

GETTING THE MOST OUT OF BUREAU OF METEOROLOGY DATA

By Paulette Baumgartl

Australia's Bureau of Meteorology website (bom.gov.au), with its associated app, is one of the most well-known websites in Australia. The status of the Bureau of Meteorology among Australians is testament to the importance of weather and climate in a country famous for its extremes.

Behind the weekly temperature and rainfall forecasts, and the much-loved radar, sits an abundance of data, both raw and interpreted. If you know where to look, this data can be a useful decision-making tool.

In a recent PotatoLink online training webinar, Agricultural Segment Lead Rachel Davis and Senior Meteorologist Jonathan How guided participants through the website's many functions and useful features to help growers understand, react, and respond to their local weather.

THE BUREAU AND PRIMARY INDUSTRIES - SOME BACKGROUND

With a directive to generate more than \$300 million in new economic and social value for the agricultural sector,

the Bureau of Meteorology supports the agricultural industry by ensuring that weather, climate and water products meet the needs of the sector.

One output of this agenda is *Forewarned is Forearmed* (FWFA), a five-year project that concluded in 2022 aimed at helping farmers and agricultural value chains to proactively manage the impacts of extreme weather events.

Farming in one of the most variable climates in the world means that extreme weather events and climate variability have a significant impact on agricultural production and income.

KEY POINTS

- The Bureau of Meteorology provides weather observations and historical data dating back to the 1800s.
- This data helps in understanding climate patterns, optimal planting windows for crops, and potential risks associated with weather events.
- Average condition maps illustrate rainfall, temperature, sunshine, cloud cover, wind patterns, cyclones, storms, and bushfire occurrences. They are useful for quickly understanding typical weather patterns in a specific area.

- Nowcasting provides real-time weather information for the immediate future, ranging from the next minute to the next hour. Users can access the radar and satellite viewers to track rainfall, storms, cloud cover, and wind patterns.
- Forecasting uses advanced models to provide weather forecasts for the coming weeks, months, and seasons. The MetEye tool allows users to access comprehensive forecasts for specific locations and provides insights into the probability of rainfall occurring.
- Futurecasting involves seasonal and long-range forecasts. The

Climate and Past Weather section offers climate outlook maps and tools to assist in decision-making for sectors like agriculture.

- The Bureau's website provides navigation instructions to access historical data, recent observations, nowcasting tools, and forecasting tools. Users can visit the specific sections under the Climate and Past Weather category to access the desired tools and information.



Watch the training session and access the links to the key tools here (<http://bitly.ws/PQam>).

The outcomes of FWFA include new forecast products, all freely available via the Bureau's climate outlooks website and described in more detail on p 31.

The agricultural sector can also look forward to more tailored tools in the near future, including:

- Climate Services for Agriculture (CSA) – a partnership with the Future Drought Fund and CSIRO – which will provide farmers with climate information for their local area to help them better prepare for climate risks (read more here, <http://bitly.ws/luiM>).
- Agri-Climate Outlooks (ACO) – a partnership with Agricultural Innovation Australia and CSIRO – which examines seasonal risks and opportunities at farm and commodity scale (read more here, <http://bitly.ws/luiW>)
- ObsCheck, a weather quality control service to check private automated weather stations and unlock value from non-Bureau weather observations.

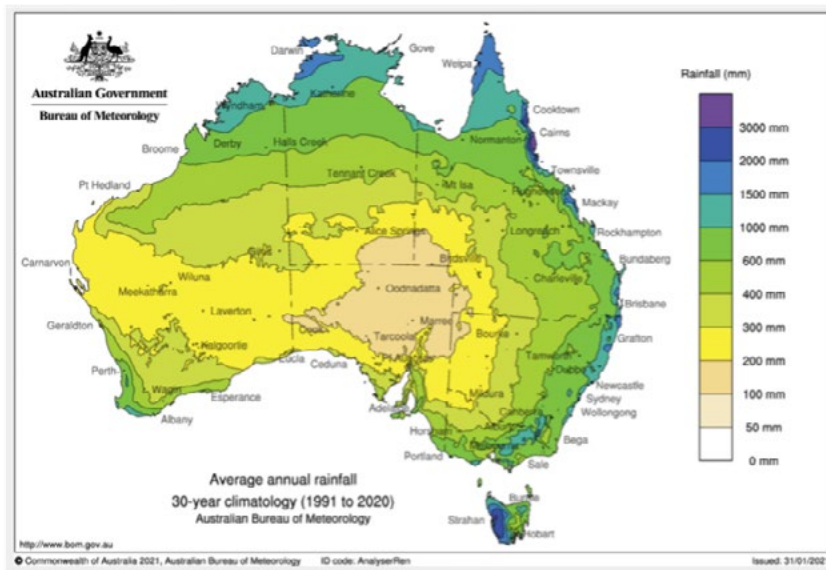
HISTORICAL OBSERVATIONS

When discussing weather, 'historical' refers from one week ago to the beginning of recorded weather records. The Bureau houses an extensive collection of weather observations and historical data on their website, dating back to the 1800s for some locations.

Historical data is particularly valuable if you find yourself in a new area. By accessing this data, you can gather essential insights about the climate patterns and conditions of the region, providing data, for example, to determine the optimal planting window for crops and understand potential risks associated with weather events.

Find historical data here (<http://bitly.ws/PQlw>)

In addition to the Bureau's tabulated data archive, the website contains a multitude of average condition



Example of the climate maps available. Options exist to select month and state. Image source: screen shot shared via the BOM Creative Commons Licence

maps. These provide a visually comprehensive overview of the aggregated weather conditions in a specific area. The maps encompass a range of parameters, including rainfall, temperature, sunshine, radiation, cloud cover, humidity, evaporation, wind patterns, cyclones and storms, and bushfire occurrences.

Average condition maps serve as a valuable tool for gaining a quick overview of the typical weather patterns and characteristics of an area. The maps can be found here: <http://www.bom.gov.au/climate/maps/averages/>

RECENT OBSERVATIONS - YESTERDAY TO LAST WEEK

Each state and territory in Australia has its own dedicated **recent observations page**, which records the data from the Bureau's automatic weather stations throughout the country. The BOM app also has observations for the past 72 hours.

Most weather stations report their data every 30 minutes, providing regular updates on temperature, humidity, wind speed, and other relevant parameters. However, some stations may only report once a day, so it is crucial to keep this in mind when accessing the observations.

Not all stations accurately represent the microclimate of specific properties

Factors such as local topography and vegetation can significantly affect weather patterns.

Rainfall measurements are recorded by an extensive rain gauge network which comprises a combination of Bureau-owned and privately-owned stations.

How to find recent observations

Website: BOM home page → click on your state or territory on the map of Australia → middle column, click the first link 'All observations' → In the left column (Latest Weather) choose latest observations, observations via clickable map then navigate to



Example of recent observations as displayed on the BOM app. Image source: screen shot shared via the BOM Creative Commons Licence

the weather station closest to your property.

Phone app: Search your location at the top; select 'past' on the bottom menu

NOWCASTING - NOW TO A FEW HOURS AHEAD

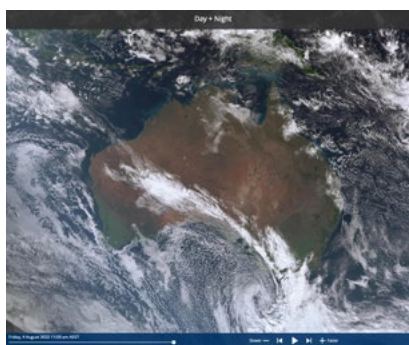
Nowcasting provides real-time weather information for the immediate future, typically ranging from the next minute to the next hour. This becomes particularly important during significant storm outbreaks or periods of extreme or catastrophic fire dangers when a wind change is anticipated.

The **radar** (<http://www.bom.gov.au/australia/radar/>) is the most accessed nowcasting tool, beloved by urban and rural Australians alike, and is used to view and track rainfall and storm events.

The Doppler radar (denoted by the black diamond symbol) can also capture smoke and insect swarms under some conditions.

Another essential tool is the **satellite viewer** (<http://satview.bom.gov.au/>), which displays fresh images every 10 minutes. While a fast internet connection is necessary, this tool plays a significant role in providing visual information.

Additionally, the BOM app offers a satellite tool that provides images every 90 minutes. While it may not capture new storm developments, it extrapolates existing weather patterns to predict their future behaviour and movement.



Satellite view of Australia, updated every 10 minutes: screen shot shared via the BOM Creative Commons Licence

Positioned below the radar on the website, the satellite tool offers users an astronaut's view of weather patterns. By correlating information from these tools, individuals can make informed decisions relating to weather. For example, anticipate the arrival of a cold front by observing cloud movement on the satellite view and track current storms using the radar.

It is important to note that not all clouds result in rainfall. It is therefore beneficial to switch between the radar, which shows rainfall intensity, and the satellite tool, which provides insights into cloud cover and storm formation. This analysis aids in accurately assessing rainfall prospects.

Warnings are another integral part of nowcasting, providing timely updates and guidance.

The Bureau's website also features a **rainfall viewer/update tool**, which visually displays the latest rainfall data on a map. Users can zoom in to their specific area, and the tool covers a daily period up to three years. Additionally, users have the option to view the data in a tabular format for a more detailed analysis.

Find the rainfall tool here

(<http://www.bom.gov.au/climate/rainfall/>).

FORECASTING AND FUTURE CASTING - NEXT WEEK TO NEXT SEASON

Have you ever wondered what lies ahead in the coming weeks, months, or even seasons? Weather

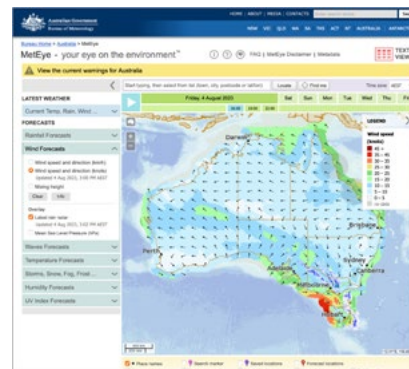


Visual presentation of recent rainfall. Image source: screen shot shared via the BOM Creative Commons Licence

forecasters rely on advanced modelling techniques to provide insight into future weather patterns. In Australia, the Bureau uses the Australian Community Climate and Earth System Simulator (ACCESS) model, specifically developed by their scientists to cater to the unique needs of the Australian climate.

These models are continually refined and improved over time, ensuring that the forecasts generated are accurate and reliable.

MetEye (<http://www.bom.gov.au/australia/meteye/>) provides a summary of these predictions. By default, the tool displays wind information but can be customised to show other parameters of interest.



Met eye map displaying wind forecasts. Image source: screen shot shared via the BOM Creative Commons Licence

Users can zoom in on specific locations or search for a particular area to obtain a comprehensive forecast for the next seven days, offering useful insights on whether the conditions will be suitable for on-farm activities like planting, spraying, irrigating, and harvesting.

The percent chance of rain displayed in the forecasts represents the likelihood of precipitation based on the consensus of various weather models. This information offers valuable insights into the probability of rainfall occurring in a specific area.

Future casting looks ahead to seasonal and long-range forecasts. These forecasts play a vital role in decision-making in agriculture. The Bureau's Climate and Past Weather section offers climate outlook maps, empowering users to gain a deeper understanding of future climate trends and anticipate any potential extreme weather events.



Climate outlook maps visually illustrate the modelled three month forecast. Image source: screen shot shared via the BOM Creative Commons Licence

Within the Climate and Past Weather sits the outcome of the **Forewarned is Forearmed** project. This provides additional tools to help producers prepare for extreme weather conditions.

The **Chance of Extremes** function enables users to determine the severity of dry periods by comparing historical records, helping to plan and mitigate potential risks. Similar analysis can be conducted for temperature data, and three-day rain events with rainfall probability maps displaying the likelihood of exceeding 3-day rainfall totals, ranging from 15mm to 75mm in the weeks and fortnights ahead.

For those interested in the **accuracy of the model's forecasts**, the Bureau offers an accuracy map. Generally, the model exhibits higher accuracy during winter months, providing users with a reliable estimation of future weather conditions.

How to find the forecasting tools

BOM homepage under → Climate and Past Weather → long range forecast.

EVAPOTRANSPIRATION

The Bureau offers evapotranspiration forecasts via its Real-time Data Services, which are subscription-based services.

Registered users can access the evapotranspiration grids, based on the Australian digital forecast database, via an FTP (file transfer protocol) system (Product ID IDBZ0003, Product Name, ADFD Evapotranspiration Grids – Australia (state-based) – Bundle).

The gridded evapotranspiration forecasts are updated twice daily, and include one to seven day forecasts.

More information on this service is available at <http://reg.bom.gov.au/reguser/reguser.shtml>

A service catalogue and charges for registered users at <http://reg.bom.gov.au/other/charges.shtml>

A user guide can be downloaded at http://reg.bom.gov.au/catalogue/Gridded_Evapotranspiration_User_Guide.pdf

Modelled data on evapotranspiration is also available through the Bureau's free to use **Australian Water Outlook** (<https://awo.bom.gov.au/products/historical>).

This interactive website offers comprehensive information on various components of the landscape water balance, including soil moisture, runoff, evapotranspiration, and precipitation across Australia.

The Australian Water Outlook allows users to access information over different timescales. For historical data, daily gridded outputs of precipitation, soil moisture, runoff, and deep drainage are available from 1911 until the previous day.

Seasonal forecasts, covering a range of 1 to 3 months, provide monthly outputs for root-zone soil moisture, evapotranspiration, and runoff. These forecasts are updated monthly to provide the most accurate information. Additionally, the website offers projections of changes in precipitation, soil moisture, evapotranspiration, and runoff for aggregated periods extending until the end of the century.

These projections are based on different greenhouse gas concentration pathways, multiple Global Climate Models (GCMs), a downscaled Regional Climate Model (RCM), and are corrected for bias.

THE BUREAU'S DATA ARCHIVES

Access for past weather and climate information is available from the Bureau's vast data archives, including data on temperature, humidity, rainfall, air pressure, sunshine, wind speed and direction, cloud and visibility.

Much of the information is free to download, although some charges may apply for specific services.

More information is available here:

<http://reg.bom.gov.au/climate/data-services/>



For any questions on the tools outlined, please contact agriculture@bom.gov.au