SW Pacific and Australian (Queensland) Landfalling Tropical Cyclones in 2000/01

Extended Range Forecast Issued 3rd April, 2000

Produced under contract for TSUNAMI in collaboration with the UK Met. Office
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Forecast Summary

SW Pacific tropical cyclone activity and Queensland strike numbers are expected to be average to slightly below average in 2000

This document presents, to our knowledge, the first ever extended range forecast for SW Pacific tropical cyclone activity, and the first ever seasonal forecast for Queensland (Australia) tropical storm strike numbers. The forecast spans the full 2000/01 SW Pacific tropical cyclone season from 1st November 2000 to 30th April 2001. It is based on information available through the end of February 2000. Our predictors are a mix of current and forecast sea surface temperatures.

1. SW Pacific Total Numbers in 2000/01

		Very Severe Tropical Cyclones	Severe Tropical Cyclones	Tropical Cyclones
Forecast (±SD)	2000/01	2.3 (±1.5)	5.1 (±2.3)	7.6 (±2.8)
Actual	1999/00 (to date)	0	4	7
Average (±SD)	1992/93-1998/99	2.9 (±1.7)	6.3 (±2.5)	10.6 (±3.3)

| Key:			
Very Severe Tropical Cyclones	= Sustained Wind > 95Kts	= Hurricane Category 3 to 5
Severe Tropical Cyclones	= Sustained Wind > 63Kts	= Hurricane Category 1 to 5
Tropical Cyclones	= Sustained Wind > 33Kt	
SW Pacific Basin	= Southern Hemisphere 142°E to 120°W (Storm Must Form as a TC Within to Count) .	

2. Queensland Landfalling Numbers in 2000/01

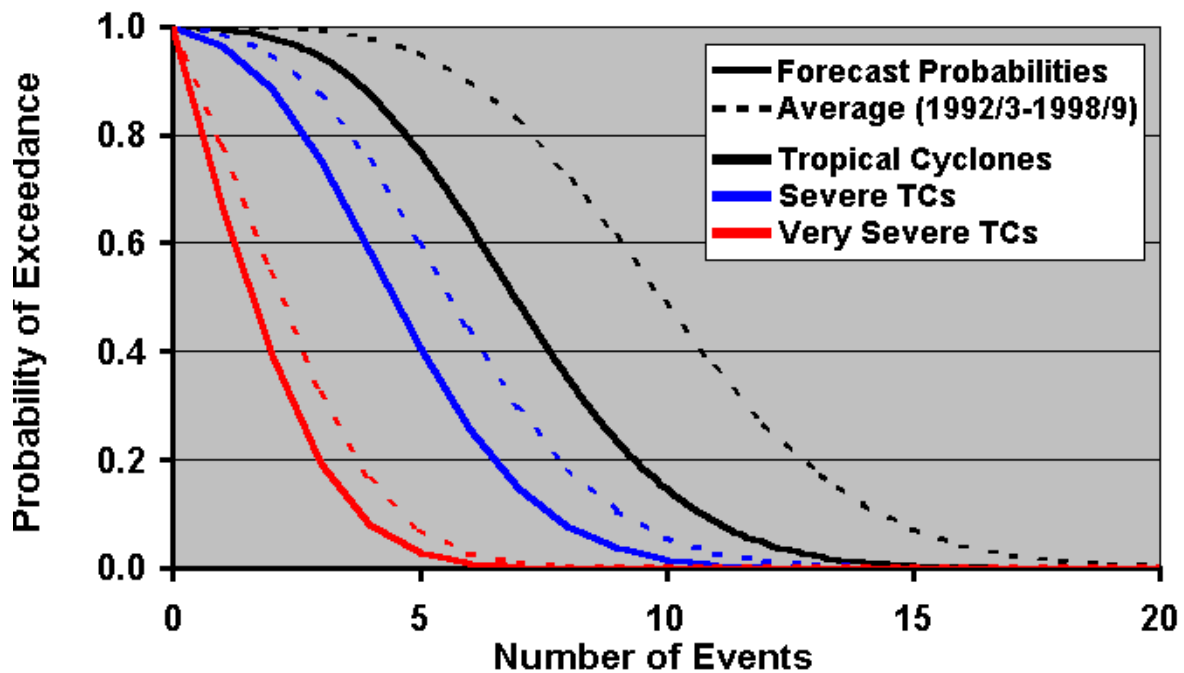|		Tropical Cyclones
Forecast (±SD)	2000/01	1.3 (±1.1)
Actual	1999/00 (to date)	2
Average (±SD)	1980/81-1998/99	1.3 (±1.1)

Key: Landfalling Region = Northeast Australian Coast from 15°S (Cooktown) to 30°S (Northern New South Wales), and >145°E longitude.
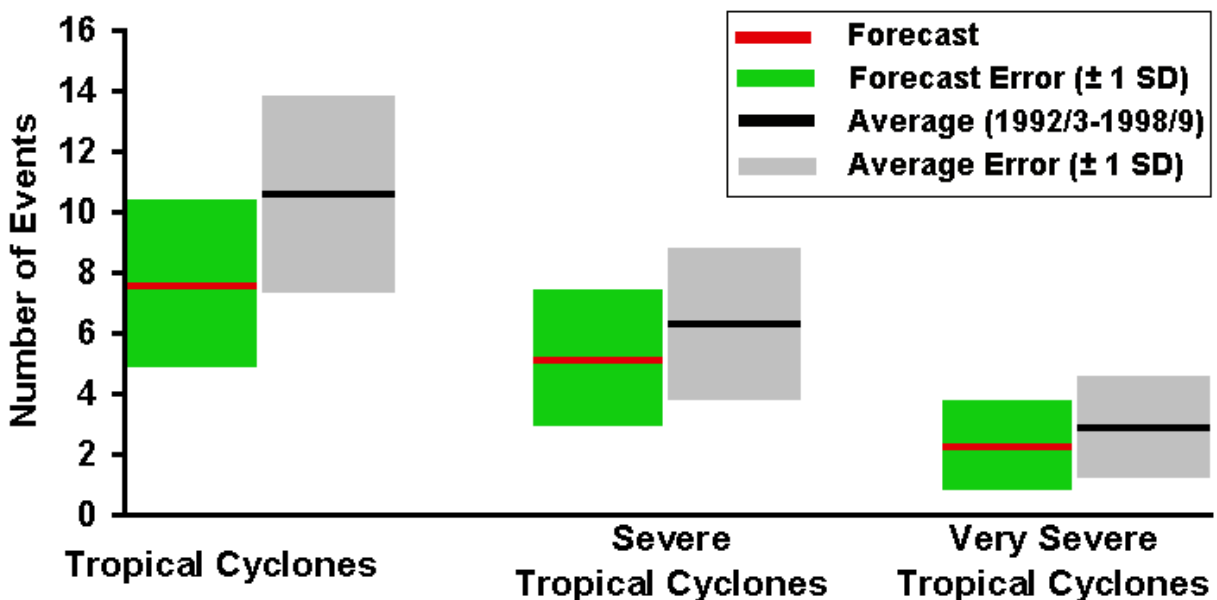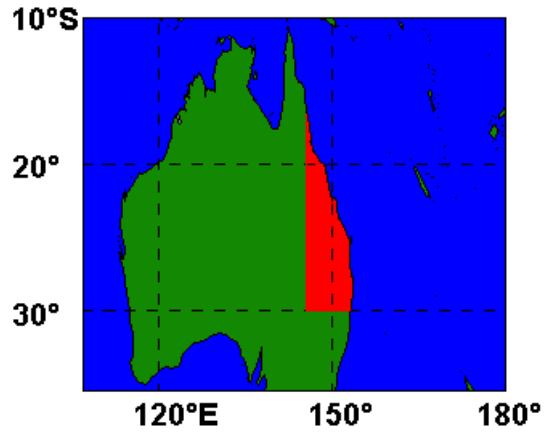
Total Number of SW Pacific Tropical Cyclones
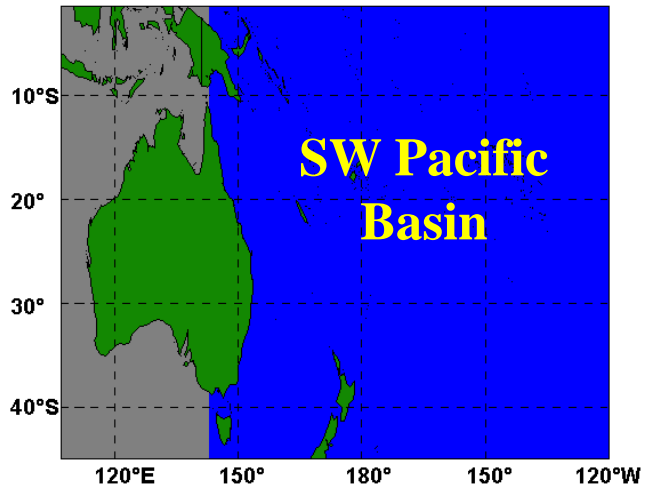
SW Pacific Basin

Probability of Exceedance Forecast for 2000/01
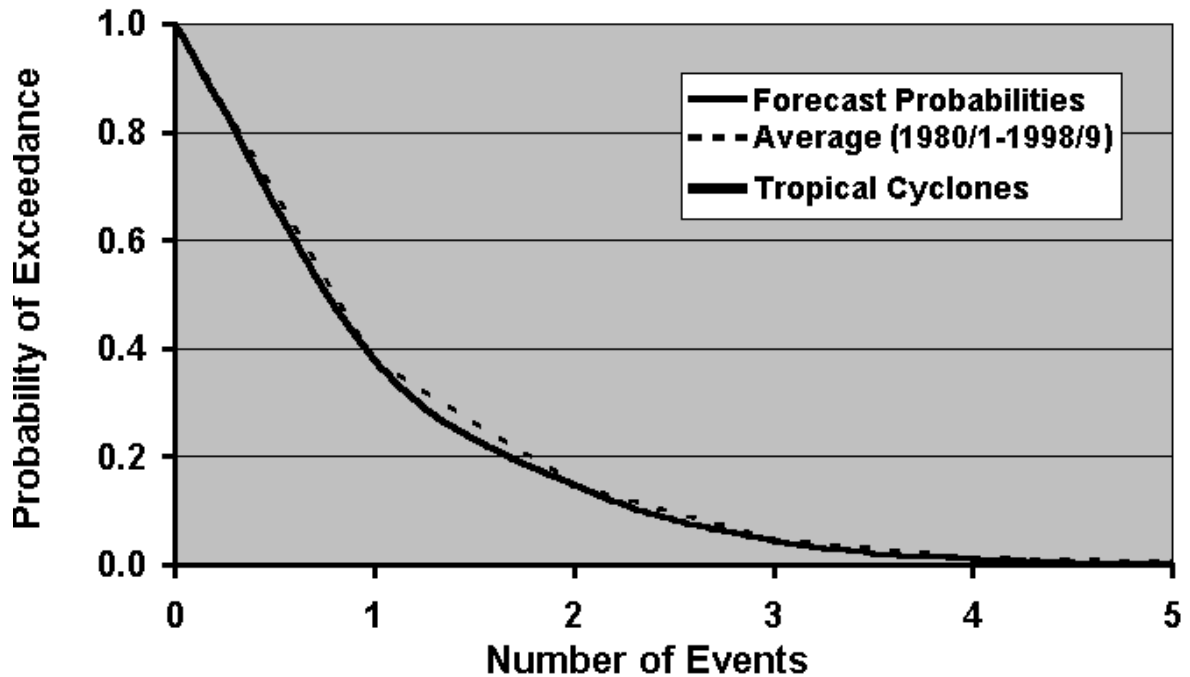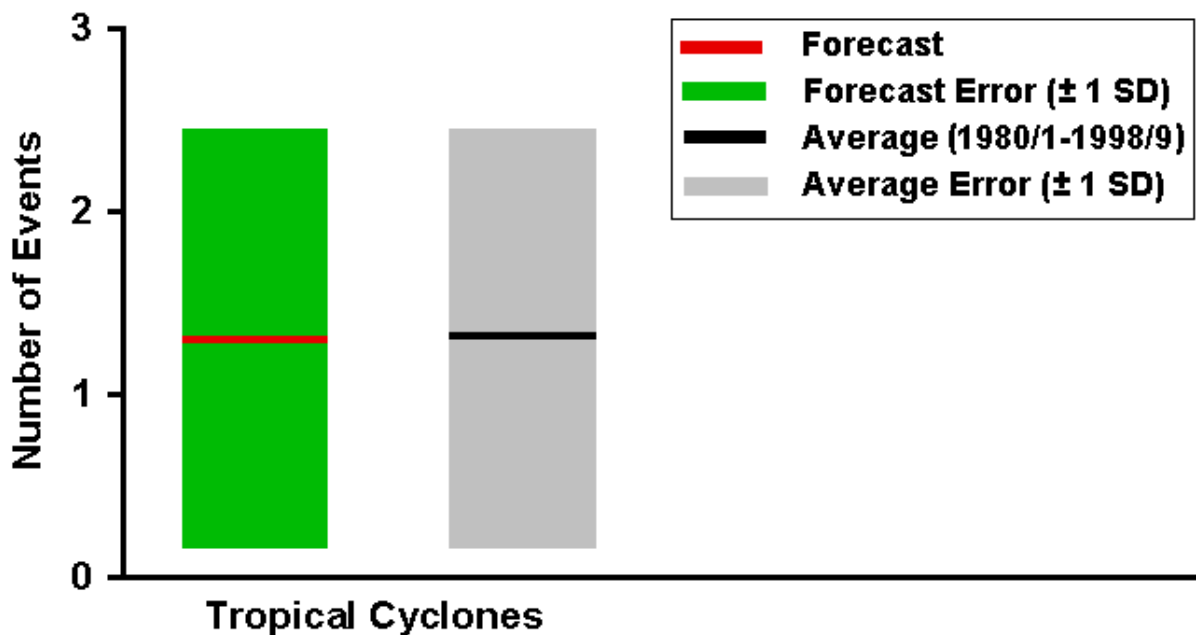

Frequency and Severity Distribution

2

Queensland Landfalling Tropical Cyclones

Probability of Exceedance Forecast for 2000/01

Frequency and Severity Distribution

Potential Benefits and Methodology

Tropical cyclones prove a costly and deadly natural disaster for northern Australia and the SW Pacific islands between 10°S and 30°S. In 1999, for example, tropical cyclone Dani killed 7 and left 2,000 homeless on the Fiji islands, and tropical cyclone John caused insured losses of US $200 million in northwest Australia. With the advent of satellites, numerical models provide warnings of impending landfall up to a week ahead. However, efforts are now being given to the seasonal probabilistic forecasting of these landfalls many months in advance. Such long-range forecasts would benefit a range of industry including insurance, energy and power, agriculture and tourism.

This forecast focusses on the SW Pacific, defined (eg see Chapter 1 in *Global Guide to Tropical Cyclone Forecasting*, World Meteorological Organisation Report No.560, 1993) as the southern hemisphere region from 142°E to 120°W. Tropical cyclone tracks giving intensity and location are available back to the1960s from the US Joint Typhoon Warning Center (JTWC) on Guam. Recently a new 'best-track' southern hemisphere historical tropical cyclone database has been compiled by Dr Charles Neumann under a US Navy contract. The JTWC and Neumann records show considerable disagreement prior to 1992. Due to this 'lack of confidence' in the correct seasonal totals, we have restricted our analysis of total numbers to data from 1992/93 to 1998/99. We use a longer data record, from 1980/81 to 1998/99, in our analysis of Queensland landfalling storms because our landfall predictors are stable back to ~1980 and because historical landfall strikes are expected to be more reliable than basin historical total number records.

The forecast model builds on our experience in forecasting seasonal Atlantic hurricane, NW Pacific typhoon, and UK winter gale activity. It is statistical, using January/February lagged sea surface temperature (SST) predictors and forecast Nino 3 SSTs. Different predictors are used in different forecasts. One factor behind our predicton of average to below average activity in 2000/01 is the current consensus forecast for neutral ENSO conditions for December 2000 to March 2001. A fundamental principle underlying our approach is to forecast probability distributions for event occurrence. In this way, imperfection in the forecast is recognised while still providing quantitative information. A Poisson distribution is used to model the random variability in tropical cyclone numbers. Forecast errors are given as the square root of the forecast value. Landfalling severe TCs and very severe TCs are not forecast due to their low occurrence rates (average numbers of 0.1 and 0.4 per year respectively) and their lack of correlation with annual landfalling TC numbers.

Due to the shortness of reliable historical data, our model has been tested independently only in forecasting the 1999/2000 season - this at a lead of 7 to 13 months. With less than a month of the season remaining, our forecast of 1.0 very intense, 4.9 intense and 7.6 tropical cyclones agree well with the actual totals to date. Our prediction of 1.3 landfalling tropical cyclones is also in close agreement with the current actual figure of 2 strikes.

We believe that SW Pacific seasonal tropical cyclone forecast skill will be further improved by the use of non-ENSO forecast SSTs, We anticipate our next SWP Pacific forecast will benefit from new long-range statistical SST forecasts currently under development in-house.

Future Forecasts

Pre-season forecasts for Atlantic seasonal hurricane activity and US strike probability in 2000 and for NW Pacific seasonal typhoon activity and Asian strike probability in 2000 will be issued at the end of May 2000.

A pre-season forecast for SW Pacific seasonal tropical cyclone activity and for Queensland strike probabilities in 2000/01 will be issued on 1st November 2000 assuming funding continues.
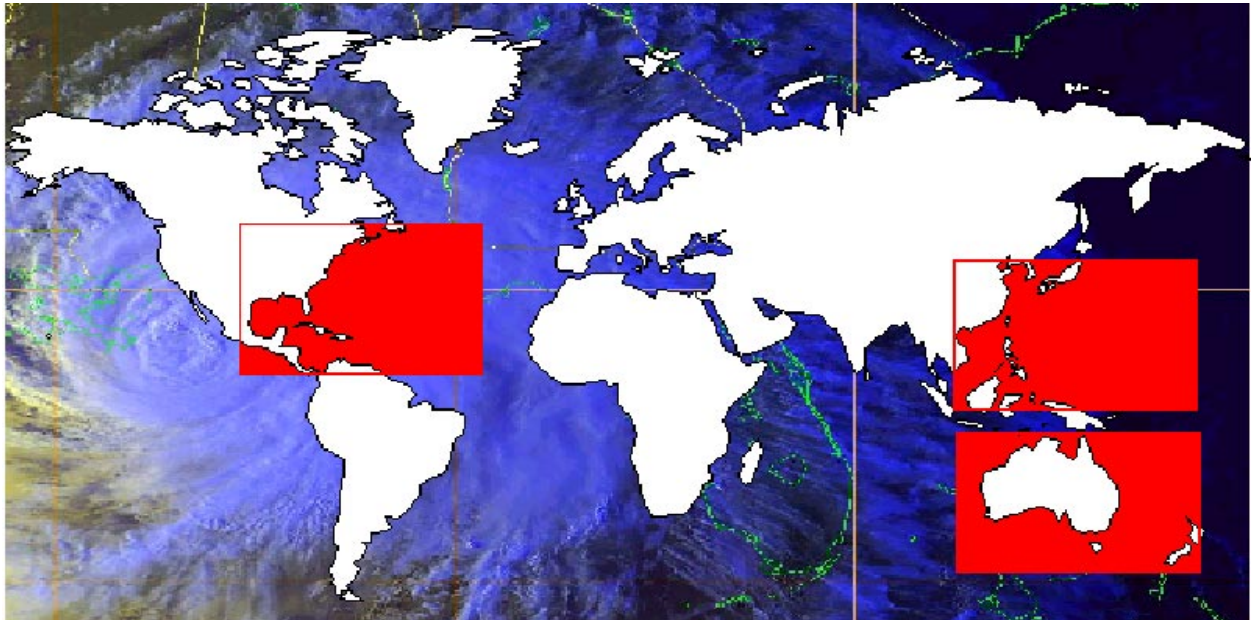
The TSUNAMI Initiative

The TSUNAMI initiative was established in response to the Foresight Programme, a UK Government initiative aimed at stimulating improved dialogue between academia and industry. TSUNAMI was formed in September 1997 by Dr Dougal Goodman, Deputy Director of the British Antarctic Survey which is a component part of the Natural Environment Research Council (NERC). It aims to improve the competitiveness of the UK insurance industry by using UK scientific expertise to improve the assessment of risk. TSUNAMI's three year programme is funded jointly by the Government through the Department of Trade and Industry's Sector Challenge, and by a consortium from the UK insurance industry comprising:

UK Composite Companies: CGU Group, Royal and Sun Alliance Insurance Group
Lloyd's Reinsurance Brokers: Benfield Greig Group, Guy Carpenter
Lloyd's Managing Agencies: Catlin Underwriting Agencies Ltd, DP Mann Ltd,
 Wren Syndicates Management Ltd.

Acknowledgements

The three basins under research in the TSUNAMI Seasonal Prediction of Tropical Cyclones project.