NO PREP

El Niño and La Niña

Ocean-Atmosphere Climate Connections

Includes: Student reading, case study, differentiated questions, teacher key

Name: Period: Date:

El Niño and La Niña: Ocean-Atmosphere Climate Connections

The ENSO Cycle: A Powerful Climate Driver

Every few years, the world feels the effects of a natural climate rhythm known as the El Niño-Southern Oscillation (ENSO). This cycle alternates between two opposite phases—El Niño and La Niña—that shift weather patterns across the globe. Even though the changes begin in the tropical Pacific Ocean, their impacts ripple outward, influencing rainfall, drought, storms, and even global food production. During El Niño, warm surface waters in the central and eastern Pacific intensify, and trade winds that normally blow westward weaken. This warming of the ocean surface alters atmospheric circulation, creating wetter conditions in some regions and severe droughts in others. In contrast, La Niña strengthens the trade winds,

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Global Impacts of El Niño and La Niña

The effects of ENSO extend far beyond the Pacific Ocean. El Niño often brings heavy rainfall and flooding to the west coasts of the Americas while triggering droughts in Australia, Indonesia, and parts of Africa. It can weaken the Indian monsoon, threatening food supplies for millions. In the Atlantic Ocean, El Niño tends to suppress hurricane formation by creating strong upper-level winds that tear storms apart. La Niña, however, often intensifies hurricane activity in the Atlantic,

while bringing wetter-than-normal conditions to Southeast Asia and drier weather to the southwestern United States. Both phases can affect agriculture by disrupting rainfall patterns, fisheries by altering upwelling zones, and even global health by creating conditions for disease outbreaks such as malaria and cholera. Because ENSO influences so many aspects of life, from food prices to disaster preparedness, it remains one of the most closely studied climate systems in the world. Understanding it is not only important for scientists but also for communities everywhere who depend on stable climate patterns for survival.

Key Information: Key Concepts Table

Concept	Description	Example/Impact
El Niño	Warm water shifts east in the Pacific	Flooding in Peru, drought in Australia
La Niña	Strong trade winds, cold upwelling	More Atlantic hurricanes, floods in Asia
ENSO Cycle	Alternating El Niño/La Niña phases	Occurs every 2–7 years
Trade Winds	Winds pushing Pacific water westward	Weaken in El Niño, strengthen in La Niña
Climate Impacts	Weather extremes across the globe	Droughts, floods, hurricanes, food shortages

Case Study: The El Niño of 1997–1998

The 1997–1998 El Niño event was one of the strongest ever recorded. Sea surface temperatures in the eastern Pacific rose dramatically, disrupting weather worldwide. In Peru and Ecuador, catastrophic flooding destroyed homes and crops. Across Southeast Asia and Australia, drought conditions led to massive wildfires. In the United States, California faced intense storms and flooding, while the Midwest experienced a milder winter. Economists estimated that the event caused over $30 billion in damages globally and tens of thousands of deaths from storms, starvation, and disease outbreaks. What made this El Niño particularly significant was the growing ability of scientists to track it in real time. Advances in satellite monitoring and ocean buoys allowed researchers to predict impacts months in advance. This case demonstrated the urgent need for accurate ENSO forecasts and international cooperation in preparing for such climate events.

1. How did the 1997–1998 El Niño impact both South America and Southeast Asia?

_____

_____

2. Why was improved monitoring technology important during this event?

_____

_____

Multiple Choice

1. What happens during El Niño?

    a) Cold upwelling increases along South America

    b) Trade winds strengthen, and cold water surfaces

    c) Hurricanes intensify in the Atlantic

    d) Warm water shifts east, and trade winds weaken

2. How does La Niña typically affect the Atlantic hurricane season?

a) Creates tsunamis

b) Suppresses Atlantic storm formation

c) Increases hurricane activity

d) Has no effect

3. Why is ENSO monitoring so important for society?

a) It allows forecasts of floods, droughts, and storms

b) It helps predict volcanic eruptions

c) It prevents earthquakes

d) It tracks how quickly sea ice is melting in the Arctic

Matching

Write the letter of the correct definition on the line next to each term.

Term	Definition
1. ___ El Niño	A) Alternating phases shaping global weather
2. ___ La Niña	B) Warmer eastern Pacific waters, weaker trade winds
3. ___ ENSO Cycle	C) Often weakened by El Niño
4. ___ Atlantic Hurricanes	D) Strengthened trade winds, colder Pacific waters
5. ___ Indian Monsoon	E) Intensify during La Niña

Fill-in-the-Blank

1. The El Niño–Southern Oscillation occurs every _____ years.

2. During El Niño, trade winds become _____, allowing warm water to move eastward.

3. La Niña is often linked to increased _____ activity in the Atlantic.

Short Answer

Answer each question in 2-4 complete sentences.

1. Compare the impacts of El Niño and La Niña on global climate.

2. How do ENSO events affect food security and agriculture worldwide?

3. Why is international cooperation essential in monitoring and preparing for ENSO?