CO_2 increase can intensify future droughts in tropics, study suggests

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Tropical forest in Martinique near the city of Fond St-Denis. Credit: Wikipedia

A new study suggests that increases in atmospheric CO_2 could intensify extreme droughts in tropical and subtropical regions—such as Australia, the southwest and central United States, and southern Amazonia—at much a faster rate than previously anticipated, explains University of Texas at Austin professor Rong Fu in a commentary in the March 9

edition of *Proceedings of the National Academy of Sciences*.

Fu, a professor at the university's Jackson School of Geosciences, writes about a new study by William K.M. Lau of the University of Maryland and Kyu-Myong Kim of the NASA Goddard Space Flight Center, explaining that it shows for the first time through computer climate modeling that the Hadley Circulation will intensify as the world warms. The study, "Robust Hadley Circulation changes and increasing global dryness due to CO2 warming from CMIP5 model projections," was posted online Feb. 23.

The Hadley Circulation, associated with the prevailing trade winds in the tropics, is an atmospheric air current centered around the equator that affects areas between the latitudes of about 30 degrees north and 30 degrees south.

The Hadley Circulation influences the distribution of rainfall, clouds and relative humidity over half of Earth's surface. It can expand or contract in a warmer or colder global climate, leading to substantial changes of regional rainfall. Such changes have been linked to the collapse of the ancient Maya civilization.

During the past decade or two, the Hadley Circulation has become stronger and expanded toward the poles at a rate faster than predicted by global climate models, contributing to increased droughts over many subtropical regions and increased rainfall in equatorial regions. Past studies have attributed the intensifying of the Hadley Circulation to natural decadal climate variability, because climate models have predicted that the Hadley Circulation will weaken in the future as climate changes. But Lau's and Kim's work found that the Hadley Circulation intensified in warmer climate, which is expected to continue.

"This is the first study that suggests a possible intensification of droughts

in the tropic-subtropical margins in warmer climate. The finding is critical to understanding what the world will be like as the climate continues to change," Fu said. "Will the Hadley Circulation continue to expand? Could the intensification of droughts over the tropics and subtropics be a new norm? These are questions that need to be answered."

More information: Global warming-accelerated drying in the tropics, www.pnas.org/cgi/doi/10.1073/pnas.1503231112

Robust Hadley Circulation changes and increasing global dryness due to CO2 warming from CMIP5 model projections, www.pnas.org/content/early/201 … 682112.full.pdf+html

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