Expert discusses La Niña and El Niño cycles effects on Australia

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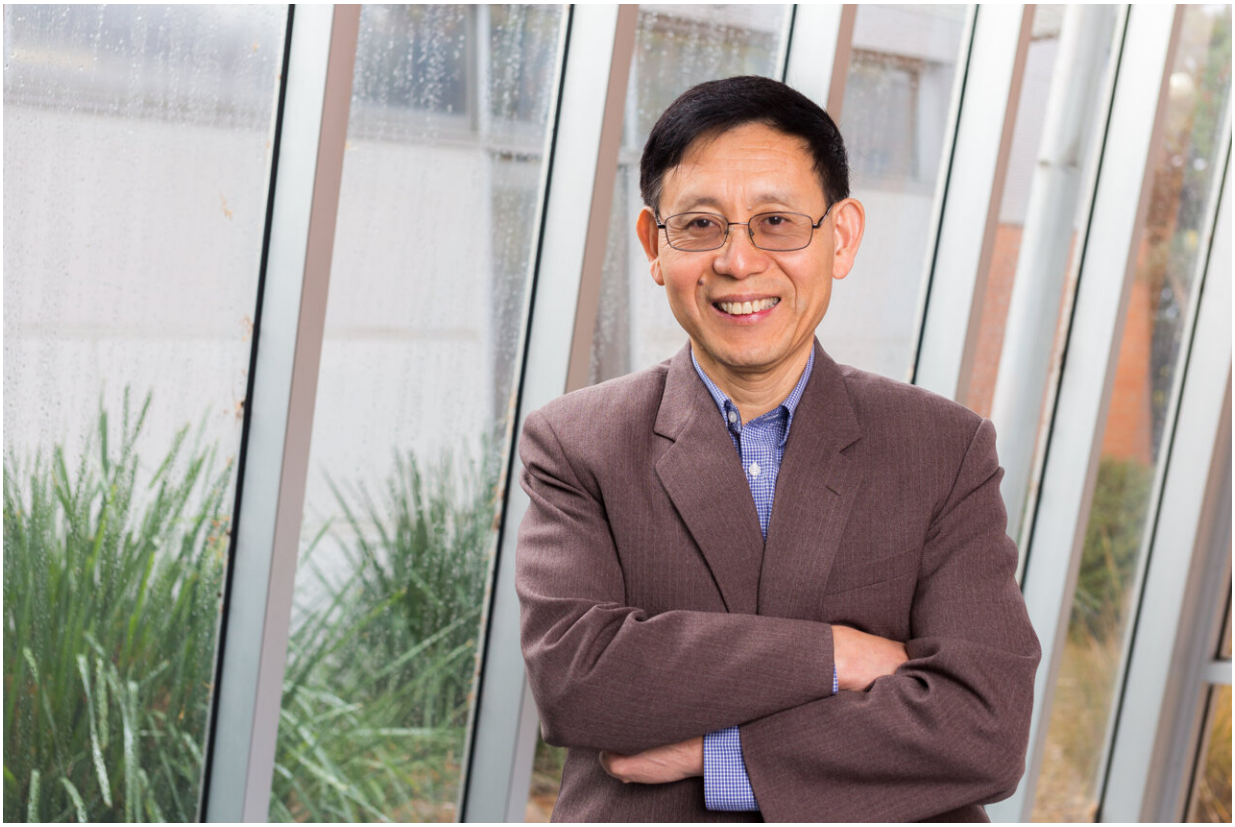

Dr Wenju Cai, CSIRO climate scientist. Credit: CSIRO

Climate models indicate La Niña is on the way out, with El Niño conditions expected later this year. CSIRO Climate Scientist Dr. Wenju Cai explains what this means for Australia's weather and how changing

conditions will affect the country.

Is La Niña really on the way out? What do the climate models tell us?

We are in the mature season of the current three-consecutive La Niña years. During the three years, heat has been stored in the equatorial Pacific Ocean. There is no precedent for four-consecutive La Niña years. Models that predict the El Niño Southern Oscillation (ENSO) cycles are indicating a demise of the current La Niña condition.

Does this mean El Nino is on the horizon?

With so much heat charged in the equatorial Pacific, an El Niño is readily triggered by relaxation of the trade winds over the equatorial Pacific. Many models are predicting an El Niño by the northern hemisphere summer months. ENSO predictions are more accurate after June, when noise is low. Several previous three-consecutive-year La Niña events, such as the 1973–1975 or 1983–1985 events, were followed by an El Niño.

What will El Niño mean for Australia?

During El Niño, drought occurs over eastern and north-eastern Australia in spring and summer. During winter and spring, a developing El Niño often drives an Indian Ocean Dipole (cooling in the eastern Indian Ocean), inducing droughts over southern Australia in the rain seasons. Overall, Australia experiences drought, higher temperatures, bushfires and more intense and frequent heatwaves on land and sea, and these extremes are likely exacerbated by warming from increasing greenhouse gases.

Droughts and heat waves cause damage to Australia's iconic ecosystems, such as the drying of the Murray and Darling Rivers, and coral bleaching on the Great Barrier Reef. Drought in the Murray Darling Basin and the drying Murray and Darling Rivers affect agriculture and mining activities, often reducing economic outputs by tens of billions of dollars. Bushfires kill and displace wild animals, and affect them in the aftermath by causing starvation, lack of shelter and predator attacks. One estimate suggested that the 2019/20 Black Summer Fires affected over three billion wild animals, most of which likely perished.

El Niño and La Niña explained

Both El Niño and La Niña are known as climate phenomena. The oceans switch between these states roughly every two to seven years, depending on the wind and ocean conditions across the equatorial Pacific Ocean between Australia and South America. El Niño is known as the warm phase and La Niña the cold phase, but it's also possible to be in a neutral ENSO phase.

The equatorial Pacific features trade winds blowing from the far east to the west which push surface warm water to the western Pacific and store heat in the equatorial Pacific. The trade winds also bring cooler subsurface ocean water to the surface in the eastern Pacific. The warm water in the west and cool water in the east support the trade winds through the associated west-minus-east temperature gradient.

The pool of warm water in the western Pacific Ocean is the engine for high-moisture air to rise which produces a rainband over the western Pacific and eastern Indian Oceans that benefits eastern and north-eastern Australia directly, and southern Australia indirectly through northwest cloud band events from the eastern Indian Ocean.

During El Niño the trade winds weaken, releasing heat to the atmosphere

and the warm pool and rainband shift to the east, causing dry and hot conditions in Australia. During La Niña, the trade winds and warm pool intensify, leading to more rainfall and lower temperatures in Australia.

Provided by CSIRO

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