



El Niño/La Niña Update

JUNE 2023

Current Situation and Outlook

The tropical Pacific is currently experiencing El Niño conditions as a result of rapid and substantial changes in oceanic conditions observed in recent months. According to the latest predictions from the WMO Global Producing Centres of Long-Range Forecasts, there is a 90% probability of the El Niño during the second half of 2023 with only a 10% chance of weakening to an ENSO-neutral state. The likelihood of La Niña development is negligible. National Meteorological and Hydrological Services (NMHSs) will closely monitor the evolution of El Niño conditions and the associated impacts on temperature and precipitation at national and local level. WMO will provide updated outlooks during the coming months as needed.

Since February 2023, monthly average sea surface temperature (SST) anomalies in the central-eastern equatorial Pacific, known as the Niño 3.4 region (5°N-5oS, 120°-170°W) have warmed significantly. According to the NOAA dataset – Optimum Interpolation Sea Surface Temperature (OISST) – the SST anomaly increased from nearly half a degree Celsius below normal (-0.44 °C) in February 2023, to around half a degree Celsius above normal (+0.47 °C) in May 2023 (1991-2020 reference period). In the week centered on 21 June 2023, the warm sea surface temperature anomalies in the Niño 3.4 region have continued to increase, reaching a value of +1.0 degrees Celsius above 1991-2020 average. The sustained gradual warming of surface temperatures is attributed to the warmer subsurface temperatures during the past 4 months and a deeper thermocline in the eastern equatorial Pacific.

As of mid-June 2023, the sea surface temperatures and other oceanic indicators in the central-eastern tropical Pacific are consistent with El Niño conditions. Currently, the subsurface temperatures in the equatorial Pacific Ocean are elevated, particularly in the equatorial eastern Pacific where notably warm temperatures prevail. This warming below the surface, coupled with periods of diminished trade winds associated with the Madden-Julian Oscillation and other tropical wave activity, has contributed to the gradual westward spread of warm surface

waters along the equator. In the atmosphere, convective activity is near normal over the equatorial Pacific near the international date line. Easterly winds in the lower troposphere (i.e., trade winds) over the equatorial Pacific have weakened. Upper-level (200-hPa) wind anomalies are easterly over the far western tropical Pacific Ocean, while being near average elsewhere. The Southern Oscillation Index (SOI: defined by the standardized Tahiti minus Darwin sea-level pressure difference), is now generally within the El Niño range, but has shown large intra-seasonal variation and is currently less strong than it was just a couple of weeks ago. There is indication of the presence of weak El Niño conditions in the Pacific, however some uncertainty remains because the coupling between the warming in the central and eastern equatorial Pacific and the overlying atmosphere has shown limited strength so far. It is expected to strengthen in the coming months.

Using recent observations as the starting point for their dynamical seasonal prediction systems, the WMO Global Producing Centres of Long-Range Forecasts routinely issue global climate forecasts for the coming months. Their most recent forecasts and expert assessment suggest a high likelihood of continued warming in the central-eastern equatorial Pacific, with sea surface temperatures (SSTs) in the Niño 3.4 region expected to surpass at least moderate El Niño thresholds (SST anomaly $\geq 1.0^{\circ}\text{C}$). There is a very high probability (around 90%) that El Niño conditions will continue to prevail until at least December 2023. The forecasts indicate a 10% possibility of the conditions in the central-eastern equatorial Pacific weakening to an ENSO-neutral state during this period, and there are no expectations for the re-emergence of La Niña throughout the forecasted timeframe. Moreover, based on the current model guidance, the possibility of a strong event occurring during the forecast period cannot be ruled out.

It is important to note that El Niño and La Niña are not the only factors that drive global and regional climate patterns, and that the magnitudes of ENSO indicators do not directly correspond to the magnitudes of their effects. At the regional level, seasonal outlooks need to assess the relative effects of both the ENSO state and other locally relevant climate drivers. Regionally and locally applicable information is made available via regional and national seasonal climate outlooks, such as those produced by WMO Regional Climate Centres (RCCs), Regional Climate Outlook Forums (RCOFs) and National Meteorological and Hydrological Services (NMHSs).

In summary:

- The tropical Pacific is experiencing El Niño conditions.
- The presence of positive temperature anomalies beneath the surface of the eastern Pacific, along with a positive thermocline depth anomaly, has resulted in significant warmth not only in the eastern Pacific but also extending further westward.
- The coupling between the warming in the central and eastern equatorial Pacific and the overlying atmosphere has shown limited strength so far, but it is expected to strengthen in the coming months based on model predictions.
- Based on model predictions and expert assessment, there is a very high likelihood (approximately 90% chance) of El Niño to prevail during the second half of 2023.
- The likelihood of the current El Niño weakening with a return to an ENSO-neutral state is estimated to be about 10% during the forecast period.
- The current model guidance does not rule out the possibility of a strong event occurring.
- La Niña re-development is practically ruled out until at least the end of 2023.

The state of ENSO will continue to be carefully monitored by WMO Members and partners. More detailed interpretations of the implications for regional climate variability will be carried out routinely by the climate forecasting community over the coming months and will be made available through the National Meteorological and Hydrological Services.

For web links of the National Meteorological Hydrological Services, please visit:

<https://public.wmo.int/en/about-us/members>

For information and web links to WMO Regional Climate Centres (RCCs) please visit:

<https://public.wmo.int/en/our-mandate/climate/regional-climate-centres>

For information and web links to Regional Climate Outlook Forums (RCOFs) please visit:

<https://public.wmo.int/en/our-mandate/climate/regional-climate-outlook-products>

For the latest Global Seasonal Climate Update (GSCU) based on WMO Global Producing Centres of Long-Range Forecasts, please visit:

<https://www.wmolc.org/gscuBoard/list>

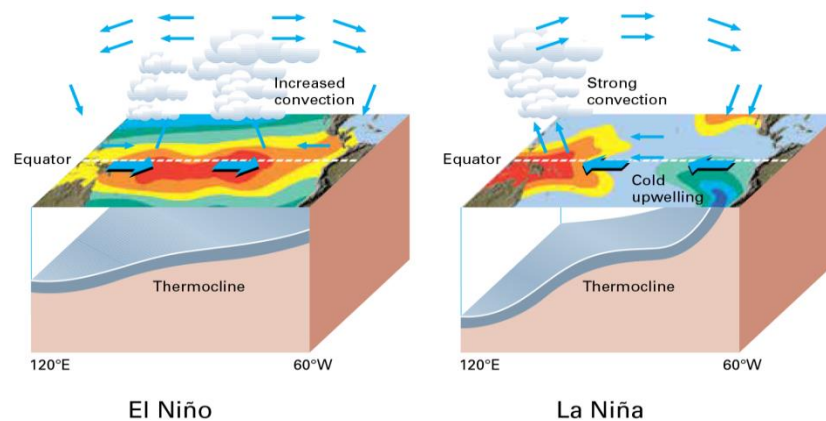
An archive of all WMO El Niño/La Niña Updates issued so far, including this one, is available at:

<https://community.wmo.int/activity-areas/climate/wmo-el-ninola-nina-updates>

Acknowledgements

The WMO El Niño/La Niña Update is prepared through a collaborative effort between the WMO and the International Research Institute for Climate and Society (IRI), USA, and is based on contributions from experts worldwide, inter alia, of the following institutions: Australian Bureau of Meteorology (BoM), Centro Internacional para la Investigación del Fenómeno El Niño (CIIFEN), China Meteorological Administration (CMA), Climate Prediction Centre (CPC) and Pacific ENSO Applications Climate (PEAC) Services of the National Oceanic and Atmospheric Administration (NOAA) of the United States of America (USA), European Centre for Medium Range Weather Forecasts (ECMWF), Météo-France, India Meteorological Department (IMD), Indian Institute of Tropical Meteorology (IITM), International Monsoons Project Office (IMPO), Japan Meteorological Agency (JMA), Korea Meteorological Administration (KMA), Met Office of the United Kingdom, Meteorological Service Singapore (MSS), WMO Global Producing Centres of Long Range Forecasts (GPCs-LRF) including the Lead Centre for Long Range Forecast Multi-Model Ensemble (LC-LRFMME).

El Niño/La Niña Background



Typical circulation patterns during El Niño/La Niña (Source: WMO, 2003, "Climate into the 21st Century").

Climate Patterns in the Pacific

Research conducted over recent decades has shed considerable light on the important role played by interactions between the atmosphere and ocean in the tropical belt of the Pacific Ocean in altering global weather and climate patterns. During El Niño events, sea surface temperatures in the central and eastern tropical Pacific Ocean become substantially warmer than normal. In contrast, during La Niña events, the sea surface temperatures in these regions become colder than normal. These temperature changes are strongly linked to major climate fluctuations around the globe and, once initiated, such events can last for 12 months or more. The strong El Niño event of 1997–1998 was followed by a prolonged La Niña phase that extended from mid-1998 to early 2001. El Niño/La Niña events change the likelihood of particular climate patterns around the globe, but the outcomes of each event are never exactly the same. Furthermore, while there is generally a relationship between the global impacts of an El Niño/La Niña event and its intensity, there is always potential for an event to generate serious impacts in some regions irrespective of its intensity.

Forecasting and Monitoring the El Niño/La Niña Phenomenon

The forecasting of Pacific Ocean developments is undertaken in a number of ways. Complex dynamical models project the evolution of the tropical Pacific Ocean from its currently observed state. Statistical forecast models can also capture some of the precursors of such developments. Expert analysis of the current situation adds further value, especially in interpreting the implications of the evolving situation below the ocean surface. All forecast methods try to incorporate the effects of ocean-atmosphere interactions within the climate system. The meteorological and oceanographic data that allow El Niño and La Niña episodes to be monitored and forecast are drawn from national and international observing systems. The exchange and processing of the data are carried out under programmes coordinated by the WMO.

WMO El Niño/La Niña Update

The WMO El Niño/La Niña Update is prepared on a quasi-regular basis (approximately every three months) through a collaborative effort between WMO and the International Research Institute for Climate and Society (IRI) as a contribution to the United Nations Inter-Agency Task Force on Natural Disaster Reduction. It is based on contributions from the leading centres around the world monitoring and predicting this phenomenon and expert consensus facilitated by WMO and IRI.

For more information on the Update and related aspects, please visit:

<https://public.wmo.int/en/our-mandate/climate/el-niñola-niña-update>