Rainfall and Flooding in Queensland

December 2010 and January 2011

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Regional Director (Qld)

Australian Government
Bureau of Meteorology

The Climate Drivers in December and January

The widespread rainfall and flooding resulted from a number of primary longer time-scale influences (or "climate drivers"):

- **Heavy rainfall in the prior months**
- **The monsoonal wet season**
- **The La Nina event; and**
- **The Madden Julian Oscillation (MJO)**

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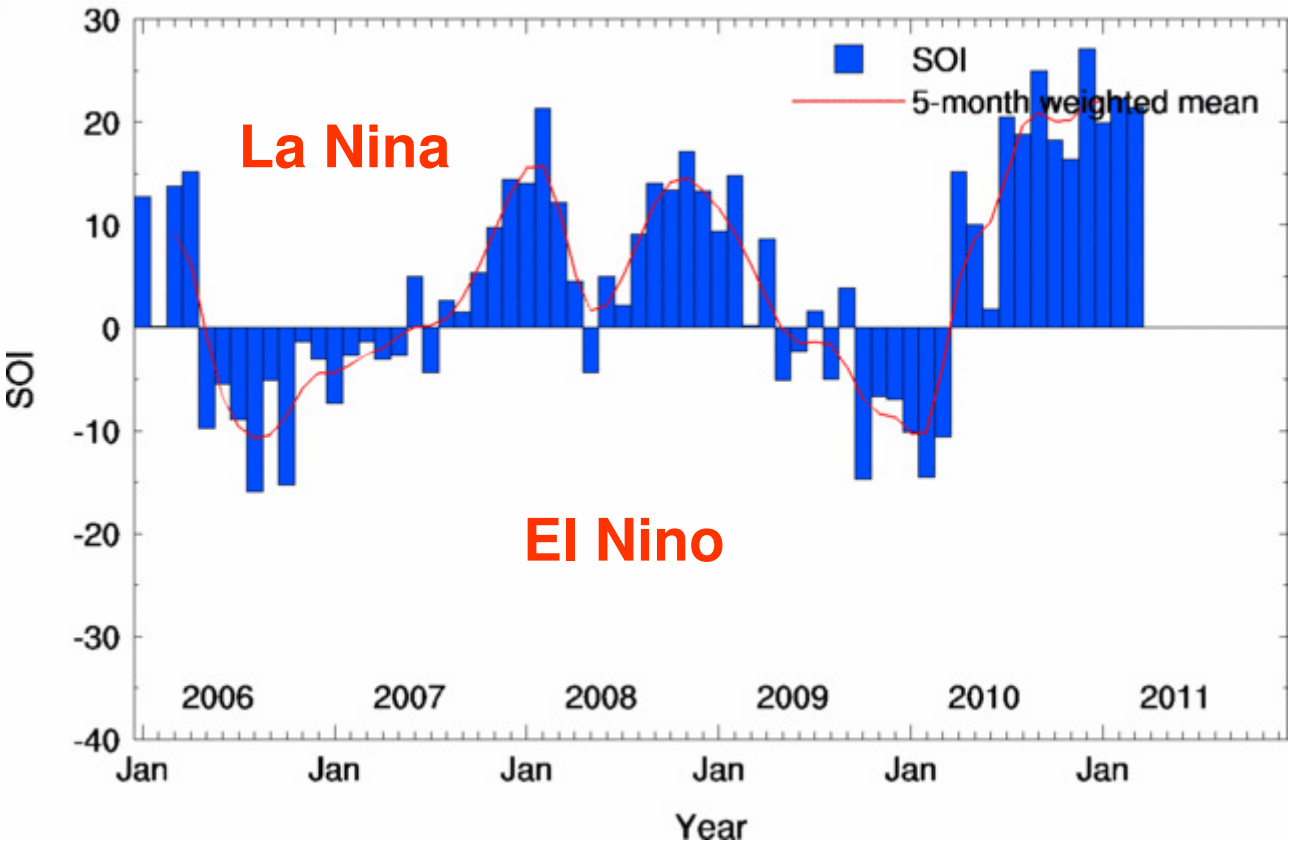
Southern Oscillation Index (SOI)



This La Nina was the 2nd strongest on record after 1917-18

2010-11 was the 4th very wet season in a row in Queensland

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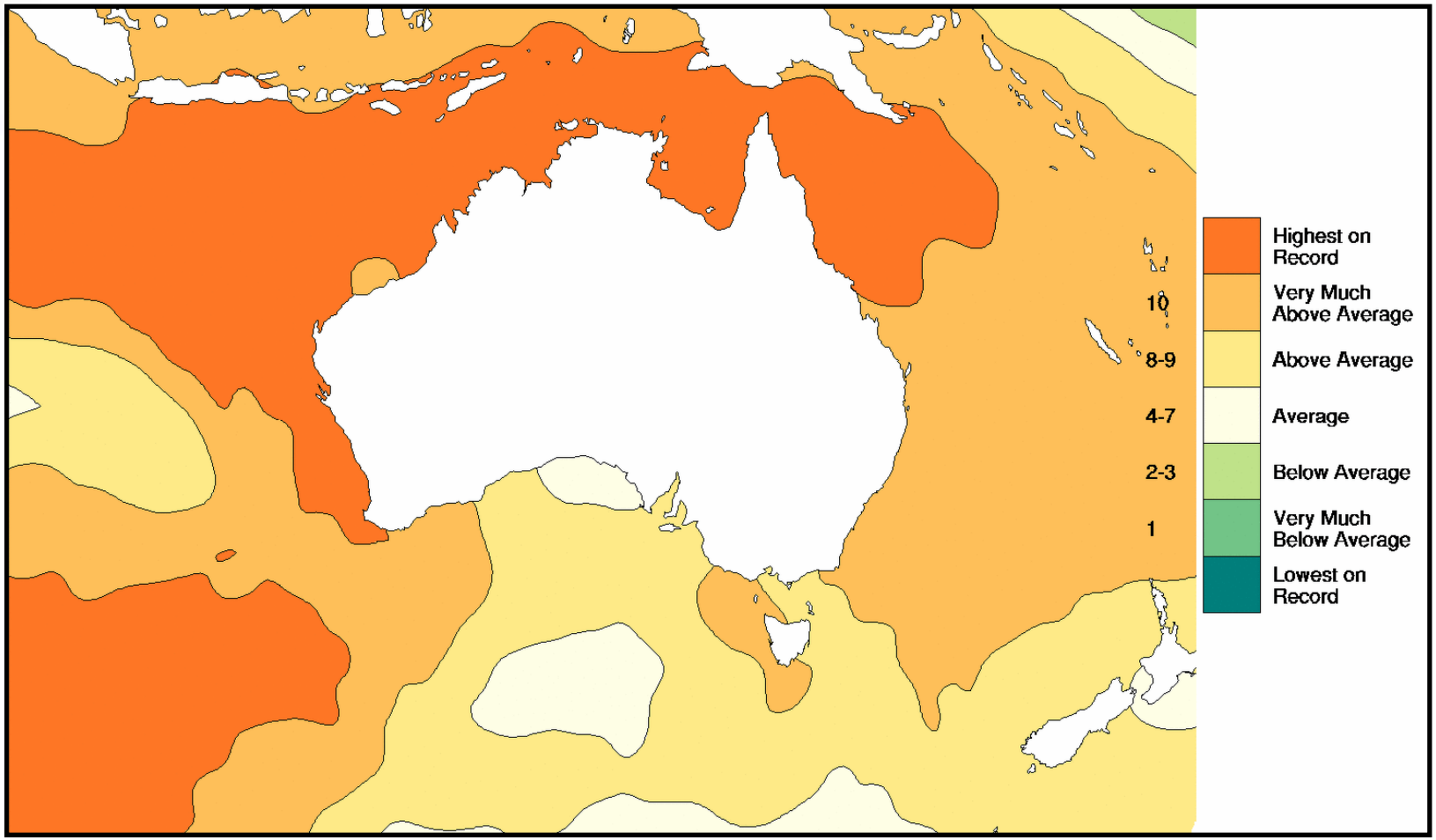
Sea Surface Temperatures
September – December 2010



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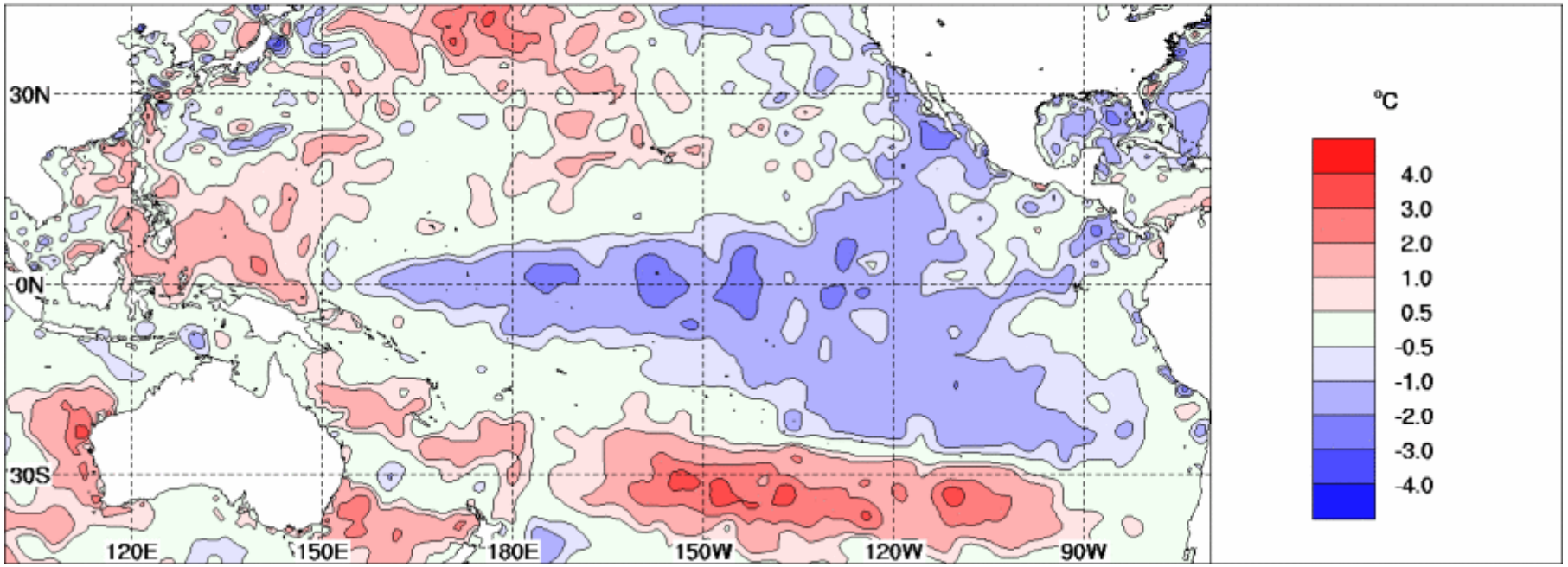
Sea Surface Temperature Anomalies during the week 9-16 January 2011

Sea Surface Temperature Anomalies for 9-16 January 2011
RED is warmer than normal – BLUE is cooler than normal



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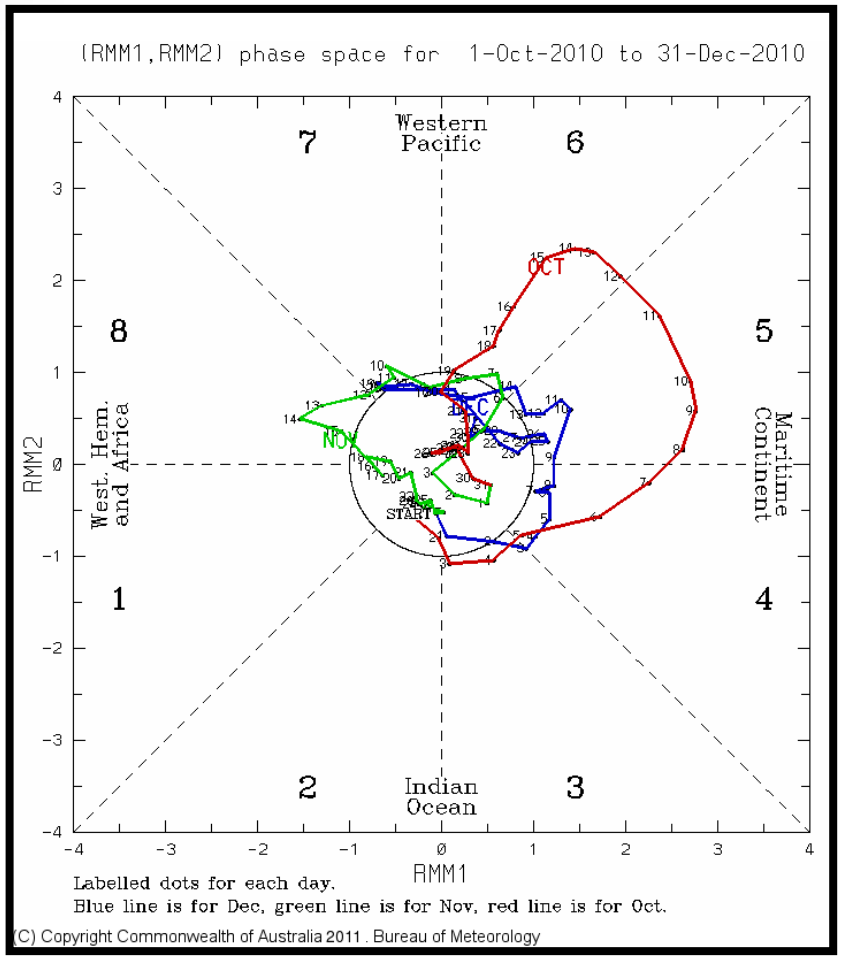
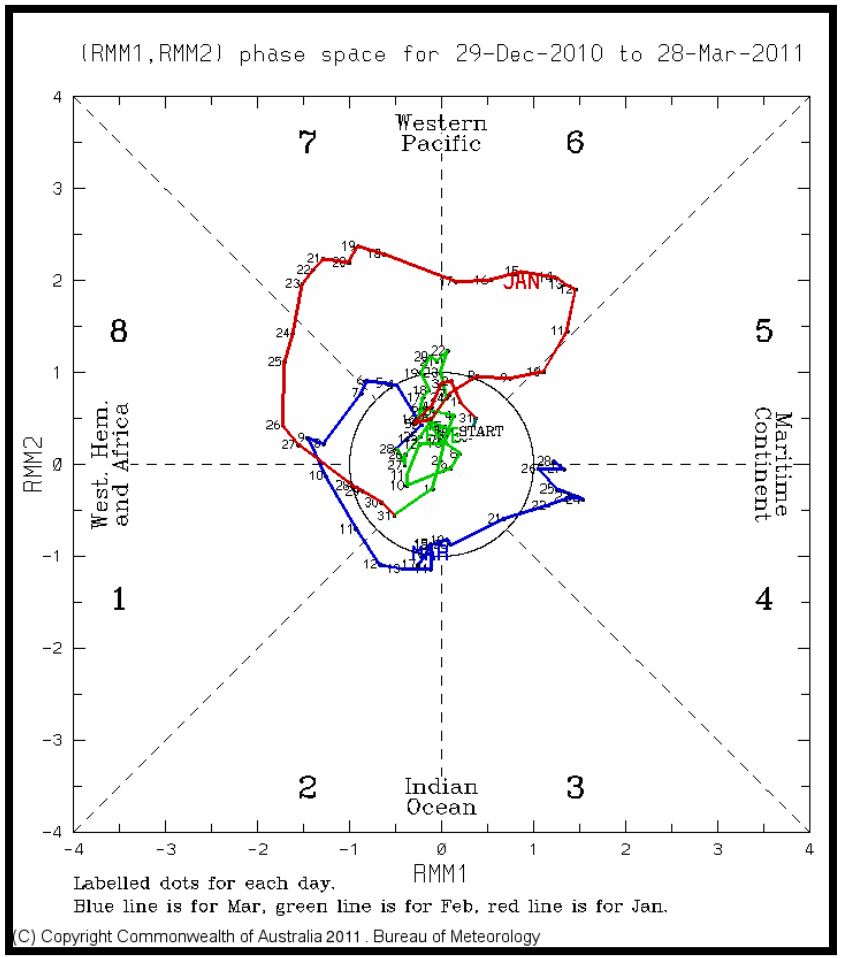
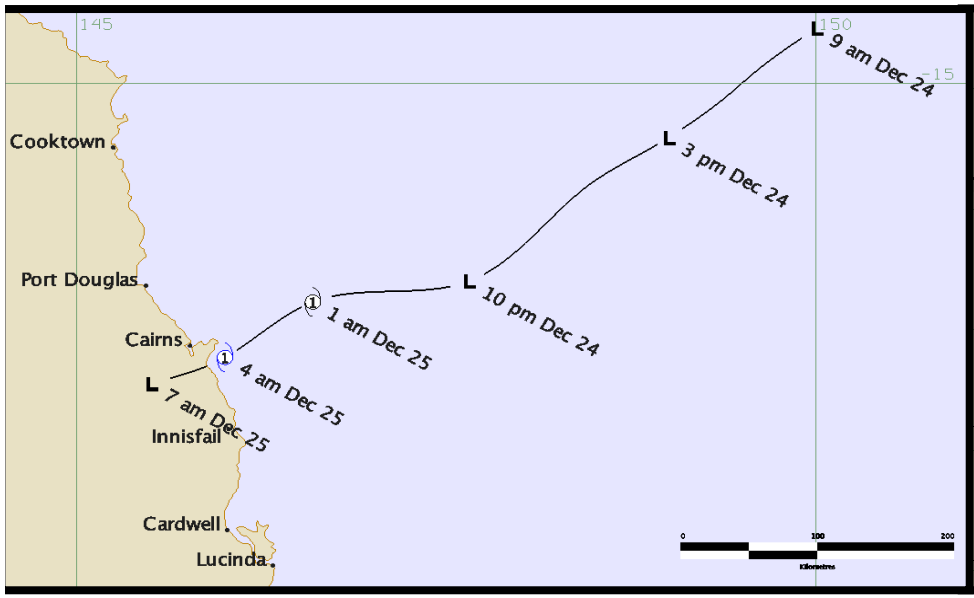
The presence of the Madden Julian Oscillation (MJO) - which enhances the strength of the monsoon - was particularly strong in the Australian Region (zones 4-6) during October 2010 and January 2011 and hovered in a weaker state for much of December 2010

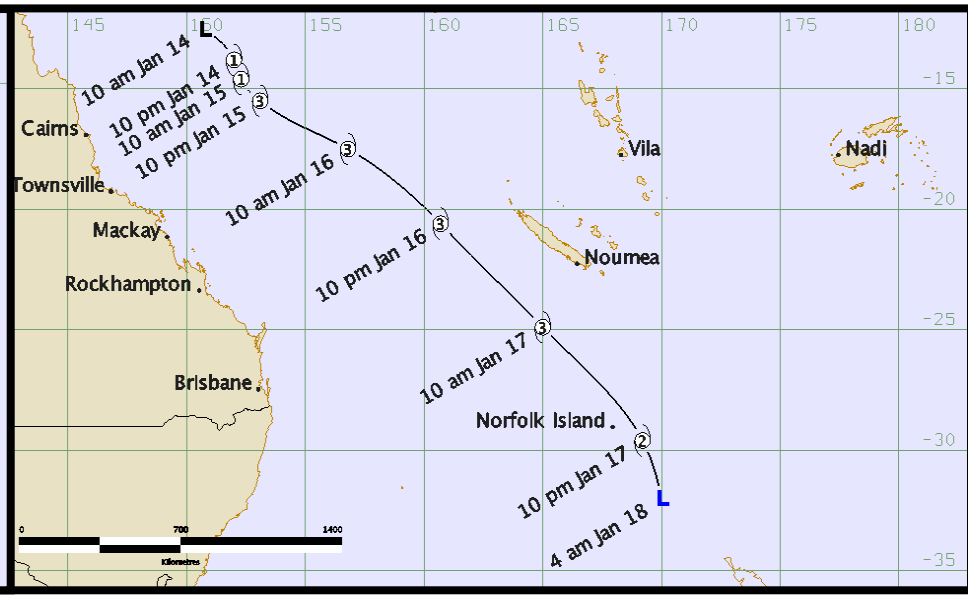




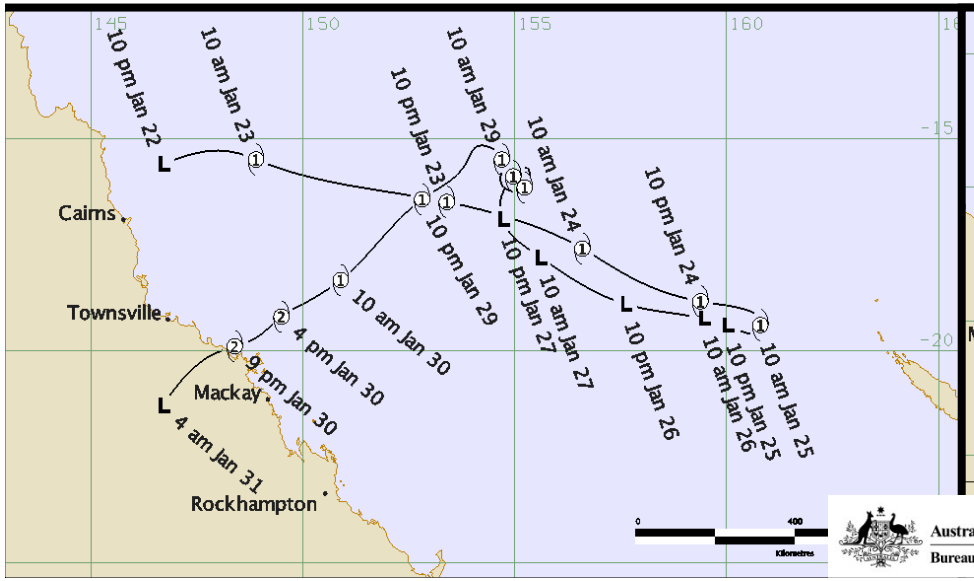
Tropical Cyclone TASHA



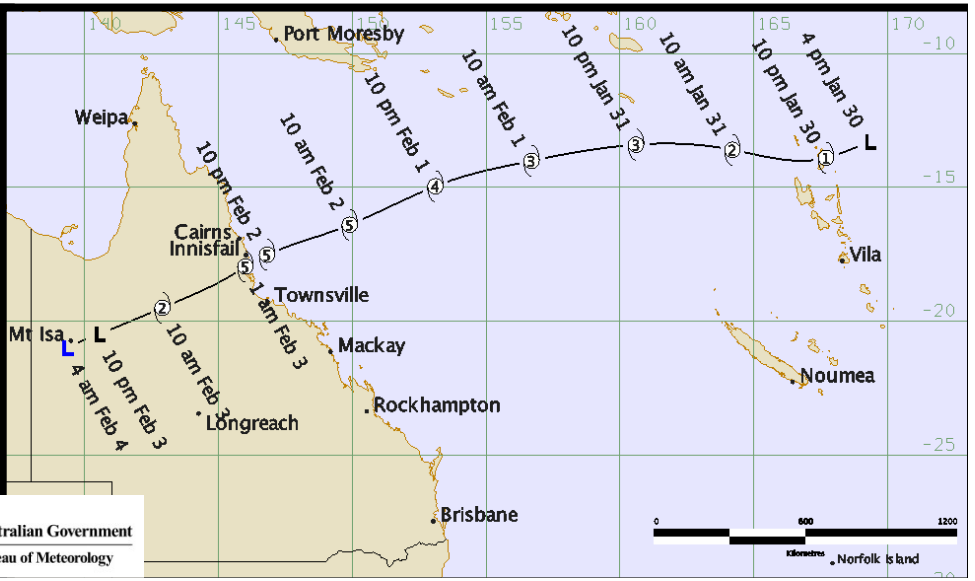
Tropical Cyclone ZELIA



Tropical Cyclone ANTHONY



Tropical Cyclone YASI



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Queensland Rainfall to January 2011

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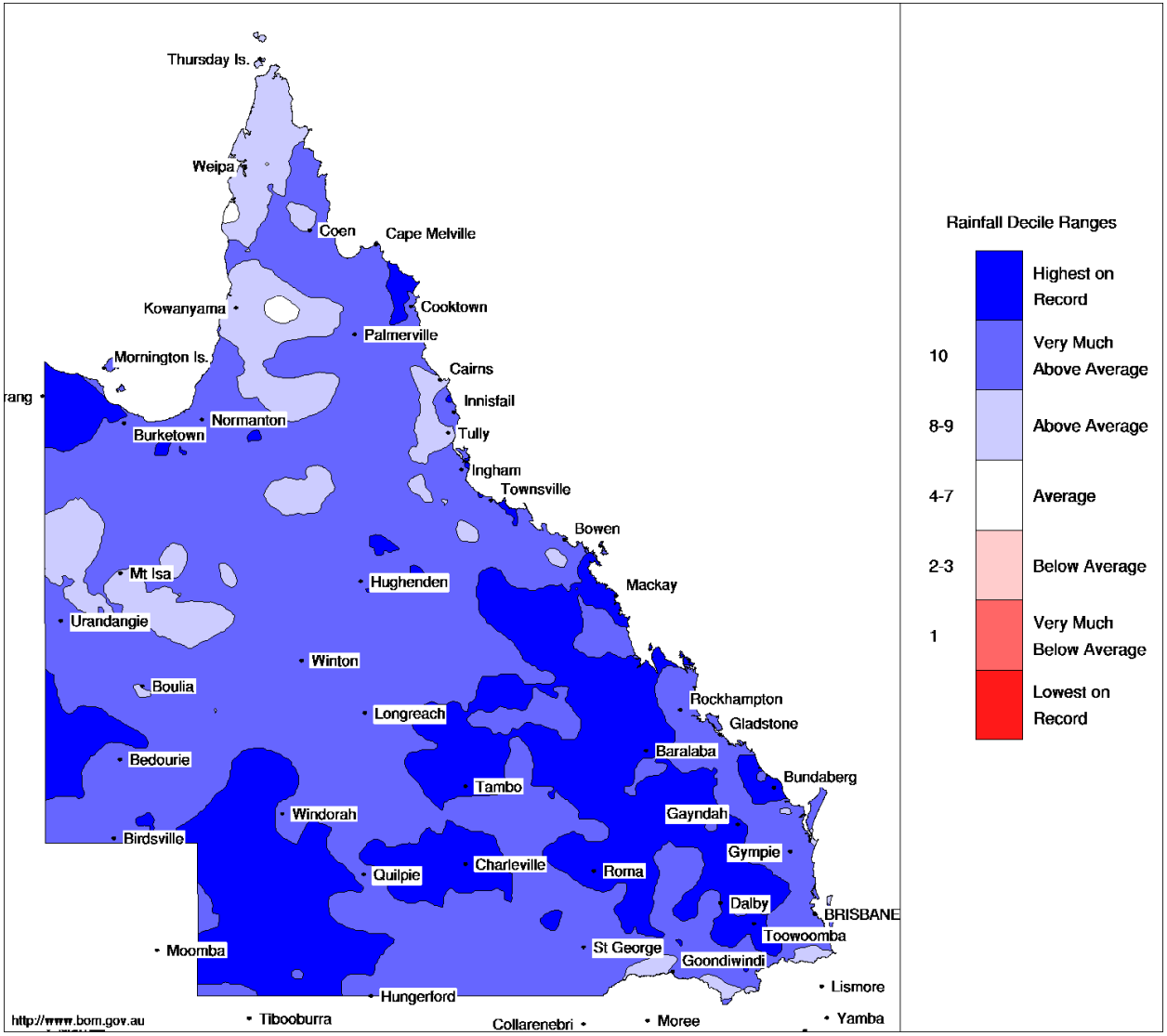
Rainfall Deciles 1 January to 31 December 2010
Queensland's Wettest Year on Record

Distribution Based on Gridded Data
Product of the National Climate Centre



 ID code: AWAP

Issued: 21/01/2011

DECILE maps show where the rainfalls have been above or below average.

The darker the BLUE – the more above average.

The darker the RED – the more below average.

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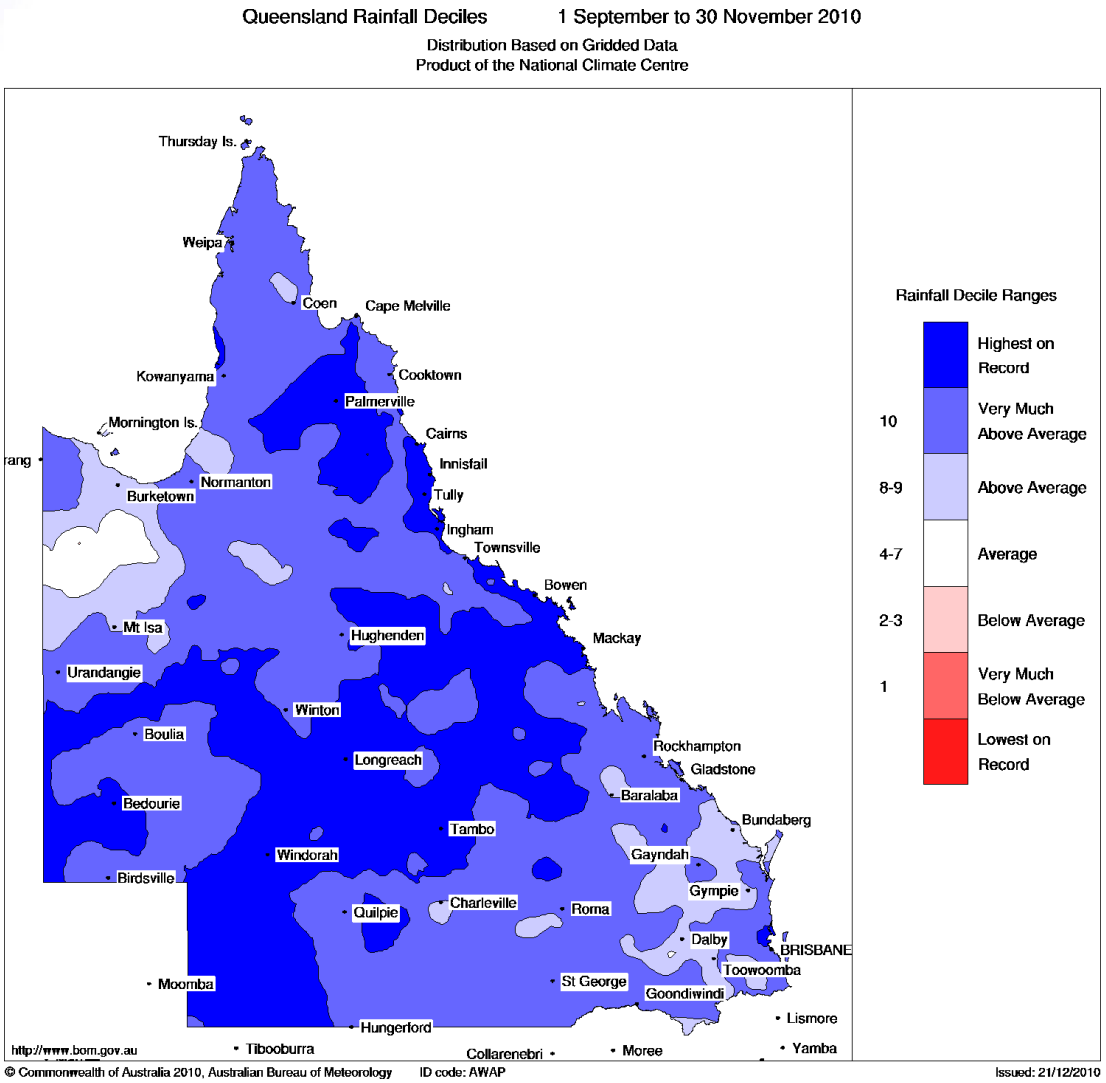
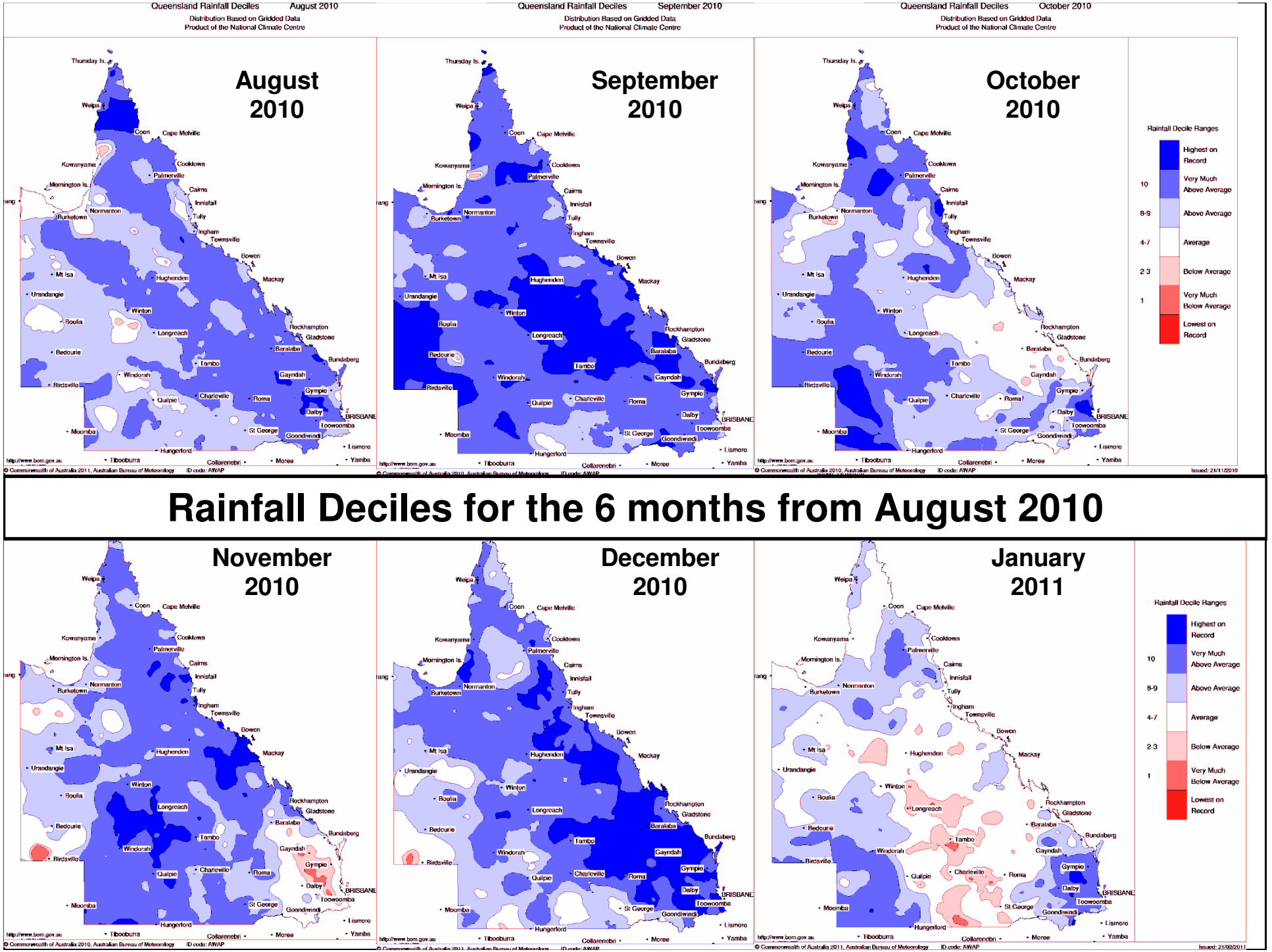
Rainfall Deciles 1 September to 30 November 2010
Queensland's Wettest Spring on Record



Queensland also experienced its wettest September and December on record



Rainfall Deciles for the 6 months from August 2010

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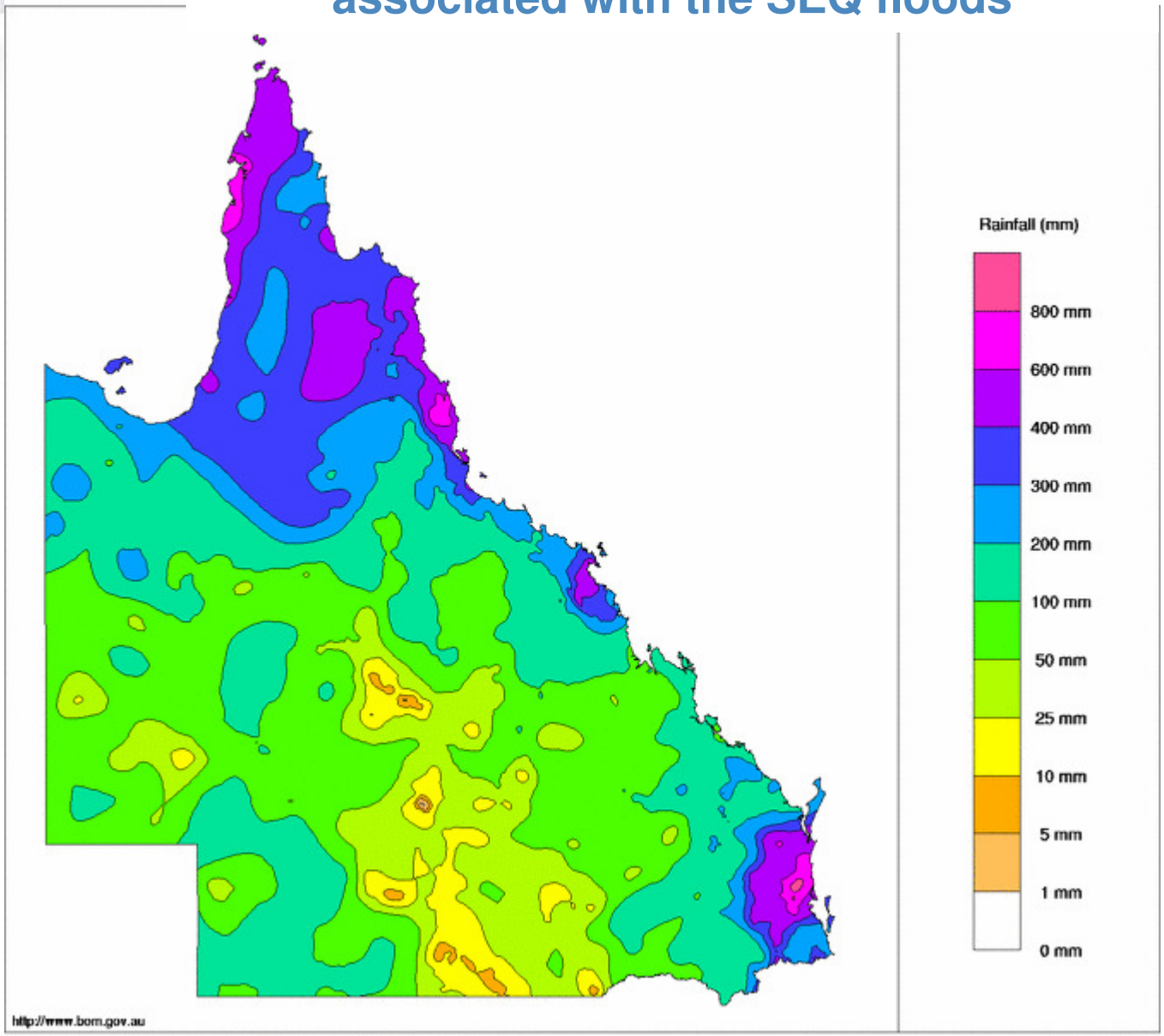
Rainfall Totals for January 2011 highlighting the extreme rainfalls associated with the SEQ floods



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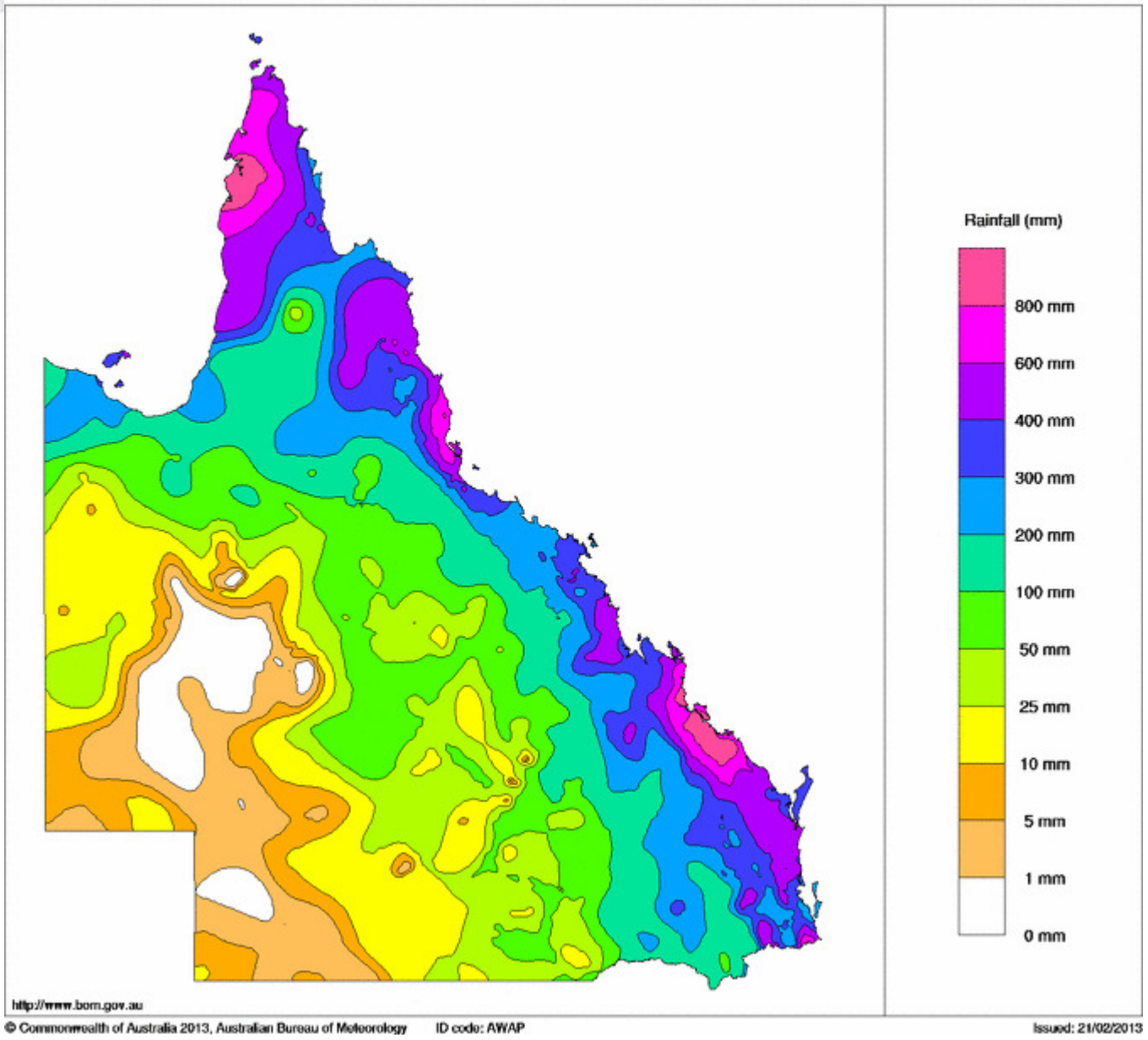
Rainfall Totals for January 2013



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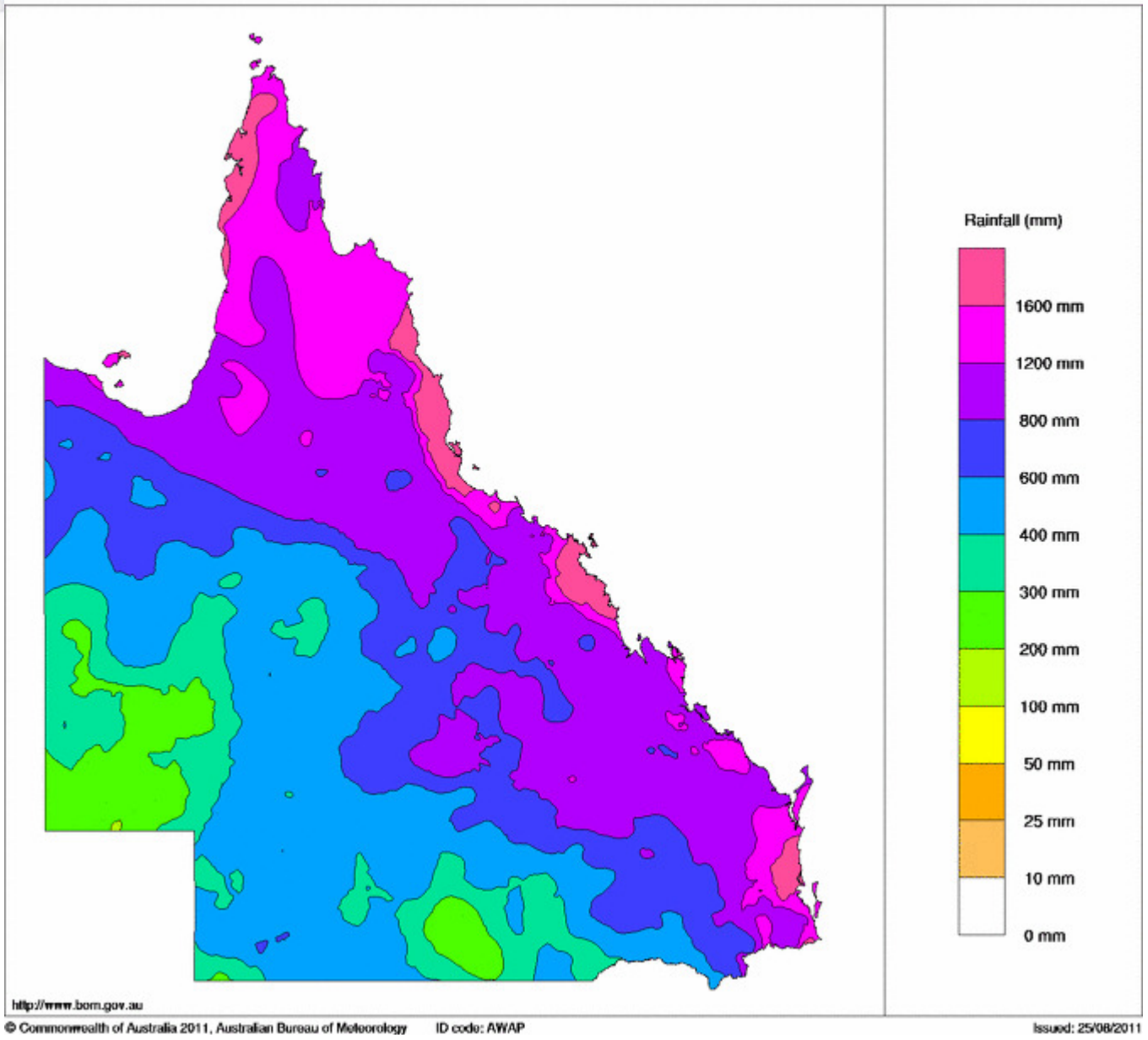
6 Month Rainfall ending Feb 2011



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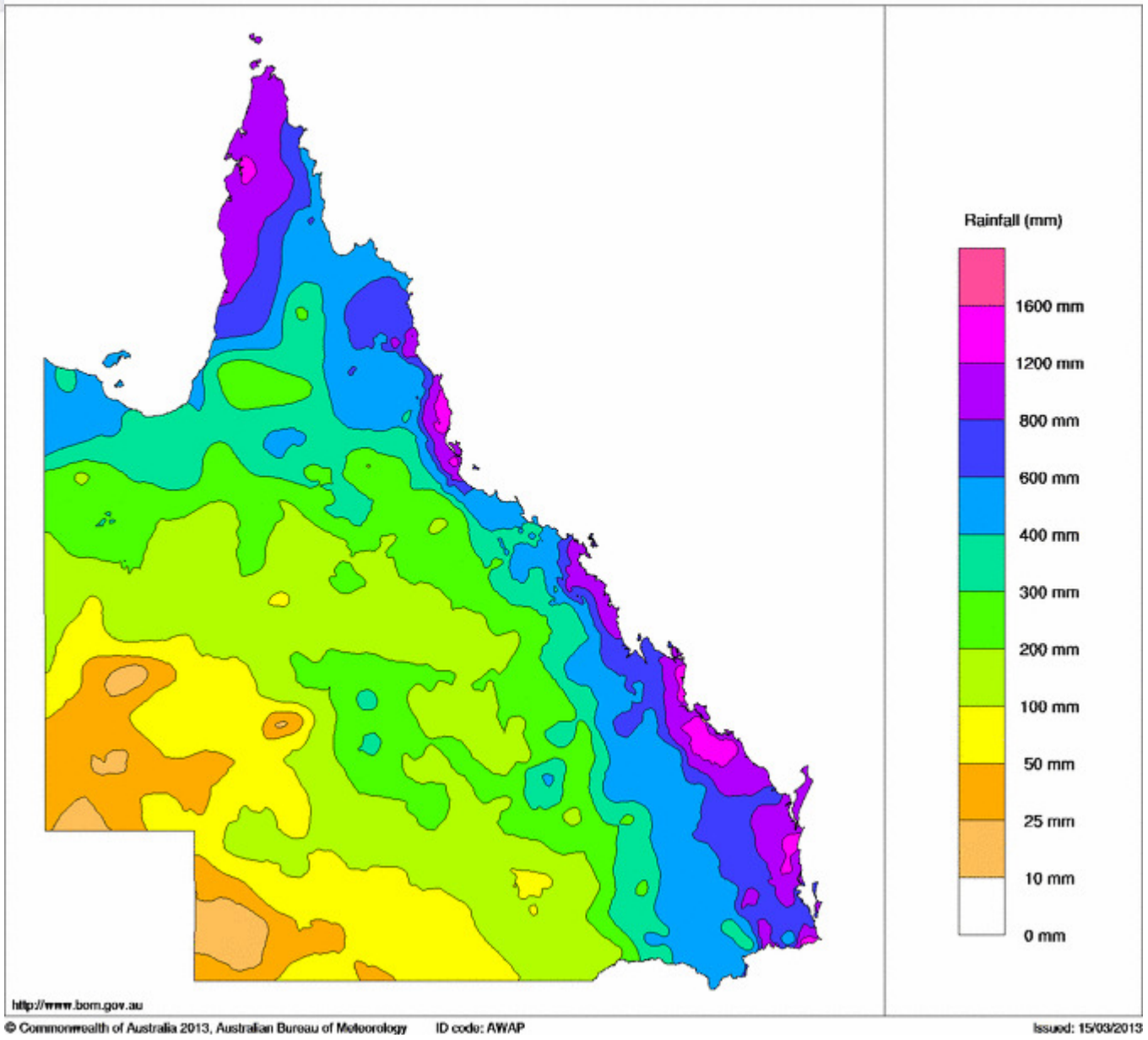
6 Month Rainfall ending Feb 2013



Weather Events
December 2010 and January 2011

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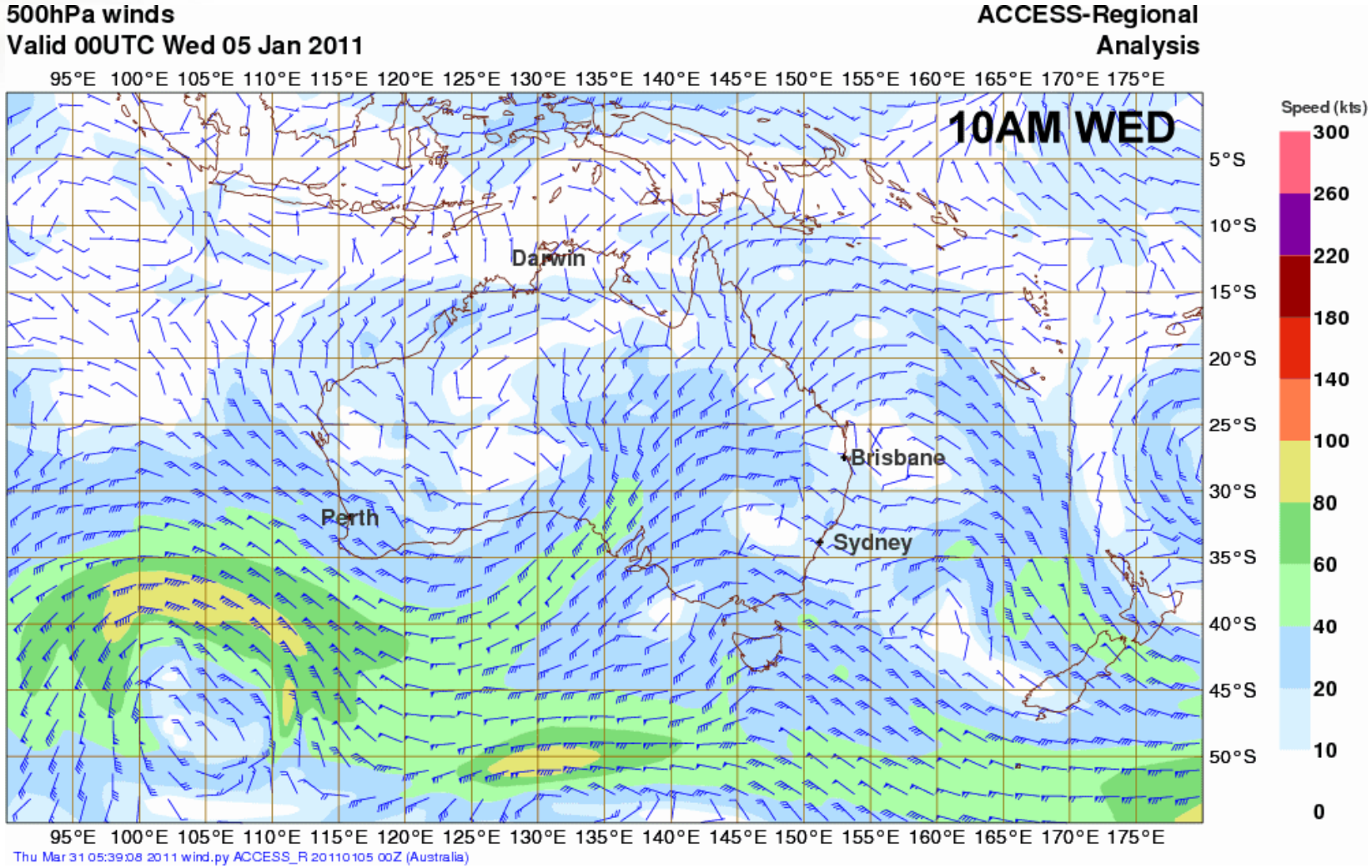
Movie Loop showing the passage of the Upper Low over Southeast Queensland



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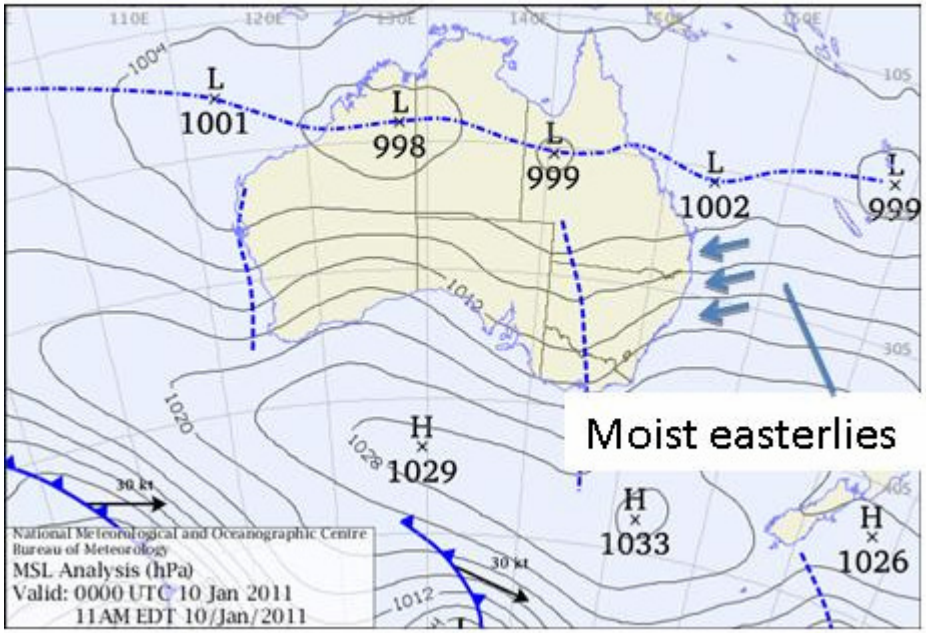
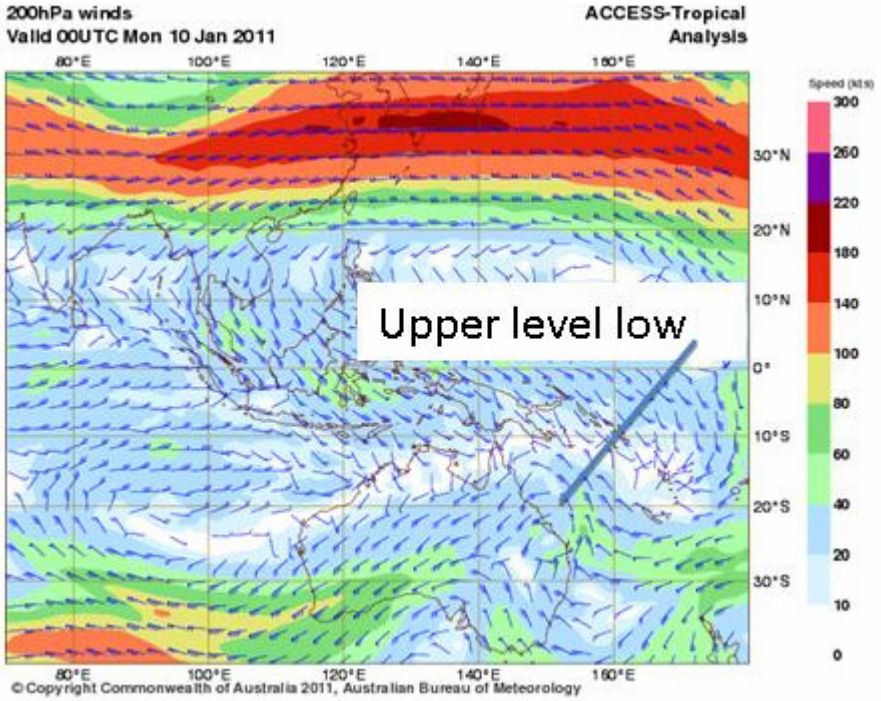
Low Level and Upper Level Features on 10 January Weather Charts





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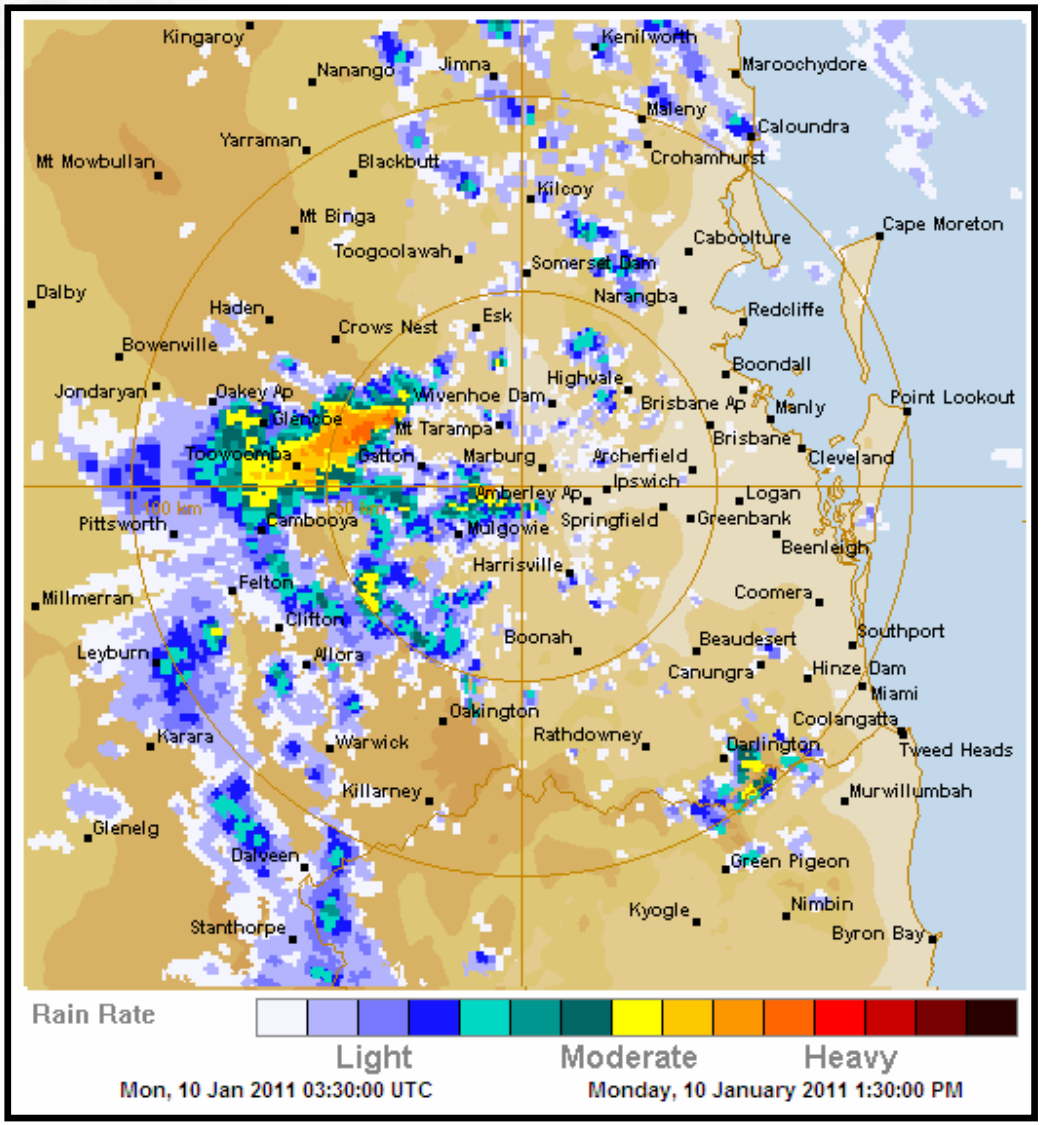
Factors Contributing to the Flash Flood on 10 January



- Monsoon trough lying to the immediate north
- Low level easterly onshore winds producing an inflow of moist tropical air
- Upper level low (unusual for this time of year) providing dynamic ascent of the airmass
- Very wet catchments
- Unusual SW movement of the storm complex
- Steep escarpment providing physical uplift of the airmass

Section 8

Flood Events December 2010 and January 2011

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The Major Rainfall Events leading to the Queensland Floods

Rainfall and flooding during the 2010-11 wet season was widespread, sustained and exceeded all previous meteorological and hydrological records in many areas of Queensland

Event 1 : 28 November 2010 – 22 December 2011	**A sequence of large scale rain events across the state**	**Major flooding of rivers across the southern half of the state**
Event 2 : 23-28 December 2011	**A single 6 day event covering almost the entire state with record rainfalls**	**Record flooding in central and southern Queensland with inundation of the cities of Bundaberg, Rockhampton, Emerald and many other towns**
Event 3 : 10-12 January 2011	**A concentrated rainfall event on the scale of several hundred kilometres, occurring directly over several small river basins**	**Flooding of the cities of Brisbane and Ipswich and many other towns**
Event 4 : 10 January 2011	**Intense rainfall from a thunderstorm complex over several hours directly over a saturated region with steep topography channelling the flow**	**Flash Floods in Toowoomba and the Lockyer Valley**

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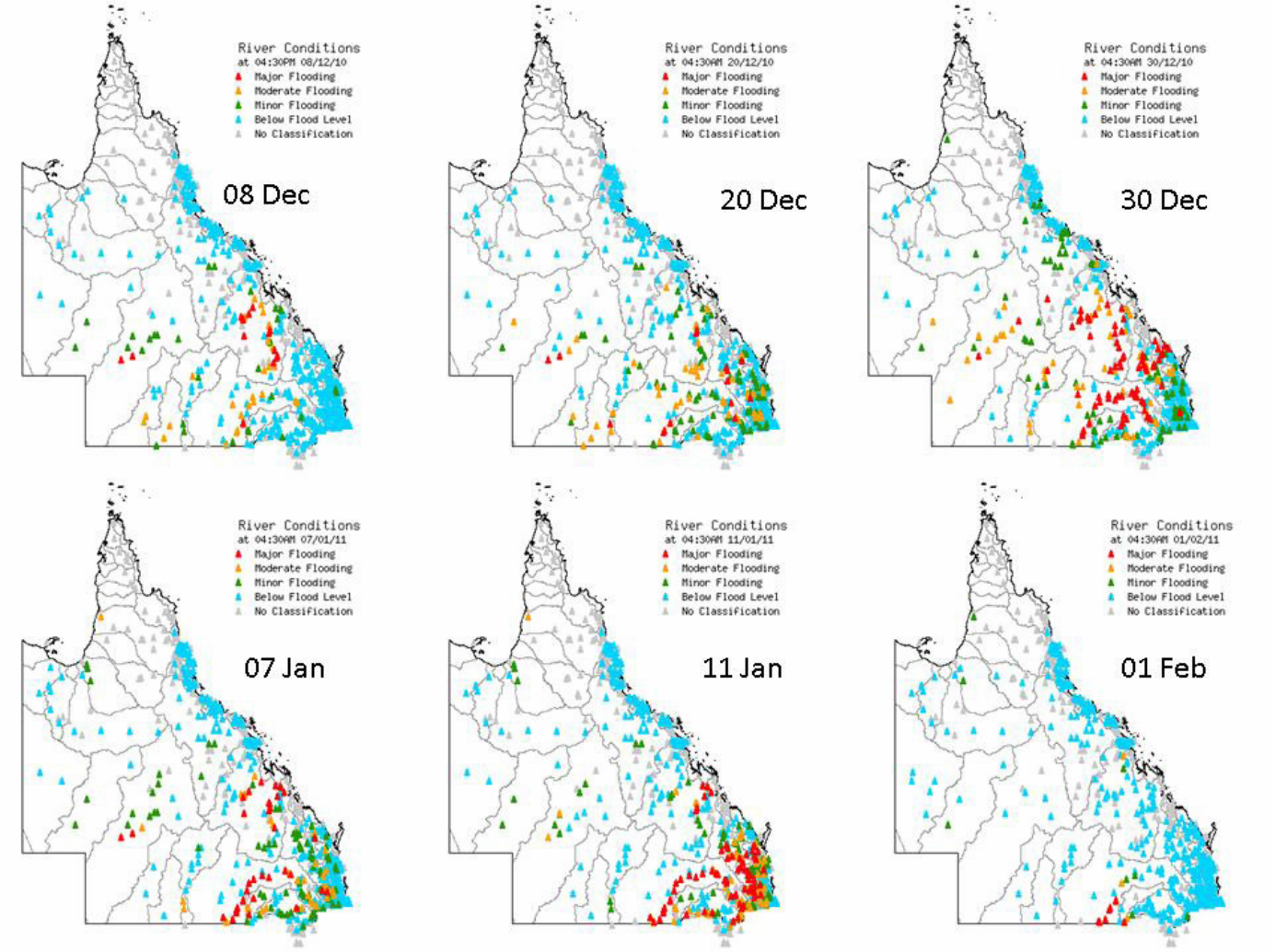
Snapshot of River Conditions during and after the Sequence of Rainfall Events



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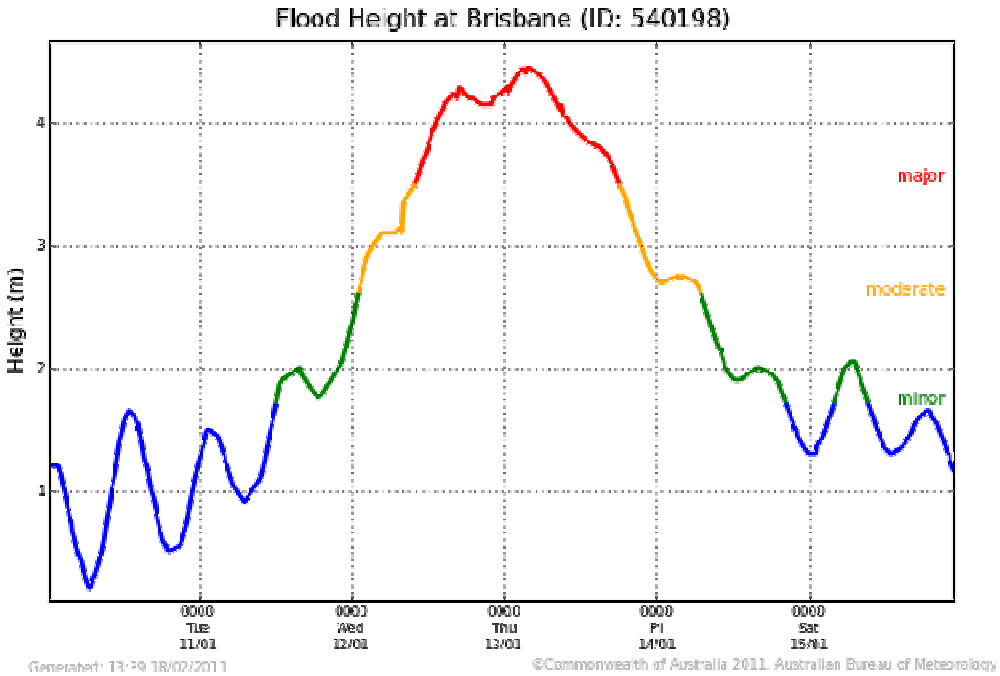
Brisbane River Floods

OPPOSITE: Flood Height 10-16 January



BELOW: Historical Annual Flood Peaks