



NEM Summer Preparedness Briefing

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Bureau of Meteorology





















Valid at 29 November

National severe weather outlook: December 2022 – April 2023 summary

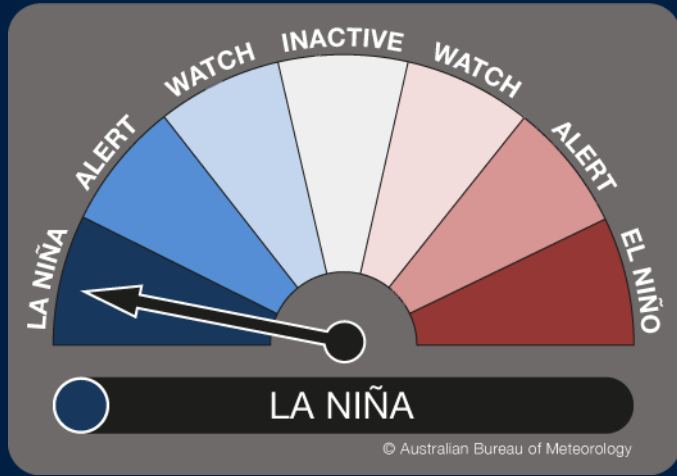
Impact

Likelihood compared to recent decades

| | | | |
|---|---|---|---|
|  | Widespread flooding (inc. landslides, tree falls) |  | More likely for eastern Australia |
|  | Coastal flooding |  | More likely eastern and northern Australia |
|  | Tropical cyclones |  | Above average seasonal activity likely |
|  | Fire potential |  | More likely in western and inland Australia |
|  | Heatwave |  | More likely in northern and Western Australia |
|  | Marine heatwave |  | Increased during summer |
|  | Storms |  | Similar |
|  | Drought |  | Less likely apart from SW WA and W Tas |
|  | Dust |  | Less likely |



Climate influences summary



El Niño-Southern Oscillation (ENSO)

- La Niña is underway in the Pacific Ocean.
- La Niña typically increases the chance of above-average rainfall for northern and eastern Australia during spring and summer.
- Long-range forecasts indicate La Niña may weaken early in 2023.

Indian Ocean Dipole (IOD)

- The negative Indian Ocean Dipole (IOD) event has weakened significantly.
- Models indicate IOD is likely to return to a neutral state by December 2022.

Southern Annular Mode (SAM)

- Southern Annular Mode (SAM) long-range forecasts indicate positive values are favoured until at least the end of 2022.
- Positive SAM during spring and summer typically increases the chance of above-average rainfall for parts of eastern Australia, while below-average rainfall is more likely for western Tasmania.

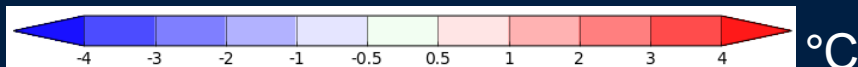
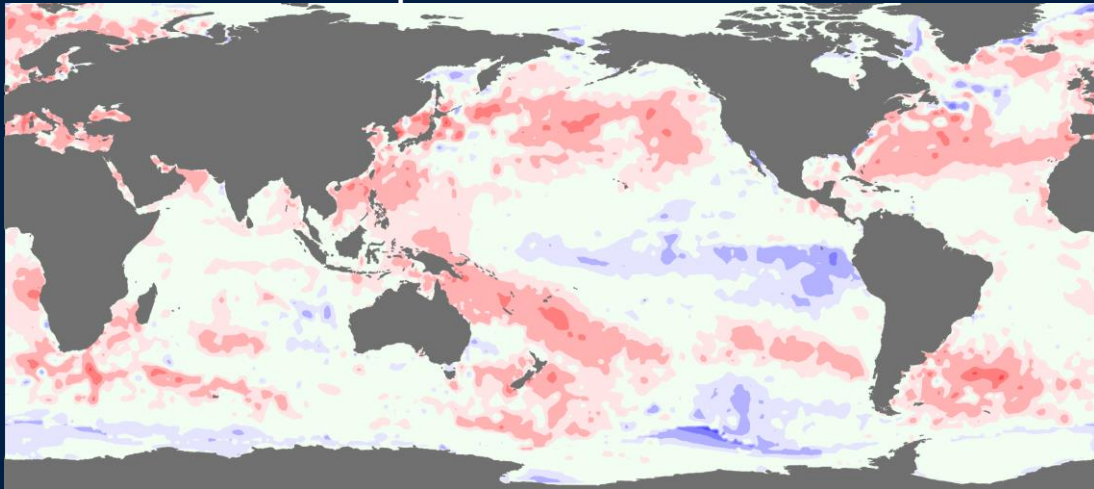
Ocean temperatures

- Sea surface temperatures are warmer than average around the southern Maritime Continent and Australian coastline. This pattern is likely contributing to the wet seasonal rainfall long-range forecasts for Australia.

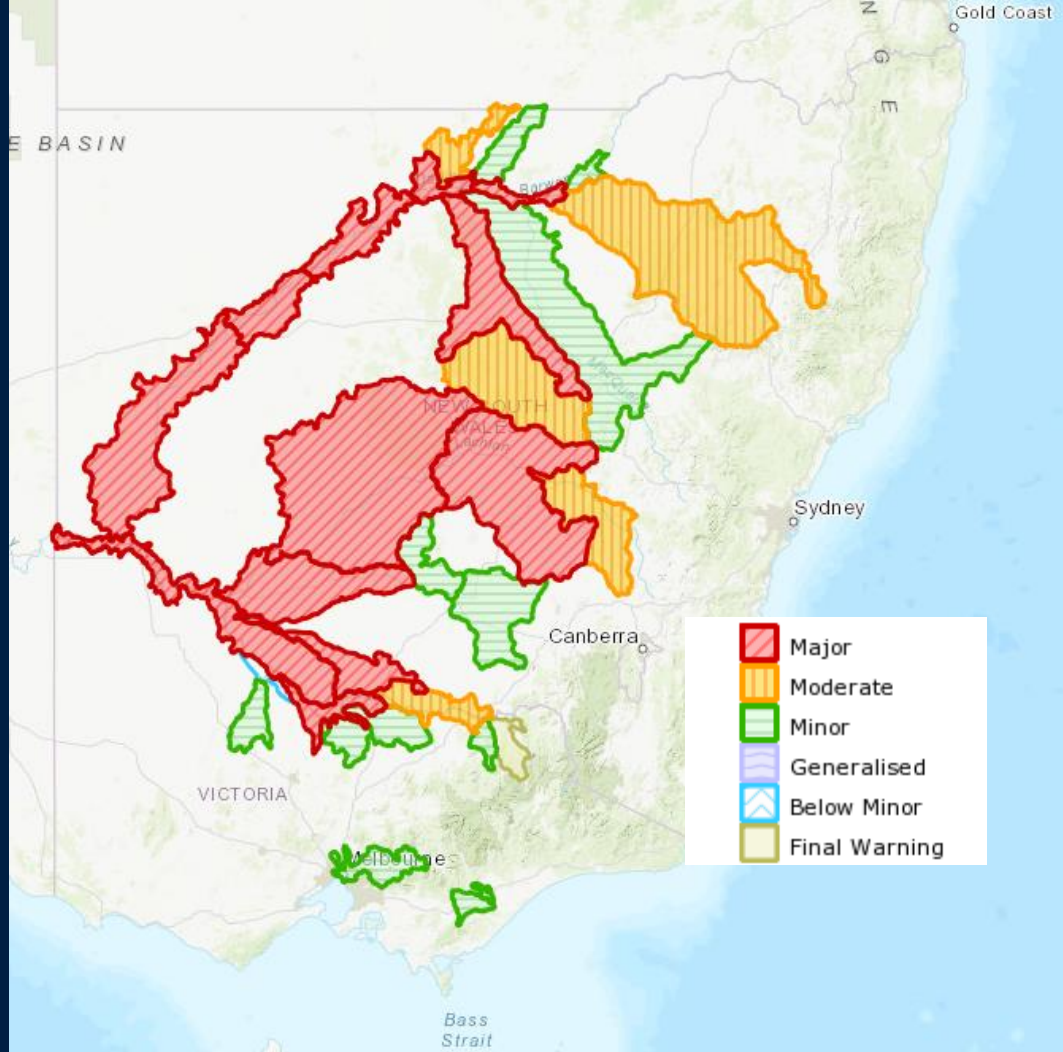
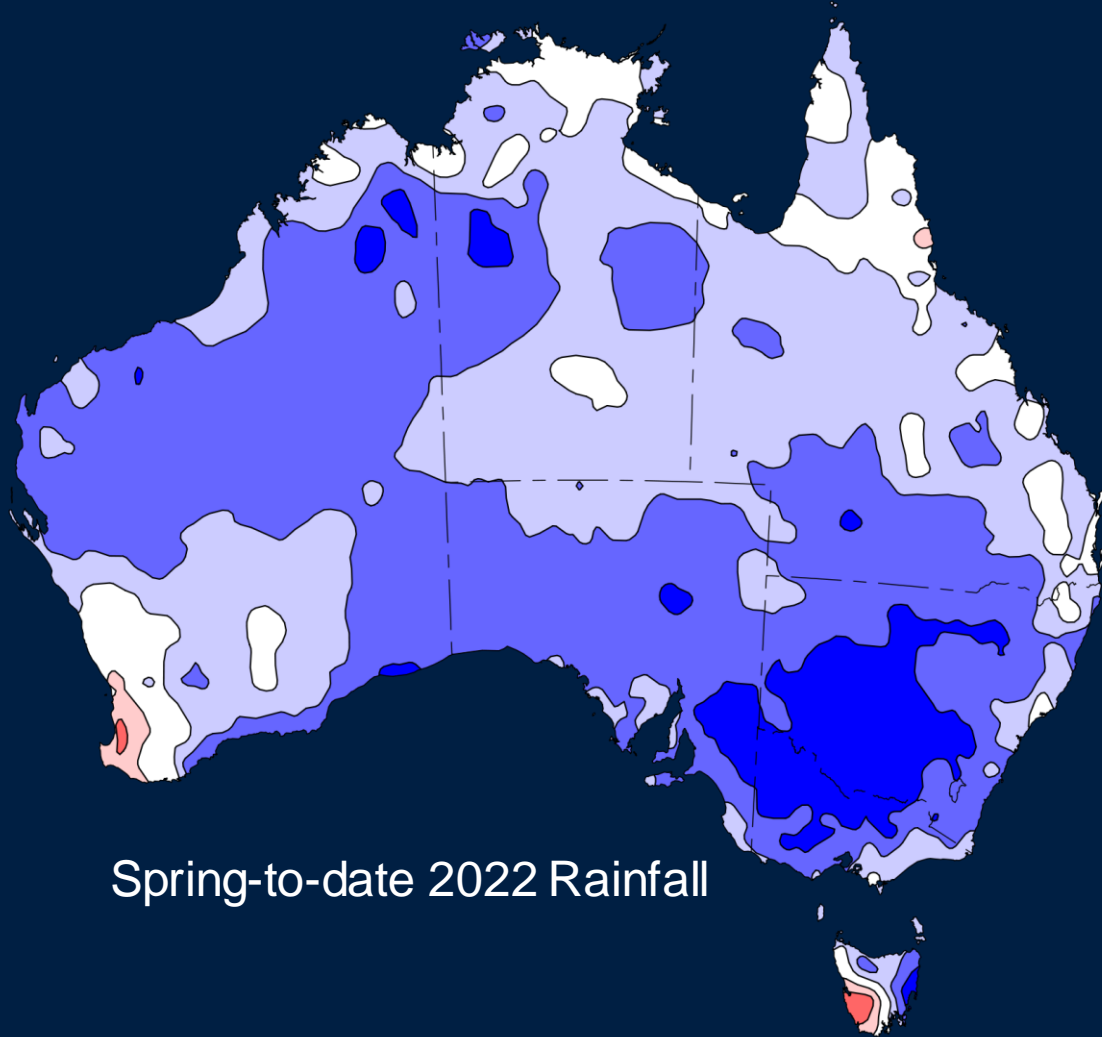
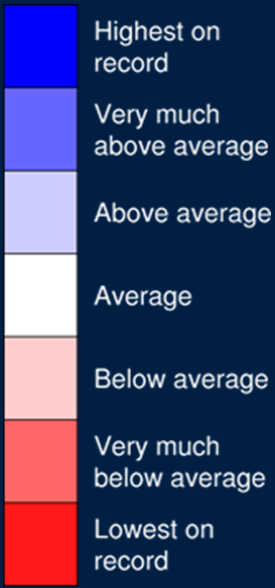
Long-term trends

- Australia's climate has warmed by $\sim 1.47^{\circ}\text{C}$ over the 1910–2020 period, leading to an increase in the frequency of extreme heat events. Rainfall across northern Australia during its wet season (October–April) has increased since the late 1990s. In recent decades there has been a trend towards a greater proportion of rainfall from high intensity short duration rainfall events especially in northern Australia.

Sea Surface Temperature difference from normal



Rainfall and current flooding



- Flood warnings and watches from southern Qld to southern Vic
- Major impacts upon agriculture, transport and natural environment
- Wettest spring on record for Vic/NSW/Murray Darling Basin, second wettest for Australia

Valid at 29 November

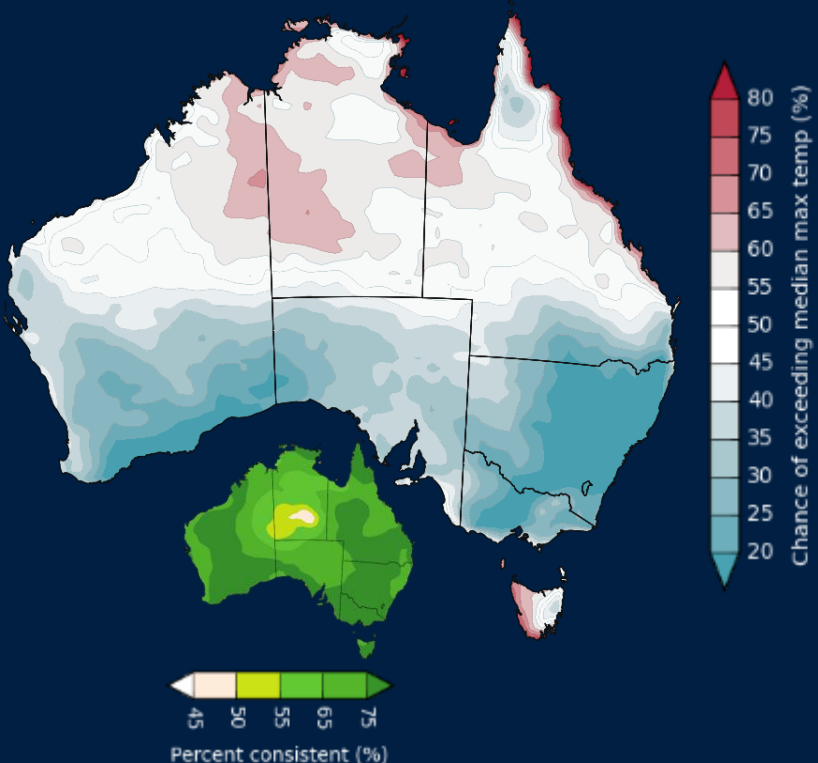




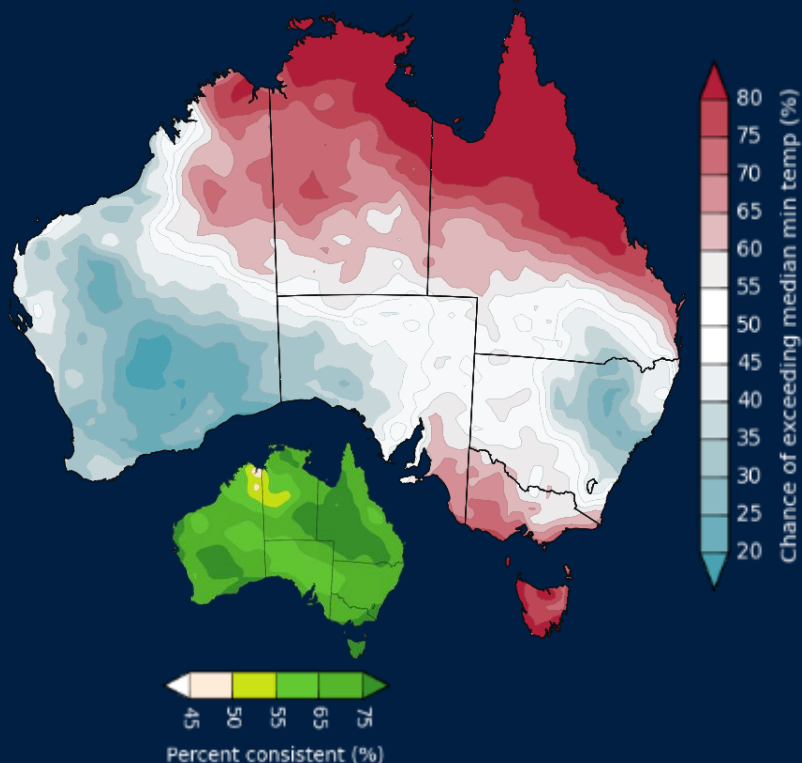
December 2022 long-range forecast

Chance of above median

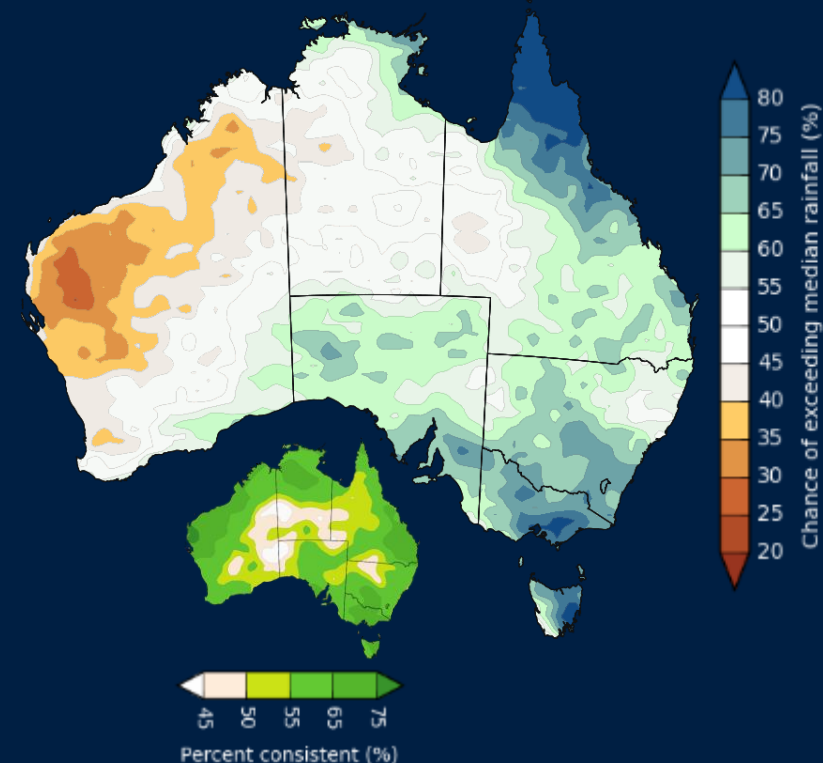
Maximum temperature



Minimum temperature



Rainfall



Reference period
1981-2018

- Below average daytime temperatures in the south; above median for parts of the north and Tasmania
- Warmer nights in the north and far south-east, cooler in WA and parts of NSW
- Near- to above-median rainfall likely for the east; below median for parts of Western Australia

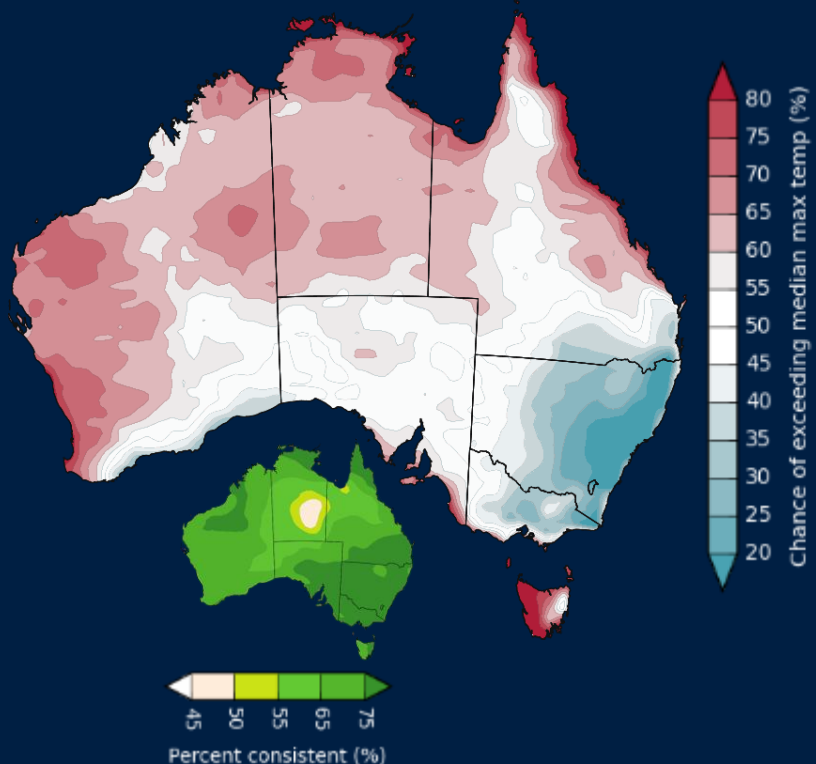




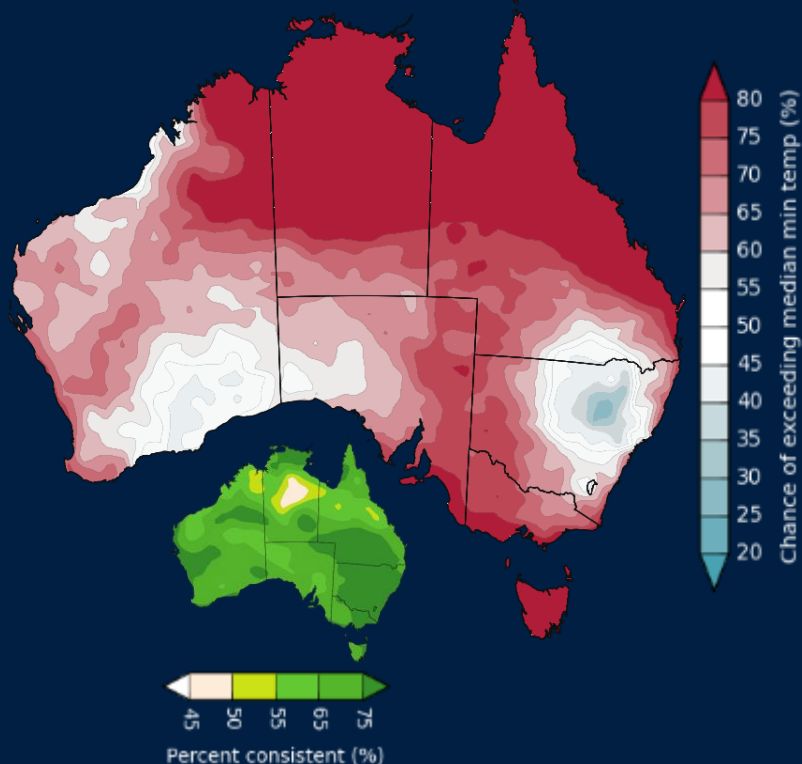
December 2022 – February 2023 long-range forecast

Chance of above median

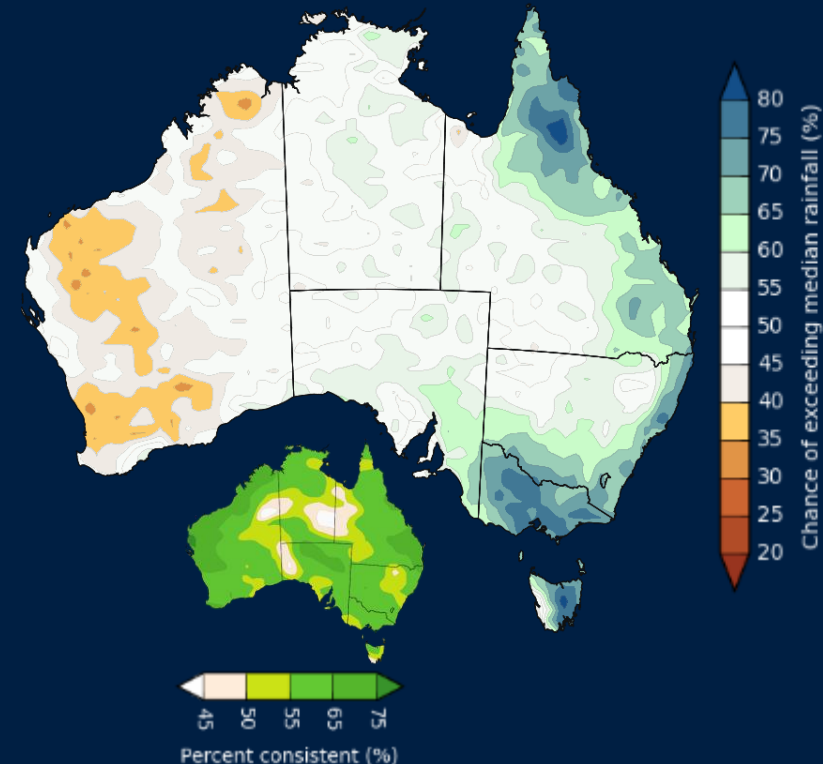
Maximum temperature



Minimum temperature



Rainfall



- Above-median daytime temperatures likely for most regions; below median likely for NSW and VIC
- Near- to above-median minimum temperatures likely for most regions
- Near- to above-median rainfall likely for most regions; below median likely for parts of western Australia

Reference period
1981-2018



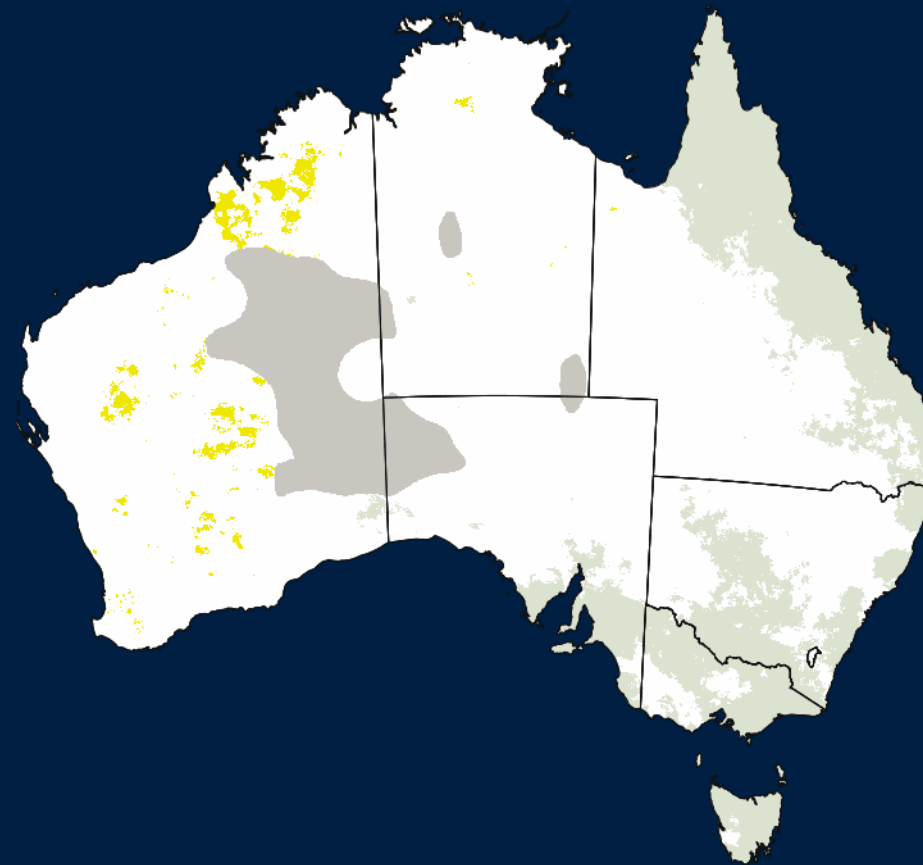
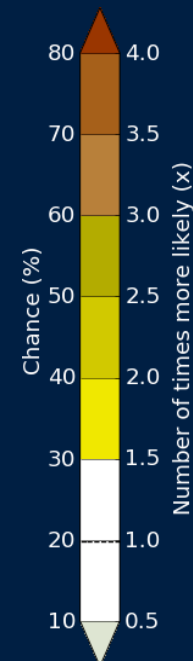
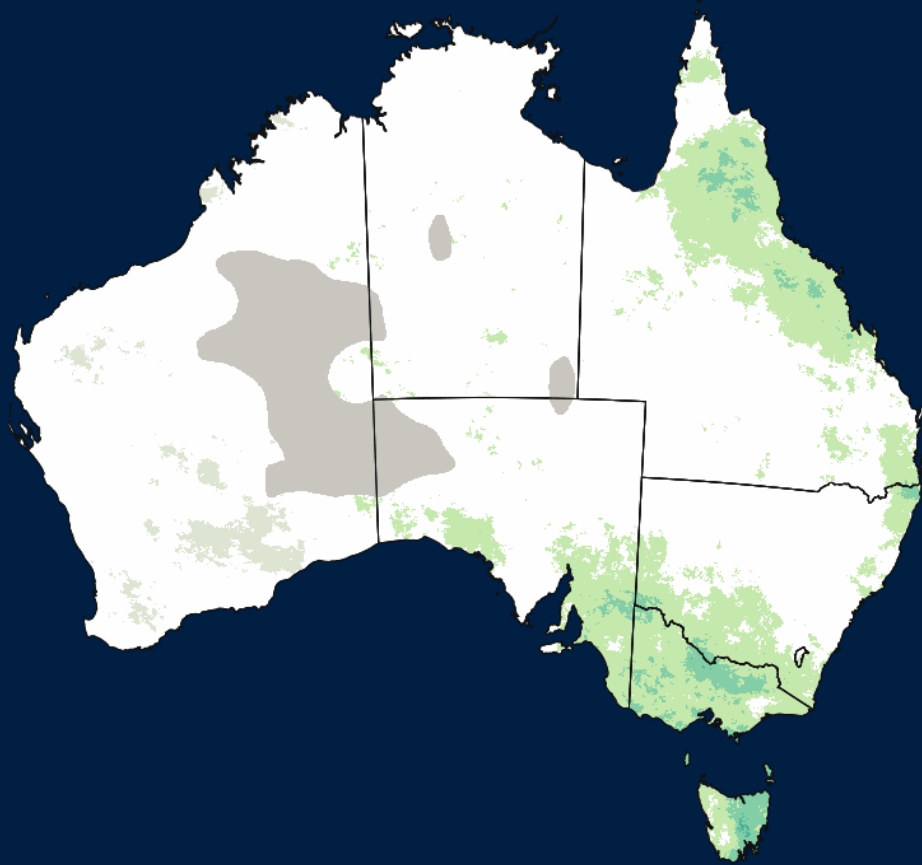
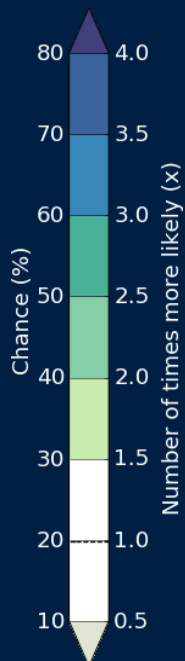


December 2022–January 2023 long-range forecast

Chance of unusually wet/unusually dry

Chance of unusually wet
(top 20% of historical range)

Chance of unusually dry
(bottom 20% of historical range)



- Unusually wet in the southeast and northeast, as well as SE Qld/NE NSW
- Isolated areas of very dry in WA

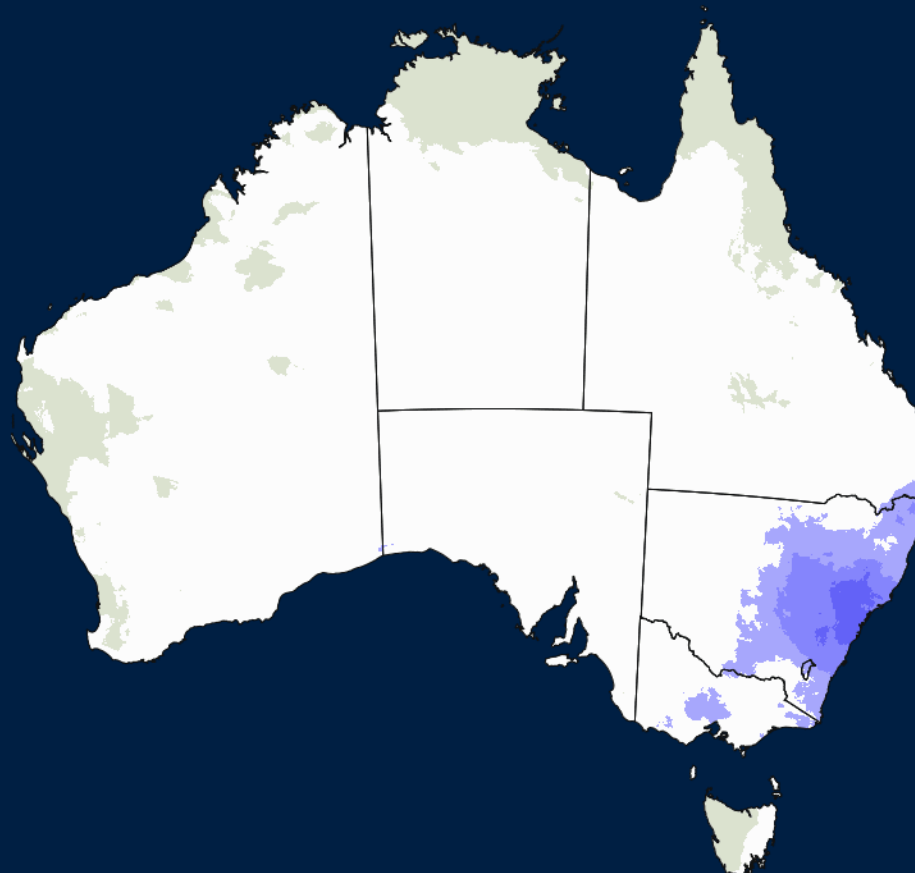
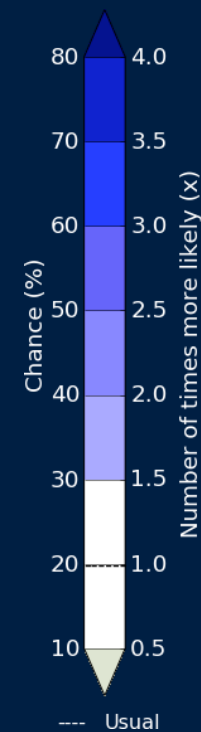
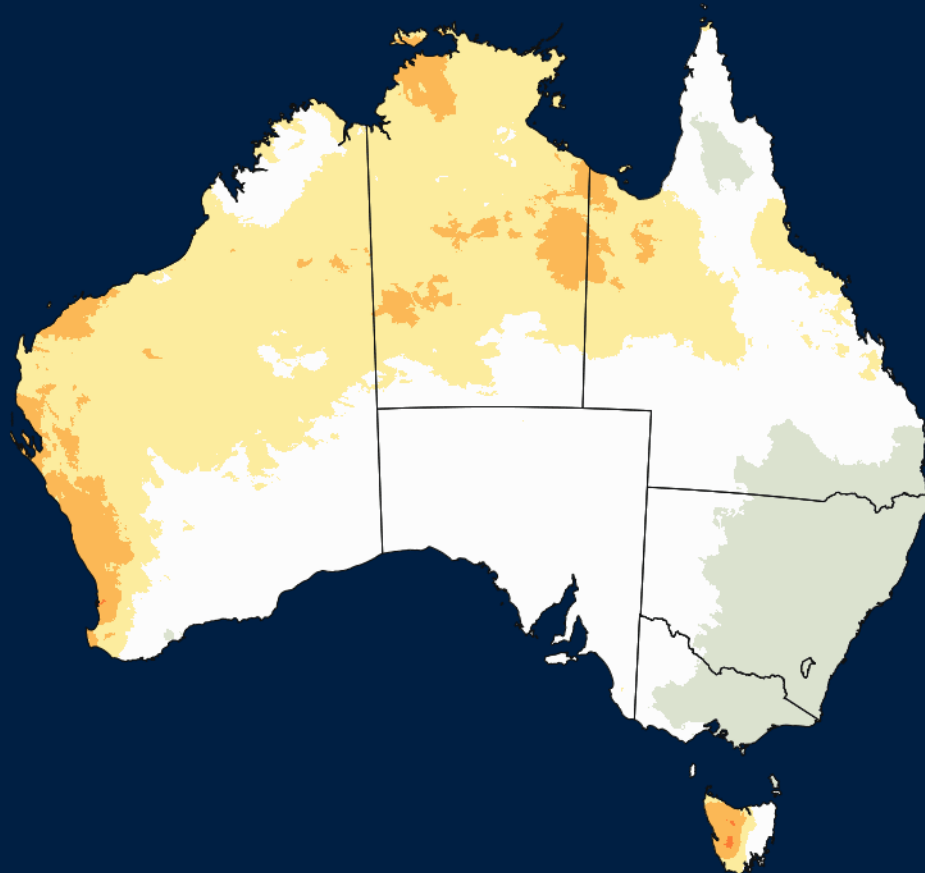
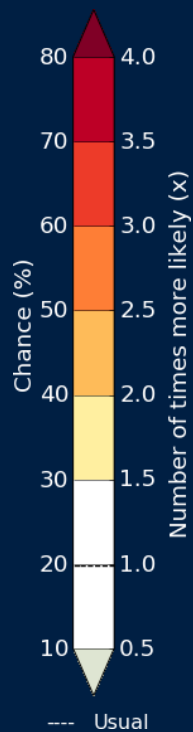


December 2022–January 2023 long-range forecast

Chance of unusually warm/unusually cool

Chance of unusually warm
(top 20% of historical range)

Chance of unusually cool
(bottom 20% of historical range)



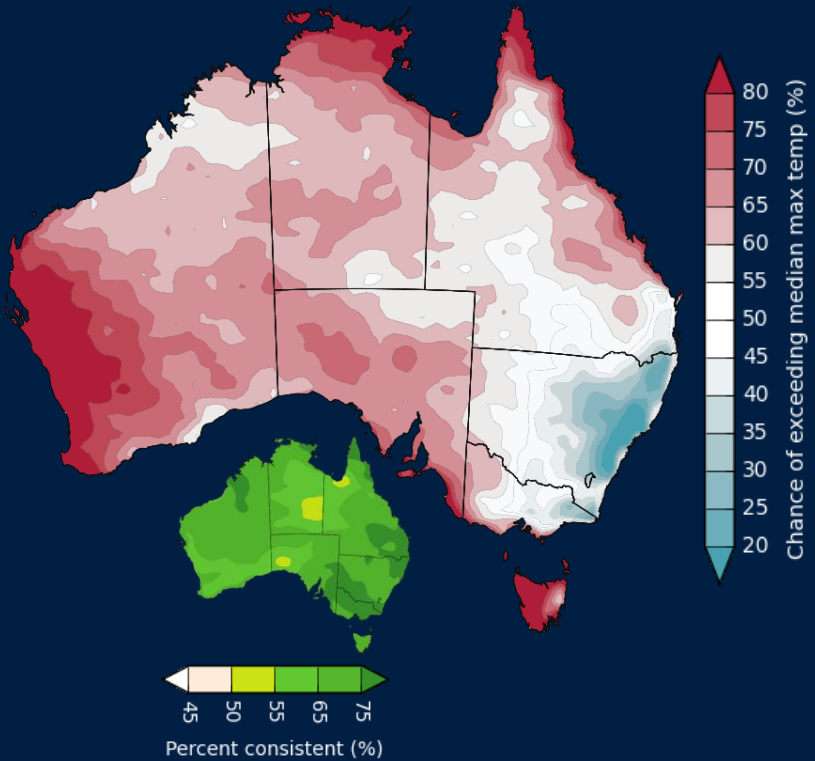
- Unusually warm in the west and north, as well as western Tasmania
- Cool in NSW and parts of Victoria



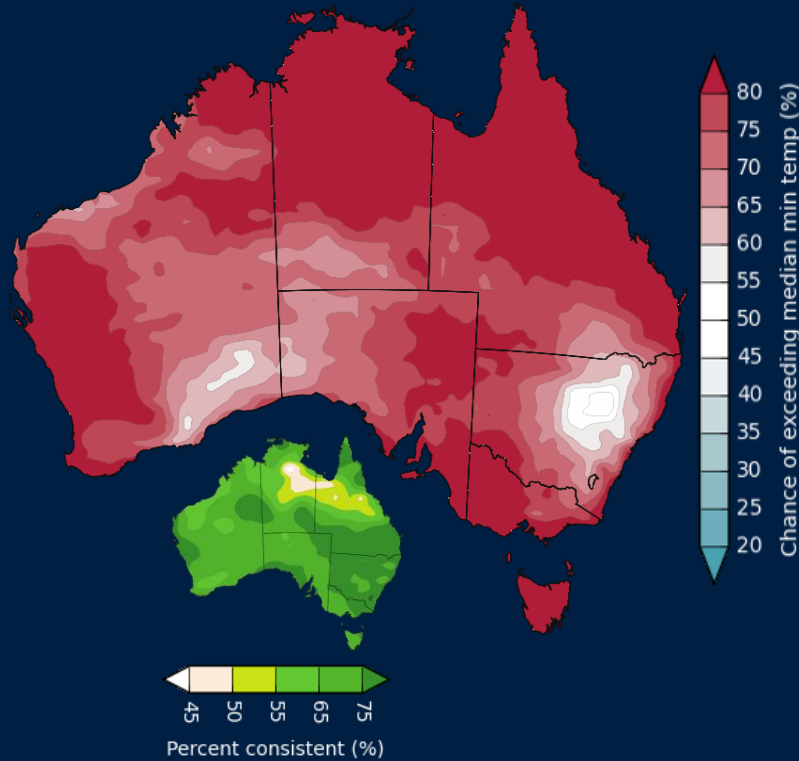
January – March 2023 long-range forecast

Chance of above median

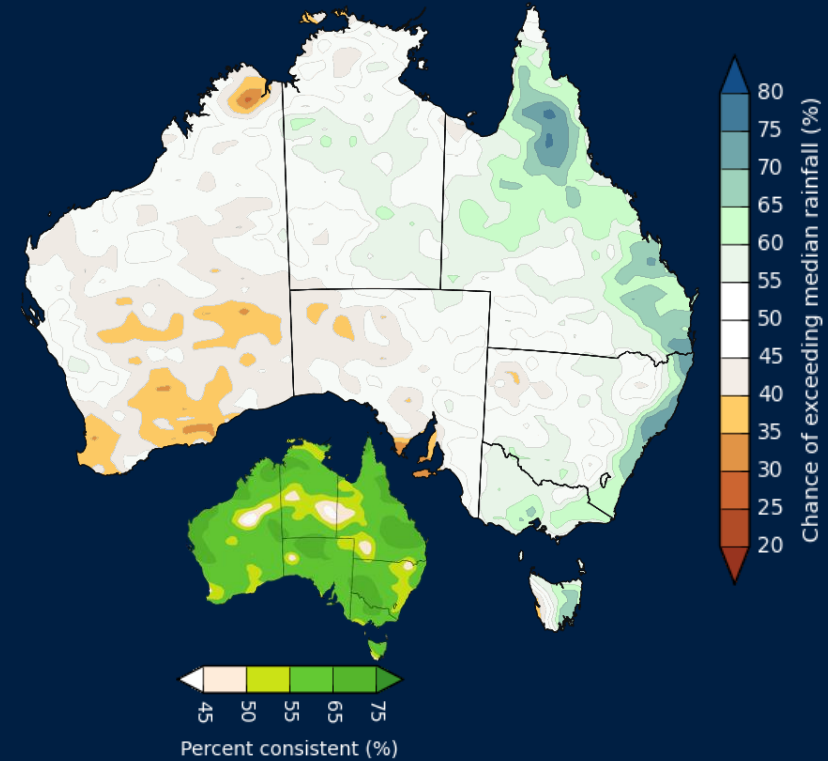
Maximum temperature



Minimum temperature



Rainfall



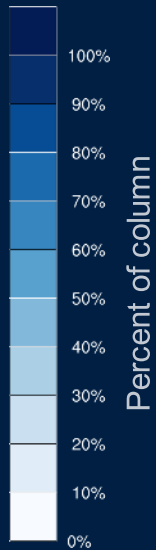
Reference period
1981-2018



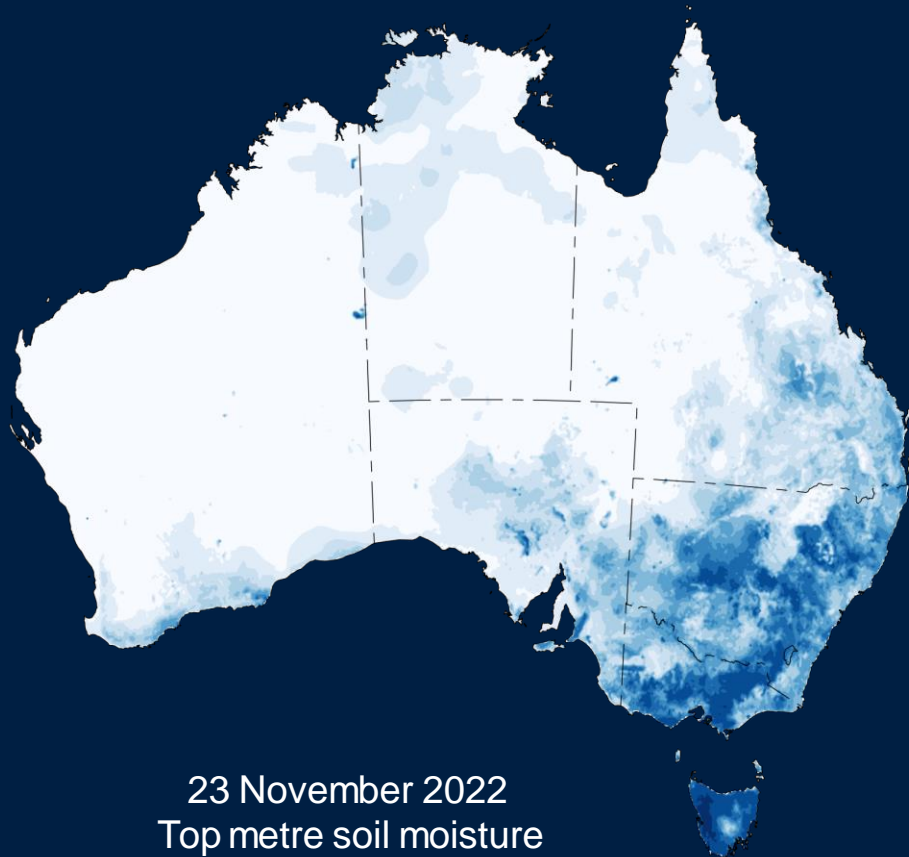
- Above-median daytime temperatures likely for most regions; below median for parts of NSW
- Above-median minimum temperatures likely for most regions
- Above-median rainfall likely for east coast; below median for parts of western Australia



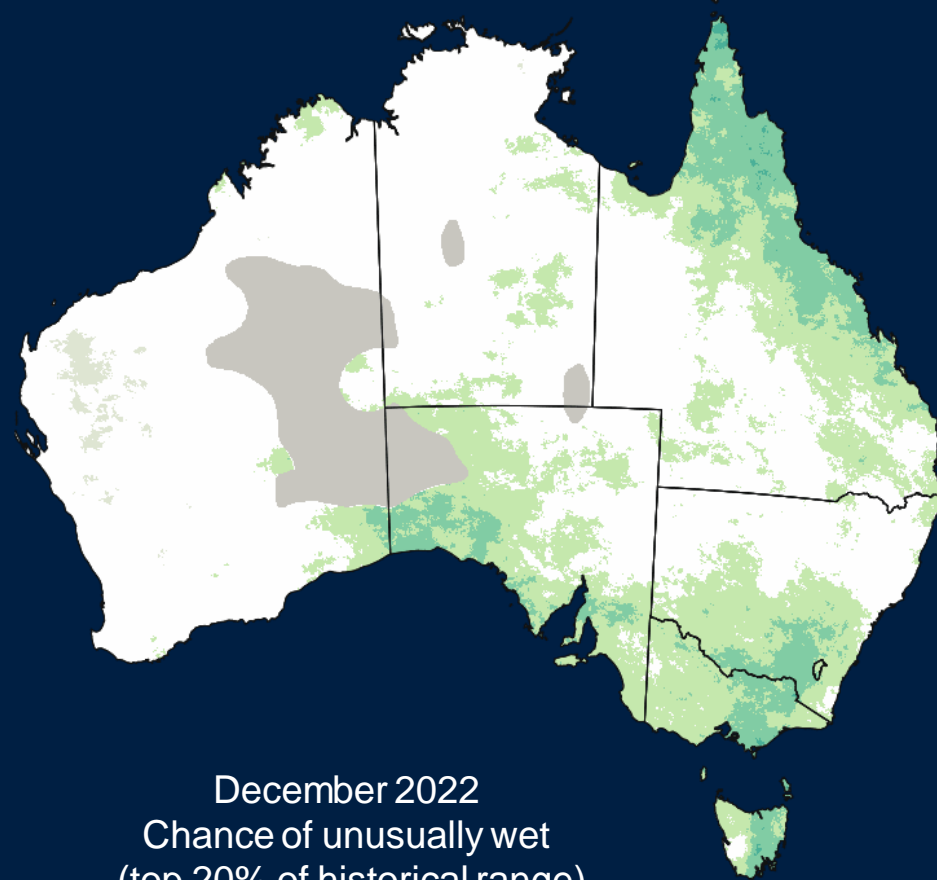
Flood risk



Percent of column

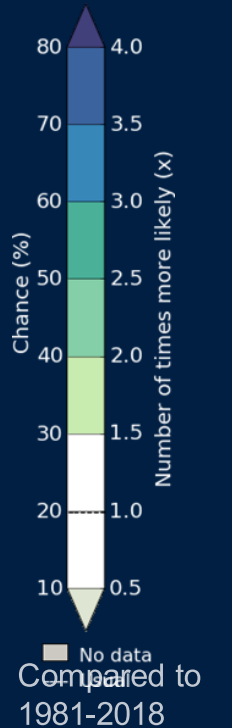


23 November 2022
Top metre soil moisture



December 2022
Chance of unusually wet
(top 20% of historical range)

Model run date 23/11/2022



- Soil moisture levels are high across much of eastern Australia, including Tasmania
- More rain on wet soils means increased risk of high runoff and flooding





Most water storages full or near full

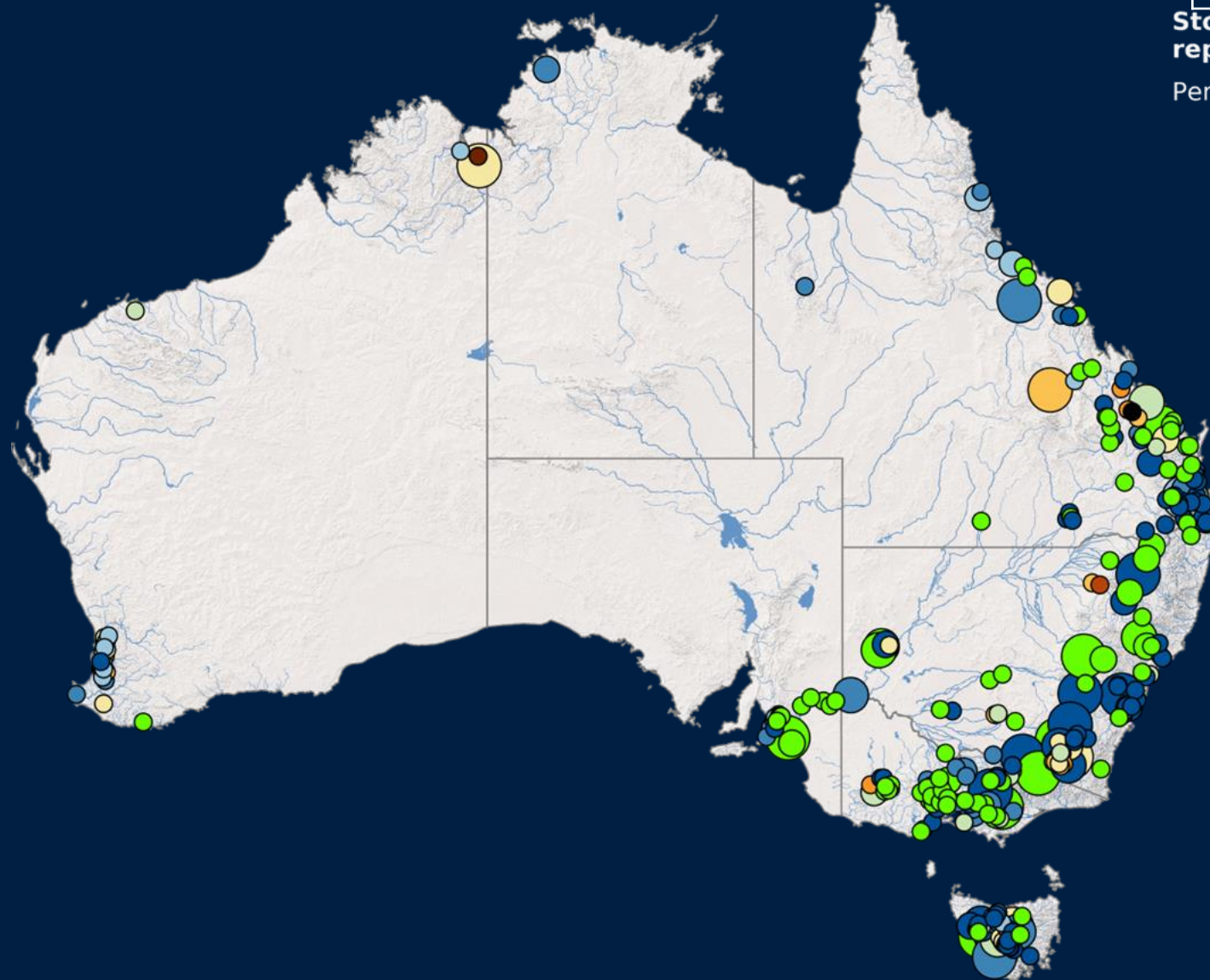
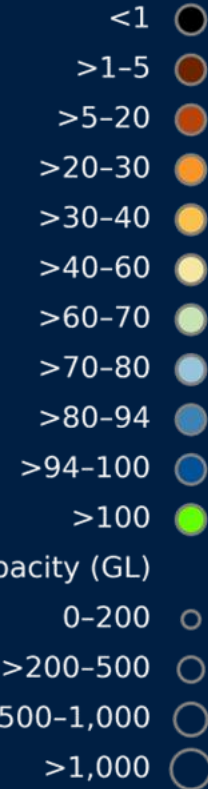
Urban Storages

Percentage Full

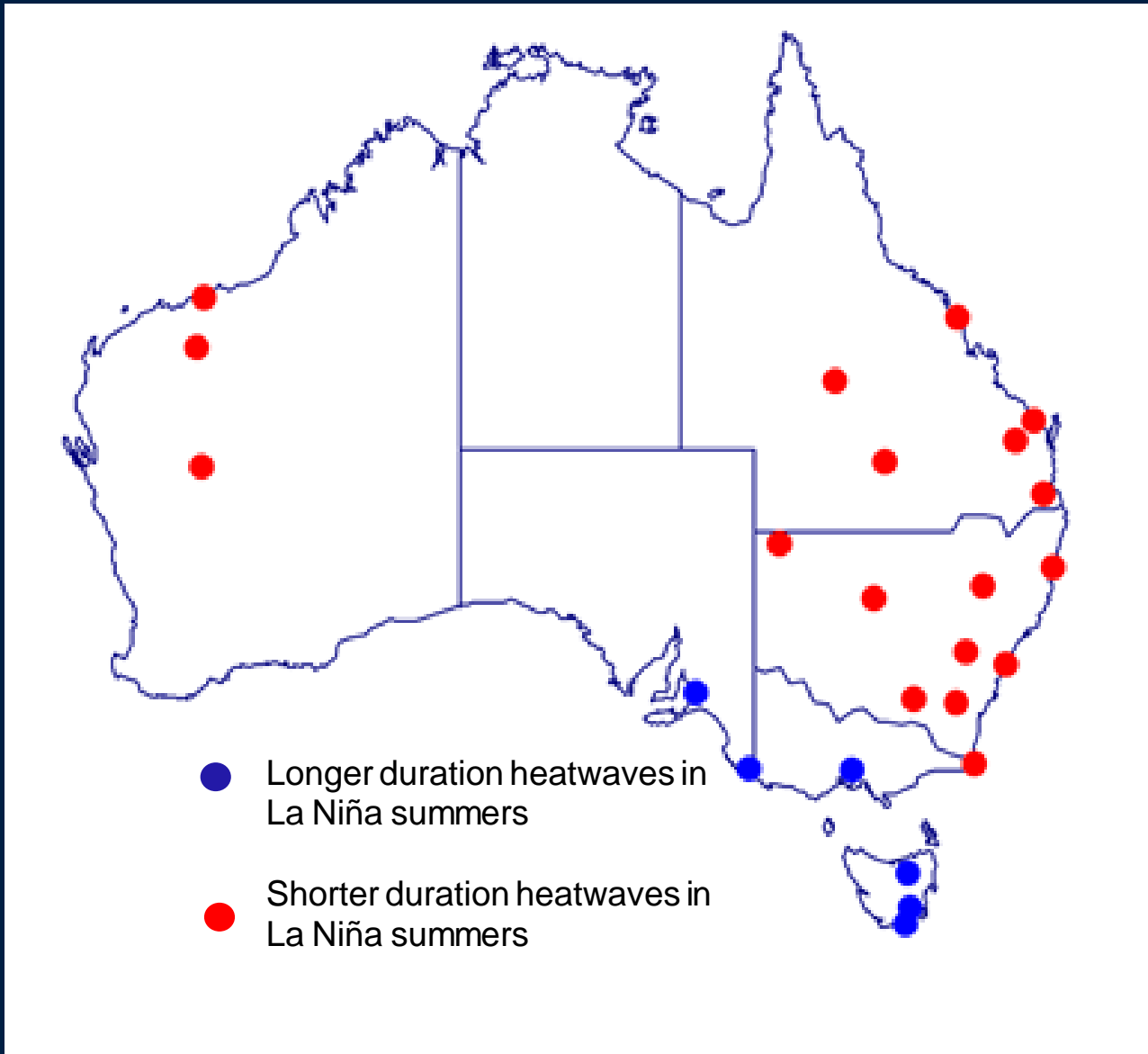
| | |
|---------------------|--------|
| Warragamba (Sydney) | 98.6% |
| Wivenhoe (Brisbane) | 79.2% |
| Thomson (Melbourne) | 101.2% |

Storage volume reported at: 29/11/2022

Percentage full (%)



Temperature: 5-day Heatwaves during ENSO events



- Less variability in La Niña years [reduced day to day temperature range]
- Longer heatwaves in south (Melbourne/Adelaide)
- Shorter duration heatwaves in north (Sydney/Brisbane)
- Weather patterns mean south and north very rarely have concurrent heatwaves



Maximum temperatures: spring/summer extremes 2021-22

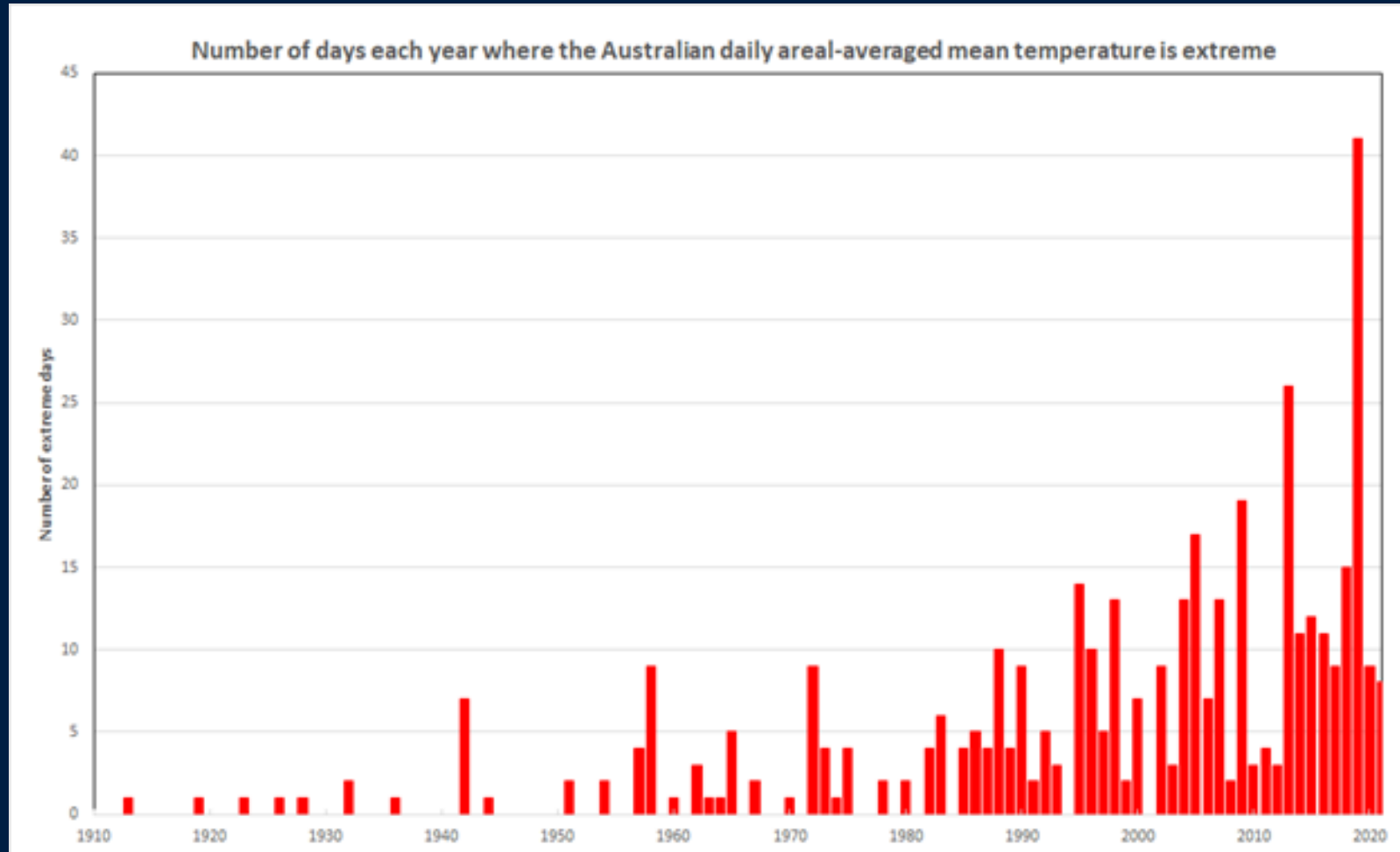
La Niña often means fewer hot days in southern Australia, but more strings of warm days

| | Days over 30 °C | | | Days over 35 °C | | |
|------------------|-----------------|---------------|------------|-----------------|---------------|------------|
| | 2021-2022 count | Average count | Difference | 2021-2022 count | Average count | Difference |
| Sydney | 10 | 13.8 | -3.8 | 0 | 3.5 | -3.5 |
| Melbourne | 29 | 25.3 | +3.7 | 3 | 9.0 | -6.0 |
| Canberra | 16 | 28.7 | -12.7 | 0 | 6.2 | -6.2 |
| Brisbane | 40 | 43.5 | -3.5 | 1 | 3.7 | -2.7 |
| Adelaide | 30 | 40.8 | -10.8 | 8 | 15.3 | -7.3 |
| Hobart | 4 | 5.2 | -1.2 | 0 | 1.7 | -1.7 |
| Perth | 62 | 57.4 | +4.6 | 32 | 21.6 | +10.4 |

Perth can be an exception, as it has more easterlies in La Nina/High SAM years.



Trends in extreme heat



- Extreme heat days (warmest 1% of days for each month, 1910–2021): recent trend shows increased frequency
- 43 extreme heat days in 2019 is highest on record
- La Niña in 2020–21 & 2021–22 likely contributed to reduced number of extreme heat days in 2020 & 2021



Australian Seasonal Bushfire Outlook: Summer 2022 - 2023

Summer 2022

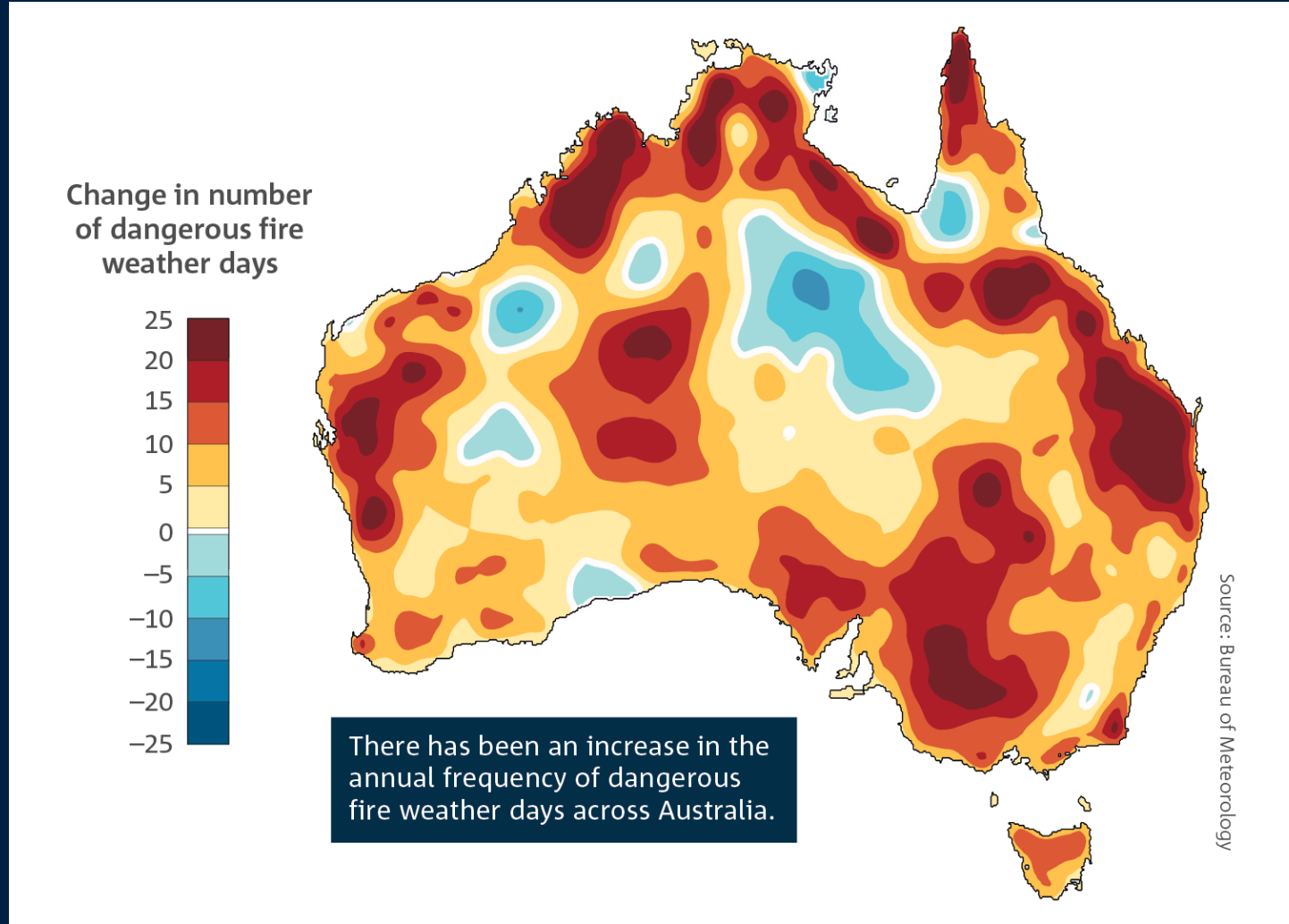


- Elevated fire risk in parts of western and central Australia
- Grassfire risk increasing through summer in NSW and southern Qld when abundant vegetation cures
- Lower than average fire risk in coastal south-eastern Australia
- Seasonal Bushfire Outlook uses new Australian Fire Danger Rating System (AFDRS), incorporates weather, climate and fuel information
- For more information: afac.com.au



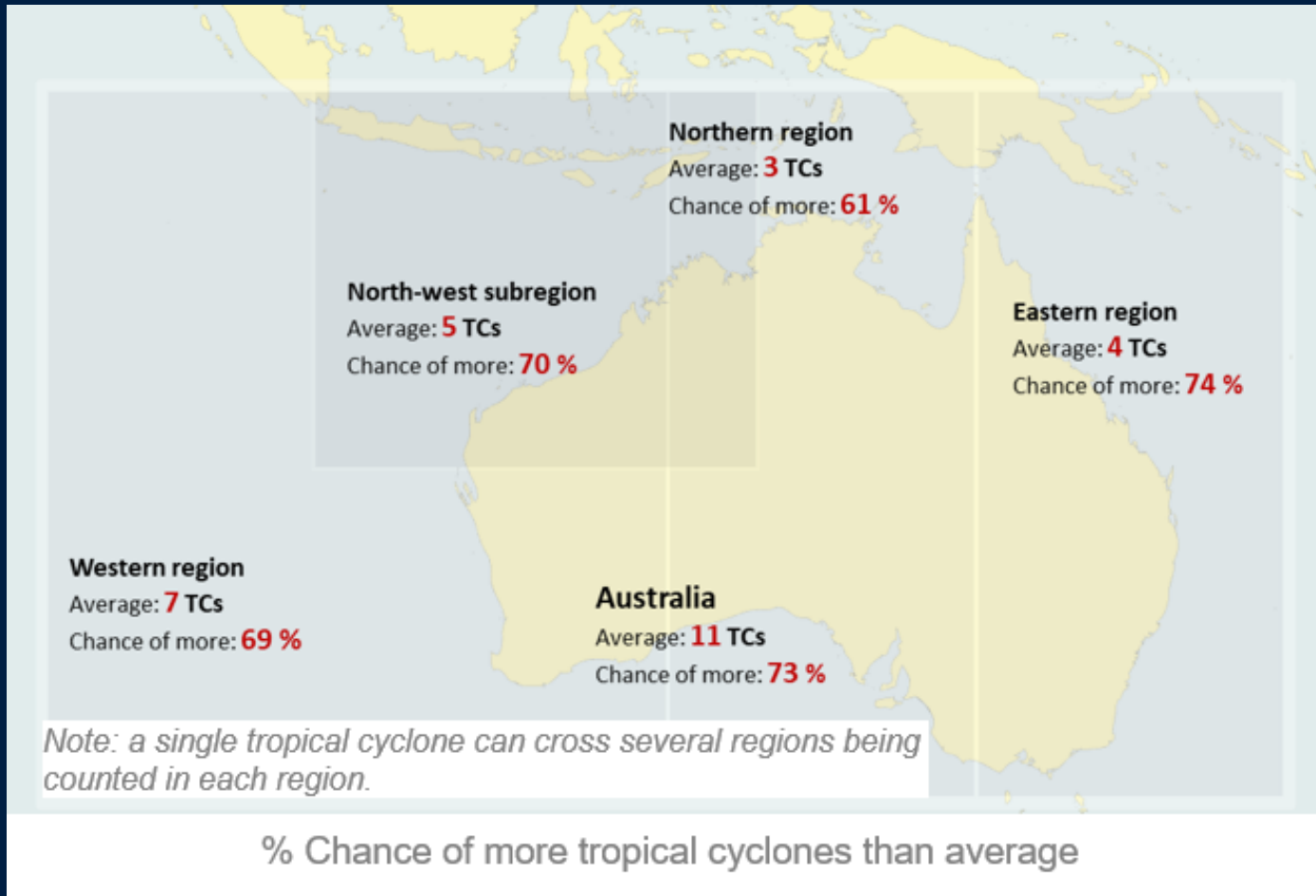


Trends in dangerous fire weather days



- Map shows the change in number of days that the FFDI exceeded 90th percentile, between two periods:
 - July 1950 – June 1986
 - July 1986 – June 2022

Tropical cyclone seasonal outlook 2022–23



- Ocean temperatures to the north of the country are expected to remain warmer than average for the coming 3 months, marginally increasing the likelihood of tropical cyclones developing.
- The number of tropical cyclones in the Australian region is generally higher with La Niña.
- In recent decades, the annual number of tropical cyclones that form in the Australian Region has decreased, from an average of 11 across all seasons since Australian records began in 1969–70, to 9 for the period since 2000–01.

For the tropical cyclone season 2022–23:

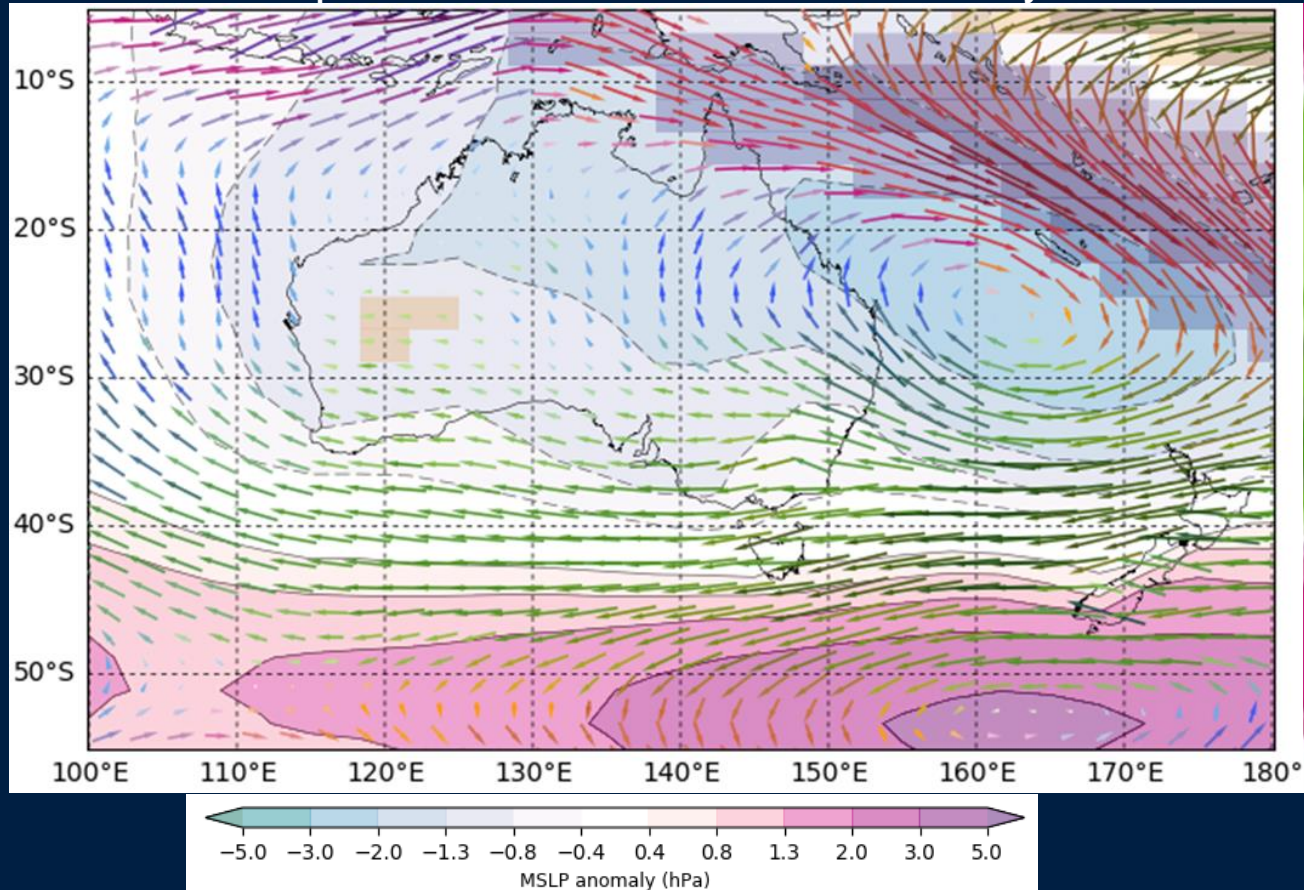
- Around 73% chance of an above-average number of tropical cyclones across the Australian Region
- In La Niña years, the first Australian landfall typically occurs early December, about 3 weeks earlier than average



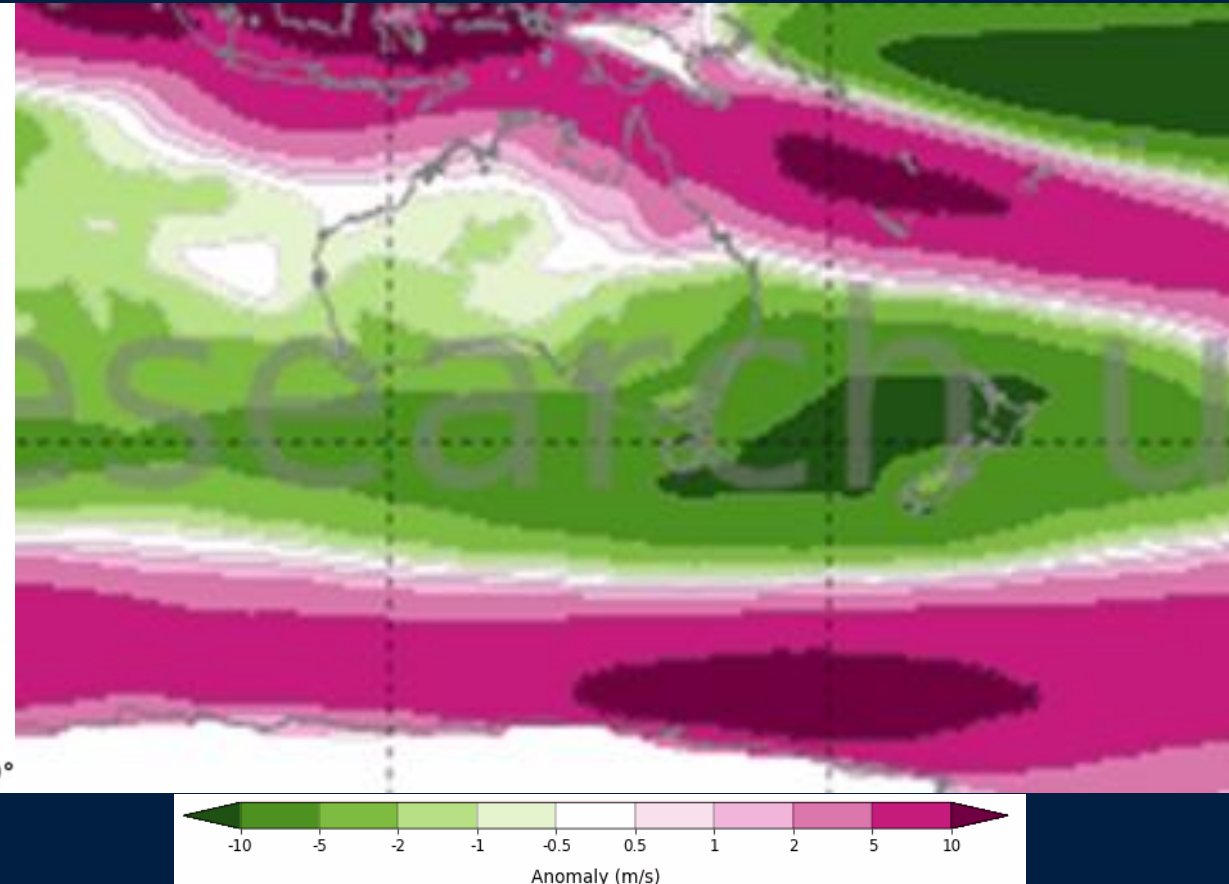
December 2022 – February 2023 long-range forecast

Wind speed and direction

Wind speed/direction and MSLP anomaly



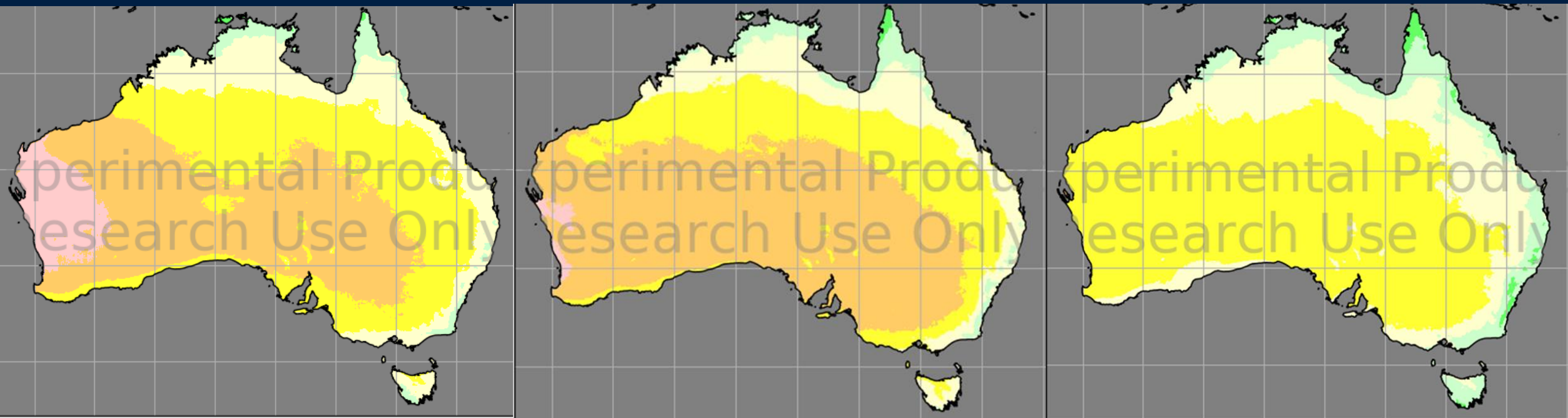
West to east wind speed anomaly



- Winds speeds lower than normal for southern Australia, but higher than normal in the north
- Weaker westerlies, or even easterly winds, for SA/Tas/NSW/Vic
- Typical of +SAM periods



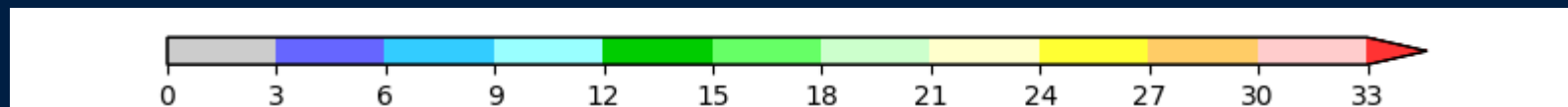
Solar Radiation at the ground



December 2022

January 2023

February 2023



Mjoules/m²

- Increased cloud for eastern states, including major cities
- December may see below average solar radiation in the north and east, above average in west.
- Eastern Australia may ease more towards normal values over the later summer



Regional hazards: spring to summer

Severe storms

- Northern wet season starts October
- Heavy rainfall and flash flooding
- Damaging winds

Fire danger

- Fire season continues in northern Australia
- Above-normal fire potential in southern NT & northern WA
- High temperatures

Fire danger

- Expected dry conditions
- Rising temperatures

Severe storms

- Heavy rainfall
- Damaging winds
- **Thunderstorm asthma** is a risk October–December

Tropical cyclones

- TC season (officially Nov–Apr)
- Above-average TC/tropical low activity expected in 2022-23
- Early TC risk increased

Flooding

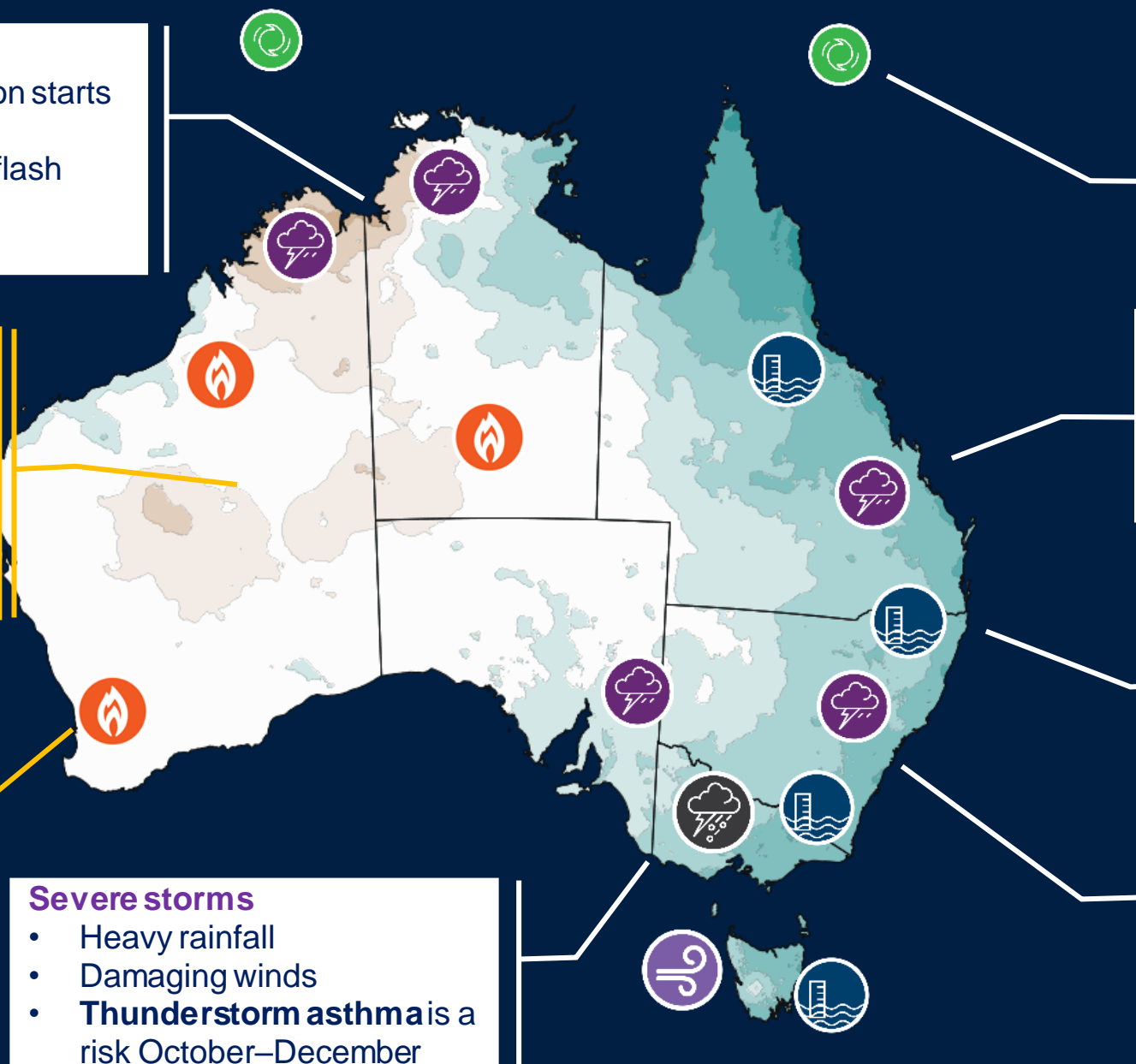
- Flash flooding due to storms
- Riverine flooding due to widespread rain

Severe storms

- Heavy rainfall
- Large to giant hail
- Damaging winds

Flooding

- Much of eastern Australia has relatively wet soils
- Wet soils increase chance of high run-off





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Thank you

Dr. Andrew Watkins
Bureau of Meteorology

