



# Long-Range Forecast for Australian-Region Tropical Storm Activity in 2003/4

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## Forecast Summary

**TSR anticipates the 2003/4 Australian region will see activity close to the 30 year average.**

The TSR (Tropical Storm Risk) consortium presents a long-range forecast for Australian-region tropical storm and severe tropical cyclone numbers, and for Australian tropical storm strike numbers in 2003/4. The forecast spans the Australian season from the 1st November 2003 to the 30th April 2004 and is based on data available through the end of April 2003. Our main predictor is the forecast anomaly in October-November Niño 4 sea surface temperature (SST) which we anticipate will be slightly cooler than normal at  $-0.11 \pm 0.45^\circ\text{C}$ . Since temperatures in this region are linked to vertical wind shear over the Australian region during Austral summer, an average Niño 4 SST indicates average wind shear and average tropical storm activity. Thus we expect Australian basin cyclone activity and landfalling numbers to be close to the 30 year average in 2003/4. Monthly updated forecasts will follow through to early December 2003.

### Australian Region Total Numbers Forecast for 2003/4

|                               |               | Severe<br>Tropical Cyclones | Tropical<br>Storms |
|-------------------------------|---------------|-----------------------------|--------------------|
| TSR Forecast ( $\pm$ FE)      | 2003 /4       | 5.5 ( $\pm$ 2.2)            | 11.6 ( $\pm$ 3.4)  |
| 10yr Climate Norm ( $\pm$ SD) | 1993/4-2002/3 | 5.8 ( $\pm$ 2.0)            | 10.6 ( $\pm$ 3.0)  |
| 30yr Climate Norm ( $\pm$ SD) | 1973/4-2002/3 | 5.8 ( $\pm$ 2.4)            | 11.2 ( $\pm$ 3.9)  |
| Forecast Skill at this Lead   | 1988/9-2002/3 | 17%                         | 22%                |

Key: Severe Tropical Cyclone = 1 Minute Sustained Wind > 63Kts = Hurricane Category 1 to 5.  
 Tropical Storm = 1 Minute Sustained Wind > 33Kts.  
 SD = Standard Deviation.  
 FE (Forecast Error) = Standard Deviation of Errors in Replicated Real Time Forecasts 1993/4-2002/3.  
 Forecast Skill = Percentage Improvement in Mean Square Error over Running 10-year Prior Climate Norm from Replicated Real Time Forecasts 1988/9-2002/3.  
 Australian Region = Southern hemisphere 100°E to 170°E (Storm Must Form as a Tropical Cyclone Within to Count).

- Tropical storm and severe tropical cyclone numbers are expected to be close to the 30-year climate norm in 2003/4.
- Very severe tropical cyclones (hurricane category 3-5) are not forecast due to data reliability problems in the historical record.
- Our Australian region (100°E to 170°E), while slightly non-standard, is selected to provide the best overview for tropical cyclone activity around the whole of Australia.

## Australian Landfalling Numbers in 2003/4

|                             |               | <u>Tropical Storms</u> |
|-----------------------------|---------------|------------------------|
| TSR Forecast ( $\pm$ FE)    | 2003 /4       | 5.2 ( $\pm$ 1.9)       |
| Average ( $\pm$ SD)         | 1993/4-2002/3 | 4.5 ( $\pm$ 2.0)       |
| Average ( $\pm$ SD)         | 1973/4-2002/3 | 4.8 ( $\pm$ 2.3)       |
| Forecast Skill at this Lead | 1988/9-2002/3 | 21%                    |

Key: Landfalling Region = Northern Australian coast from Perth around to Brisbane.

- Severe tropical cyclone strikes are not forecast due to their low occurrence rate and to their lack of correlation with tropical storm strike numbers.

## Predictors and Key Influences for 2003/4

Our model exploits the predictability of tropical sea surface temperatures (SSTs). Anomalous patterns of SST are the primary source of tropical atmosphere forcing at seasonal and interannual timescales. The predictors in our model for tropical storm and severe tropical cyclone numbers are:

1. The forecast October-November SST for the El Niño Southern Oscillation (ENSO) Niño 4 region 5°N-5°S, 150°W-160°E. (Main predictor for leads up to October).
2. The observed October Niño 4 SST. (Main predictor for November forecast).
3. The observed October-November SST for the region 5°N-5°S, 170°W-160°E. (Main predictor for December forecast).

The predictor in our model for Australian landfalling tropical storm numbers is the forecast December-March SST for the extended Niño region 5° N-5° S, 120°W-177.5°W.

The Niño 4 and extended Niño forecast SSTs come from an in-house extension of the Knaff and Landsea (1997) ENSO-CLIPER model.

The key factor behind our forecast for average Australian-region tropical storm activity in 2003/4 is the anticipated neutral effect of early austral summer SSTs in the Niño 4 region. Average SSTs in this region lead to average atmospheric vertical wind shear over the Australian region during Austral summer; a condition favouring average tropical storm activity. Our current forecast SST anomaly (1973/4-2002/3 climatology) for October-November 2003 Niño 4 SST is  $-0.11 \pm 0.45$  °C. The forecast skill for this predictor is 53% (assessed using replicated real-time forecasts over the last 15 years). Our landfalling predictor (December 2003 - March 2004 forecast SST value for the extended ENSO region 5°N-5°S, 120°W-177.5°W) is anticipated to be  $-0.47 \pm 0.65$  °C. The forecast skill for this predictor at this lead is 51%.

## Forecast Methodology

Our forecast model is statistical. We model the interannual variability in Australian region tropical storm activity using a Gaussian distribution. Forecast skill is assessed by rigorous hindcast testing over the period 1988/9-2002/3. We use only prior years in identifying the predictors and in calculating the regression relationship for each future year to be forecast - ie the hindcasts are performed in replicated real-time 'forecast' mode. Thus 1988/9 activity is forecast using 1960/1-1987/8 data, 1989/90 activity using 1960/61-1988/9 data, etc.

## Monthly Updated Forecasts

For the 2003/4 Australian season, TSR will be offering monthly updated forecasts through to early December for Australian-region tropical storm and severe tropical cyclone activity and for Australian tropical storm strikes. A summary and forecast verification for the 2003/4 Australian season will be issued in May 2004.

## Potential Benefits

Tropical storms are a costly natural disaster for northern Australia and adjacent southwest Pacific islands between latitudes 10°S and 30°S and longitudes 100°E and 170°E. The average storm damage bill per year 1990/1-2000/1 for this region is US \$55 million (2001 \$). By providing a lead time on storm forecasts, TSR helps governments, administrators and businesses plan ahead, thereby reducing the risk and uncertainty from varying active and inactive storm seasons.

## Tropical Storm Risk.com (TSR)

Tropical Storm Risk.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 industry 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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