Centre for Applied Climate Sciences

Climate Outlook Review – Northern Australia

January 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.

Mostly patchy low rainfall probability values are indicated for most regions of Queensland and Northern Territory, but with higher probability values for WA in some models.

In terms of three-month total rainfall, the SOI phase system indicates low values for the next three months with a 30%-40% probability of exceeding median rainfall through most regions of Queensland and eastern NSW, decreasing to 20%-30% in central western Qld, the Barkly, and parts of the Queensland tropical coast (see map below). (Note also that the forecast issued for the total period December 2019 to February 2020, still remains valid for that particular period).

The latest UK Met Office forecast indicates low probability of exceeding median rainfall values for eastern and northern Australia for the January to March 2020 but with higher values close to 'climatology' for the latter part of summer and into autumn.

The ECMWF seasonal forecast indicates low rainfall probability values for the January to March 2020 and February to April periods. However, in keeping with the above set of forecasts, this model is indicating higher rainfall probability values across most of northern and eastern Australia for the April to June 2020 period.

The Bureau of Meteorology ACCESS model is indicating mostly patchy low probability values of exceeding median rainfall (approx. 30-40% over many regions of Queensland). Conversely higher rainfall probability values are indicated for many areas of Western Australia and parts of the Top End – see maps below.

Two models (FSU and CPC) are suggesting an easing of drought/low rainfall probability values in our southern hemisphere late autumn/winter period, 2020.

The next MJO event is due again across our longitudes around early-January.

The average Southern Oscillation Index (SOI) value for the month of December was close to Minus 6.8 (-6.8).

Please also note the forecast pasture growth map (courtesy Queensland Government) that utilises the integrated SOI phase system and a pasture growth model.









Figure 1: Using the SOI phase system in this example, the 'probability of exceeding median rainfall' values for Australia for the overall period January to March 2020 based on 'Consistently Negative phase' SOI pattern during November/December. Regions shaded grey have 40-50% probability of exceeding median rainfall. Regions shaded yellow have a 30-40% probability of exceeding median rainfall values relative to this period, whereas, regions shaded orange have a 20%-30% probability of exceeding median rainfall.



Figure 2: Chances of exceeding median pasture growth for Australia for January to March 2020 period (relevant 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 Negative'. The most recent 30-day average value to 31 December 2019, was close to -6.8 (minus 6.8).





Australian Bureau of Meteorology forecasts:



Figure 4: Bureau of Meteorology Forecast 'Chance of exceeding median rainfall' probability values for northern Australia for the overall total period January to March 2020.



Figure 5: Bureau of Meteorology Past accuracy of rainfall from January to March 2020, 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 January to March 2020. Queensland is showing at least an 80% chance of exceeding median maximum temperatures over this overall period. Some regions of Western Australia and Northern territory are showing around a 60% chance of exceeding median maximum temperatures over this overall period.



Figure 7: Bureau of Meteorology Forecast 'Chance of exceeding median minimum temperatures' for northern Australia for the overall period January to March 2020. Regions of northern Australia show at least 80% chance of exceeding median minimum temperatures.







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 20-40% chance of above Median rainfall for March to May 2020 for those regions shaded yellow.



Probability of above median precipitation Mar/Apr/May Issued December 2019

Figure 8: UKMO forecast map: Probability of getting above median precipitation for the total period March to May 2020. Regions shaded yellow have a 20-40% probability of above median precipitation and regions shaded white have a 40-60% chance of above median rainfall.









Figure 9: ECMWF forecast rainfall probability values for northern and eastern Australia – and the region generally for April to June 2020. (Courtesy ECMWF).

At this stage, most regions of northern Australia indicate about a (normal) 40%-60% probability of above median rainfall for this seasonal period, Autumn 2020.







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) may next be due in longitudes relevant to northern Australia around early January. 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 January 2020. The purple line for November, the red line for December. 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 January 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 <u>1 January to 31 March 2020</u>



Seasonal climate forecast valid 1 November 2019 to 31 January 2020



Seasonal climate forecast valid 1 September to 30 November 2019



Seasonal climate forecast valid <u>1 December 2019 to 29 February 2020</u>



Seasonal climate forecast valid 1 October to 31 December 2019



Seasonal climate forecast valid 1 August to 31 October 2019





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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Northern Australia Climate Program

Seasonal Climate Outlook Supplement North West QLD January 2020

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All of the maps on these pages are from the Bureau of Meteorology webpage. You can access them yourself for more information. http://www.bom.gov.au/climate/rainfall-onset/ and https://www.longpaddock.qld.gov.au/aussiegrass/?tab=aussie-grass-maps Contact Megan Munchenberg:Email: megan.munchenberg@usq.edu.au or phone (07) 4748-5522







Climate outlook overview – January 2020

- For 14-19 January, a wetter than average week is likely across much of the north and west of the continent, as well as in southwest Queensland and northern parts of NSW.
- The fortnight of 20 January to 2 February is likely to be drier than average across northern WA, most of the NT, western SA, and parts of eastern Queensland.
- February to April has roughly equal chances of being wetter or drier than average for most of Australia. This means there is no push towards significantly wetter or drier than average conditions for most of the country over the coming three months.
- Parts of the far north are slightly more likely to be wetter than average.
- While outlooks for drier than average conditions have eased compared to those issued for late 2019 for most areas, several months of above average rainfall are needed to see a recovery from current long-term rainfall deficiencies.
- The positive IOD we experienced was one of the strongest on record and contributed to the significantly drier than normal conditions.
- While monsoon-like conditions were experienced over northern Australia this past week, and some locations experienced heavy rainfall, official thresholds used to determine the monsoon onset at Darwin were not met. Monsoonal flow was too shallow and did not last long enough over Darwin for the monsoon criteria to be met.
- The rapidly moving MJO and other tropical atmospheric waves have contributed to a shift of the most active tropical weather from northern Australia, further east into the northern Coral Sea.
- The MJO is forecast to rapidly track further east into the tropical southwest Pacific in the coming week, and so the strongly enhanced cloudiness and rainfall over northern Australia is expected to steadily reduce from next week

What is the Madden Julian Oscillation (MJO) and how does it affect our local weather?

The Madden-Julian Oscillation (MJO) is the major fluctuation in tropical weather on weekly to monthly timescales. The MJO can be characterised as an eastward moving 'pulse' of cloud and rainfall near the equator that typically recurs every 30 to 60 days.

MJO effects are most evident over the Indian Ocean and western equatorial Pacific. It influences the timing, development and strength of the major global monsoon patterns, including the Indian and Australian monsoons.

Tropical cyclones are also more likely to develop in association with certain phases of a strong MJO event.

The MJO is associated with variations in wind, cloudiness, and rainfall. Most tropical rainfall comes from tall thunderstorms which have very cold tops. The MJO has its greatest effect on the tropical areas of Australia during summer. It may have some effect on parts of southern Australia; however this impact appears small when compared to the effect on northern regions.

The MJO can have an effect on the timing and intensity of "active" monsoon periods in northern Australia. This can lead to enhanced rainfall -in both the intensity of the rainfall and the duration of the rainfall.



Figure 1: MJO phase diagram for 14th to 29th of January 2020. The purple line for December, the red line for January. 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 14th to 29th January 2020 with the green line showing the (ensemble) mean.

For More information about the MJO: <u>http://www.bom.gov.au/climate/about/?bookmark=mjo</u> or <u>https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/foregfs.shtml</u>

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4 Probability of receiving above median rainfall during January 15th -31st 2020

The majority of the North West region has a below average to average chance of receiving above median rainfall during the 2nd half of January. The north western corner of the Gulf has a low 35 -45% chance of receiving above the median rainfall in the next fortnight. Further to the east the chance increases.



Probability of receiving above median rainfall during February 2020



The majority of the North West region has a 45 -50% chance of receiving above median rainfall during February which is roughly equal chances of being wetter or drier than average. Excluding the region around Richmond and Hughenden where it is predicting a low 30-35% chance of being above the median or a 70 -75% chance of <u>not</u> being above the median.

Probability of receiving at least 50 mm during January 15th -31st 2020

Most areas show that the probability of receiving at least 50mm during December is between 25 - 50% chance for much of the region. The further North, the higher the % chance.



Maximum temperature outlook for 15th-31st of January

There is an 80% chance of above median temperatures for January for much of the Gulf with the more southern regions of North West QLD with a 60% chance of reaching Max Temps.



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What has been the accuracy of forecasts during this period in the past? Past Accuracy is 65% for the period of 15th -31st January across much of the North West.



What about looking ahead one month to February 2020?



The accuracy looking forward a month is much lower through much of the north west, with accuracy being above 50% in the eastern Gulf around Normanton and between 45-50% accurate elsewhere.

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7 How much rain is normally received during January across the North West?

The average and median rainfall totals for January for a number of North West QLD locations is included in the following table;

Average and median rainfall totals for the month of January (mm)					
Recording Station	Median	Average	Recording Station	Median	Average
Cloncurry Airport	107.8	157.5	Gregory Downs	113.5	140.9
Julia Creek Airport	91.2	124.9	Burketown Airport	195.9	223.7
Normanton Airport	186.4	239.3	Mount Isa Airport	70.8	114.7
Richmond Airport	90.6	121.3	Hughenden Airport	89.8	114.5
Camooweal	65.9	98.0	Georgetown Airport	191.4	224.9

(Figures from BOM. Do you know where to find this historical data for your nearest weather station? Get in touch and I can help you find it)

Median or Average?

The BoM uses median rainfall rather than average rainfall for forecasting, as median rainfall is a more reliable predictor than average. The median is the middle value of all recorded data, and the average is the sum of all data values divided by the number of data values.

To learn more about the Madden Julian Oscillation (MJO) head to the following website where you can watch a video all about the MJO and other local climate drivers for Australia:

http://www.climatekelpie.com.au/index.php/climatedogs/#mojo



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Root Zone Soil Moisture Levels



Root Soil Moisture levels are between 7% in the southern regions up to around 32% in the North.

Anything above 23% moisture levels is primed for growth of pastures with as little as 2-3mm of rainfall. Many of these areas are well below 23 % due to low rainfall. Soil moisture levels can be looked at as a predictor of potential pasture growth. Root Zone Soil Moisture is the sum of water in the Upper and Lower soil layers and represents the percentage of available water content in the top 1 m of the soil profile.

Pasture Growth Predictor

Chance of Exceeding Median Growth December 2019 to February 2020

For much of the North West, the chance of exceeding median growth of pastures is below average to average.

Chance of Exceeding Median Growth December 2019 to February 2020



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www.LongPaddock.qld.gov.au

WHAT DOES THIS INFORMATION MEAN FOR YOUR BUSINESS?

This information may help you with some of your decision making.

Have you received your median or average rainfall for the month of January yet?

Have you thought about what you are going to do if you don't get rain?

Is early weaning an option so that you can give cows a better chance to maintain their condition in the drier conditions?

If you don't get rain, have you set a date that you will wean calves?

If your still feeding supplement, can you continue feeding supplement and will this be of benefit to your livestock and your business profitability?

Can you sell the least productive cows such as pregnancy tested empty and late calving cows early?

Feeding livestock, or selling livestock?

What are the markets doing and what other rainfall/drought has there been in other areas of the country that could impact your market access or provide new opportunities for market access?

Are there opportunities for further development on your property to improve your ability to improve production during dry years? E.g. More watering points, division of paddocks to improve pasture utilisation and to allow for regular wet season spelling.....

Future updates and more information

The next local update will be available in early to mid-February.

Scroll down for links to more information and websites.

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For more information, the following websites could be useful. Click on the links to take you there.

Bureau of Meteorology

Climate drivers: a useful site that explains the influences on the Australian climate http://www.bom.gov.au/climate/about

Seasonal outlooks: forecast information for the next few months http://www.bom.gov.au/climate

Weekly local forecast: MetEye http://www.bom.gov.au/australia/meteye

Put in your location or postcode for a 7- day forecast for your location. Depending on your location, this forecast can be relatively accurate.

Australian CliMate

A free online app for your smart device where landholders can get a whole lot of Information about their local area, including how's the season, the drought situation, El Nino, rainfall and temperature trends, and much more. <u>https://climateapp.net.au</u>

The Long Paddock Website

A Queensland Government website providing seasonal climate and pasture condition information to the grazing community. https://www.longpaddock.qld.gov.au/seasonal-climate-outlook/about/

UK Met Office For medium to longer term forecasts:

https://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/gpc-outlooks/globseas-prob

ECMWF Medium term forecasts:

https://www.ecmwf.int/en/forecasts/charts/catalogue/seasonal_system5_public_standa rd_rain?facets=Range,Long%20(Months)&time=2019010100,2208,2019040300&stats=tsu m_

WX Maps Useful US site for an alternative 6-day forecast and short-term climate outlook: <u>http://wxmaps.org/fcst.php</u>

National Oceanic and Atmospheric Administration https://www.noaa.gov/

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