Tell-tale El Nino signal detectable 18 months ahead

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(Phys.org) -- The origins of the El Niño climatic events that usually bring extended hot, dry conditions to much of Australia are detectable up to 18 months beforehand, a new study has found.

This is nine months earlier than they can be detected at present, meaning that forecasters will be alerted much sooner to watch for the possibility of damaging drought and bushfire seasons.

Not all El Niño events follow the same course or have the same severity, but they all begin with the same tell-tale discharge of massive volumes of sub-surface warm water from the equatorial western Pacific Ocean, says the study in the journal *Nature Climate Change*.

The study, titled "All flavours of El Niño have similar early subsurface origins", was led by Ms Nandini Ramesh, of the Indian Institute of Science, in Bangalore. Ramesh, a pre-PhD student, is presently a researcher at the UNSW Climate Change Research Centre.

Nandini and colleague Raghu Murtugudde noticed the revealing pattern when they were reviewing decades of climatic data relating to El Niño events. The process hadn't been noticed before because the discharge happens in a sub-surface layer of warm water and is not readily apparent from satellite measurements of surface temperatures.

"Satellite observations are only taking the ocean's skin-temperature, and it turns out that's not always a good indicator of what's happening in the

top couple of hundred metres, which is a key driver of the El Niño cycle," says Ramesh.

Warm water accumulates in the equatorial western Pacific when driven there by persistent trade winds. The researchers say that once the discharge begins in June to August (in the northern hemisphere summer) of the year before the event, the warm water spreads eastward beneath the surface, roughly along the equator. This occurs in every El Niño event, even though surface temperature patterns can be very different between events (producing different El Niño "flavours").

Regardless of which "flavour" of El Niño event occurs – either concentrated in the east or central Pacific - forecasters can presently reliably detect the warming trend of sea-surface temperatures no earlier than March to June – and begin to assess the likelihood of an El Niño developing months later in the southern summer.

"We still don't know what triggers the sub-surface discharge to begin in the first place, and it doesn't always result in an El Niño event," says Ramesh. "But we have confirmed that all El Niño events begin this way, which means we can be on the alert for them much, much earlier than before.

"That's good news for farmers, fire authorities and anyone whose livelihood or wellbeing can benefit from advance warnings like this. It will also improve our theoretical understanding of global climate and how the El Niño cycle may respond to climate change."

Provided by University of New South Wales