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El Nino and La Nina

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Why is in news? North India more affected by El Nino

Ahead of every monsoon, meteorologists track, with a degree of nervousness, temperatures in the central and eastern Pacific Ocean.

Six in 10 years, a half degree or more rise — an El Nino — corresponds to diminished rainfall in India. The converse, or a La Nina, is linked to increased rain.

A study last week however suggests that this cyclical swing — called **the El Nino Southern Oscillation (ENSO)** — affects vast regions of India differently.

About ENSO:

El Niño–Southern Oscillation (ENSO) is an **irregularly periodic variation** in winds and sea surface temperatures over the **tropical eastern Pacific Ocean**.

Every three to seven years, the surface waters across tropical Pacific Ocean warm or cool by 1°C to 3°C, compared to normal.

The **warming phase of the sea** temperature is known as **El Niño** and the **cooling phase as La Niña**.

Thus, El Niño and La Niña are opposite phases of what is known as the El Niño-Southern Oscillation (ENSO) cycle.

These deviations from normal surface temperatures can have large-scale impacts not only on ocean processes, but also on global weather and climate.

El Niño and La Niña are the extreme phases of the ENSO cycle; between these two phases is a third phase called ENSO-neutral.

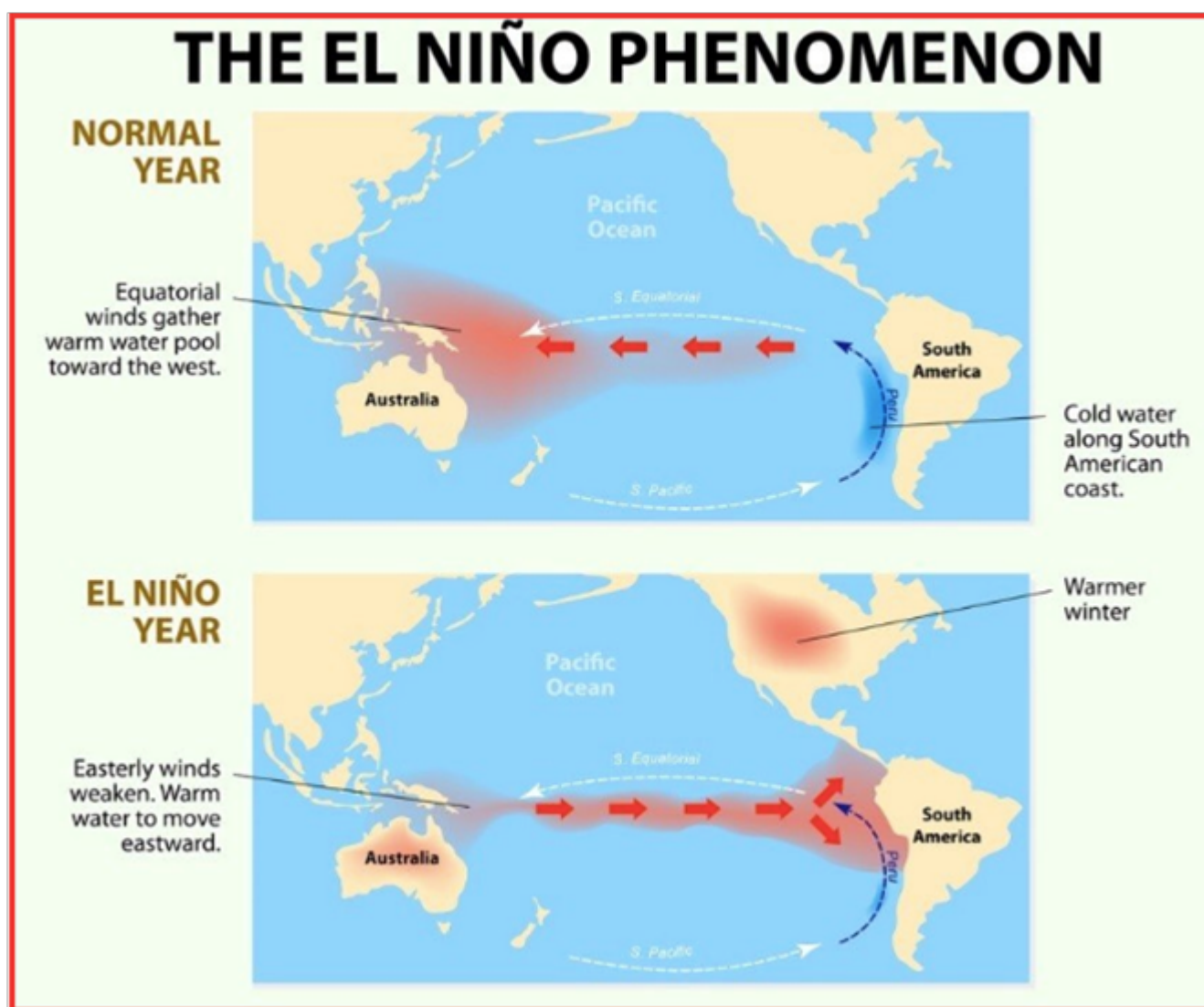
Comparison of El Nino and La Nina:

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	El Nino	La Nina
Definition	Warmer-than-normal sea surface temperatures	Cooler-than-normal sea surface temperatures
Frequency	Every two to seven years	Every two to seven years
Duration	Several months to a year or more	Several months to a year or more
Impact on winds	Weakens trade winds, leading to changes in patterns	Strengthens trade winds, leading to changes in patterns
Impact on rains	Reduces rainfall and can cause droughts	Increases rainfall and can cause flooding
Impact on temperature	Warmer-than-average temperatures	Colder-than-average temperatures
Global effects	Droughts in Asia and Africa, floods in Americas	Floods in Asia and Africa, droughts in South America



Impact of El Nino and La Nina on India:

El Nino:

Associated with **weak monsoons and drought-like conditions** in India

Sea surface temperature in the equatorial Pacific Ocean rises above normal levels

Changes in the atmospheric circulation patterns

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Shift in the location of the jet stream, affecting the strength and direction of the monsoon winds

Results in **reduced rainfall, dry spells, and heatwaves**, leading to crop failures and water scarcity

La Nina:

Associated with **above-normal rainfall and floods** in India

Sea surface temperature in the equatorial Pacific Ocean drops below normal levels

Changes in the atmospheric circulation patterns

Increase in the **strength of the monsoon winds**, bringing more moisture and rainfall to India

Excessive rainfall can also lead to **floods and landslides**, causing damage to crops and infrastructure

El Nino and Indian Monsoon:

El Nino and its impact on Indian monsoon: El Nino refers to **abnormal warming of surface waters** in the equatorial Pacific Ocean, which tends to **suppress monsoon** rainfall in India.

Phases of El Nino Southern Oscillation (ENSO): ENSO consists of **three phases** in the Pacific Ocean: El Nino, La Nina (abnormal cooling), and a neutral phase with sea surface temperatures close to long-term averages.

Ocean and atmospheric conditions: ENSO involves **not only temperature abnormalities** of sea surface waters but **also atmospheric conditions**, including differences in sea-level air pressure and wind strength and direction.

Southern oscillation and the role of winds: **Southern Oscillation Index** measures the difference in sea-level air pressure over the western and eastern sides of the Pacific Ocean, while wind patterns play a crucial role in ENSO.

Others:

Triple dip La Nina:

The extended spell of La Nina lasting across three winter seasons in the northern hemisphere is called 'Triple dip La Nina'.

Walker circulation:

The air circulation as a result of difference in surface pressure and temperature over the western and eastern tropical Pacific Ocean is known as Walker circulation.

Madden-Julian Oscillation (MJO):

The Madden-Julian Oscillation (MJO) is the **major fluctuation in tropical weather** on **weekly to monthly timescales**.

The MJO can be characterized as an eastward moving 'pulse' of cloud and rainfall near the equator that typically recurs **every 30 to 60 days**.

The MJO consists of two parts, or phases: one is the **enhanced rainfall** (or convective) phase and the other is the **suppressed rainfall phase**.

Strong MJO activity often dissects the planet into halves: one half within the enhanced convective phase and the other half in the suppressed convective phase.

These two phases produce opposite changes in clouds and rainfall and this entire dipole (i.e., having two main opposing centers of action) propagates eastward.

