

Where has our summer gone and will it come back?

January 12 2024, by Andrew King and Andrew Dowdy



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Back in September last year, the Bureau of Meteorology (BoM) declared an El Niño and after three soggy years of La Niña conditions, many Australians started thinking about barbeques and beach days during a

long, hot summer.

The start of summer hasn't matched those expectations and many parts of the continent have experienced a drenching with severe floods in several states. So, what has happened to our summer, and will we see a return to hotter and drier conditions?

Why do we expect dry conditions when we have an El Niño?

[El Niño events](#) are characterized by warmer than normal seas in the central and eastern tropical Pacific and cooler conditions in the western Pacific nearer Australia. This is related to a weakening of the easterly winds near the equator called the trade winds.

When we have these conditions, we also see a shift in weather patterns with low pressure moving further east in the Pacific and a tendency for higher atmospheric pressure nearer Australia.

High pressure is associated with air sinking rather than rising in the atmosphere, and this promotes clear skies and drier weather. In contrast, when we have [low pressure](#), air rises and cools causing condensation of water vapor, cloudy skies and rainfall to occur.

As El Niño events can persist for many months, typically starting to form in late winter and decaying the following autumn, the shifts in predominant [weather patterns](#) can lead to persistent wetter or drier conditions in different parts of the world.

For example, El Niño is often blamed for floods in parts of South America and East Africa, and for drought in Australia and Indonesia.

What's bringing all the rain if we have an El Niño?

Despite all the recent [rain](#), we are still in an El Niño event, but it's worth pointing out that the unusual rain only started in mid-to-late spring. If we cast our minds back to the start of spring, Australia experienced a warm and [record-dry September](#).

At that time, we had a developing El Niño and positive [Indian Ocean Dipole](#) conditions, both of which promote [high pressure](#) and dry weather over most of Australia. As spring progressed, we saw the rain take hold, first in Eastern Victoria in October and then more widely in November and December, particularly in parts of eastern Australia.

Although El Niño events mean a higher-than-normal chance of a dry spring in parts of Australia, this does not mean that all El Niño events will always be drier than normal.

It is a bit like "loading the dice" to get an increased chance that [dry conditions](#) will occur, rather than a guarantee of dry conditions in all cases.

Additionally, the relationship between La Niña and Australian rainfall is considerably stronger than the effect of El Niño on rainfall. While La Niña events are pretty reliably wet, El Niño events can often be wet or dry.

Also, the El Niño relationship to the Australian climate tends to be strongest in spring, and the influence is somewhat weaker by summer. Given these nuances, there perhaps could have been somewhat less of an expectation of a dry summer by keen beachgoers.

There are other influences on Australia's climate beyond El Niño too. The [heavy rainfall](#) on the east coast in late December occurred with a

[positive Southern Annular Mode](#) which is associated with moist onshore flow from the Tasman Sea and rainy conditions in eastern New South Wales and Queensland.

We also have [remarkably high sea surface temperatures](#) around eastern Australia and this is providing moisture and promoting instability that can lead to rainfall.

In contrast, around western Australia, the sea surface temperatures are not notably higher than normal and many regions in the west have been dry so far this summer, with one example being [no rain in Perth](#) at all during December.

A comprehensive analysis will be needed to fully understand the causes of the different rain events across eastern Australia in the last few months.

Is it hard to predict extreme rain events?

Weather forecasting has progressed in leaps and bounds, so we now have an expectation that major rain events will be reasonably well predicted in most cases.

On timescales of up to about 7–10 days, rainfall events, including significant events seen over the last few months, are generally very well forecast and the quality of weather forecasting has greatly improved since the 1980s.

Seasonal outlooks which can attempt to predict the probability of very wet or dry conditions over lead times of about one to three months ahead are [also improving](#).

In summer, more of our rain falls in localized storms and the exact

locations and paths these storms take can be very hard to predict, even a few hours in advance let alone days, weeks or months.

For seasonal prediction, this poses a big challenge as smaller weather systems, including thunderstorms, [aren't strongly related to climate influences like El Niño](#). As a result, we see [greater limitations in seasonal prediction around summer](#) when thunderstorms occur than around winter.

What does the rest of summer hold?

It's hard to say with confidence what the remainder of the summer will look like given the challenges in seasonal prediction at this time of year. The BoM seasonal outlook suggests a slightly heightened chance of wet conditions in the southeast while drier conditions are more likely across northern and western Australia.

The recent extreme rainfall, along with the December heat waves and hailstorms, act as a reminder of how variable and fickle Australia's [summer](#) weather can be.

One thing we can be confident of is that we will see more extreme [weather](#) in the coming months and that future summers will continue the trend towards being hotter as global warming continues.

Provided by University of Melbourne

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