Global warming's influence on El Nino still unknown

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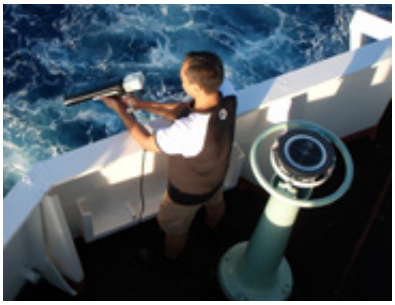

Monitoring ocean surface temperatures. (CSIRO)

(PhysOrg.com) -- The climate of the Pacific region will undergo significant changes as atmospheric temperatures rise but scientists can not yet identify the influence it will have on the El Nino-Southern Oscillation (ENSO) weather phenomenon.

This is a central finding of an international science review by the World Climate Research Program's Climate Variability and Predictability Pacific Panel, published today in *Nature Geoscience*.

The Panel convened in Australia at the Greenhouse 2009 climate change conference to consider new research that could build an understanding of changes in the behaviour of ENSO. ENSO is a naturally occurring phenomenon causing climate variability that originates in the tropical Pacific region and influences ecosystems, agriculture, freshwater

supplies, hurricanes and other severe weather events worldwide.

“There is an increasing body of evidence pointing to significant changes in Pacific Ocean climate as a consequence of global warming,” says co-author, Dr Wenju Cai from CSIRO’s Wealth from Oceans Flagship.

“What we are attempting to clarify is how those changes will enhance or moderate ENSO and, in Australia’s case, deliver stronger or weaker El Niño events which would have vastly different implications,” he says.

Dr Cai and Dr Scott Power, a Bureau of Meteorology scientist at the Centre for Australian Weather and Climate Research were members of the international team of authors of the *Nature Geoscience* paper; *The impact of global warming on the tropical Pacific Ocean and* El Nino.

Dr Power says ENSO will continue to have a profound influence on climate around the world over the coming century “ This report shows, however, that determining how ENSO will change in response to further global warming and what this means for Australia and our Pacific neighbours is a real challenge.”

The report concludes that rising global temperatures will bring change to the Pacific region in several ways: tropical easterly trade winds are expected to weaken; surface ocean temperatures are expected to warm fastest near the equator; and, the thin water layer separating the ocean's upper surface layer from its calm deep water below (the thermocline) is expected to become narrower and less deep.

“During El Niño events, weakening trade winds slosh warm water to the eastern equatorial Pacific and this reduces the east-west ocean temperature difference across the Pacific Ocean,” Dr Power says.

“This reduction further weakens the winds to produce a reinforcing

feedback loop that makes El Niño grow."

On the other hand, as the ocean temperature increases along the equator, enhanced cloud cover will curtail the growth of El Niño." Global warming causes changes in ocean temperatures, ocean currents, winds and clouds and these changes alter the strength of these feedbacks. This could change the character of ENSO and the impact that ENSO has on countries like Australia."

Dr Cai says quantifying changes to the many competing feedbacks underlying ENSO is very difficult.

"Clouds in particular are such a difficult feature to represent in models and cloud feedbacks remain the largest uncertainty in the global climate models."

"Year-to-year ENSO variability is controlled by this delicate balance of such amplifying and damping feedbacks.

"While the possibility of large changes in ENSO cannot be ruled out, research conducted to date does not yet enable us to say precisely whether ENSO variability will be enhanced or moderated, or how the frequency of events will change," Dr Cai says.

The authors suggest further research directions and coordination efforts that would continue to improve science's understanding of, and ability to accurately model ENSO, and enable researchers to predict the level of ENSO activity in the short-term (10 to 30 years).

Provided by CSIRO

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