

CAN CHANGES IN THE ATLANTIC OCEAN AFFECT THE INDIAN SUMMER MONSOON

Relevant for: Geography | Topic: Indian Climate including Monsoons

Daily commuters walking along a road near Delhi Gate during morning rainfall in New Delhi on February 14, 2019 | File | Photo Credit: [Prateek kumar](#)

Changes in the equatorial Atlantic ocean have been known to have an inverse relationship with the Indian summer monsoon rainfall. This means if there is a cold phase in the Atlantic, it can bring more rainfall to India and vice versa.

Now, researchers from New York University, Abu Dhabi (NYUAD) have shown that this relationship has significantly strengthened in recent decades.

The researchers looked at sea surface temperature changes, wind patterns over the Atlantic Ocean and compared it with the Indian monsoon patterns for the past 106 years. They studied how the relationship has evolved from 1903- 2010 They divided the years into three equal parts and looked at the emerging trend.

“Until 1975, ENSO was the dominant factor affecting the Indian monsoon. Only after the 70s we see an increasing influence from the Atlantic Ocean. Also during the 70s we note the anomalies in sea surface temperature increases, not just in Atlantic but across the tropical oceans,” explains Dr. C.T. Sabeerali, a research associate at the Center for Prototype Climate Modelling (CPCM), NYUAD and the first author of the paper published in *Geophysical Research Letters*.

El Niño–Southern Oscillation (ENSO) refers to the changes in winds and sea surface temperatures over the tropical eastern Pacific Ocean. These changes are known to influence the climate the tropical countries.

El Niño occurs when sea surface temperatures rise to above-normal levels for an extended period of time, The opposite phase of El Niño is called La Niña when sea surface temperatures drop to lower-than-normal levels.

El Niño generally suppresses monsoon rainfall; La Niña generally increases it. But the relationship is not that straightforward. There are many years especially past 1990, this relationship do not hold.

Not just these two oceans but also changes in the Indian Ocean known as Indian Ocean dipole play an important role in our rainfall patterns.

Indian Ocean dipole is an irregular oscillation of sea-surface temperatures in which the western Indian Ocean becomes alternately warmer and then colder than the eastern part of the ocean.

Anomalous warming of the West Indian Ocean (South Arabian Sea) relative to the East is considered a booster for a concurrent Indian monsoon.

The warming or cooling of the Atlantic Ocean (also known as Atlantic Zonal Mode or Atlantic Nino) influences the Kelvin waves in the atmosphere. These waves are eastward moving disturbances in the troposphere (lowest region of the atmosphere, just about 10 km above the ground).

The waves move towards the tropical Indian Ocean and either increase or decrease the atmospheric temperature. This in turn influences the temperature gradient between Indian Ocean and subcontinent and thereby affecting the monsoon.

When predicting monsoon patterns, the India Meteorological Department (IMD) should start taking the changes in the Atlantic Ocean also into consideration.

“Till now, we know that El Niño has the strongest connection with our monsoon. But there have been instances where the El Niño predictions have failed. 1997 is a classic El Niño year but the monsoon was normal. This could be due to the fact that other teleconnection features overcome the effects caused by El Niño,” explains Dr. R.S. Ajayamohan, senior scientist at CPCM, NYUAD and corresponding author of the study.

“IMD should give more weightage to anomalies in the Atlantic sea surface temperature and take in these teleconnections in their forecast models to get a better prediction of our monsoons.”

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The study uses tree ring records to reconstruct the Asian summer monsoon back to 1566.

This is in connection with a proposal to ban walkers

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