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Climate Change Pushing Tropics Farther, Faster

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for [National Geographic News](#)

December 3, 2007

Over the past 25 years the tropics have expanded by as much as 300 miles (500 kilometers) north and south—evidence of climate change in action, a new study says.

This not only means that rain-drenched regions near the Equator are growing, experts say, but also that global warming may be pushing deserts poleward in places such as the U.S. Southwest, Mexico, Australia, South Africa, South America, and the Mediterranean.

(See [a map of where global warming will hit the hardest](#).)

"The rate of increase is pretty big," said study lead author Dian Seidel of the National Oceanographic and Atmospheric Administration's (NOAA) Air Resources Laboratory in Silver Spring, Maryland.

"It's several degrees of latitude over the course of 25 years."

Tracking Air Circulation

If it sounds strange to think of the tropics as expanding, that's because geographers and climate scientists view them differently. To mapmakers, the tropics are simply the regions between 23.5 degrees north and south latitude, where at least once a year the sun is directly overhead.

But Seidel and her team based their definition of the tropical belt on air circulation.

Near the Equator, moist air rises, producing clouds and ideal conditions for [rain forests](#).

That air then moves poleward—north in the Northern Hemisphere, south in the Southern Hemisphere.

Wrung dry of moisture, the air eventually descends back to Earth, producing deserts. Surface breezes then angle back toward the Equator, completing the cycle.

Seidel's team used meteorological and satellite data to find the northern and southern edges of this zone, mapping changes from the late 1970s to the present.

Within the tropics, for example, there is less stratospheric ozone—the compound that absorbs harmful UV radiation from the sun—than in the zones to the north and south.

Jet streams—fast-moving air currents traveling through Earth's atmosphere—are also influenced by the air circulation boundary between the tropics and other zones.

Also, satellites can "see" the temperature difference between cold, high-altitude cloud tops near the Equator and warmer surface lands in the cloudless dry zones to the north and south.

Seidel's team tracked changes in five measures of the tropical-subtropical air circulation boundary.

All five showed that the tropical zone was steadily broadening, at a rate of 2.5 to 4.8 degrees latitude every 25 years.

The study appears in the advance online edition of the new journal *Nature Geoscience*.

Faster Than Anticipated

Global climate-change models predict that the tropics will expand as Earth warms up, Seidel said, but her team's observed expansion was much faster than predicted.

"The models indicate only fractions of a degree," she said.

Seidel and colleagues aren't sure why the tropics' spread has been so much more rapid.

But she thinks it might have something to do with the stratosphere, the second layer of Earth's atmosphere, which isn't well represented in most climate models.

Because current models don't explain what's going on, it's impossible to tell whether the tropics expansion is part of a cycle that might reverse in the future or an indicator that global warming is having stronger-than-anticipated effects.

'Unpredictable Consequences'

If the trend continues, however, the impacts would extend well beyond the tropics.

That's because the shift in the Northern and Southern Hemisphere jet streams could alter the tracks of storms, such as those that hit the U.S. West Coast each winter.

"If some of that storminess moves farther north, there is potential for changes in water supply [and] snowpack—things that determine climate in mid-latitudes, where a lot of agriculture is dependent on reliable rainfall," Seidel said.

(Related news: ["Humans Changing Rainfall Patterns, Study Says"](#) [July 23, 2007].)

Steven Running, a professor of ecology at the University of Montana who was not involved in the study, said there could be ecological changes.

"Biogeographers define tropical ecosystems [as existing] in climate zones where it never freezes—a very fundamental biophysical threshold," Running said by email.

That keeps cold-intolerant species—such as mosquitoes—from migrating into today's temperate latitudes, he said. ([Read about dengue fever's spread and its link to climate change.](#))

"If tropical climates move, the tropical-temperate geographic transition of ecosystems will be disrupted—with very unpredictable consequences."

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