

# Parts of Caribbean and Central America Likely to Have Less Summer Rain

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Parts of the Caribbean and Central America are likely to experience a significant summer drying trend by the middle of this century, UCLA atmospheric scientists will report in the April 18 issue of *Proceedings of the National Academy of Sciences* (PNAS).

Their research is based on an analysis of 10 global climate computer simulations, from the U.S. National Center for Atmospheric Research, the U.S. National Oceanic and Atmospheric Administration's Geophysical Fluid Dynamics Laboratory, and from Australia, Britain, France, Germany and Japan.

The majority of the computer models calls for a substantial decrease in tropical rainfall to occur by 2054, or sooner under some of the models, said J. David Neelin, UCLA professor of atmospheric and oceanic sciences, a member of UCLA's Institute of Geophysics and Planetary Physics, and lead author of the study. By the end of this century, the models call for a decrease in summer rainfall of 20 percent or more in parts of the Caribbean and Central America, Neelin said. The winter change in rainfall in this region is not dramatic, added Neelin, who noted that summer and winter rains occur by very different climate phenomena. If the models prove correct, the decreased rainfall would be a consequence of human-induced global warming, he said.

"The regions in the tropics that get a lot of summer precipitation are going to get more, and the regions that get very little precipitation will get even less, if the models are correct," Neelin said. "Certain regions in

between will get shifted from a moderate amount of precipitation to a low amount. The bigger the temperature rise, the larger the change in precipitation."

Neelin cautioned, however, that precipitation changes due to global warming have been more difficult to detect and attribute to global warming than changes in temperature.

"Precipitation change is much more difficult than temperature change to detect, and requires great precision; the models do not all agree, but the majority of them do," Neelin said. "A slight error — for example, whether the wind is flowing from a dry region into the convection zone, or whether the wind is blowing past the convection zone without going into it — can cause one model to have a drought in a particular region, while another model does not. You have to be careful when talking about precipitation; there is natural variability, from year-to-year and from decade-to-decade."

The computer climate simulations also agree on the magnitude of drying trends in other regions within the tropics but disagree on where it will occur. The Caribbean/Central-American region is an example where the models agree reasonably well.

Neelin's research is federally funded by the National Science Foundation and the National Oceanic and Atmospheric Administration.

In addition to analyzing the computer simulations, Neelin and his colleagues analyzed satellite precipitation data available since 1979, and rain gauge measurements since the 1950s. Over the last 50 years, the Caribbean has experienced a trend of decreased summer precipitation, but not a dramatic one, Neelin said. The computer models predict that will be a continuing trend.

"We can't exclude that the precipitation decrease over the last 50 years is part of a natural cycle, unrelated to global warming," Neelin said. "It is plausible that the decrease is due to global warming, but there is not yet a 'smoking gun' that shows that to be the case."

Co-authors on the PNAS article are Matthias Münnich, a UCLA researcher in atmospheric and oceanic sciences; Hui Su, a former UCLA researcher now at Caltech's Jet Propulsion Laboratory; Joyce Meyerson, a UCLA researcher in atmospheric and oceanic sciences; and Chris Holloway, a UCLA graduate student in atmospheric and oceanic sciences.

Neelin conducts research on processes that govern tropical precipitation, and year-to-year climate variability. He is writing a textbook for Cambridge University Press on climate modeling and climate change.

Concerning global warming, Neelin said, "For years, the vast majority of scientists have felt there is convincing evidence that we are at the beginning stages of human-induced global warming, and the observed global temperature record keeps supporting these predictions. However, there is still uncertainty about the amount of warming that will occur by the end of this century."

Source: UCLA

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