TSR forecast update for the 2024 Northwest Pacific typhoon season. A summary of the 2024 NW Pacific typhoon season and a review of the TSR seasonal forecasts will be issued in December 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	7 August 2024	177	24	14	6
	5 July 2024	211	24	14	7
	7 May 2024	225	25	15	7