



El Nino 2023: Unusual Warming Like 2009

For Prelims: [El Nino](#), [La Nina](#), [El Nino-Southern Oscillation](#)

For Mains: EL Nino and its impacts, Relationship between El Nino and global warming

Why in News?

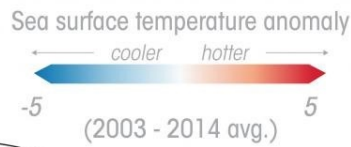
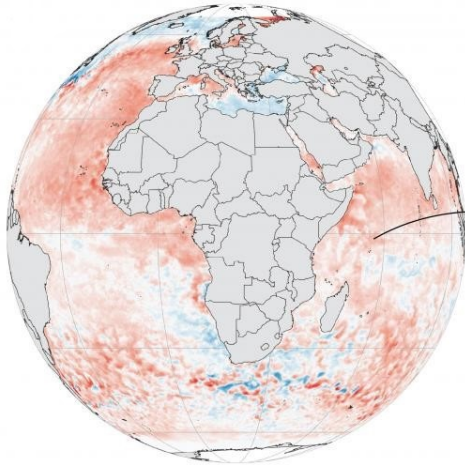
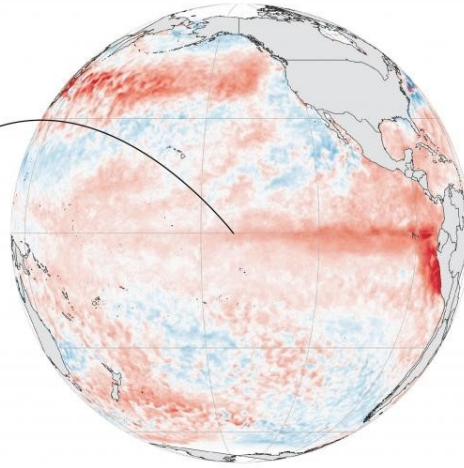
Recently, an **unusual phenomenon** is developing along the **equatorial Pacific region**, indicating the **emergence of [El Nino](#) conditions in 2023**. Experts warn that this **simultaneous warming of the eastern and western regions of the equatorial Pacific**, a trend **last observed in 2009**, could have severe implications for marine life worldwide.

What are the Causes for this Phenomenon?

- The **eastern Pacific is getting warmer**, which should make the **west cooler**.
 - However, due to [global warming](#), there is **basin scale warming** across the tropical Pacific.
- Two things could have triggered this phenomenon:
 - **Global warming** in the Pacific and other modes of natural variability
 - The transition from [La Nina winter](#) into an **El Nino summer** which is part of the [El Nino-Southern Oscillation \(ENSO\) cycle](#).
- **Basin Scale Warming in the Equatorial Pacific:**
 - Due to **global warming**, the equatorial Pacific experiences basin scale warming, **causing both eastern and western regions to become warmer**.
 - The measurement of basin scale **refers to the spatial extent of a basin or common water outlet**, in this case, the **equatorial Pacific region**.
 - Recent data analysis shows that the ocean temperatures on May 29, 2023, were unusually warm compared to the 2003-2014 average.

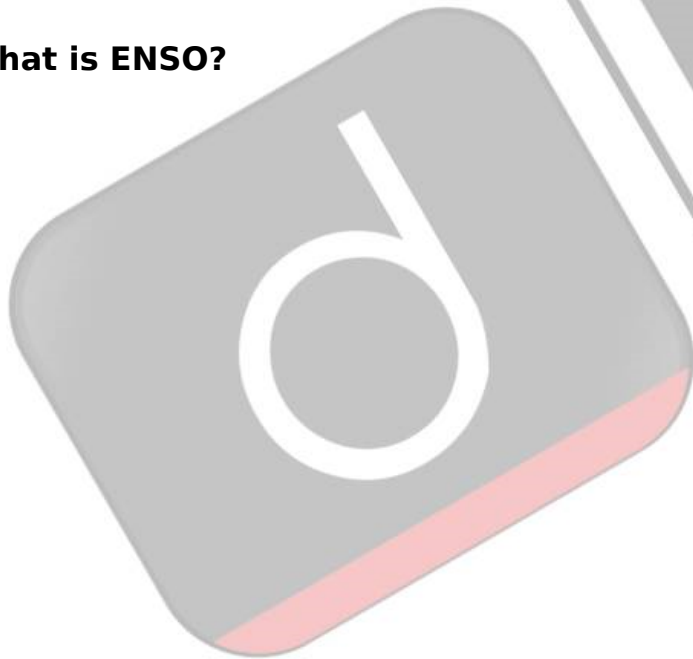
TRACKER: EL NINO

While all the signs are pointing towards an impending El Nino in the next few months, currently, an unusual phenomenon — not experienced since 2009 — is unfolding in the Pacific. As seen on the map (upper right), a high sea surface temperature anomaly off the coast of Peru is pointing towards a strong El Nino formation. But, that should also mean the western half of the Pacific (the region closer to Australia) should also be cooler. So why this anomaly?



Not just the Pacific, globally, our oceans are unusually warm and while it is still early to suggest, according to experts, the Earth might temporarily breach the 1.5°C threshold

What is ENSO?



El Niño Southern Oscillation (ENSO)

Describes the fluctuations in temperature between the ocean and atmosphere in the east-central Equatorial Pacific

Significance:

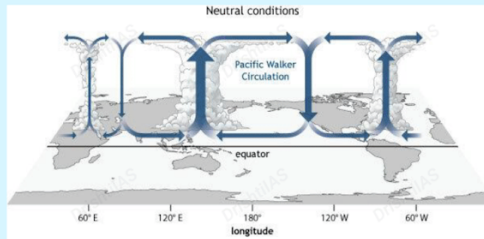
- Ability to change the global atmospheric circulation, influencing temperature and precipitation worldwide

States of ENSO:

- The two opposite phases - **El Niño** and **La Niña**
- The middle of the continuum - **Neutral**

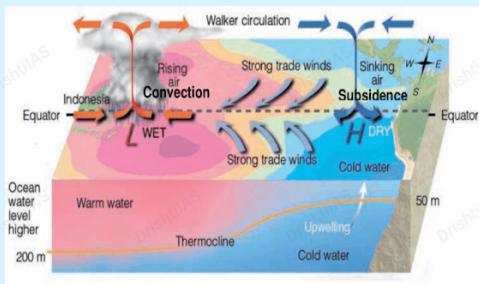
Walker Circulation (WC)

- An **atmospheric system of air flow** in the equatorial Pacific Ocean
 - The trade winds across the tropical Pacific flow from east to west: air rises above the warm waters of the western Pacific, flows eastward at high altitudes, and descends over the eastern Pacific
- WC and ENSO:
 - A weak/reverse WC produces **El Niño**
 - Stronger WC results in **La Niña**



Normal (non ENSO) Conditions in the Pacific Ocean

NEUTRAL ENSO



- Trade winds (easterlies) blow west along the equator, taking warm water from S. America towards Asia
- To replace that warm water, **cold water rises from the depths** — a process called **upwelling**
 - **El Niño and La Niña** are two climate patterns that **break these normal conditions**
- During an El Niño, sea level pressure tends to be lower in the eastern Pacific and higher in the western Pacific while the opposite tends to occur during a La Niña
 - This see-saw in atmospheric pressure between the eastern and western tropical Pacific is called the **Southern Oscillation (SO)**

What are the Potential Consequences of this Phenomenon?

- **Global Warming:**
 - The end of La Niña means that the **ocean is not taking up heat**, which **will dissipate into the atmosphere**.
 - If the atmosphere is warmer, then the **ocean doesn't lose as much heat, causing it to warm up at the surface**.
 - This may temporarily push **global warming beyond 1.5°C**.
- **Geophysical Effect:**
 - The phenomenon will affect **cyclones, hurricanes, and typhoons**, with **Typhoon Mawar** in the **western Pacific** already being one of the strongest.
 - The warming of ocean waters acts as a catalyst for **marine heatwaves**, the **slowing of meridional circulation**, which could cause unmitigable losses for **marine biodiversity**.
- **Coral Bleaching:**
 - A warming of 1.5°C threatens to **destroy 70 to 90 per cent of coral reefs**, and a 2°C increase means a **nearly 100 per cent loss** – a point of no return.

Previous El Nino Events:

- El Nino events of **1982-83 and 1997-98** were the **most intense** of the 20th century.
- During the **1982-83** event, sea surface temperatures in the eastern tropical Pacific were 9-18° F above normal.
- The El Nino event of **1997-98** was the first El Nino event to be **scientifically monitored from beginning to end**.
- The 1997-98 event produced drought conditions in Indonesia, Malaysia, and the Philippines. Peru and California experienced very heavy rains and severe flooding.
- The Midwest experienced record-breaking warm temperatures during a period known as **“the year without a winter.”**
- **The El Nino, along with global warming, had made 2016 the warmest year on record.**

What is the Impact El Nino 2023 on India?

- **Weak Monsoon for India:** The development of an El Nino in May or June 2023 may cause weakening of the **southwest monsoon season**, which brings around 70% of the total rainfall India receives and on which most of its farmers still depend.
 - However, **sub-seasonal factors such as the Madden-Julian Oscillation (MJO)** and monsoon low-pressure systems **can temporarily enhance rainfall** in some parts as witnessed in the year 2015.
- **Hot Temperatures:** It may also cause **heatwaves** and **droughts** in India and other regions around the world such as South Africa, Australia, Indonesia and the Pacific Islands.

El Niño and La Niña

El Niño

- Warming of the ocean surface/ Above average sea surface temp. (SST)
- Easterly winds either weaken or start blowing in the opposite direction
- First noticed by Peruvian fishermen in the 1600s
- More frequent than La Niña

Impacts

- Drastically higher rainfall in S. America (coastal flooding and erosion)
- Droughts in Indonesia and Australia; wildfires
- Weaker monsoons and even droughts in India and SE Asia
- Reduces the upwelling of cooler, nutrient-rich waters from the deep - along the west coast of South and Central America.



Fig. 1 - Depiction of El Niño Phenomenon

La Niña

- Also called El Viejo, anti-El Niño, or simply “a cold event”
- Normal easterly winds along the equator become even stronger
- May last 1-3 years, unlike El Nino (which usually lasts no more than a year)

Impacts

- Heavier rains in SE Africa, catastrophic floods in Australia
- Drier-than-normal conditions in S. America
- Summer Monsoon rainfall - greater than normal rainfall in India; beneficial for agriculture dependent Indian economy
- Off the west coast of the Americas, upwelling increases, bringing cold, nutrient-rich water to the surface.



Fig. 2 - Depiction of La Niña Phenomenon

Oceanic Niño Index (ONI)

- It is a measure of the departure from normal sea surface temperature in the east-central Pacific Ocean.
- It is the standard means by which each El Niño episode is determined, gauged, and forecast.



Drishti IAS

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. With reference to 'Indian Ocean Dipole (IOD)' sometimes mentioned in the news while forecasting Indian monsoon, which of the following statements is/are correct? (2017)

1. IOD phenomenon is characterised by a difference in sea surface temperature between tropical Western Indian Ocean and tropical Eastern Pacific Ocean.
2. An IOD phenomenon can influence an El Nino's impact on the monsoon.

Select the correct answer using the code given below:

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (b)

Mains

Q. Most of the unusual climatic happenings are explained as an outcome of the El-Nino effect. Do you agree? (2014)

Source: DTE

PDF Reference URL: <https://www.drishtiias.com/printpdf/el-nino-2023-unusual-warming-like-2009>

