

# EL NIÑO - Comprehensive Notes

## 1. Introduction

El Niño is a periodic warming of the central and eastern equatorial Pacific Ocean. It is a major phase of the El Niño–Southern Oscillation (ENSO) system and significantly influences global weather and climate patterns.

## 2. Normal Pacific Conditions

- Strong trade winds blow from east to west across the equatorial Pacific.
- Warm water accumulates in the western Pacific near Indonesia and Australia.
- Cold water upwelling occurs along the west coast of South America (Peru and Ecuador).
- Low pressure dominates the western Pacific; high pressure dominates the eastern Pacific.

## 3. El Niño Conditions

- Trade winds weaken or reverse.
- Warm water shifts eastward toward the coast of South America.
- Upwelling of cold water is reduced or suppressed.
- Sea Surface Temperature (SST) increases in the eastern Pacific.
- Atmospheric pressure patterns shift (Southern Oscillation).

## 4. Causes of El Niño

El Niño results from ocean-atmosphere interaction in the tropical Pacific. Weakening of trade winds leads to reduced upwelling and redistribution of warm surface water. The Bjerknes feedback mechanism amplifies the warming process.

## 5. Impacts of El Niño

- Drought in Australia, Indonesia, and parts of India.
- Heavy rainfall and floods in Peru and Ecuador.

- Weakening of Indian Monsoon.
- Reduction in fisheries due to decreased nutrient upwelling.
- Global temperature rise during strong events.

## 6. El Niño and Indian Monsoon

El Niño often weakens the Indian Summer Monsoon, leading to below-normal rainfall. However, the relationship is not absolute and may be influenced by other factors such as the Indian Ocean Dipole (IOD).

## 7. La Niña (Opposite Phase)

La Niña is the cooling phase of ENSO characterized by stronger trade winds, enhanced upwelling, and cooler-than-normal sea surface temperatures in the eastern Pacific.

## 8. Simplified Diagram (Text Form)

Western Pacific (Low Pressure) ----> Weak Trade Winds ----> Eastern Pacific (Warm SST)  
Indonesia/Australia Peru/Ecuador Reduced Upwelling Warmer Surface Waters