Box 2
The New RONI: An Improved Indicator for Characterizing Climate Anomalies

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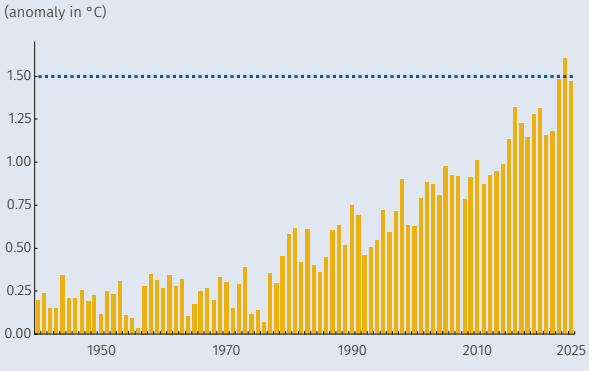
Graph B2.1
Annual change in global temperature anomalies relative to preindustrial levels



Source: Copernicus, https://climate.copernicus.eu/GCH2025-graphics-gallery.

In recent decades, Earth's average temperature has steadily increased, with the average over the past three years surpassing the 1.5 °C threshold set by the 2016 Paris Agreement[1] (Graph B2.1). The Agreement states that higher levels of global warming would substantially raise the risks of droughts, floods, and forest fires. It would exacerbate the decline of terrestrial and marine ecosystems, increase food insecurity, and pose greater risks to human health. Additionally, it would generate ongoing pressures on supply chains and living costs, resulting in economic and social effects worldwide. Consequently, the U.S. National Oceanic and Atmospheric Administration (NOAA) recently replaced the Oceanic *El Niño* Index (ONI) with the Relative Oceanic *El Niño* Index (RONI) to better track *El Niño* Southern Oscillation (ENSO) phases in a scenario of warmer oceans. This box explains the key differences between the two indices and their implications for reclassifying and forecasting climate anomalies.

1. What is *El Niño*, how is it measured, and when is it officially declared?

ENSO is a climatic phenomenon, involving both atmospheric and oceanic interactions, that occurs in the tropical Pacific Ocean and can exhibit three states: warm (*El Niño*), cold (*La Niña*), and neutral (no extreme climatic event is present). The *El Niño* phenomenon involves an anomalous warming of the surface waters of the central and eastern tropical Pacific, in the so-called Niño 3-4 region, and develops when the trade winds weaken and the warm waters from the Pacific Ocean, off Australia, move towards northwestern South America, weakening the cold Humboldt ocean currents.

To monitor *El Niño*, NOAA previously used the ONI to measure sea surface temperature anomalies in the equatorial Pacific relative to its climatological average over the last three decades. For an *El Niño* event to be declared, ONI values must be equal or exceed 0.5 °C for at least five consecutive periods, where each period corresponds to

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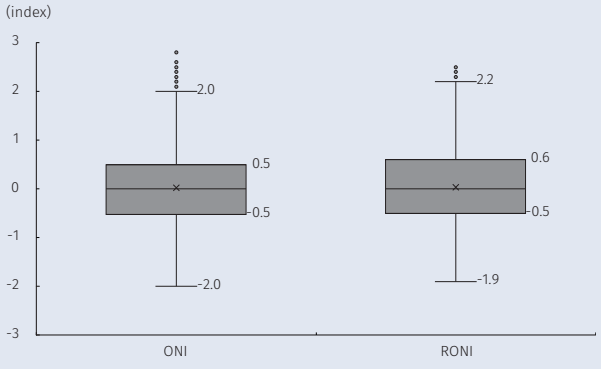
1 The Paris Agreement is an international treaty on climate change, signed in late 2015 and adopted in 2016 by 194 countries. It sets temperature rise thresholds; sustained exceedance of these thresholds would significantly increase the risk of severe and potentially irreversible climate impacts. See: https://unfccc.int/process-and-meetings/the-paris-agreement

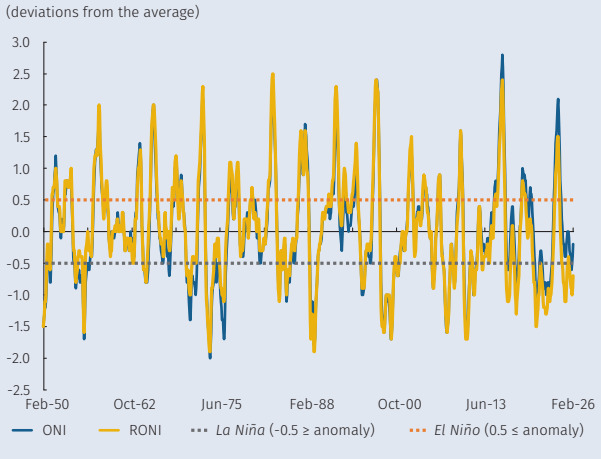
Graph B2.2
ONI and RONI distribution



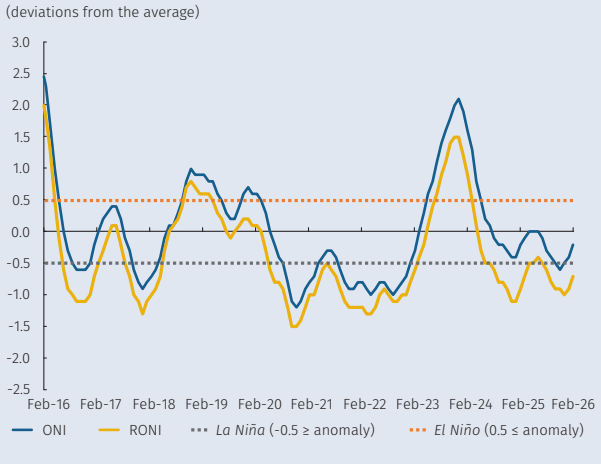
Note: The graph shows that the variability of the two indicators is similar, as are their central tendency measures (the line inside the box represents the median, and the "X" corresponds to the mean).
Source: Authors' own elaboration using NOAA data.

Graph B2.3
Comparison of ONI and RONI estimates

A. Historical ONI vs. RONI



B. ONI vs. RONI



Source: Authors' own elaboration using NOAA data.

a 3-month moving average. Additionally, the strength of an *El Niño* event is determined by the magnitude of the temperature anomaly, as follows: when temperatures range between 0.5°C and 1.0°C, it is considered weak; from 1.0°C to 1.5°C, it is considered moderate; from 1.5°C to 2.0°C, it is considered strong; and, when the temperature exceeds 2.0°C, it is classified as a very strong event.[2] To classify the intensity of an El Niño event, anomalies must fall within defined ranges for at least three consecutive months.

To conduct rigorous monitoring, it is important to distinguish among warm conditions, *El Niño* conditions, and an actual *El Niño* event. Warm conditions are recorded when temperature anomalies are between 0 and 0.5°C, while *El Niño* conditions occur when temperatures equal or exceed 0.5°C but do not persist for five consecutive observations. An official event is declared when temperature anomalies equal or exceed 0.5°C for five or more consecutive observations (Graph B2.3, panel A).[3]

2. What is the Relative Oceanic *El Niño* Index (RONI) and how is it constructed?

The RONI, calculated by NOAA's Climate Prediction Center, is the new official index adopted in February 2026 for identifying ENSO states. It aims to correct the climate-change bias inherent in the ONI. Although both indicators have numerically similar values, the RONI exhibits more consistent statistical behavior by isolating the relative signal of the equatorial Pacific Ocean from the average warming of the tropical oceans. It is calculated by subtracting the average sea surface temperature anomaly across the entire global tropical belt, defined as the region between 20° S and 20° N latitude (NOAA, 2026), from the original ONI value. Following L'Heureux et al. (2024), the result of this subtraction must be adjusted to ensure the RONI has the same variability as the ONI, thereby ensuring comparability between the two indices. The formal expression of the RONI is:

$$RONI = \left(ONI - \frac{1}{n} \sum_{i=1}^{n} A_i \right) \cdot \frac{\sigma_{ONI}}{\sigma_{(ONI - Tropical\ Average)}}$$

Where A_i is the sea surface temperature (SST) anomaly at point *i* within the tropical belt; *n* is the total number of measurement points[4] in the tropical belt; σ_{ONI} is the standard deviation of the ONI in the referenced period; and, finally, $\sigma_{(ONI - Tropical\ Average)}$ is the standard deviation of the relative series. Once the RONI has been obtained, the reclassification of the ENSO events is performed using the same criteria as the ONI, as already mentioned.

Graph B2.2 summarizes the distributions of ONI and RONI using a box plot. The analysis shows that while the two indicators are largely similar, a key difference is the higher prevalence of positive outliers in the ONI, indicating a greater relative frequency of episodes classified as El Niño events. This result is consistent with the RONI indicator's objective of correcting the positive bias induced by the generalized

2 This section is excerpted and summarized from a work by Eduardo Caicedo and Pablo Bonilla (2023).

3 See https://www.climate.gov/enso

4 Where a measurement point corresponds to a specific geographic location where an ocean surface temperature anomaly value has been recorded.

increase in surface ocean temperature in the tropical Pacific belt, associated with global warming. In short, the RONI does not incorporate new climate information; it only corrects the ONI's climate-change sensitivity, thereby enabling better identification of ocean temperature anomalies and their climate impact.

3. Why was ONI skewing the intensity of El Niño in recent decades?

Within the ONI framework, *El Niño* events are identified based on deviations from the historical average temperature in the central tropical Pacific Ocean (in Niño region 3-4). However, this statistic has been gradually adjusted and no longer accurately reflects the recent increasing trend caused by the intensification of global warming. Consequently, ENSO's neutral conditions would tend to lag behind the current warming trend in the Pacific Ocean, leading to an exaggeration of positive anomalies associated with *El Niño*. Indeed, analysis of data from the past ten years (see Graph B2.3, panel B) shows that the ONI, unlike the RONI, tends to overestimate anomalies in the Niño 3-4 region. This results in more frequent, longer, and more intense *El Niño* events, while simultaneously reducing the detection of *La Niña* events. Such bias affects accurate tracking and precise historical identification of ENSO phases, diminishing the reliability of analyses and forecasts that rely on the ONI as a reference.

4. What differences are noted when the RONI replaces the ONI in characterizing historical ENSO episodes?

NOAA data[5] were used to update the table originally compiled by Bejarano et al. (2020), providing a similar characterization of climatic anomalies for RONI (see Appendix B2.1). Along with its methodology update, NOAA introduced three important changes in the historical characterization of ENSO events. First, the RONI calculation generates three additional *La Niña* episodes that were not recognized under the ONI. The first extends from August 1955 to January 1956, while the remaining two occurred between June 2024 and May 2025, and July 2025 and March 2026. Second, the new classification reduces the total number of *El Niño* events from 25 episodes under ONI to 24 using RONI. In addition, it reduces the number of episodes and the average duration of very strong *El Niño* events: from 9 events under ONI to 8 under RONI, and from 16 months under ONI to less than 14 months under RONI. Finally, the RONI indicator reduces the average duration of both neutral ENSO conditions (from 9.3 months under ONI to 9 months under RONI) and *La Niña* periods (from 12.4 months to 11 months).

5. What is ENSO's forecast for the coming months?

ENSO is currently in a neutral phase, following two consecutive *La Niña* episodes between June 2024 and February 2026. Forecasts point to a higher risk of an *El Niño* event as of mid-year, with the probability rising above 60% and exceeding 90% by the end of the year (Appendix B2.1 and Graph B2.4, panel A). In addition, NOAA CPC recently began publishing a graph that details ENSO probabilities by strength (Graph R2.4, panel B). Their analysis suggests that once *El Niño* conditions begin to manifest, a moderate event is most likely in the coming months. However, in the final quarter of 2026, the likelihood of a more intense event, ranging from strong to very strong, begins to increase significantly. In conclusion, the above suggests an increase in the probability and intensity of an *El Niño* occurrence relative to that reported in previous months, with a growing risk of a strong or even very strong event.

5 Available at: https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ONI_v5.php (ONI) and https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso/roni/#:~:text=The%20RONI%20is%20one%20measure,atmosphere%20phenomenon%20accompanied%20these%20periods (RONI)

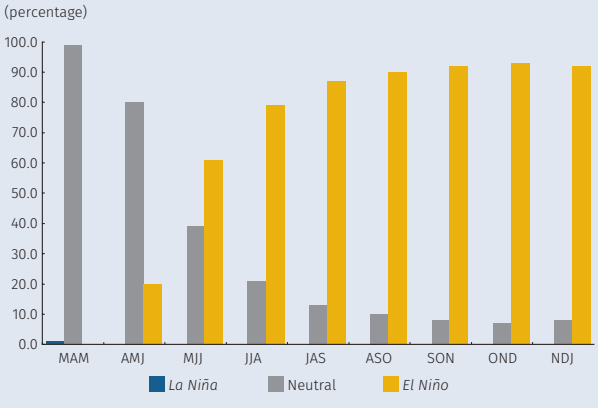
Table B2.1
Characterization of *El Niño* events

ONI				RONI			
El Niño intensity	Average duration in months	Maximum duration in months	Maximum number of consecutive events	*El Niño* intensity	Average duration in months	Maximum duration in months	Maximum number of consecutive events
Weak	6.8	13	3	Weak	7.9	14	2
Moderate	8.3	9	1	Moderate	9.0	12	2
Strong	14.0	18	1	Strong	16.0	18	1
Very strong	16.0	20	1	Very strong	13.8	15	1

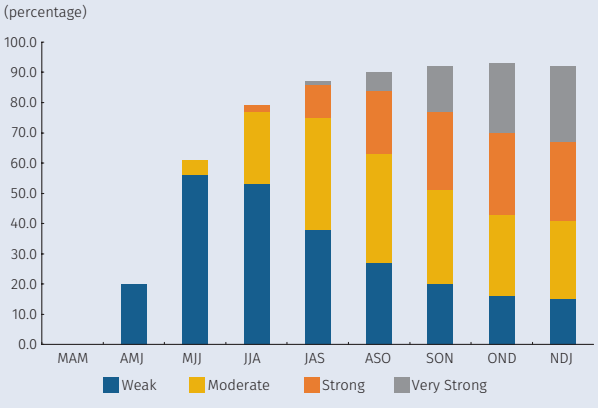
Source: Authors' own elaboration using NOAA data.

Graph B2.4
Probability of occurrence of an *El Niño* phenomenon

A. NOAA CPC ENSO official probabilities



B. NOAA CPC ENSO intensity probabilities



Fuente: Columbia Climate School, IRI, https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

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