Distant oceanic phenomena influence climate in South America

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The role played by the Atlantic and Pacific, and Indian Oceans in South American climate variability is one of the topics researched by Marcelo Barreiro, Head of Atmospheric Sciences at Uruguay's University of the Republic (UDELAR). Barreiro and his research group study climate variability and predictability on the continent in timescales varying from a single season to decades. This involves the study of regional and global oceanic processes and their impact on remote areas via atmospheric teleconnections—distant but connected climate phenomena.

"Different temperature patterns in the tropical Pacific Ocean can produce anomalies in rainfall in northern and southern Uruguay, for example," he said. The Atlantic, Pacific and Indian Oceans interact via oceanic and atmospheric teleconnections. Sea surface temperature anomalies in the tropical Pacific and Atlantic can lead to rainfall anomalies in tropical regions.

Barreiro and colleagues employed a complex networks approach using computational resources capable of processing large volumes of data to simulate the influence of El Niño, the Indian Ocean Dipole and variability in the tropical North Atlantic on the spring rainfall regime in South America. The Indian Ocean Dipole is an irregular surface temperature oscillation between the western and eastern Indian Ocean, in which, like two poles, each becomes alternately warmer and colder than the other. Climate researchers first identified the phenomenon in 1999.

Barreiro and colleagues are also studying how the aggregate influence of

the tropical oceans in the southeast of South America observed during the 20th century may be altered in the 21st century by anthropogenic factors and climate change. "The influence of the tropical oceans is the basis for seasonal forecasts of rainfall and temperature in the extratropics, which, on the contrary, are dominated by internal atmospheric variability so that forecasting is difficult. A key question that must therefore be addressed is whether this influence will change in a global warming scenario," Barreiro said.

"To answer the question we use observations and numerical models of atmospheric and oceanic circulation. Our work has implications for the productive sector's decision-making process on a scale of months and in determining the regional climate change signal." Reduced predictability hinders the production of seasonal weather forecasts and other information of vital importance to sectors such as agriculture and energy. Results obtained by Barreiro's group suggest that anthropogenic factors will lead to a decrease in the number and duration of periods in which the tropical oceans collectively influence rainfall over southeastern South America.

"This could reduce the predictability of seasonal rains in future decades," Barreiro said.

Provided by FAPESP

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