

The great heatwave of 2013

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Sydneysiders flocked to Bondi as the heatwave hit the east coast. Picture: Katrina Tepper *Source:* Supplied

AS the winds turned to the northwest yesterday, the nation's heavily populated eastern seaboard finally got a taste of the sweltering conditions that started in Western Australia at Christmas and have roasted the red centre for a record-breaking spell.

City newspapers warned of "Armageddon" as the bushfire danger in NSW reached catastrophic levels, heightened by a build-up of fuel from two cool years of heavy rain.

A weather-obsessed nation has become used to the vagaries of drought that come with El Nino and the flood-inducing La Nina, both of which are determined by sea surface temperatures in the Pacific Ocean.

This is supposed to be a neutral, in-between year: the El Nino system that was brewing faltered at the last moment. But you wouldn't know it from the weather.

The great heatwave of 2013 has been remarkable for its geographic spread, if not maximum temperatures.

National records have fallen for consecutive days of stifling heat.

On Monday, a new national daily average maximum temperature record was set at 40.33C. The previous record of 40.17C dated back to December 21, 1972.

But, surprising as it seems, the maximum temperatures at individual locations have not been particularly out of season.

This may well just be a truly Australian summer. But it does pose an age-old question: what is normal when it comes to weather?

Karl Braganza, the manager of climate monitoring at the Bureau of Meteorology's National Climate Centre, says this has been the sort of weather system that typically is associated with heatwaves in the middle of summer, especially across southern Australia. But the heat has been exacerbated by the monsoonal trough that usually brings cloud and rain in the north of the continent remaining far offshore in the Timor Sea.

A stationary high-pressure system over Australia has allowed heat to circulate over the inland, and with no respite from monsoonal cloud or rain, temperatures are building upon themselves.

Despite this, Braganza says the current event "is not notable for the size of individual temperature anomalies. It is notable for its size, as almost the whole continent is warm," he points out.

"It is more typical for parts of the continent to be significantly cooler when we have a large heatwave."

But is it climate change at work?

"We have broken the record daily average temperature over the whole of Australia set at 40.17C in December 1972," Braganza says.

"We have gone six consecutive days with the average (national) temperature over 39C and that has never happened before, and we expect that will go seven days all up (including yesterday).

"There are aspects of the heatwave that are at the very edges of what we have experienced in the past, but in terms of individual sites I don't think this is the sort of event like Black Saturday," he says.

"We can't really pull apart all the influences of the climate system to say what caused this particular event.

"With this sort of event you have background climate trends and natural climate variability pushing in the same direction.

"It is the frequency of these events we are watching."

For climate-change watchers it is more the frequency of events than the severity of this particular event that matters. The prospect of more frequent heatwaves has become a core concern.

Australia's Climate Commission has said Australia can expect to experience an increase in summer heatwaves that pose a danger to agriculture, health and even life.

A commission paper on the health impacts of climate change says there has been an increase in hot days and nights and a decrease in cold days and nights across Australia.

In the past five decades, it says, the number of record hot days has more than doubled.

"Recent heatwaves had caused increased hospital admissions for kidney disease, acute renal failure and heart attacks."

During the severe heatwaves in southeastern Australia in 2009, when Melbourne sweltered through three consecutive days with temperatures higher than 43C in late January, ahead of Black Saturday

on February 7, there was a more than 30 per cent increase in the number of deaths.

Despite the Climate Commission's warnings it will not be possible for several decades to say with certainty that there is a climate change signal in recent heatwaves, including this year's hot spell.

In a report on extreme weather last year, the UN's Intergovernmental Panel on Climate Change outlined the difficulty in establishing whether climate change is driving more intense weather.

It says many weather and climate extremes are the result of natural climate variability. "Even if there were no anthropogenic changes in climate, a wide variety of natural weather and climate extremes would still occur."

The IPCC says it has "medium confidence in an observed increase in the length or number of warm spells or heatwaves in many regions of the globe".

It also has medium confidence in the projected increase in duration and intensity of droughts in some regions of the world, including southern Europe and the Mediterranean region, central Europe, central North America and Mexico, northeast Brazil and southern Africa.

However, for future projections it says it is "virtually certain" that increases in the frequency and magnitude of warm daily temperature extremes and decreases in cold extremes will occur through the 21st century on a global scale.

It is "very likely" that the length, frequency and-or intensity of warm spells or heatwaves will increase over most land areas.

But, it says, there are three main sources of uncertainty in future projections: "The natural variability of climate, uncertainties in climate model parameters and structure; and projections of future emissions."

In a counter-intuitive development, Britain's Met Office this week revised downwards its projections for future global average temperature increases until 2017, based on the use of new computer models.

It now believes that global temperatures up to 2017 will most likely be 0.43C above the 1971-2000 average, with an error of plus or minus 0.15C.

British reports claim the revision means the forecast is for no increase in global temperatures above current levels over the forecast period.

The Met Office had previously estimated the most likely global temperature increase to be 0.54C above the 1971-2000 average during the period 2012 to 2016.

It is all pretty academic for Oodnadatta, in the South Australian outback 1011km north of Adelaide, which has just set a record with seven consecutive days of temperatures above 45C.

A five-day sequence has been recorded three times previously, all this century: in January 2004, February 2004 and January 2011.

However, for meteorologists there is nothing particularly mysterious about the cause behind the extended hot spell.

"Heatwaves over the interior are a common part of summer in Australia and this one is not likely to set individual (daily) state or national records," Braganza says.

"It has hit some site records, but we are really looking at the duration of the heat in many locations in terms of how unusual this has been compared with previous years.

"It is a function of how stationary the weather patterns are over Australia at the present time."

This blocking of the monsoonal trough is the key to understanding what has been going on.

A high-pressure system has sat over the Tasman Sea that has allowed heat continually to circulate over the continent.

"That is almost always when you get a heatwave in Australia," Braganza says.

"The last two years we didn't see much of it because we had a different seasonal climate influence.

"You can say that for years where you didn't get a very hot summer in Australia, you probably had less of the weather systems becoming stationary over the continent.

Bureau of Meteorology assistant director of weather services Alasdair Hainsworth says the current weather system has meant the continent has been mostly cloud-free for several months "and it has just got hotter and hotter".

"The monsoon trough has not developed over northern Australia at all," he says. "It is still lying to the north of the continent."

The monsoon trough follows the summer sun as it tracks southwards, but this year it has failed to do so.

The northern monsoon is critical to bringing relief to the central areas and southern capitals.

"Normally we would see the development of the monsoons, which would pump moisture into central Australia to develop cloud and rain," Hainsworth says.

"We have seen none of that this year, so we have had no rain over central Australia."

As a result, and in combination with the high-pressure system sitting over the Tasman, the soils are now completely dry, heat is radiating day after day into clear skies and the centre of the continent has built up a record run of high temperatures.

Hainsworth's forecast is for more of the same.

"Until we see some moisture setting in there and some cloud and some rain, the pool of hot air over the central part of the continent is going to persist," he says.

The weather patterns that allow heat to build up in the centre of the continent usually bring cooler conditions on the eastern seaboard.

The coastal region got a taste of the hot conditions yesterday as northwesterly winds brought the hot air over the Great Dividing Range.

But the 40C-plus temperatures on the coast are not expected to last long.

"Getting those really hot days - into the 40 degrees Celsius - is less common over the east coast than it is in the southern capitals, where the air is dragged down from the north over the southern states," Braganza says.

The big question is: when will the monsoon season finally break in the tropics to bring relief to the centre?

A low has been forming in the monsoon trough that has the potential to become a tropical cyclone.

"What we are hoping is as that comes south it is going to drag the monsoon trough down with it,"

Hainsworth says.

"And then we will finally get some decent activity to pump this moisture in and provide us with some relief over northern Australia.

The flip side is a tropical cyclone will come close to the coast.

"It is a double whammy," says Hainsworth.

"We might well get some relief in terms of heat but we are likely to see the cyclone impacting on coastal communities."

From flood to drought to fire and on to cyclonic winds.

This may be the very definition of a truly Australian summer.