December Forecast Update for Australian-Region Tropical Storm Activity in 2010/11

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Forecast Summary

TSR continues to anticipate Australian tropical cyclone activity in 2010/11 will be about 45% above-norm.

The TSR (Tropical Storm Risk) early December forecast for Australian-region tropical cyclone activity in 2010/11 continues to anticipate activity ~45% above the 1975/6-2009/10 climate norm. The forecast spans the Australian season from the 1st November 2010 to the 30th April 2011 and is based on data available through the end of November 2010. TSR's main predictor is the observed anomaly in October/November Niño 4 sea surface temperature (SST) which is cooler than average at -1.53^{o}C. Since SSTs in this region are linked to vertical wind shear over the Australian region during Austral summer, below-average Niño 4 SST indicates below-average wind shear and above-average tropical storm activity. Thus we expect Australian basin cyclone activity and landfalling numbers to be well above-average in 2010/11.

Australian Region Total Numbers Forecast for 2010/11

		ACE Index	Severe Tropical Cyclones	Tropical Storms
TSR Forecast (±FE)	2010/11	111 (±39)	8.3 (±2.1)	15.5 (±2.8)
34yr Climate Norm (±SD)	1975/6-2009/10	79 (±41)	5.5 (±2.4)	10.5 (±3.5)
Forecast Skill at this Lead	1975/6-2009/10	9%	21%	37%

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 1975/6-2009/10.
Forecast Skill	=	Percentage Improvement in Mean Square Error Afforded by Cross-Validated Hindcasts 1975/6-2009/10 with 5-year block elimination over Hindcasts Made with the 1975/6-2009/10 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 92% probability that Australian-region tropical storm numbers in 2010/11 will be above average (defined as more than 12 tropical storms), a 7% likelihood they will be near normal (defined as between 9 and 12 tropical storms) and only a 1% chance they will be below normal (defined as less than 9 tropical storms). The 1975/6-2009/10 climatology probabilities for each category are 37% (above-normal), 29% (near-normal) and 34% (below-normal).

Australian Landfalling Numbers in 2010/11

		Tropical Storms
TSR Forecast (±FE)	2010/11	6.2 (±2.0)
Average (±SD)	1975/6-2009/10	4.5 (±2.1)
Forecast Skill at this Lead	1975/6-2009/10	4%

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 64% probability that Australian tropical storm strike numbers in 2010/11 will be above average (defined as more than 5 landfalling tropical storms), a 27% likelihood they will be near normal (defined as 4 or 5 landfalling tropical storms) and only a 9% chance they will be below normal (defined as less than 4 landfalling tropical storms). The 1975/6-2009/10 climatology probabilities for each category are 23% (above-normal), 43% (near-normal) and 34% (below-normal).

Predictors and Key Influences for 2010/11

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 SST for the Niño 4 region. (Main predictor for November forecast).
3. 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 2010/11 being above-average is the anticipated enhancing effect of early austral summer SSTs in the Niño 4 region. Cooler than norm SSTs in this region lead to below-average atmospheric vertical wind shear over the Australian region during Austral summer; a condition favouring above-average tropical storm activity. The current SST anomaly (1975-2009 climatology) for October/November 2010 Niño 4 SST is -1.53^{o}C.

Further Information

Further information on the TSR forecast methodology and on TSR in general, may be obtained from the TSR website (http://www.tropicalstormrisk.com). This is TSR's final forecast for Australian-region tropical storm activity in 2010/11. A summary of the 2010/11 Australian tropical cyclone season and a verification of the TSR seasonal forecasts will be issued in early May 2011. The TSR first extended range forecast for Australian-region tropical storm activity in 2011/12 will be issued in early May 2011.

Appendix - Predictions from Previous Months

1. Australian Region Total Numbers

a) Deterministic forecasts

Australian Region Total Numbers 2010/11				
		ACE Index (x 10^4 kts^2)	Tropical Storms	Severe Tropical Cyclones
Average Number (±SD) (1975/6-2009/10)		79 (±41)	10.5 (±3.5)	5.5 (±2.4)
TSR Forecasts (±FE)	6 Dec 2010	111 (±39)	15.5 (±2.8)	8.3 (±2.1)
	9 Nov 2010	111 (±39)	15.4 (±2.8)	8.3 (±2.1)
	6 Sep 2010	108 (±39)	15.1 (±2.8)	8.1 (±2.1)
	6 July 2010	-	12.5 (±3.0)	6.7 (±2.2)
	5 May 2010	-	9.3 (±3.3)	4.9 (±2.3)

b) Probabilistic forecasts

Australian Region Tropical Storm Numbers 2010/11				
		Tercile Probabilities		
		below normal	normal	above normal
Climatology 1975/6-2009/10		34	29	37
TSR Forecasts	6 Dec 2010	1	7	92
	9 Nov 2010	1	7	92
	6 Sep 2010	1	9	90
	6 July 2010	9	27	64
	5 May 2010	42	33	25

2. Australian Landfalling Numbers

a) Deterministic forecasts

Australian Landfalling Numbers 2010/11		
		Tropical Storms
Average Number (±SD) (1975/6-2009/10)		4.5 (±2.1)
TSR Forecasts (±FE)	6 Dec 2010	6.2 (±2.0)
	9 Nov 2010	6.2 (±2.0)
	6 Sep 2010	6.1 (±1.9)
	6 July 2010	5.2 (±2.0)
	5 May 2010	4.0 (±2.0)

b) Probabilistic forecasts

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<tr><th colspan="5">Australian Landfalling Numbers 2010/11</th></tr>
<tr><th colspan="2" rowspan="2"></th><th colspan="3">Tercile Probabilities</th></tr>
<tr><th>below normal</th><th>normal</th><th>above normal</th></tr>
<tr><td colspan="2">Climatology 1975/6-2009/10</td><td>34</td><td>43</td><td>23</td></tr>
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<tr><td>6 July 2010</td><td>20</td><td>37</td><td>44</td></tr>
<tr><td>5 May 2010</td><td>39</td><td>38</td><td>23</td></tr>
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