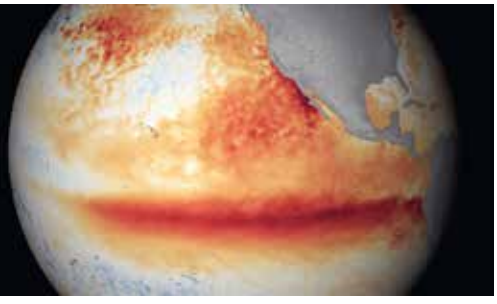
El Niño in the spotlight

El Niño is a major driver of climate variability in the Intertropical Zone. It modifies rainfall, impacts productivity in certain ocean areas and influences cyclone formation, with major consequences for local populations. Understanding this phenomenon better is a high-priority scientific objective.



Ocean surface temperatures during an El Niño event in November 2015.

In the 1980s, meteorologists were adamant that it would never be possible to forecast the weather beyond one or two weeks. Ten years later, climatologists demonstrated the opposite by being able to predict certain climate anomalies several seasons in advance.

This required greater understanding of a phenomenon about which very little was known at the time: El Niño. Achieving this hard-won objective involved observing and collecting a vast amount of data using merchant ships, oceanographic campaigns, satellites and networks of instrumented buoys (such as the TAO buoys, positioned in the Equatorial Pacific since the 1990s).

These observations have gradually revealed the secrets of El Niño, a major climate phenomenon linked to interactions between the ocean and the atmosphere. Normally, in the Pacific, the trade winds blow from east to west, generating upwelling of deep, cold, nutrient-rich waters near the South American coast, and warmer waters favouring heavy rainfall on the other side of the basin. But when El Niño occurs, the trade winds weaken, leading to droughts in Australia and Southeast Asia, abnormally warm waters with low productivity in Peru, and tropical cyclones in French Polynesia.

In the late 1990s, major advances were made in our understanding of the ocean-atmosphere interactions that cause El Niño events and the oceanic processes that put an end to them. However, many questions remain unanswered. How can this phenomenon be translated into simple mathematical models? What are the key differences between extreme El Niño events, with devastating impacts, and more moderate episodes, limited to the central Pacific? These are crucial issues, because most of the Intergovernmental Panel on Climate Change (IPCC) models predict that extreme El Niño events will double by 2080, with major consequences for societies that are vulnerable to exceptional climate events.

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••• Research over many years has made it possible to gain a better understanding of the multiple facets of El Niño, but many questions remain unanswered •••

Flooding is one of the consequences of El Niño events, Porto Alegre, Brazil.

"El Niño events cause drought in the Amazon basin and Northeast Brazil, as well as flooding in the south of the country. The socioeconomic consequences for Brazil are considerable, ranging from water and energy shortages to crop losses. Research into El Niño has improved forecasting of extreme events, helping to mitigate their impact on Brazil's water, food and energy security."

Regina Rodrigues, Federal University of Santa Catarina, Brazil

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