UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

Centre for Applied Climate Sciences

Climate Outlook Review – Northern Australia

December 2018

Authors: Prof Roger C Stone
& Dr Chelsea Jarvis

Overview

Rainfall: Generally average to below average for most regions (see maps).
Day time temperatures: Above average
Night time temperatures: Average to above average

The Australian and international long-term dynamic climate models that focus on forecasting central Pacific sea surface temperatures are continuing to predict further development of an El Niño within the next few months (December 2018 to February 2019).

Consequently, most rainfall forecasts for northern Australia, especially north east Australia, currently indicate varying probability values of exceeding the respective long-term median rainfall right through to and including summer 2018/19. As the SOI is back on the rise again (somewhat unexpectedly) SOI phase-based forecasts show a varied pattern for Queensland and northern Australia (see maps).

The average Southern Oscillation Index (SOI) values for the month of November was close to plus 0.6 (+0.6).

Both minimum and maximum temperatures are expected to be above average for the months of December 2018 to February 2019.

Due to the further development of El Niño-like conditions, there is a higher than average chance of a later start to the monsoonal wet season than usual.

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Australian Bureau of Meteorology forecasts:

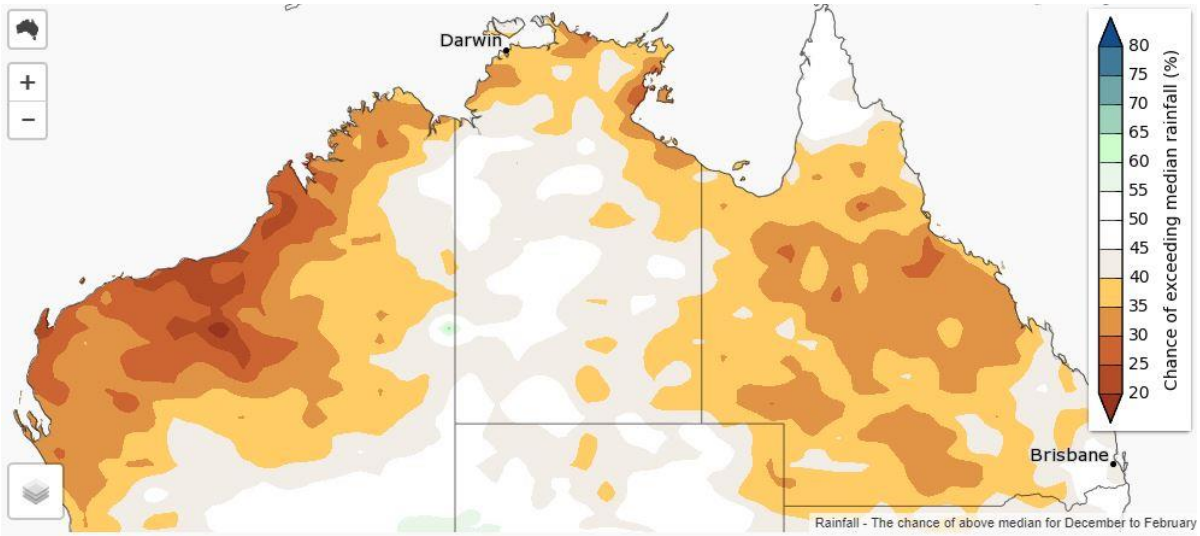

Figure 1: Bureau of Meteorology Forecast 'Chance of exceeding median rainfall' probability values for northern Australia for the overall period December 2018 to February 2019. Parts of northern Australia is showing a less than 50% chance of exceeding median rainfall.

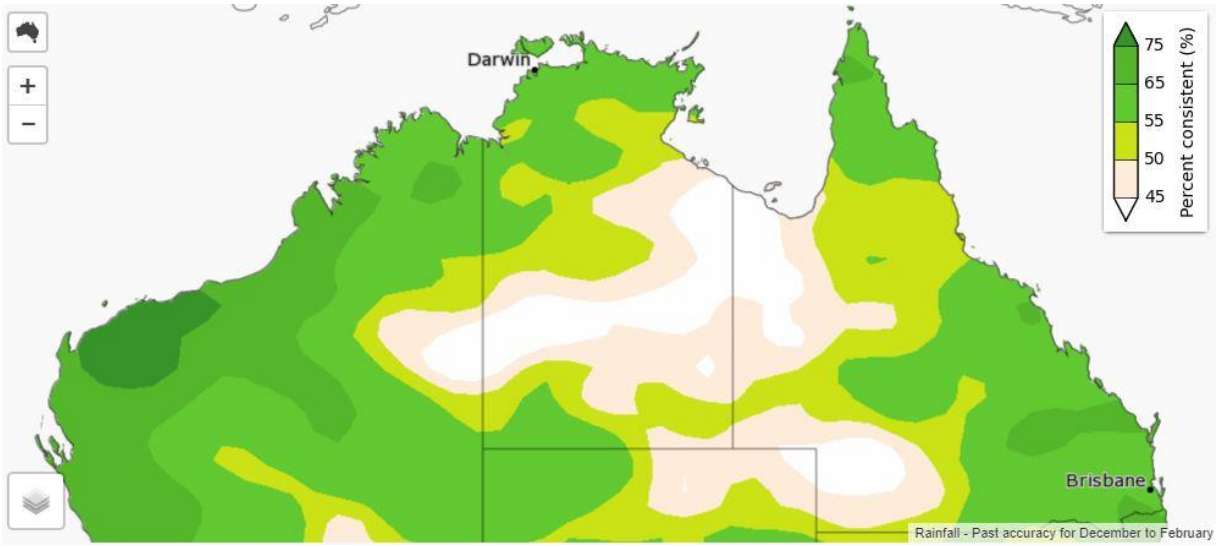

Figure 2: Past accuracy of rainfall from December 2018 to February 2019, indicating how accurate past rainfall forecasts have been for these months.

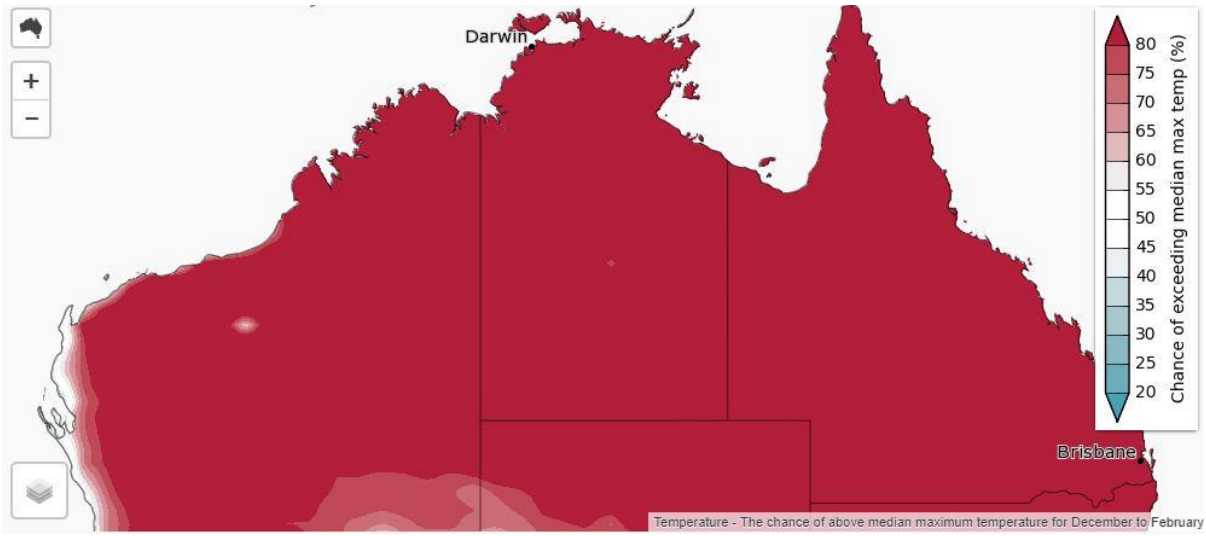

Figure 3: Bureau of Meteorology Forecast 'Chance of exceeding median maximum temperatures' for northern Australia for the overall period December 2018 to February 2019. The majority of northern Australia is showing at least a 80% chance of exceeding median maximum temperatures. This indicates that **day time temperatures are likely to be above median**.

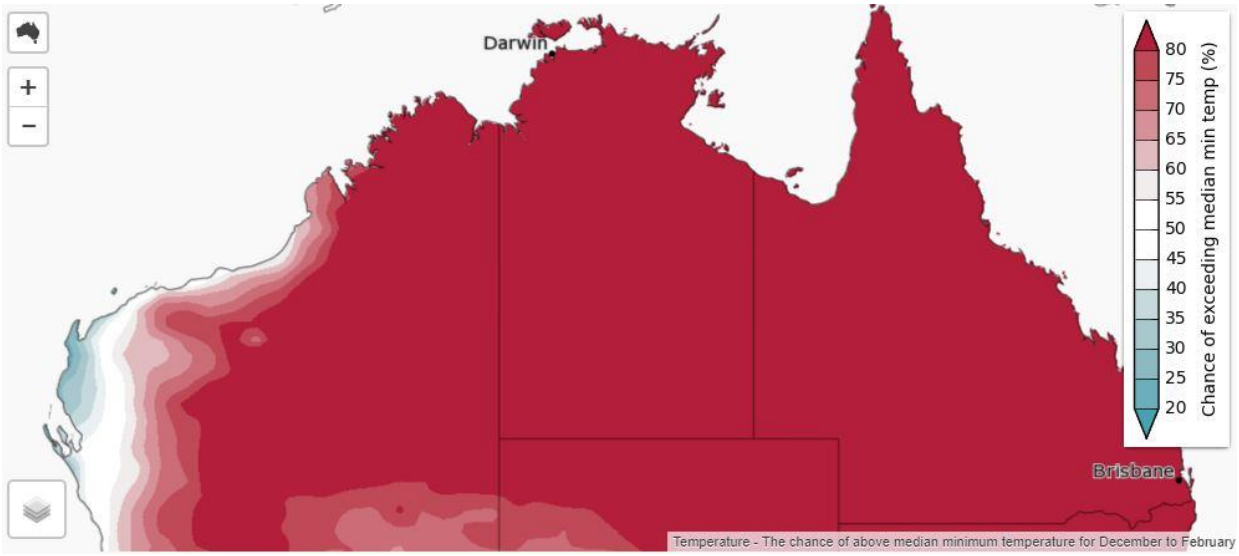

Figure 4: Bureau of Meteorology Forecast 'Chance of exceeding median minimum temperatures' for northern Australia for the overall period December 2018 to February 2019. The majority of northern Australia is showing at least an 80% chance of exceeding median maximum temperatures. This indicates that **night time temperatures are likely to be above median.**

UKMO forecasts:

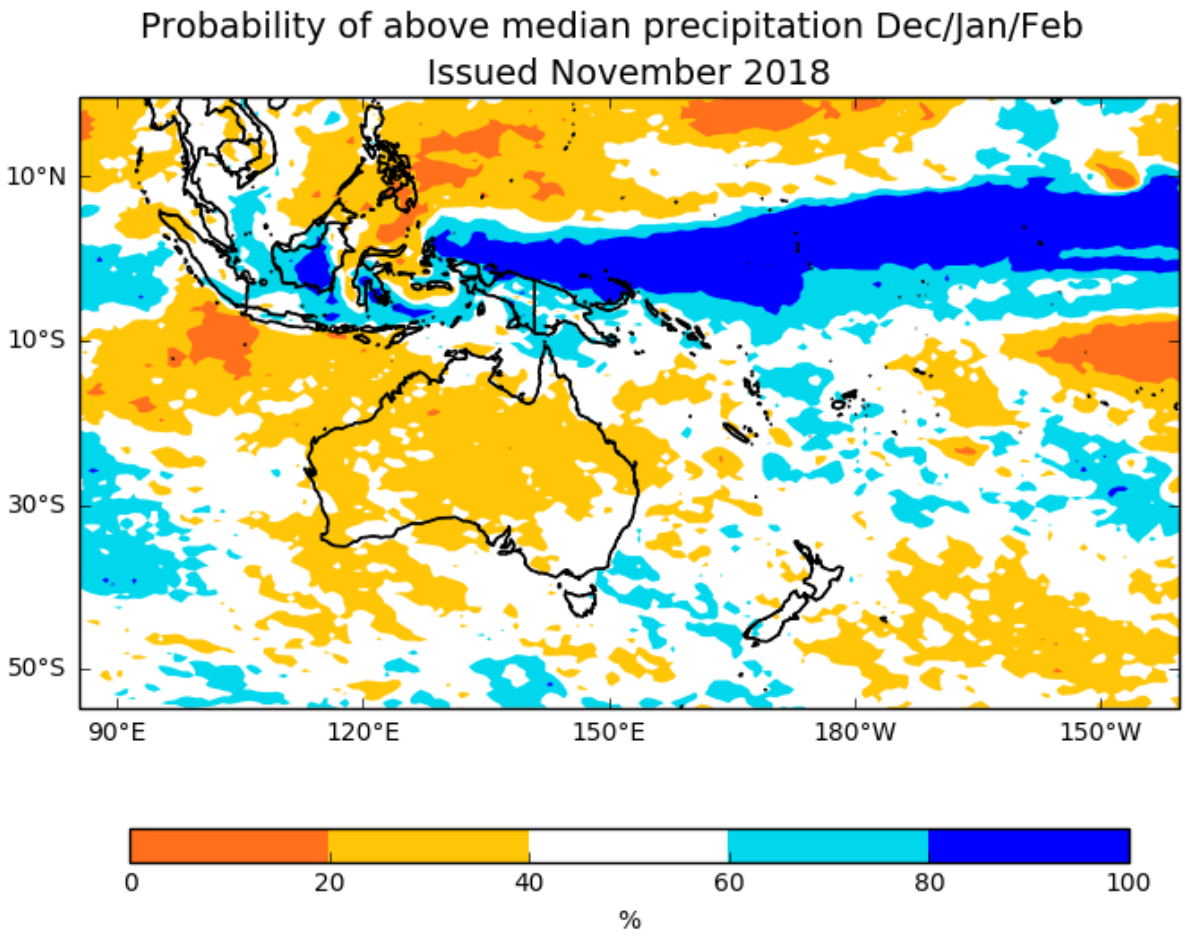

Figure 5: Probability of above median precipitation during the months of December, January and February. For the majority of northern Australia, there is a 20-40% chance of receiving above median rainfall.

The Southern Oscillation Index:

The Southern Oscillation Index (SOI) is an index based on the difference between surface pressure in Darwin, Australia and Tahiti, which are related to ENSO phases.

The SOI consists of five different categories that take into account both rate of change and consistency in the SOI: Consistently Negative – when values are consistently below negative 5, indicating an El Niño phase; Consistently Positive – when values are consistently above positive 5, indicating a La Niña phase; Rapidly Falling – often the transition period between a La Niña and El Niño phase; Rapidly Rising – often the transition period between an El Niño and La Niña phase; and Near Zero, during which time there is not, at that period, a strong ENSO signal or phase.

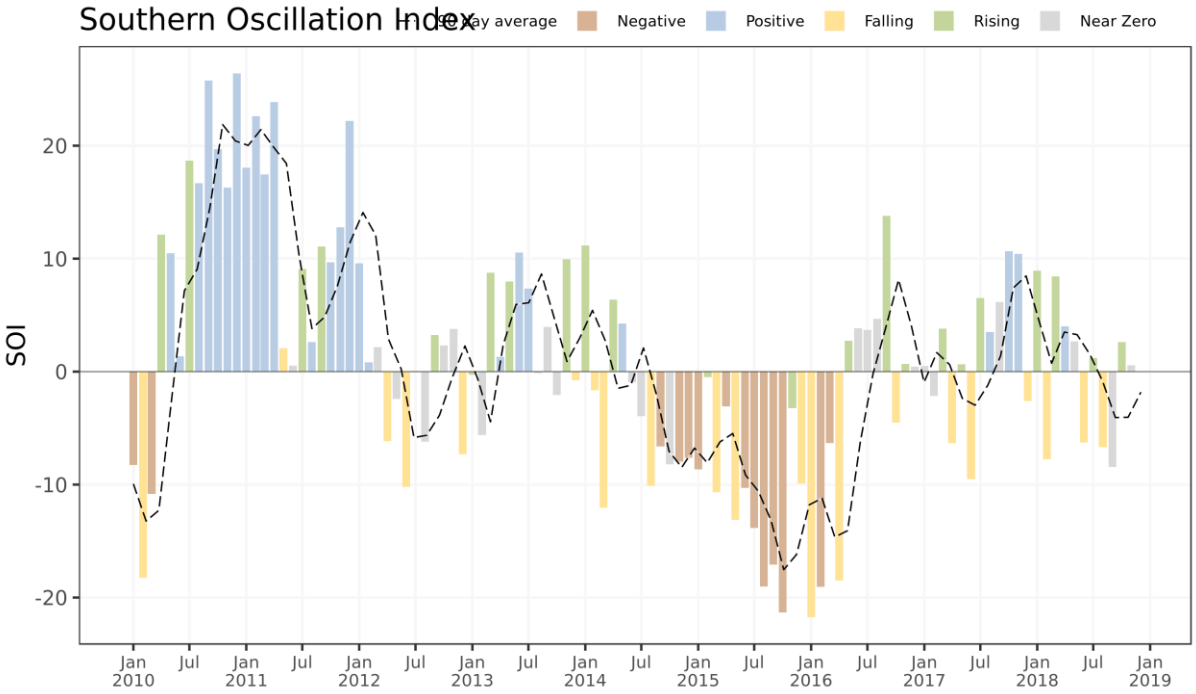

Figure 6: Monthly SOI values since January 2010 – the most recent phase was rapidly rising, reflecting a continuing widely oscillating SOI.

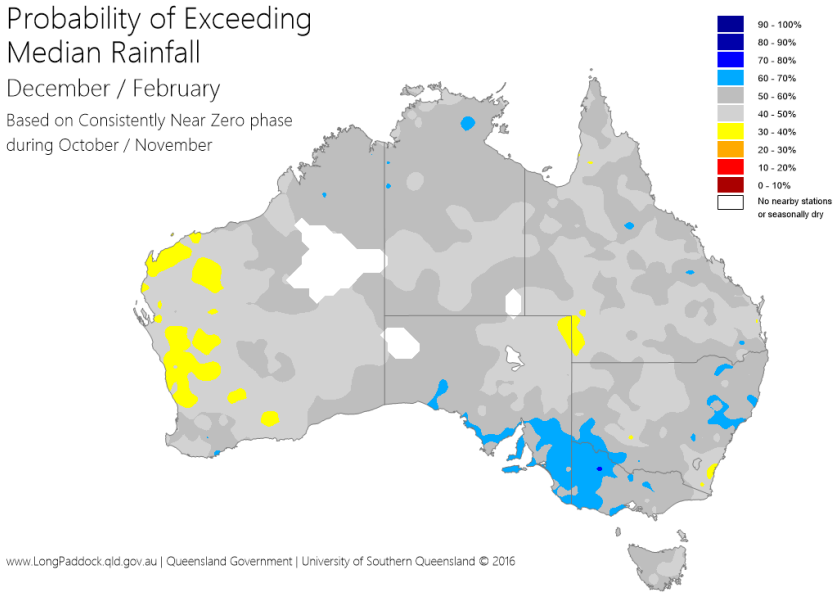

Figure 7: 'Probability of exceeding median rainfall' values for Australia for the overall period December 2018 to February 2019 based on 'near zero' SOI pattern during October and November. Regions shaded darker grey have a 50%-60% probability of exceeding median rainfall values and regions shaded lighter grey have a 40% to 50% probability of exceeding median rainfall values relative to this period.

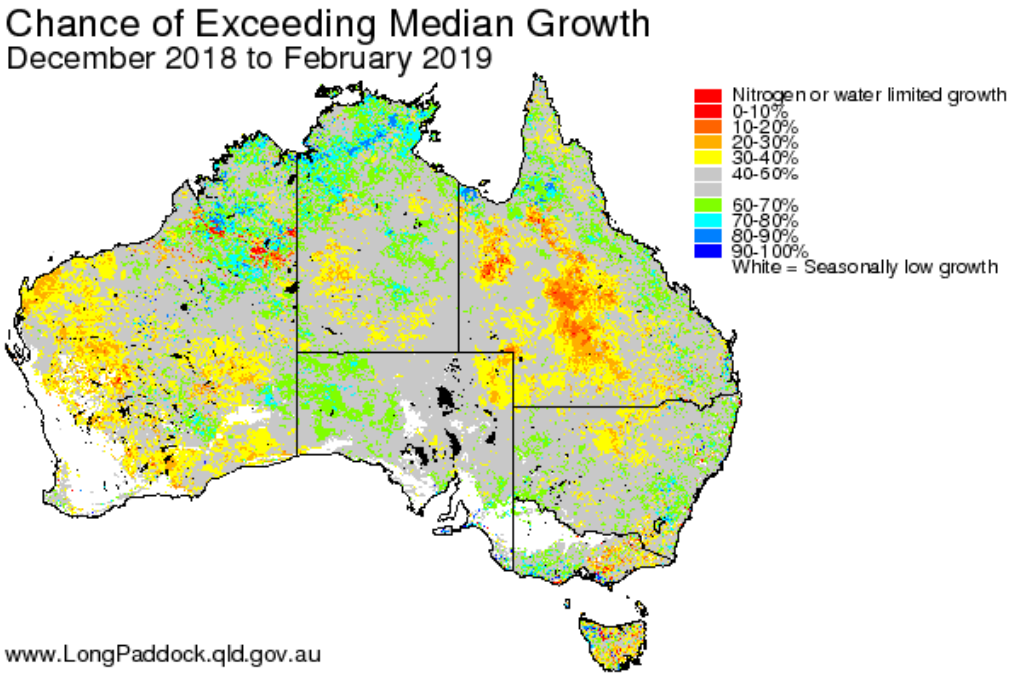

Figure 8: Chances of exceeding median pasture growth for Australia for December 2018 to February 2019 period. This output integrates antecedent moisture and forecast rainfall, temperature, within a pasture growth model.

Explaining the differences between models:

BOM, UKMO, and SOI rainfall 'Probabilities of exceeding median' differ slightly. This is due to the BOM and UKMO using dynamical models for predicting rainfall, while the SOI is applied as a statistical system. 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.

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. Currently, ENSO conditions are neutral, with some models predicting an El Niño phase beginning sometime in December or January while other models predict neutral conditions to prevail. Impacts of and El Niño (dry and warm conditions) can occur even if conditions do not meet thresholds for an official event and can occur in eastern Australia while El Niño is developing.

Madden Julian Oscillation (MJO)

The MJO impacts weather in tropical Australia (and occasionally in higher latitude areas) on a weekly to monthly timescale. The MJO can either be active (line outside of the circle in Figure 9) or weak/inactive (line inside the circle in Figure 9).

According to multiple forecasting systems (BoM, NOAA, USQ) and analyses, the MJO was active in phases 1, 2, 3, and 4 from the end of October (purple line) to the middle of November (red line). When the line is outside of the circle in sectors 8 or 1, as it is here from 27 October to 1 November, there is an increased chance of clear conditions (reduced chance of rainfall). When the line is outside of the circle in sectors 4 and 5, as it is here from 10 – 14 November, there is an increased chance of rainfall. The active MJO in sector 5 very likely influenced the rainfall event at Darwin (73 mm) on 15 November.
The shaded grey area with yellow lines shows the estimated activity of the MJO based on the Global Ensemble Forecast System for the next two weeks. Here the ensemble indicates that the MJO may be active, though not strong, in phases 8 and 1 (reduced chance of rainfall) from the end of November to the first week of December and then become inactive (inside of the circle) during the middle of December. Please also refer to the interesting NOAA website for updated information on the MJO.

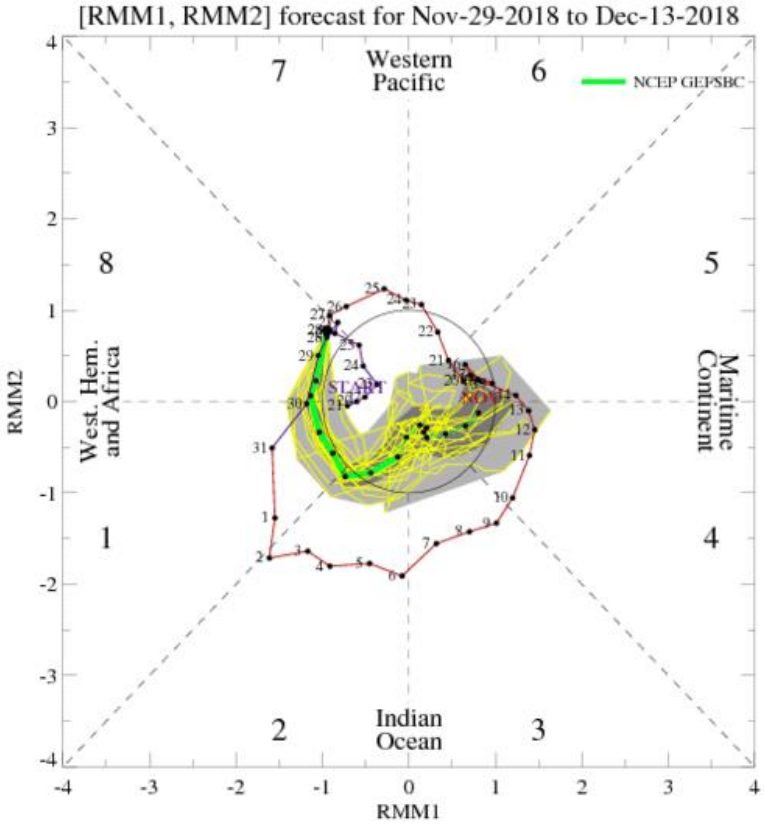

Figure 9: MJO phase diagram for 29 November to 13 December 2018. The purple line shows values for October and the red line for November. The numbers indicate the day of the month. When the line is in the circle, it indicates a weak/inactive MJO phase and when the line is outside of the circle, the MJO is active with strength indicated by distance from circle. The area shaded in grey containing yellow lines indicates the ensemble plume prediction for the 29 November to 13 December, with the green line showing the ensemble mean.

Monsoon/Wet Season Onset (Included seasonally)

The monsoon season has not yet started and it is predicted to be average to slightly late in timing due to El Niño-like conditions. Figure 10 shows areas that have received at least 50mm of rainfall since 1 September and Figure 11 shows how the rainfall in Figure 10 compares to other years.

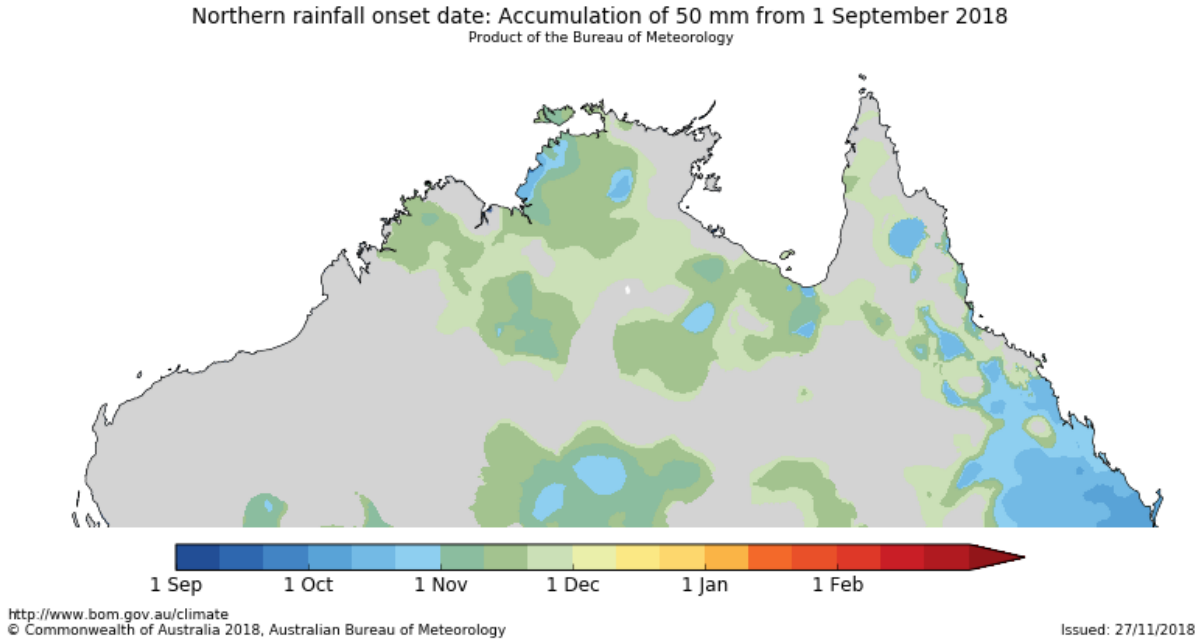

Figure 10: Accumulation of at least 50mm since 1 September. Note, this rainfall is not related to the start of the monsoon, but rather due to convection. Grey areas have not yet received 50mm.

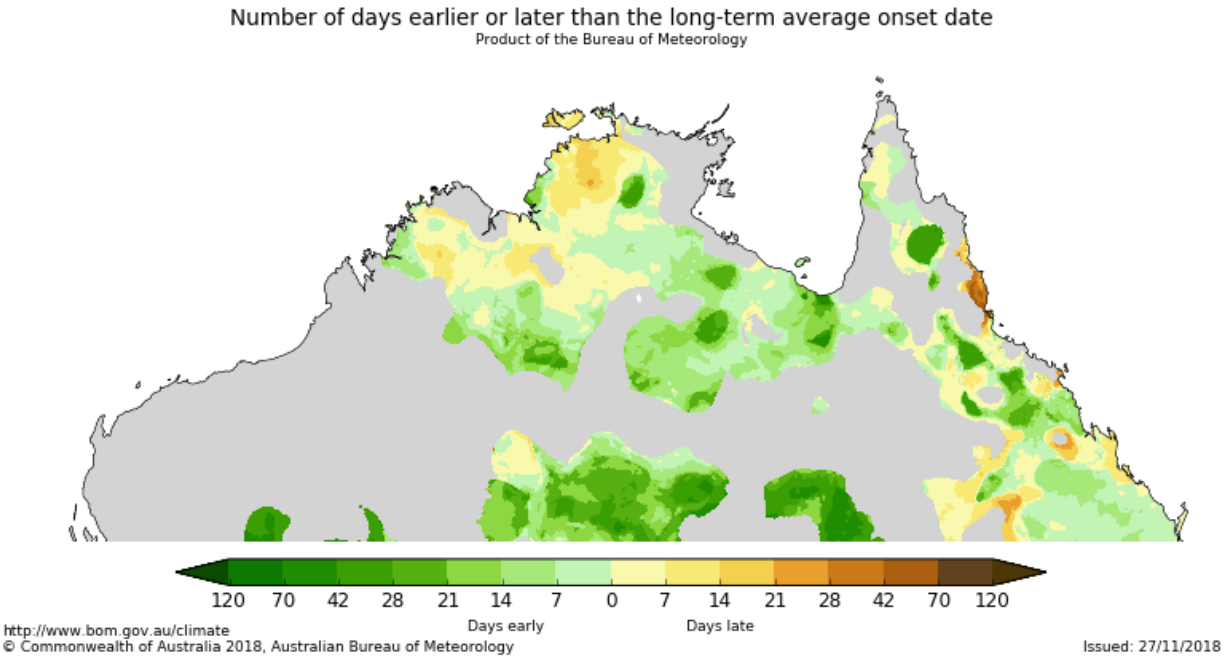

Figure 11: Number of days earlier or later than the long-term average of receiving at least 50mm after 1 September. Grey areas have not yet received 50mm.

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

USQ Research
Centre for Applied Climate Sciences

Please email Prof Roger Stone at
Roger.stone@usq.edu.au

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