

Making Progress on the Operational Alerting of El Niño and La Niña in a Warming World

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2nd Workshop on ENSO/IOD Alert Systems in a Warming World

What: Researchers and operational climatologists from Australia, New Zealand, South Korea, Japan, New Caledonia, Singapore, and the United States met online to discuss the challenges of making ENSO and IOD declarations in the presence of global warming, with a focus on the implementation of the relative Niño-3.4 index.

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Where: Online

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1. Introduction

Motivated by warming sea surface temperatures (SSTs) globally and the challenge this causes for operational alerting of El Niño–Southern Oscillation (ENSO) and Indian Ocean dipole (IOD) events, researchers and operational climatologists met online in March 2024 after an initial workshop in August 2022. Organized by the Australian Bureau of Meteorology, participants attended from seven countries. The focus in 2024 was the operational alerting of the 2023 El Niño and the use and implementation of the relative Niño indices (van Oldenborgh et al. 2021) going forward.

2. Recap of the 2022 workshop and subsequent progress

All countries surveyed in the 2022 workshop (Nguyen et al. 2022) had the Niño-3.4 region SST anomaly (i.e., “traditional” Niño-3.4 index) as a primary component of their ENSO alerting systems. Due to the global warming trend, the participants identified the need to act to keep the index focused on the ENSO phenomenon and remove the global warming influence where possible. Some countries already had strategies to reduce the impact of warming, such as using a shifting climatology by NOAA in the United States and detrending by Centre for Climate Research Singapore (CCRS) in Singapore (Turkington et al. 2018). Another suggested solution was the “relative” Niño-3.4 index, which is the SST anomaly in the Niño-3.4 region relative to the tropical 20°S–20°N mean anomaly (van Oldenborgh et al. 2021). As a result of the 2022 workshop, the suitability of the relative index for monitoring and predicting ENSO was further explored in L’Heureux et al. (2024), and a decision was made by the Australian Bureau to switch to using it.

For the IOD, its SST-difference index had shown less of a climate change signal and therefore considered of less pressing concern.

3. Format of the 2024 workshop

Presentations were given framed around four questions:

- When did your organization provide official alerts and/or declarations of the 2023 El Niño?
- How would this have been different if you were using the relative Niño indices?
- Do you think your organization will switch to the relative Niño indices?
- Is there anything else about ENSO alerting that you think needs to be considered in a future warmer world?

4. Outcomes

Declaration of the 2023 El Niño varied between April for Japan and September for Australia and New Zealand, noting that different countries use different methods, thresholds, and/or

a combination of indicators. For Japan, Korea, and the United States, the use of the relative Niño indices would have likely pushed their declarations back by 1 month, whereas for Australia and New Zealand, whose later declarations were due to atmospheric indicators, the timing would have remained the same. For Singapore, their declaration timing would have also likely remained the same had they used the relative Niño index due to their detrending method. However, it was noted that the difference between the relative and traditional Niño indices has increased since early 2023, meaning that timing uncertainties are likely to amplify in future. Countries also noted that using relative Niño SST indices would have led to the 2023 El Niño event being characterized as less strong compared to the view with the traditional indices.

Australia among participants is comparatively more advanced in the formal adoption of the relative Niño indices, while all countries are exploring how to maintain ENSO monitoring and prediction methods which remain robust under global warming. The switch in the Bureau will result in current Niño index–related charts on the Bureau’s website to display the relative indices by default. Values of traditional Niño indices will remain available in the background, as will historical reports of the Bureau’s ENSO Alert status.

Regarding future considerations for operational alerting of climate phenomena, the participants highlighted the following:

- In a changing climate, it could help to have more flexible alert systems.
- Gradients of SST across the Pacific have become more La Niña like in recent decades. How will this impact ENSO alerting?
- Will other measures of ENSO, such as the station-based Southern Oscillation index, remain appropriate as indicators? It is important that our other ENSO indices continue to reflect the aggregate behavior of the coupled ocean–atmosphere phenomenon.

The participants agreed to continue to have dialogue and meet again.

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