# Summary of 2003/4 Australian Region Tropical Storm Season and Verification of Authors' Seasonal Forecasts

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## Summary

**A year with below-average Australian basin activity and near-normal Australian land-falling activity. Forecasts from August performed well, the only discrepancies being a slight overestimation of basin storm numbers and a slight underestimation of landfalling activity.**

The Tropical Storm Risk (TSR) consortium presents a validation of their seasonal forecasts for Australian-region tropical storm and severe tropical cyclone numbers and for Australian tropical storm strikes in 2003/4. These forecasts were issued monthly from the 15th May to the 4th December 2003 and span the Australian tropical storm season from 1st November 2003 to 30th April 2004. All forecasts from September onwards were correct to within one standard error. Landfalling events were well forecast but the landfalling ACE index was underforecast due to two very intense storms making landfall.

## Features of the 2003/4 Australian Region Season

- The 2003/4 Australian-region tropical storm season featured 7 storms of which 3 made severe tropical cyclone strength (U.S. hurricane equivalent). These figures compare to 30-year climatology values of 11.2 and 5.8 respectively.
- A third consecutive inactive season. Only 4 years in the last 30 have seen less tropical storms. The period 2001/2 to 2003/4 has seen the lowest activity of any three-year period in the last 30 years.
- A large percentage (71%) of basin tropical storms made landfall. This is the highest percentage since 1995 and the second highest in the last 30 years.
- Two very severe tropical cyclones (U.S. hurricane category 3-5 equivalent) made landfall on the northwest coast of Australia. Cyclone Monty struck near Mardie station with wind gusts of 209kph and Cyclone Fay hit to the east of Port Hedland with wind gusts up to 235kph. Fortunately the damage from both cyclones was minimal.
- Cyclone Debbie struck an uninhabited region of the Northern Territories to the east of Darwin with minimal hurricane force winds. Severe damage to vegetation was reported with 30-40% of trees felled, but fortunately no injuries.

## Catalogue of Events in 2003/4

| Individual Storm Summary 2003/4 | | | | | |
|---|---|---|---|---|---|
| No. | Name | Dates | Peak Wind (kts) | Storm Category | Category at Australian Landfall |
| 1 | Debbie | 17-21 Dec | 65 | STC | STC |
| 2 | Ken | 01-06 Jan | 40 | TS | - |
| 3 | Fritz | 12-12 Feb | 35 | TS | TS |
| 4 | Monty | 27 Feb-02 Mar | 110 | STC | STC |
| 5 | Evan | 01-02 Mar | 35 | TC | TS |
| 6 | Fay | 16-27 Mar | 120 | STC | STC |
| 7 | Grace | 21-22 Mar | 35 | TC | - |

Key: Severe Tropical Cyclone (STC) = 1 Minute Sustained Wind > 63Kts = Hurricane Category 1 to 5.
Tropical Storm (TS) = 1 Minute Sustained Wind > 33Kts.
Australian Region = Southern Hemisphere 100°E to 170°E (Storm must form as a tropical depression within to count).
Australian Strike = Strike on Australian Coast from Perth around to Brisbane.

## Verification of Forecasts for 2003/4

### 1. Australian Region Total Numbers and ACE Index

| Australian Region (100°E to 170°E) Total Numbers and ACE Index | | | | |
|---|---|---|---|---|
| | | ACE Index ($x10^4$ knots$^2$) | Tropical Storms | Severe Tropical Cyclones |
| Average Number (±SD) (1973/74-2002/3) | | 85 (±42) | 11.2 (±3.9) | 5.8 (±2.4) |
| Actual Number 2003/4 | | 49 | 7 | 3 |
| TSR Forecasts (±FE) | 4 Dec 2003 | 60 (±38) | 8.7 (±2.2) | 4.4 (±1.7) |
| | 4 Nov 2003 | 62 (±38) | 9.0 (±2.2) | 4.5 (±1.7) |
| | 9 Oct 2003 | - | 9.6 (±2.4) | 4.7 (±1.8) |
| | 8 Sep 2003 | - | 9.6 (±2.4) | 4.8 (±1.7) |
| | 5 Aug 2003 | - | 10.0 (±2.7) | 4.9 (±1.8) |
| | 4 Jul 2003 | - | 11.3 (±3.0) | 5.3 (±2.0) |
| | 10 Jun 2003 | - | 12.1 (±3.2) | 5.6 (±2.1) |
| | 15 May 2003 | - | 11.6 (±3.4) | 5.5 (±2.2) |

Key: ACE Index = Accumulated Cyclone Energy Index = Sum of the squares of 6-hourly Maximum Sustained Wind Speeds (in units of knots) for all Systems while they are at least Tropical Storm Strength. ACE Unit = $x10^4$ knots$^2$.

Total activity (ACE index) was ~60% of the 30-year climate norm. TSR correctly anticipated a below average season from early August. Forecasts correctly predicted the number of tropical storms and severe tropical cyclones to within one standard error from early September. The December forecast performed best but slightly overpredicted the total activity.

## 2. Australian Strike Numbers and ACE Index

Five tropical storms made Australian landfall. The TSR forecasts from May to October correctly predicted the number of landfalling events, while the November and December forecasts slightly underpredicted the number of landfalling events. The landfalling ACE index was underpredicted due to two very severe tropical cyclones making landfall. All forecasts were correct to within one standard error.

| Australian Strike Numbers and ACE Index | | | |
|---|---|---|---|
| | | ACE Index ($x10^4$ knots$^2$) | Tropical Storms |
| Average Number (±SD) (1973/74-2002/3) | | 3.0 (±2.2) | 4.7 (±2.5) |
| Actual Number 2003/4 | | 4.2 | 5 |
| TSR Forecasts (±FE) | 4 Dec 2003 | 2.8 (±2.8) | 4.3 (±1.8) |
| | 4 Nov 2003 | 2.7 (±2.8) | 4.3 (±1.8) |
| | 9 Oct 2003 | - | 4.5 (±1.8) |
| | 8 Sep 2003 | - | 4.5 (±2.0) |
| | 5 Aug 2003 | - | 4.7 (±1.9) |
| | 4 Jul 2003 | - | 5.0 (±1.9) |
| | 10 Jun 2003 | - | 5.2 (±2.4) |
| | 15 May 2003 | - | 5.2 (±2.4) |

Key: ACE Index = Accumulated Cyclone Energy Index = Sum of the squares of hourly Maximum Sustained Wind Speeds (in units of knots) for all Systems while they are at least Tropical Storm Strength and over the Australian Mainland (reduced by a factor of 6). ACE Unit = $x10^4$ knots$^2$.

## 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 claims management solutions company. The TSR scientific grouping brings together climate physicists, meteorologists and statisticians based at the *UCL* (University College London) Benfield Hazard Research Centre. TSR forecasts are available from *http://tropicalstormrisk.com*.

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