

Tropics are widening as predicted by climate models, research finds

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Australia's Lake Hume is on the fringes of the tropics and could be affected by the expansion of desert areas associated with widening of the tropics. Credit: Tim J. Keegan

Scientists have observed for years that the Earth's tropics are widening in connection with complex changes in climate and weather patterns. But in recent years, it appeared the widening was outpacing what models predicted, suggesting other factors were at work.

A new paper co-authored by Indiana University Bloomington researcher Paul Staten, however, finds that the most up-to-date models and the best data match up reasonably well.

"If we compare the observed trends of how the tropics have widened to modeling trends, it's actually not outside of what the models predict," said Staten, assistant professor of atmospheric sciences in the College of Arts and Sciences.

Staten is an affiliated researcher with the IU Environmental Resilience Institute, which was established under Prepared for Environmental Change, the second initiative funded by the university's Grand Challenges Program.

The paper, "Re-examining Tropical Expansion," was published in the journal *Nature Climate Change*. Additional authors include Jian Lu of the Pacific Northwest National Laboratory, Kevin Grise of the University of Virginia, Sean Davis of the National Oceanic and Atmospheric Administration in Colorado and Thomas Birner of Ludwig Maximilians University Munich in Germany.

Staten said the research should add confidence to predictions based on current climate models.

"Climate change should continue to expand the tropics over the next several decades," he said. "But the expansion may not continue at the rapid rate we've seen; at times it may even temporarily contract."

The authors conclude that the tropics have been widening at an average rate of about 0.2 degrees latitude, or about 17 miles, per decade in both the Northern and Southern hemispheres. The rate varies widely from year to year and from location to location.

Widening of the tropics is important because it could be associated with severe changes in climate, Staten said. The world's hot, dry deserts tend to be located in bands along the northern and southern edges of the tropics, so widening of the tropics could lead to expansion of the subtropical deserts. At sea, the edges of the tropics are zones of high salinity and low marine productivity.

About half of the world's population lives in or near subtropical semi-arid climate zones, the researchers write, so changes in the subtropical climate could affect billions of people.

The researchers focus on five factors that may influence the widening of the tropics:

- Increases in greenhouse gas emissions, which lead to a warmer global [climate](#).
- Depletion of ozone in the stratosphere over the South Pole, which probably shifts the edge of the tropics, especially in the Southern Hemisphere.
- Aerosols from volcanic eruptions.
- Pollution, including soot and ozone in the troposphere.
- Natural variation, including changes in sea surface temperatures tied to the El Niño and La Niña phenomena.

Given the complexity of the factors, the authors say, it is difficult for now to tease out differences in natural and human-caused influences on the widening of the tropics. But if [greenhouse gas emissions](#) and pollution continue to increase, they write, human causes will become

more obvious.

More information: Paul W. Staten et al, Re-examining tropical expansion, *Nature Climate Change* (2018). [DOI: 10.1038/s41558-018-0246-2](https://doi.org/10.1038/s41558-018-0246-2)

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