# Extended Range Forecast for Australian-Region Tropical Storm Activity in 2006/7

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## Forecast Summary

**TSR anticipates the 2006/7 Australian season will see activity close to 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 2006/7. The forecast spans the Australian season from the 1st November 2006 to the 30th April 2007 and is based on data available through the end of April 2006. Our main predictor is the forecast anomaly in October-November Niño 4 sea surface temperature (SST) which we anticipate will be near-neutral at 0.13±0.50 $^{o}$C. Since SSTs 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 average in 2006/7. Monthly updated forecasts will follow through to early December 2006.

## Australian Region Total Numbers Forecast for 2006/7

| | | Severe Tropical Cyclones | Tropical Storms |
|---|---|---|---|
| TSR Forecast (±FE) | 2006/7 | 5.6 (±2.2) | 10.0 (±3.4) |
| 31yr Climate Norm (±SD) | 1975/6-2005/6 | 5.7 (±2.4) | 10.6 (±3.6) |
| Forecast Skill at this Lead | 1975/6-2005/6 | 14% | 12% |

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 Simulated Real Time Forecasts 1975/6-2005/6.
Forecast Skill = Percentage Improvement in Mean Square Error Afforded by Cross-Validated Hindcasts 1975/6-2005/6 with 5-year block elimination over Hindcasts Made with the 1975/6-2005/6 Climate Norm.
Australian Region = Southern Hemisphere 100$^{o}$E to 170$^{o}$E (Storm Must Form as a Tropical Cyclone Within to Count).

- Very severe tropical cyclones (hurricane category 3-5) are not forecast due to data reliability problems in the historical record.
- Our Australian-region (100$^{o}$E to 170$^{o}$E), while slightly non-standard, is selected to provide the best overview for tropical cyclone activity around the whole of Australia.

There is a 19% probability that Australian-region tropical storm numbers in 2006/7 will be above average (defined as more than 12 tropical storms), a 53% likelihood they will be near normal (defined as between 9 and 12 tropical storms) and a 28% chance they will be below normal (defined as less than 9 tropical storms). The 1975/6-2005/6 climatology probabilities for each category are 29% (above-normal), 36% (near-normal) and 35% (below-normal).

## Australian Landfalling Numbers in 2006/7

| | | Tropical Storms |
|---|---|---|
| TSR Forecast (±FE) | 2006 /7 | 4.4 (±2.0) |
| Average (±SD) | 1975/6-2005/6 | 4.6 (±2.1) |
| Forecast Skill at this Lead | 1975/6-2005/6 | 8% |

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.

There is a 21% probability that Australian tropical storm strike numbers in 2006/7 will be above average (defined as more than 5 landfalling tropical storms), a 54% likelihood they will be near normal (defined as 4 or 5 landfalling tropical storms) and a 25% chance they will be below normal (defined as less than 4 landfalling tropical storms). The 1975/6-2005/6 climatology probabilities for each category are 32% (above-normal), 42% (near-normal) and 26% (below-normal).

## Predictors and Key Influences for 2006/7

Our model exploits the predictability of tropical SSTs. Anomalous patterns of SST are the primary source of tropical atmosphere forcing at seasonal and interannual timescales. The predictors in our model for Australian-region tropical storm numbers are:

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

Australian-region severe tropical cyclones and landfalling tropical storm numbers are forecast by thinning from the total tropical storm numbers.

The Niño 4 forecast comes from an in-house multi-ensemble extension of the Knaff and Landsea (1997) ENSO-CLIPER model (Lloyd-Hughes et al, 2004).

The key factor behind our forecast for Australian-region tropical storm activity in 2006/7 being close to average 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 (1975-2005 climatology) for October-November 2005 Niño 4 SST is 0.13±0.50$^{o}$C. The forecast skill for this predictor at this lead is 46% (assessed using cross-validated hindcasts over the period 1975-2005).

## Forecasts for 2006/7

For the 2006/7 Australian-region season, TSR will be: (1) Issuing monthly updated deterministic forecasts through to early December for Australian-region tropical storm and severe tropical cyclone numbers and for Australian tropical storm strike numbers; (2) Issuing forecasts in early November and early December for the basin and Australian landfalling ACE indices. The ACE index reflects a combination of intensity and duration for all storms each season and may be linked more closely to total losses and disruption than is the number of tropical storms or severe tropical cyclones making landfall; (3) Issuing probabilistic forecasts for the numbers of basin and landfalling tropical storms; (4) Issuing storm forecast strike probabilities out to 5 days lead through the TSR Tropical Storm Tracker; (5) Issuing automatic storm e-mail alerts with an option for users to select their preferred windspeed and probability thresholds for an alert to be triggered.

## Potential Benefits

Tropical storms are a costly natural disaster for the northern coastline of Australia and for southwest Pacific islands between latitudes 10$^{o}$S and 30$^{o}$S and longitudes 100$^{o}$E and 170$^{o}$E. The average storm damage bill per year 1990/1-2000/1 for this region is US $60 million (2005 $). By providing a lead time, storm forecasts help governments, administrators and businesses plan ahead, thereby reducing the risk and uncertainty from varying active and inactive storm seasons. TSR has an impressive seasonal forecast track record. Its forecasts for the 2001/2, 2002/3, 2003/4 2004/5 and 2005/6 Australian-region tropical cyclone seasons were all successful.

## Further Information

Further information on the TSR forecast methodology and on TSR in general, may be obtained from the TSR website (http://tropicalstormrisk.com). The TSR next monthly forecast update for Australian-region tropical storm activity in 2006/7 will be issued on the 6th June 2006.