

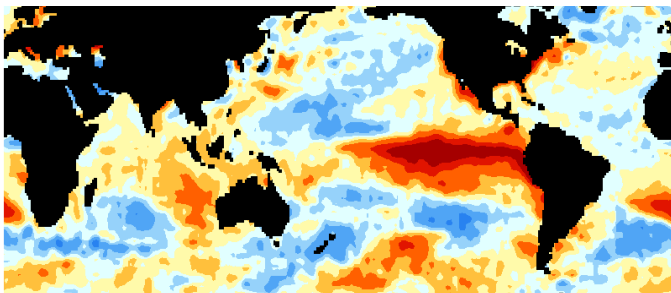
“Natural climate variability is not attributable to or influenced by any activity related to humans.”

A prominent aspect of our climate is its variability. This variability ranges over many time and space scales and includes phenomena such as El Niño/La Niña, droughts, multi-year, multi-decade, and even multi-century changes in temperature and precipitation patterns.

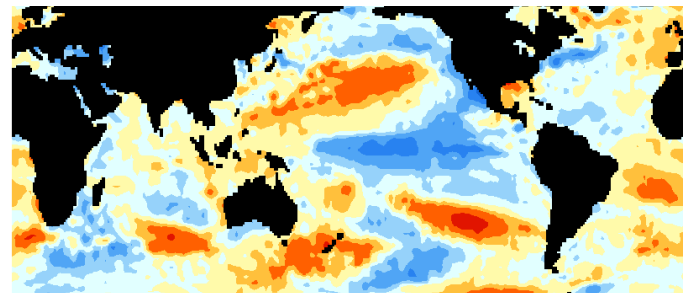
Some examples of longer time-scale variability might include a series of abnormally mild or exceptionally severe winters, and even a mild winter followed by a severe winter.

## Examples of Natural Climate Phenomena

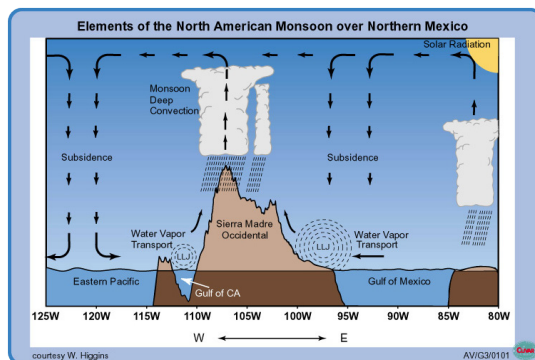
El Niño conditions occur when abnormally warm waters accumulate in tropical latitudes of the central and eastern Pacific Ocean. Consequently, tropical rains that usually fall over Indonesia shift eastward.



La Niña conditions occur when cooler-than-average waters accumulate in the central and eastern tropical Pacific and tropical rains shift to the west.



El Niño and La Niña affect rainfall distribution in the tropics that strongly influences weather patterns across the United States and other parts of the world.



## Monsoons

Monsoons are atmospheric systems with certain well-defined characteristics. All monsoons have a life cycle characterized by distinct onset, mature, and decay phases. They feature abundant rainfall during summer and dry conditions during winter.

The strongest monsoon, the Asian summer monsoon, affects about half of the world’s population. Monsoons are also found in other tropical–subtropical land areas, including Australia, Africa, South America, and North America.

*Monsoon variability is often related to floods, drought, and other hazardous extreme weather and climate events.*

- Excessive monsoon rainfall causes floods, landslides and loss of infrastructure.
- Insufficient monsoon rainfall leads to drought, and therefore scarcer freshwater supplies.
- Monsoon behavior, such as the intensity and duration, influences economic planning and development, water resource management, agriculture (planting and harvesting), and emergency response.

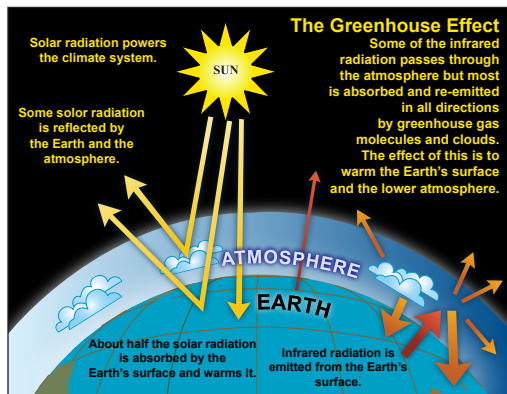


Climate Change may result from persistent human activities, such as the burning of fossil fuels and deforestation.

Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer).

Our environment, and especially our climate, is changing. Changes have occurred in several aspects of the atmosphere and surface that alter the global energy budget of the Earth and can therefore cause the climate to change. Among these are increases in greenhouse gas concentrations and deforestation.

## The Greenhouse Effect



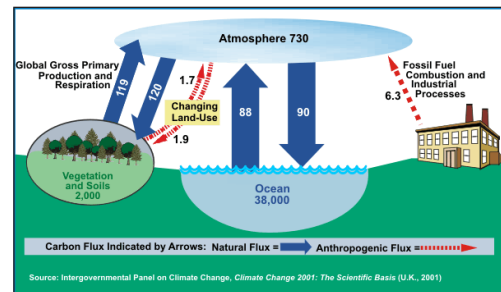
Water Vapor ( $H_2O$ ) is the most important greenhouse gas, and carbon dioxide ( $CO_2$ ) is the second most important. Methane, nitrous oxide, ozone, and several other gases also contribute to the greenhouse effect. Adding more greenhouse gases, such as  $CO_2$ , to the atmosphere intensifies the greenhouse effect.

The Greenhouse Effect is necessary for life on Earth, as we know it, to survive. The effect is enhanced by human activities, such as the burning of fossil fuels.

Projecting climate into the future and forecasting regional impacts depends on our understanding of the exchange of carbon dioxide among the atmosphere, oceans and land ecosystems.

### What is the Carbon Cycle?

Carbon is exchanged, or “cycled” among Earth’s oceans, atmosphere, ecosystem, and geosphere. All living organisms are built of carbon compounds. It is the fundamental building block of life and an important component of many chemical processes. It is present in the atmosphere primarily as carbon dioxide ( $CO_2$ ), but also as other less abundant but significant gases, such as methane ( $CH_4$ ).



The National Oceanic Atmospheric Administration (NOAA) is charged with providing the atmospheric measurements and analyses required to track the fate of carbon dioxide emissions caused by the burning of fossil fuels and biomass, and to reducing uncertainties in how the exchange of carbon responds to the variations and trends of climate and land use.

## Why Worry About Climate Change?

Temperature increases will have significant impacts on human activities: where we can live, what food we can grow, and how or where we can grow it.

To be prepared for the effects of these potential impacts

we need to know how much the Earth is warming, for how long it has been warming, and the causes. Answers will provide a better basis for making decisions related to issues such as water resource management and agricultural planning.



Changes in the occurrence of weather and climate extremes are among the most serious challenges to society in coping with a changing climate.

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