

Northern Australia Climate Program

Centre for Applied Climate Sciences

Climate Outlook Review – Northern Australia

December 2020

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Overview

This is a review and opinion of various seasonal and other forecast systems currently available from a range of sources, from Australia and internationally.

La Niña has become established in the central and eastern Pacific although sea-surface temperatures in the Coral Sea are back to normal or slightly below normal, reducing the current strength of the La Niña pattern. For most of Northern Australia for the coming season and beyond, the various models (statistical and GCM) continue to indicate fairly high rainfall probability values for exceeding the median, especially for the north east of Australia and parts of Western Australia (eg Pilbara). However, as always, we recommend a frequent review of the situation (from month to month) to make sure this particular pattern is following this process.

In terms of three-month total rainfall, the SOI phase system for the end of November shows the SOI phase as “consistently positive”. For this December to February period, this equates to a ~60-70% probability of exceeding of the long-term median rainfall for most of eastern Queensland, coastal and central inland NSW, and patchy areas of the Gascoyne and the Top End. Higher rainfall probability values through the Atherton Tablelands, Cape York, parts of SE Qld coast and the NSW south coast (also see “the LongPaddock” web site).

The Bureau of Meteorology ACCESS model is indicating a ~80% probability of exceeding the median, for the December to February period, for almost all of Australia, especially for eastern Queensland.

The UK Met Office is forecasting 60% to 80% probability of exceeding the long-term median through, at this stage, to April 2021 for most of Australia, especially for eastern Australia.

The ECMWF model is indicating 70%-80% probability of exceeding median rainfall through to at least the end of March 2021, although with the highest probability values over eastern Australia.

The MJO is due to cross our longitudes around early December and indirectly impact our regions and again in about mid-January.

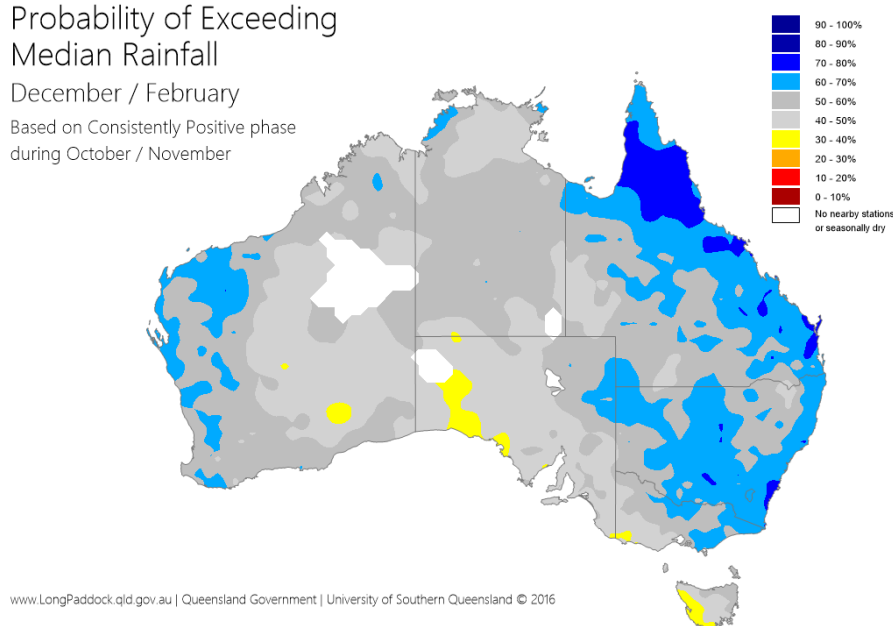
The average Southern Oscillation Index (SOI) value for the month of November was close to plus 9.2 (+9.2).

Please note page 3, the forecast pasture growth map (Queensland Government: “DES”) that utilises the integrated SOI phase system and a pasture growth model.

Probability of Exceeding Median Rainfall

December / February

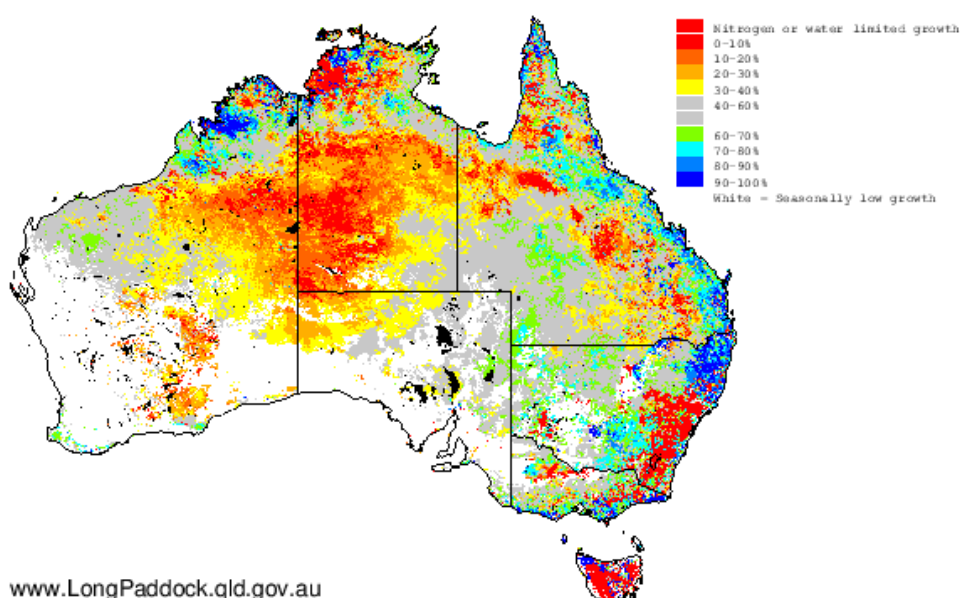
Based on Consistently Positive phase
during October / November



www.LongPaddock.qld.gov.au | Queensland Government | University of Southern Queensland © 2016

Figure 1: The SOI phase system showing the 'probability of exceeding median rainfall' values for Australia for the overall period December 2020 to February 2021 based on a 'Consistently Positive Phase' SOI pattern during November. Regions shaded darker blue have 70-90% probability of exceeding median rainfall. Regions shaded lighter blue have a 60%-70% probability of exceeding median rainfall, relative to this time of the year. Regions shaded darker grey have 50-60% probability of exceeding median rainfall.

Chance of Exceeding Median Growth December 2020 to February 2021



www.LongPaddock.qld.gov.au

Figure 2: Chances of exceeding median pasture growth for the December 2020 to February 2021 period (relative to this period of the year). This output integrates antecedent moisture and forecast rainfall, temperature, within a pasture growth model and the SOI phase forecast system.

The Southern Oscillation Index:

The Southern Oscillation Index (SOI) is an index based on the difference between surface pressure anomalies between Tahiti and Darwin.

The SOI phases (constructed using principal components and cluster analysis) consists of five different categories that take into account both rate of change and consistency in the SOI.

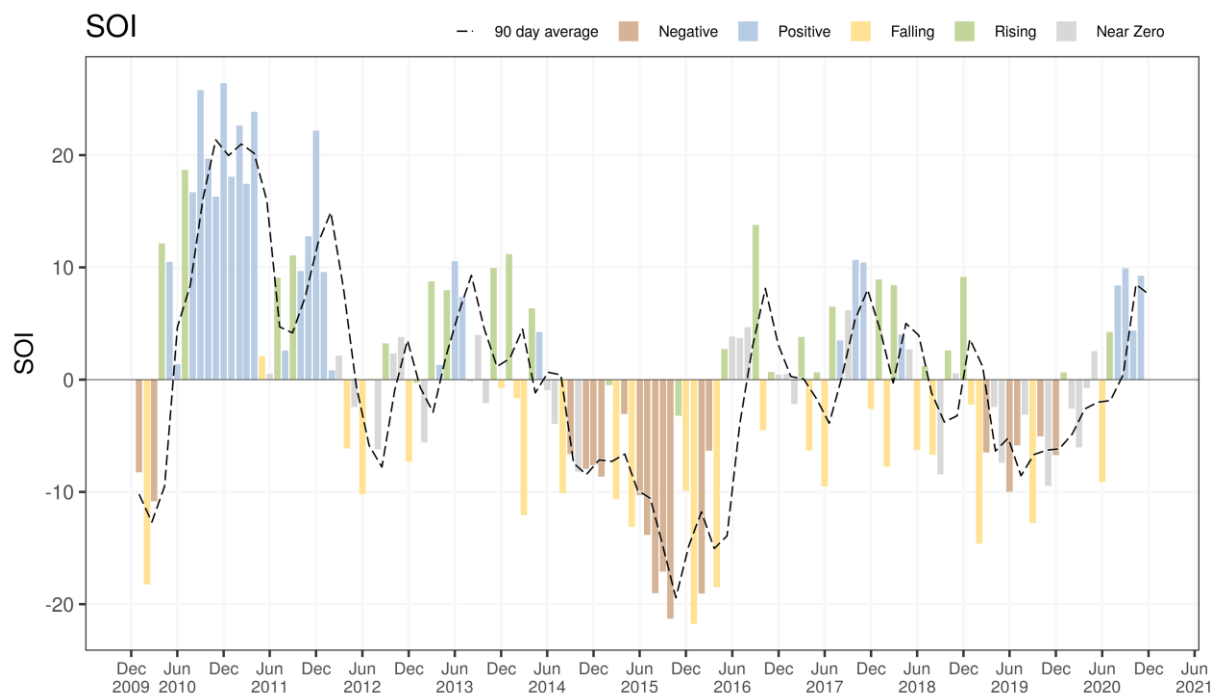


Figure 3: Monthly SOI values since December 2009 – the most recent phase was 'Consistently Positive Phase'. The most recent 30-day average value to 30 November 2020, was close to plus 9.2 (+9.2.)

Australian Bureau of Meteorology forecasts:

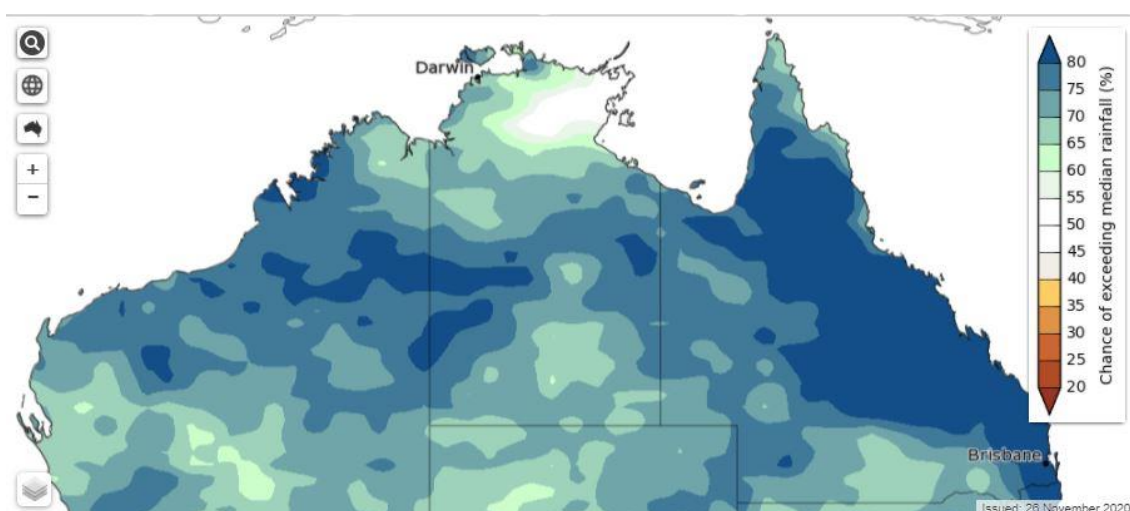


Figure 4: Bureau of Meteorology Updated Forecast 'Chance of exceeding median rainfall' probability values for northern Australia for the overall period December 2020 to February 2021.

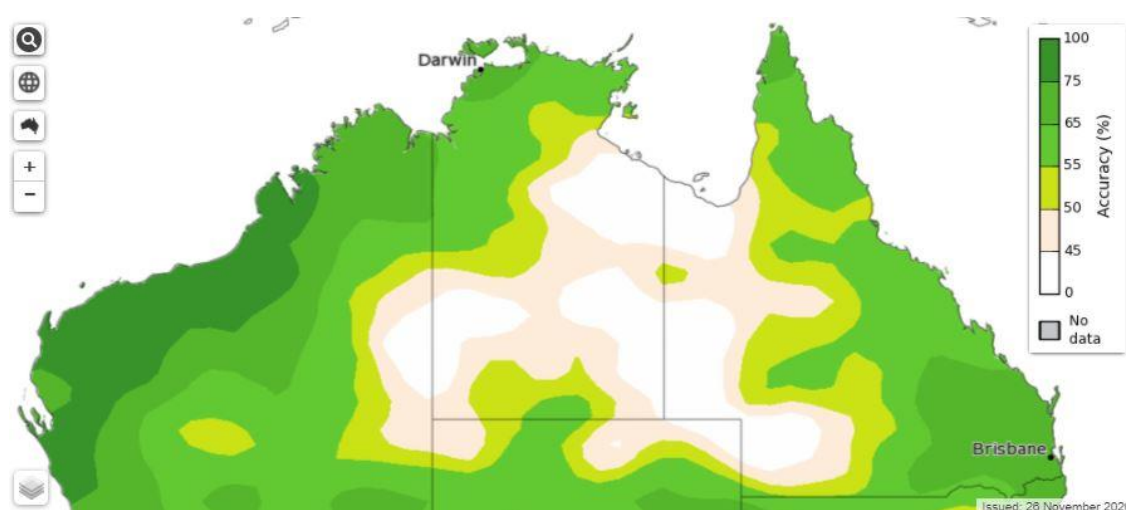


Figure 5: Bureau of Meteorology Past accuracy of rainfall from December 2020 to February 2021, indicating how accurate past rainfall forecasts have been for these months.

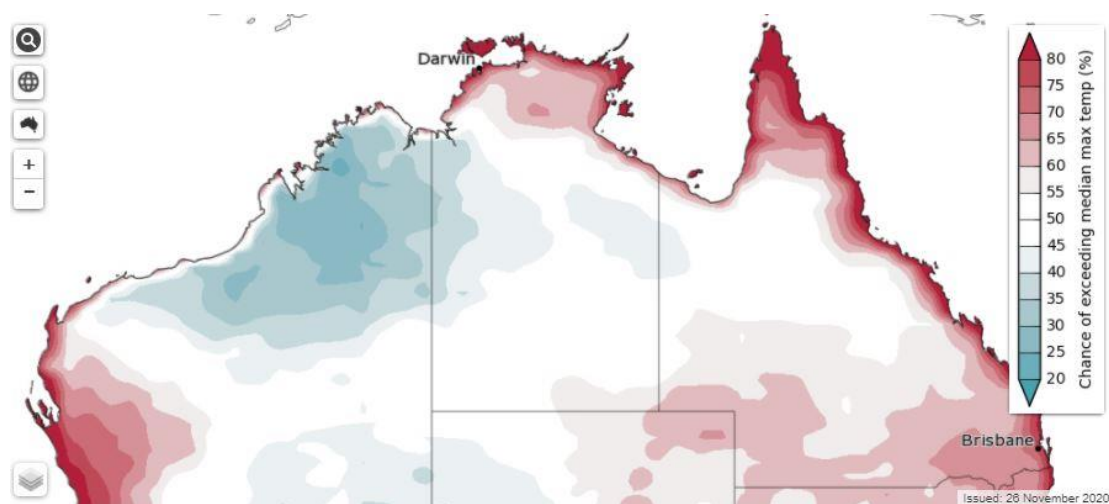


Figure 6: Bureau of Meteorology Forecast 'Chance of exceeding median maximum temperatures' for northern Australia for the overall November 2020 to January 2021. Many regions of northern Australia are now showing at least 50% chance of exceeding median maximum temperatures. Regions of inland northern WA show around 30-40% chance of exceeding median maximum temperature.

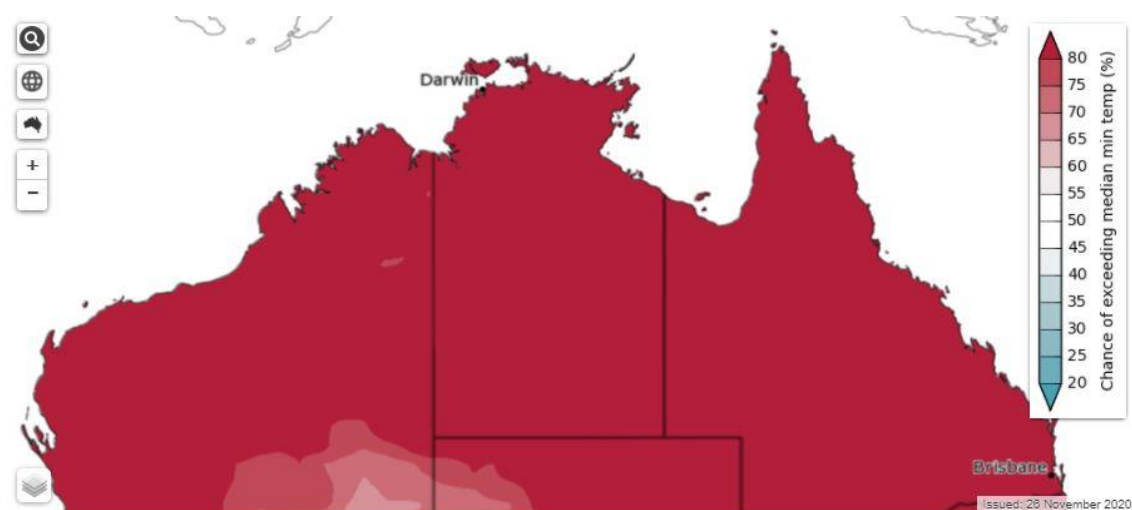


Figure 7: Bureau of Meteorology Forecast 'Chance of exceeding median minimum temperatures' for northern Australia for the overall period December 2020 to February 2021. Many regions of northern Australia show at least 80% chance of exceeding median minimum temperatures. Regions of western WA show around 60% chance of exceeding median minimum temperature.

Longer-term forecasts:

The UKMO and ECMWF models provide useful assessments of longer-term rainfall probability values for northern Australia. The UKMO example below suggests about a 60-80% chance of above Median rainfall for January to March 2021 for those regions shaded lighter blue.

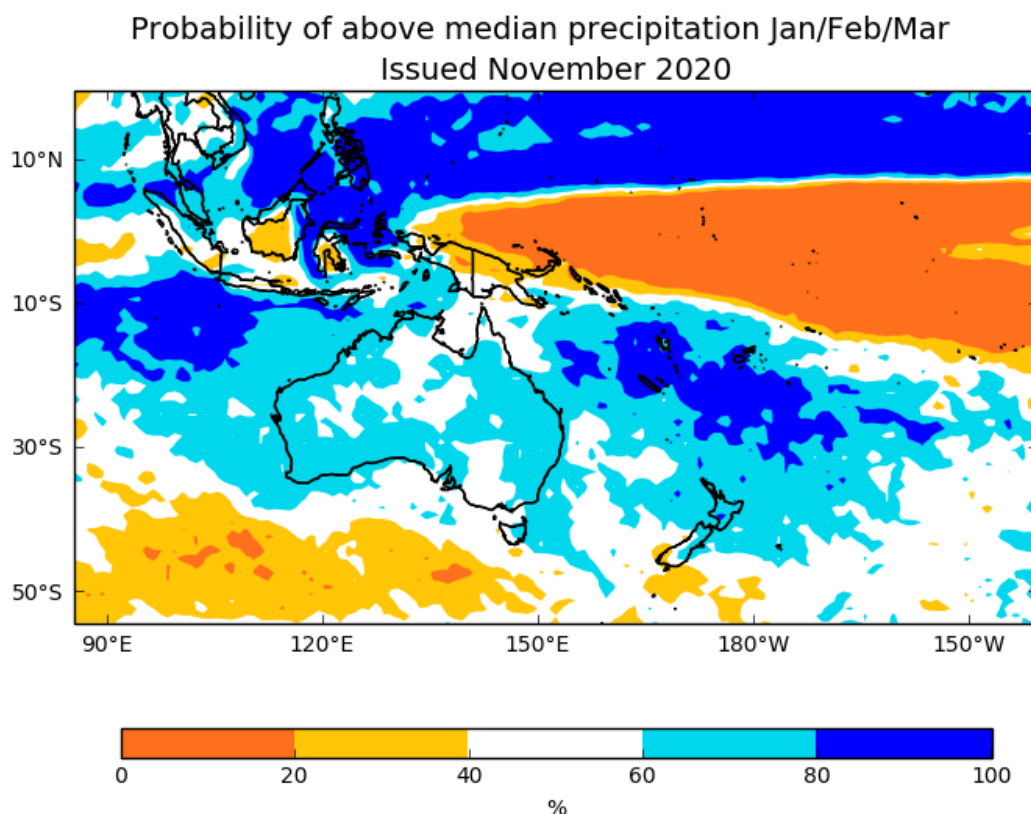


Figure 8: UKMO forecast map: Probability of getting above median precipitation for the total period January to March 2021. Regions shaded lighter blue have a 60-80% probability of above median precipitation. Regions shaded white have a 40- 60% probability of above median precipitation.

ECMWF Seasonal Forecast

Prob(precipitation > median)

Forecast start is 01/11/20, climate period is 1993-2016

Ensemble size = 51, climate size = 600

System 5

MAM 2021

Solid contour at 1% significance level

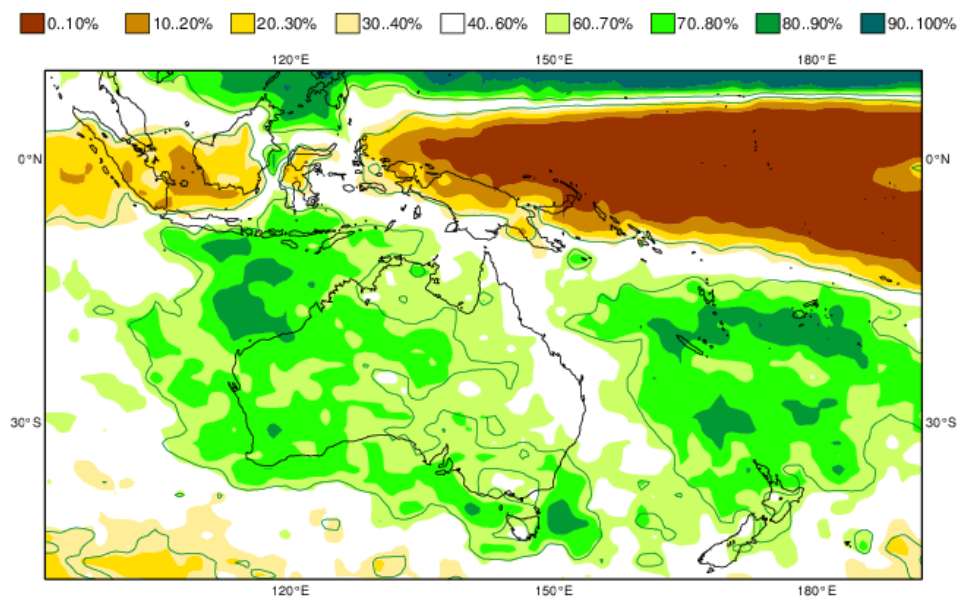


Figure 9: ECMWF forecast rainfall probability values for northern and eastern Australia – and the region generally for March to May 2021. (Courtesy ECMWF). Some regions of north western and central Australia indicate a 60%-80% probability of above median rainfall for this seasonal period, summer/autumn 2020/2021.

Explaining the differences between models:

Dynamical models use the current state of the oceans and atmospheres combined with our understanding of the physical processes behind weather and climate to forecast the likelihood of future rainfall. Each dynamical model is based on certain model calibrations, which differ from model to model, providing slightly different outcomes. Statistical models use historical climate data to determine when conditions were similar in the past and what rainfall resulted from those past conditions.

While all of the models may be slightly different, it is important to focus on the overall predicted outcomes. All three of the models presented here show that there is an average to below average likelihood of receiving median rainfall when assessed over a three month period.

El Niño-Southern Oscillation (ENSO)

ENSO events generally begin in the Southern Hemisphere winter, peak during summer, and then usually end during autumn. The El Niño phase is *often* associated with warmer and drier conditions while La Niña phases are *often* associated with cooler and wetter conditions. The main areas of Australia impacted by ENSO phases are the eastern seaboard, north-eastern Australia and south-eastern Australia.

Madden Julian Oscillation (MJO)

MJO impacts weather in tropical Australia (and occasionally in higher latitude areas) on a weekly to monthly timescale. According to BoM's and NOAA's forecasting system and USQ's analysis. The Madden Julian Oscillation (MJO) is due to cross our longitudes around early December. Please also refer to the interesting NOAA website (last page of this review) for updated information on the MJO.

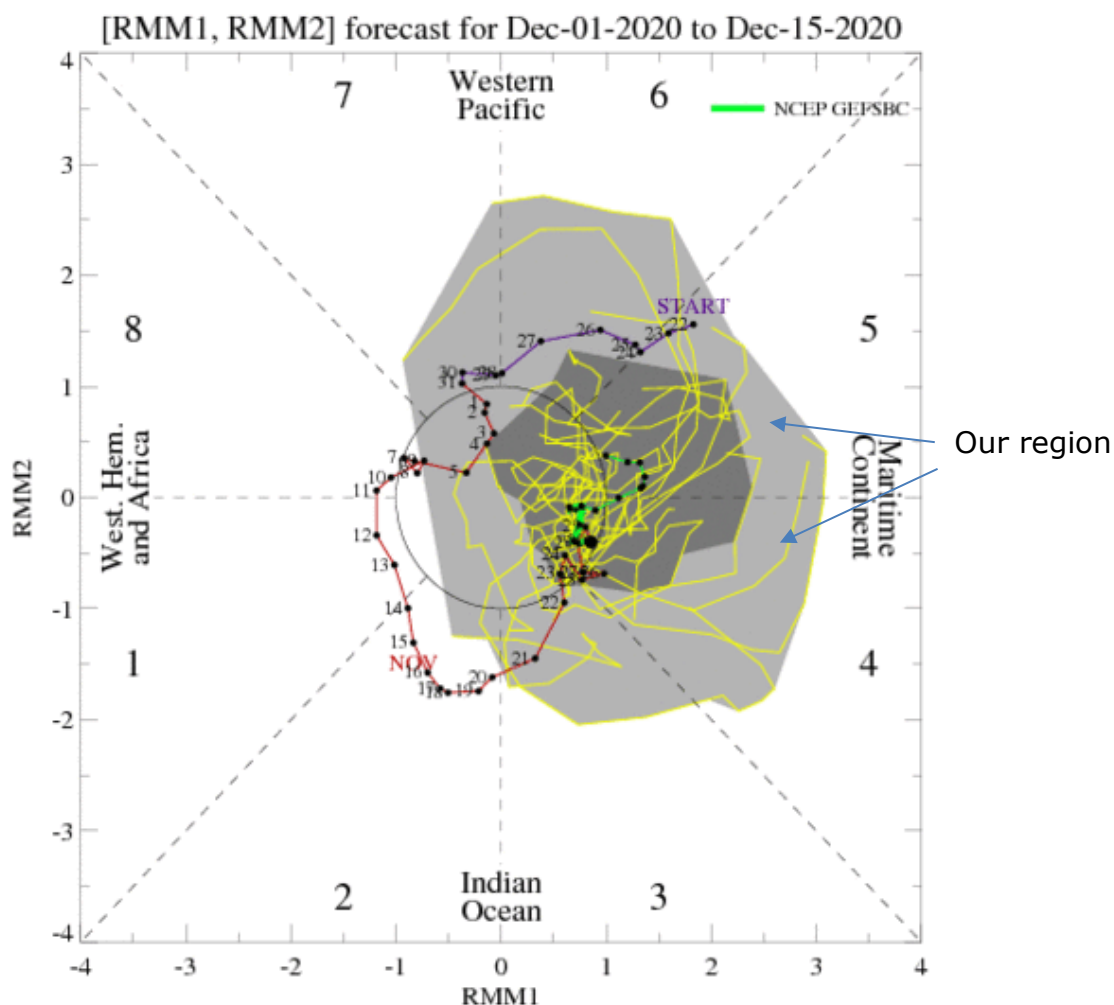
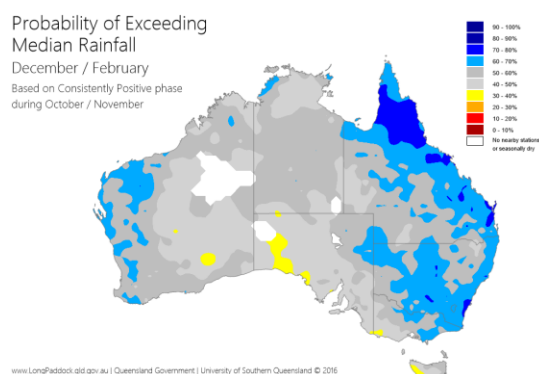


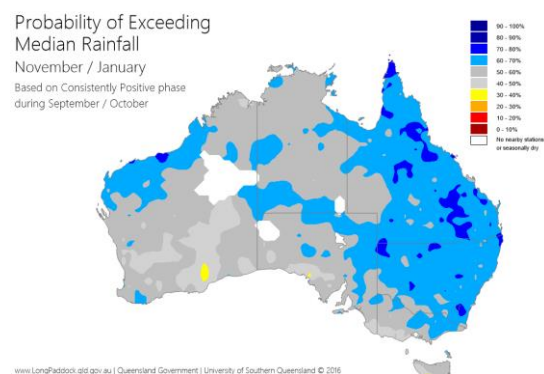
Figure 10: MJO phase diagram for 1 to 15 December 2020. The purple line for October, the red line for November. The numbers indicate the day of the month. When the line is in the circle, it indicates a weak/inactive MJO phase and when the line is outside of the circle, the MJO is active with strength indicated by distance from circle. The area shaded in grey containing yellow lines indicates the ensemble plume prediction for 1 to 15 December 2020 with the green line showing the (ensemble) mean.

Recent SOI-phase forecast maps

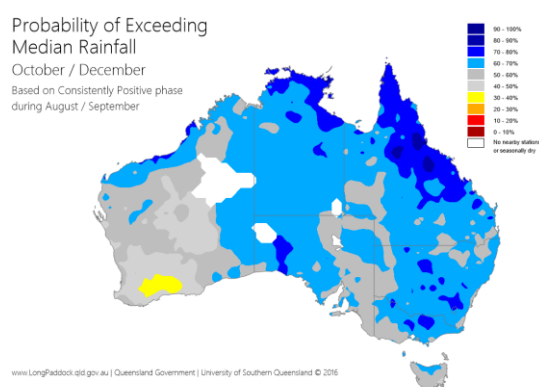
As these forecasts are issued for a three-month validity on a rolling monthly basis, it has been decided to provide a continuous reference to these forecasts, as below:



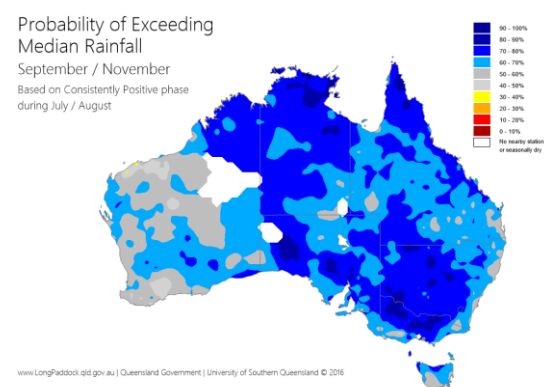
Seasonal climate forecast valid
1 December 2020 to 28 February 2021



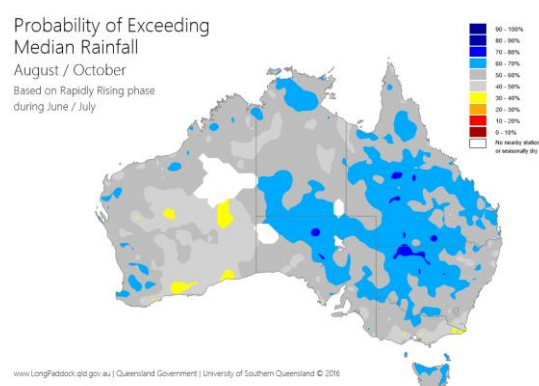
Seasonal climate forecast valid
1 November 2020 to 31 January 2021



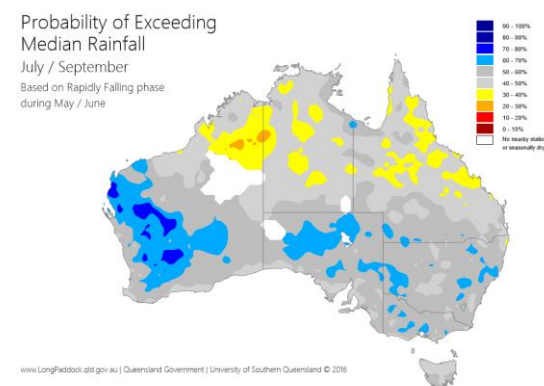
Seasonal climate forecast valid
1 October to 31 December 2020



Seasonal climate forecast valid
1 September to 30 November 2020



Seasonal climate forecast valid
1 August to 31 October 2020



Seasonal climate forecast valid
1 July to 30 September 2020

Northern Australia Climate Program

For further information, click on the following links:

- For the MJO
- For weekly SSTs
- For easterly (and westerly) wind anomalies across the Pacific
- For sub-surface temperatures across the Pacific
- For ECMWF forecast products (note the web site for this output has changed)
- For 'plume' forecasts of SSTs in the central Pacific
- For a complete history of the SOI
- The Long Paddock
- Additional information on ENSO

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