



# Extended Range Forecast for NW Pacific and Japan Landfalling Tropical Storms in 2001

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*Produced in collaboration with the UK Met. Office  
by Drs Paul Rockett, Mark Saunders and Tony Hamilton  
Benfield Greig Hazard Research Centre, UCL (University College London), UK.*

## Forecast Summary

**NW Pacific typhoon and intense typhoon numbers are expected to be slightly below average in 2001 while tropical storm and Japanese landfalling storm and typhoon numbers are expected to be average**

The *Tropical Storm Risk* (TSR) consortium presents an extended-range forecast for NW Pacific tropical storm, typhoon and intense typhoon numbers, and for tropical storm and typhoon strikes on Japan. Our forecasts span the full NW Pacific season from 1st January to 31st December 2001. They are based on a composite type approach using data available through the end of December 2000. Our expectation for continuing weak La Niña conditions through until at least the end of September is responsible for our forecast of another, relatively quiet year.

### 1. NWP Total Numbers in 2001

|                          |           | Intense Typhoons | Typhoons          | Tropical Storms   |
|--------------------------|-----------|------------------|-------------------|-------------------|
| TSR Forecast ( $\pm$ SD) | 2001      | 6.6 ( $\pm$ 2.2) | 16.2 ( $\pm$ 2.7) | 28.1 ( $\pm$ 2.9) |
| Average ( $\pm$ SD)      | 1971-2001 | 8.2 ( $\pm$ 3.4) | 17.0 ( $\pm$ 4.1) | 27.2 ( $\pm$ 4.6) |
| Actual                   | 2000      | 7                | 14                | 25                |

Key: Intense Typhoons = 1-Minute Sustained Wind > 95Kts = Hurricane Category 3 to 5  
Typhoons = 1-Minute Sustained Wind > 63Kts = Hurricane Category 1 to 5  
Tropical Storms = 1-Minute Sustained Wind > 33Kts  
NW Pacific Region = Northern Hemisphere region west of 180° East.

- Intense typhoon numbers are expected to be 20% below average in 2001.
- Typhoon numbers are expected to be 5% below average.
- Tropical storm numbers are forecast to be slightly above average.



## 2. Japan Landfalling Numbers in 2001

|                          |           | Typhoons         | Tropical Storms  |
|--------------------------|-----------|------------------|------------------|
| TSR Forecast ( $\pm$ SD) | 2001      | 2.5 ( $\pm$ 1.3) | 4.0 ( $\pm$ 1.3) |
| Average ( $\pm$ SD)      | 1971-2000 | 2.5 ( $\pm$ 1.5) | 4.1 ( $\pm$ 1.7) |
| Actual                   | 2000      | 2                | 4                |

Key: Typhoons = 1 Minute Sustained Wind > 63Kts = Hurricane Category 1 to 5  
 Tropical Storms = 1 Minute Sustained Wind > 33Kts

- The risk from tropical storm and typhoon strikes is anticipated to be about average in 2001.

### Predictors and Key Influences in 2001

Anomalous patterns of sea surface temperatures (SST) are the primary source of tropical atmospheric forcing at seasonal and interannual timescales and we exploit the predictability of these in our model. The primary predictor is our August-September 2001 SST forecast for the Niño 3.4 Region (5°N-5°S, 120°W-170°W). This SST forecast value comes from an in-house statistical model which utilises initial conditions and trends in global SSTs. It predicts an anomaly of -0.27°C for the Niño 3.4 region indicating that the present weak La Niña conditions will persist. This is similar to last year's value of -0.36°C.

### Definitions

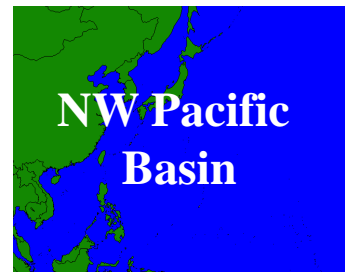
In accordance with the definition provided in Chapter 1 of the Global Guide to Tropical Cyclone Forecasting, World Meteorological Organisation Report No. 560, 1993, the NW Pacific basin is defined, for the purposes of this forecast, as the northern hemisphere region west of 180°E. The speed assigned to a given storm is the highest 1-minute sustained windspeed achieved within this region, irrespective of whether the storm first develops in the East or West Pacific. We use tropical cyclone best track data provided by Dr C J Neumann, though due to concerns about data quality, we focus on records post 1970 .

Landfalling events are defined as the maximum 1-minute sustained windspeed of a storm coming within 140-km of land. This accounts for the fact that the radius of damaging winds typically extend this far from a storm centre. Japan for the purposes of this forecast, is defined as the islands north of 31°N.

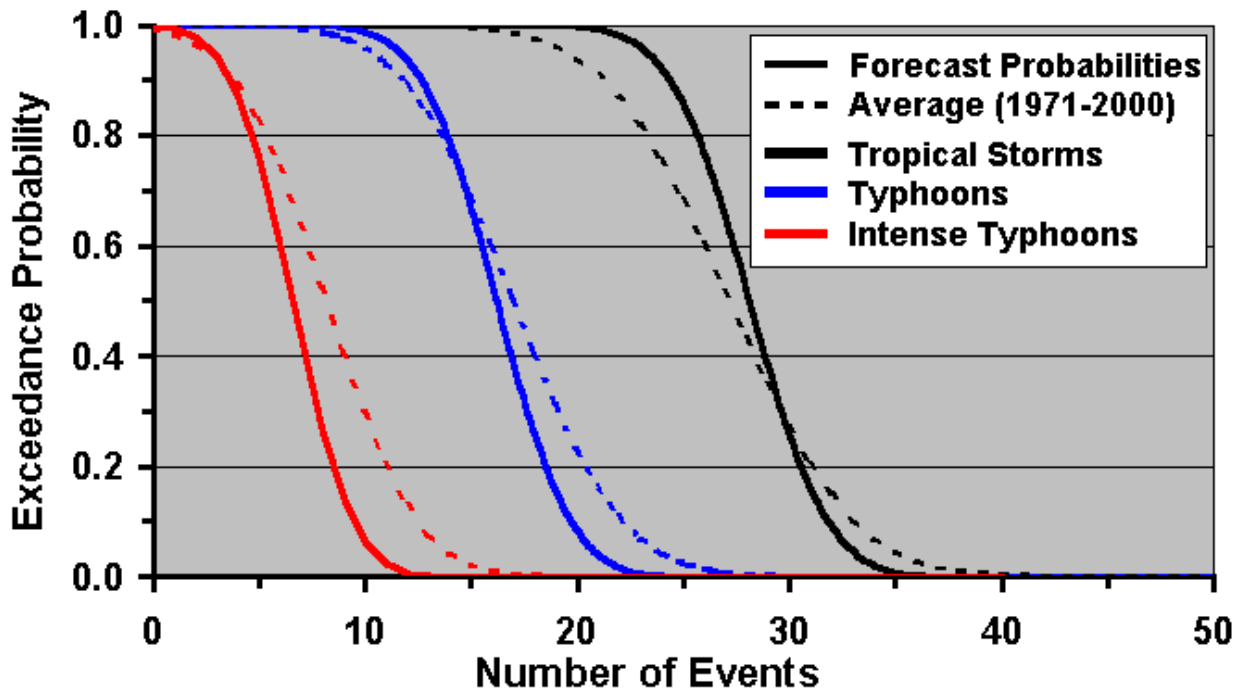
### Methodology

The forecast issued in May 2000 was based on forecast SST values for El Niño Southern Oscillation (ENSO) regions, together with March-April lagged predictors. This proved very successful but at this current extended lead the lagged predictors are not available. Furthermore, with many of these regions being extra-tropical, we are unable to predict their March-April 2001 values with sufficient accuracy to utilise them in this forecast. Nevertheless, our ENSO predictors still have 15% skill at this lead range and as the major atmospheric forcing factor in the NW Pacific, we feel it is reasonable to adopt the following composite type approach. In this, we select those years with contemporaneous Niño 3.4 SST anomalies that were within  $\pm$ 0.5°C of our August-September 2001 forecast SST value (approximately 1-standard error) and calculate the mean and standard deviation of the number of storms for these years. Exceedance probabilities are then derived using the Gaussian distribution with these parameters set and compared against the relevant climatology values calculated over the full set of years 1971-2000.

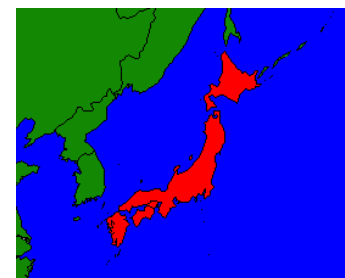
# Number of NW Pacific Tropical Storms in 2001



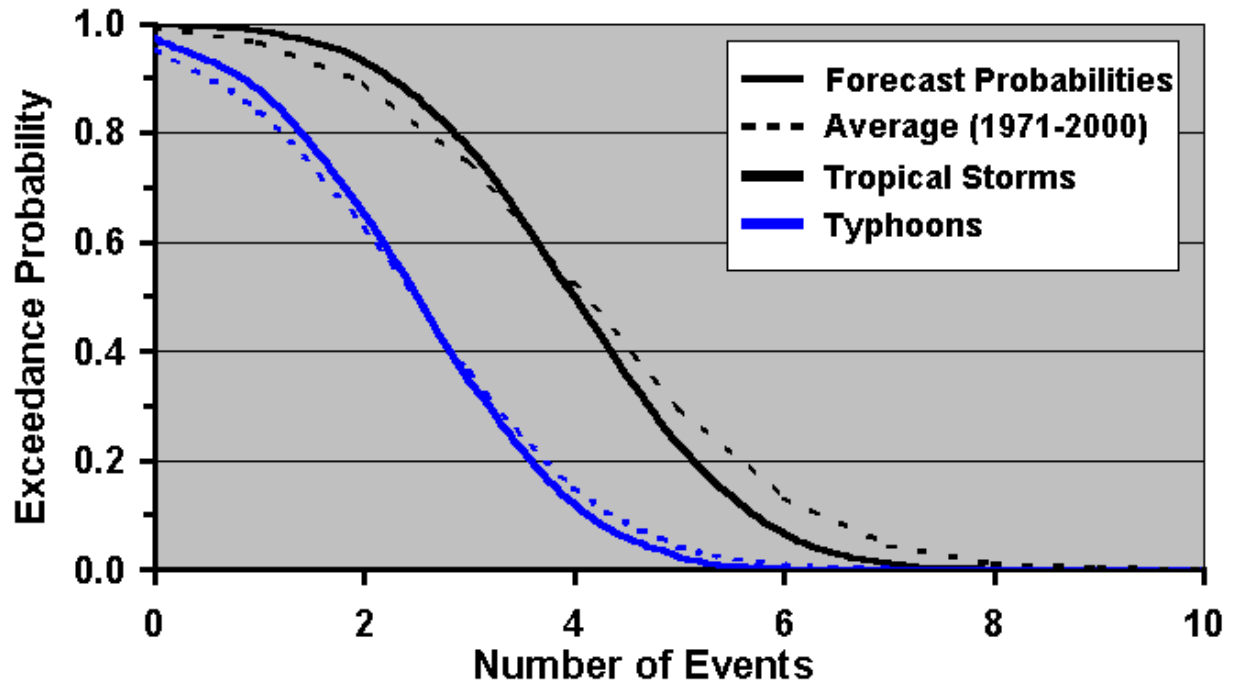
Probability of Exceedance Forecast for 2001



# Japanese Landfalling Tropical Storms in 2001



Probability of Exceedance Forecast for 2001



## Potential Benefits

Tropical cyclones are the most costly and deadly natural disaster affecting much of Japan, South Korea, Taiwan, the Philippines and coastal areas in other southeast Asian countries. The annual damage bill and fatality rate from tropical cyclone impacts in southeast Asia 1990-1998 averages, respectively US \$3.3 billion (at 2000 prices) per year and 740 deaths [information from Munich Re]. Intense tropical cyclones - or typhoons - are responsible for the vast majority of this damage. Typhoon Bart, which struck Japan on 22nd September 1999, caused economic (insured) losses of US \$3.3 billion (\$ 3.0 billion) respectively, and ranks as the second worst natural catastrophe insurance loss of 1999. By reducing the uncertainty associated with these events, skilful extended range forecasts can benefit society in many ways if utilised effectively.

## Future Forecasts and Verifications

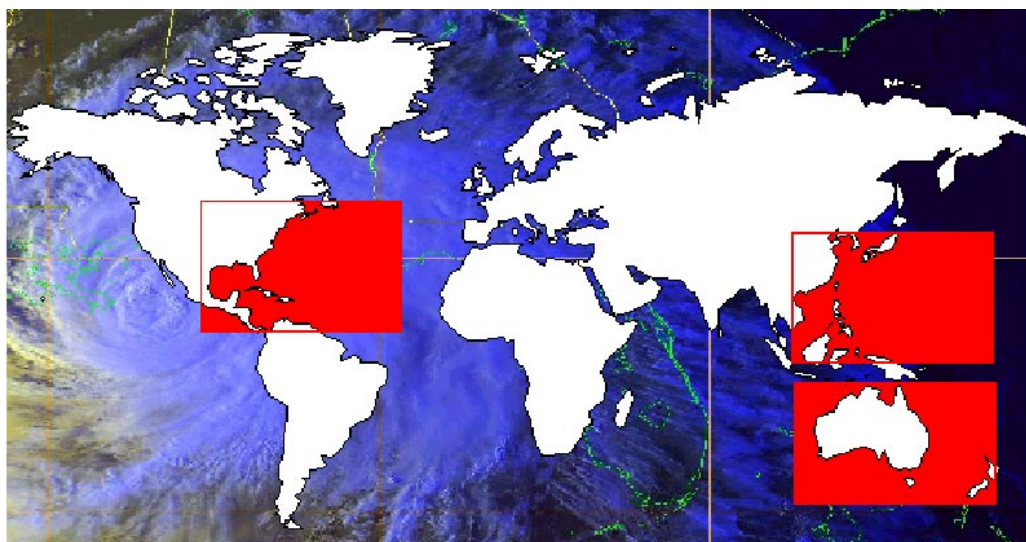
1. Australian 2000/01 tropical cyclone season summary and forecast verification will be issued in May 2001.
2. Pre-Season forecast for NW Pacific and Japan landfalling tropical cyclone activity in 2001 will be issued in early June 2001.

## 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 leading UK insurance industry experts and scientists at the forefront of seasonal forecasting. The *TSR* insurance expertise is drawn from the *Royal and Sun Alliance* insurance company, *Benfield Greig*, a leading independent global reinsurance and risk advisory group, and from the *CGNU Insurance Group*. The *TSR* scientific grouping brings together climate physicists, meteorologists and statisticians at *UCL* (University College London) and the *UK Met. Office*. *TSR* forecasts are available from <http://tropicalstormrisk.com>.

## Acknowledgements

The *TSR* venture is administered by Mrs Alyson Bedford of the Met. Office. We wish to thank Mike Cooper (CGNU Group), David Simmons (Benfield Greig Group) and Julia Graham (Royal and Sun Alliance) for industrial liaison. We acknowledge meteorological input from Dr Mike Davey (Met. Office), statistical advice from Dr Richard Chandler (Department of Statistical Science, University College London), and computing and web-site assistance by Steve George, Frank Roberts and Justin Mansley (UCL).



*The three basins under research by the TSR Tropical Storm Risk venture*