



# Summary of 2001 NW Pacific Typhoon Season and Verification of Authors' Seasonal Forecasts

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## Summary

**A year with slightly above average typhoon activity but below average Japanese landfalling events. Forecasts anticipated near-average activity.**

The Tropical Storm Risk (TSR) consortium presents a validation of their seasonal forecasts for NW Pacific tropical storm, typhoon and intense typhoon numbers and Japanese landfalling storms and typhoons in 2001. These forecasts were issued on 31<sup>st</sup> January and 15<sup>th</sup> June 2001, spanning the official NW Pacific typhoon season from 1<sup>st</sup> January to 31<sup>st</sup> December. All TSR forecasts were generally accurate to within 1-standard error of the observed totals.

## Features of the 2001 NW Pacific Season

- The 2001 NW Pacific season was slightly above average, featuring 28 storms, 20 typhoons and 11 intense typhoons. This compares to 1971-2000 climatologies of 27.1, 16.9 and 8.2 respectively. Whilst activity has increased year-on-year since 1998, it remains the lowest four-year period of activity since 1976-1979.
- Nearly 40% of storms developed to intense typhoon strength - the largest proportion to have done so since 1987.
- Typhoons Toraji, Nari and Lekima were responsible for an estimated 300 fatalities in Taiwan, making the 2001 season one of the most deadly in recent times for this island. Nari was the most destructive, producing widespread flooding which contributed to an estimated \$US 800m damage bill (\$US 600m insured).
- Typhoons Danas and Pabuk struck Japan, causing combined estimated economic losses of \$US 1.3bn and insured losses \$US 800m.
- Typhoon Vamie, which passed near Singapore on the 27th December, became the lowest latitude typhoon (at 1.5°N) ever to have been observed in the NW Pacific.



### Individual Storm Summary 2001

No.	Name	Dates	Peak Wind (kts)	Typhoon Category	Category at Japan Landfall
1	Cimaron	11-14 May	60	-	
2	Chebi	19-24 Jun	100	3	
3	Durian	29 Jun-02 Jul	75	1	
4	Utor	01-06 Jul	80	1	
5	Trami	09-12 Jul	35	-	
6	Kong-	21-28 Jul	85	2	
7	Yutu	22-26 Jul	85	2	
8	Toraji	25-31 Jul	100	3	
9	Man-Yi	01-08 Aug	115	4	
10	Usagi	09-10 Aug	40	-	
11	Pabuk	14-22 Aug	95	2	TS
12	Wutip	27 Aug-02	130	4	
13	Sepat	27-30 Aug	45	-	
14	Fitow	29-31 Aug	40	-	
15	Danas	03-12 Sep	115	4	1
16	Nari	06-21 Sep	100	3	
17	Vipa	17-21 Sep	75	1	
18	Francisco	19-25 Sep	100	3	
19	Lekima	22-29 Sep	95	2	
20	Krosa	03-09 Oct	105	3	
21	Haiyan	11-17 Oct	90	2	
22	Podul	19-27 Oct	140	5	
23	Lingling	06-12 Nov	115	4	
24	28W	18-24 Nov	40	-	
25	29W	20-23 Nov	35	-	
26	Kajiki	05-09 Dec	35	-	
27	Faxai	11-25 Dec	155	5	
28	Vamei	27-28 Dec	75	1	

## Verification of Forecasts

### 1. NW Pacific Total Numbers

<b>NW Pacific Total Numbers 2001</b>				
		Tropical Storms	Typhoons	Intense Typhoons
Average Number ( $\pm$ SD) (1991-2000)		28.6 ( $\pm$ 5.2)	17.6 ( $\pm$ 4.8)	9.0 ( $\pm$ 3.1)
Average Number ( $\pm$ SD) (1971-2000)		27.1 ( $\pm$ 4.6)	16.9 ( $\pm$ 4.1)	8.2 ( $\pm$ 3.3)
Actual Number 2001		28	20	11
TSR Forecast ( $\pm$ SD)	15 June 2001	26.1 ( $\pm$ 3.4)	17.5 ( $\pm$ 3.1)	8.7 ( $\pm$ 2.1)
	31 Jan 2001	28.1 ( $\pm$ 2.9)	16.2 ( $\pm$ 2.7)	6.6 ( $\pm$ 2.2)
Chan Forecast ( $\pm$ SD)	12 July 2001	28 ( $\pm$ 3)	18 ( $\pm$ 2)	-
	10 May 2001	27 ( $\pm$ 3)	18 ( $\pm$ 2)	-

TSR's June forecast successfully predicted that typhoon activity in the NW Pacific would be above the long-term average but like Chan, underestimated the actual number by approximately 10%. TSR's tropical storm forecast was correct in January and accurate to within one standard error in June whilst the intense typhoon forecasts were both accurate to within two standard errors. TSR's tendency to under-predict activity in 2001 has been traced back to an underestimation of the *Nino* 4 August-September sea surface temperature anomaly (0.3°C instead of 0.6°C). Had TSR issued a forecast in early August using their updated *Nino* 4 forecast of 0.5°C, their intense typhoon forecast would have risen to 10 and their typhoon forecast of 20 would have been correct. For more details on Chan's forecasts, see [http://aposf02.cityu.edu.hk/~mcg/tc\\_forecast/forecast.htm](http://aposf02.cityu.edu.hk/~mcg/tc_forecast/forecast.htm).

### 2. Japan Landfalling Numbers

<b>Japan Landfalling Numbers 2001</b>			
		Tropical Storms	Typhoons
Average Number ( $\pm$ SD) (1991-2000)		4.1 ( $\pm$ 1.8)	2.4 ( $\pm$ 1.2)
Average Number ( $\pm$ SD) (1971-2000)		3.2 ( $\pm$ 1.8)	2.0 ( $\pm$ 1.3)
Actual Number 2001		2	1
TSR Forecast ( $\pm$ SD)	15 June 2001	3.4 ( $\pm$ 1.5)	2.2 ( $\pm$ 1.1)

Japan strike numbers were less than expected, though if Pabuk had been 5-knots stronger when it made landfall the typhoon forecast would have been correct. TSR's landfalling definition changed in June so the January forecast is not included here.

## Definitions

The NW Pacific basin is defined as the northern hemisphere region west of 180°E whilst Japan is defined for the purposes of this study as the islands north of 31°N. The windspeed assigned to a given storm is the highest 1-minute sustained windspeed achieved within the NW Pacific

irrespective of where it first forms, with landfalling events defined as the maximum 1-minute sustained windspeed of a storm occurring within 30km of land. These speeds are converted to their respective typhoon categories according to the table below.

<b>Definitions</b>				
Tropical Cyclone Type	Category	Peak 1-Min Sustained Wind		Minimum Pressure (mb)
		knots	mph	
Tropical Storm	TS	34-63	39-73	-
Typhoon	1	64-82	74-95	>980
Typhoon	2	83-95	96-110	965-980
Typhoon *	3	96-113	111-130	945-965
Typhoon *	4	114-135	131-155	920-945
Super Typhoon *	5	>135	>155	<920

\* Denotes Intense Typhoon Strength (Category 3 and Above)

Our forecast is validated using track and intensity data obtained from the Unisys Weather Website (<http://weather.unisys.com>) and from Julian Heming's Met Office Tropical Cyclone Website (<http://www.met-office.gov.uk/sec2/sec2cyclone/tcver.html>). Position and maximum windspeeds are supplied at 6-hour time intervals. We interpolate these to 15-minute intervals for landfalling events.

## Future Forecasts and Verifications

1. Extended range forecast for the 2002 NW Pacific typhoon season will be issued on the 7th February, and a monthly forecast update for the 2002 Atlantic hurricane season will be released on the 6th February.
2. Extended-range forecast for Australian-region tropical storms in 2002/03 will be issued in April and an end-of-season summary for the 2001/02 Australian-region tropical storm season will be released in May.

## Tropical Storm Risk.com (TSR)

*TropicalStormRisk.com* (TSR) is a venture which has developed from the UK government-supported TSUNAMI initiative project on seasonal tropical cyclone prediction. The TSR consortium comprises experts on insurance, risk management and seasonal climate forecasting. The TSR insurance expertise is drawn from the *Benfield Group*, the leading independent reinsurance intermediary, *Royal & SunAlliance*, the global insurance group, and from *Crawford & Company*, a global provider of risk management services. The TSR scientific grouping brings together climate physicists, meteorologists and statisticians at *UCL* (University College London) and the *Met. Office*. TSR forecasts are available from <http://tropicalstormrisk.com>.

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