

Published: 04.21.2008

Is our drought a sign of longterm climate change?

By Tony Davis

ARIZONA DAILY STAR

The Southwest's current drought could be the start of the Dust Bowl-like future that some scientists have already predicted will come from human-caused warming.

Or, it could just be another in the long line of natural, cyclical droughts in this region dating back 1,000 years.

But one of the nation's leading climate scientists, the University of Arizona's Nobel Prize-sharing Jonathan Overpeck, says he's coming to believe there's "a real likelihood" the drought is caused by global warming. New research at the UA backs that up.

Some other scientists disagree, even as leading climate experts generally agree that someday, global warming will make the Southwest drier.

This drought is already known as the region's worst in more than a century and one of the worst in the past 500 years.

The dispute has implications for Tucson's water supply. The drought has already shrunk water levels in the Colorado River, which furnishes Central Arizona Project water that's pumped to Tucson.

If those believing this drought is caused by warming are right, major shortages could occur much sooner than expected on the river, says Connie Woodhouse, a University of Arizona geography professor who has studied tree-ring records to understand river runoff patterns.

Various studies have already warned that a drying climate could ultimately reduce spring runoff in the Colorado by 6 percent to 45 percent, meaning less water for the CAP.

Until now, federal officials have predicted that shortages could start sometime after 2010 but won't be serious enough to cut deliveries to Tucson and Phoenix for another 20 years or more. Before then, non-Indian farmers in Central Arizona would take the big hit.

The leading proponent of the theory that this drought isn't natural says it could have been caused not just by warmer weather but also by the hole in the atmosphere's ozone layer that has been linked to past use of aerosol sprays. The key compounds in those sprays are illegal now, but the ozone hole may not heal for 70 to 80 years.

"Whether it's man-made global warming or a man-made ozone hole, either way, it's more drought for us," says UA climatologist Joellen Russell. She acknowledges that her opinion is based on "cutting edge" research, some still unpublished, and that the controversy may not be settled for decades.

Other scientists, however, say that while the current drought is consistent with what they would expect from global warming, it's too early to blame warming.

One reason some scientists hesitate to blame this drought on warming is that the Southwest has had large "megadroughts" in the past, as shown in detailed tree-ring records studied by UA's Laboratory of Tree Ring Research.

about this series

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- **TOday:** New research links global warming to the drought, but local scientists are split on the issue.

- **Tuesday:** Arizonans tackle potential solutions to the problem of global warming.

Sampling of viewpoints

Is today's drought natural or human-caused? The debate heats up:

"We made the ozone hole and we made the global warming. There are two different gases that . . . may have combined to give us this ugly effect."

— Joellen Russell, a UA climatologist who believes warming may have caused the current drought.

"The Southwest has been warming. . . . But everything that has been varying and changing in the past two decades won't be due to a single factor."

— Martin Hoerling, a National Oceanic and Atmospheric Administration scientist.

"There is a real likelihood that the current drought is linked to, and at least exacerbated by, human actions, particularly greenhouse gas emissions."

— UA's Jonathan Overpeck, a co-author of International Panel of Climate Change report.

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The worst megadrought came for six decades in the 1100s, when the Colorado River's flow was significantly below normal for 25 years, says David Meko, an associate professor at the lab.

All do agree that warmer weather aggravates the effects of drought.

Russell's theory rests on several points. She says:

- Jet streams have moved slightly toward the North and South poles over 25 to 30 years, probably because of global warming and the hole in the ozone layer. Jet streams in the upper atmosphere mark boundaries between hot and cold air and affect U.S. rainfall patterns.
- This movement contributed to the current drought. That would match the regular pattern where jet streams move north in the winter, and drier, warmer weather dominates in the Southwest.
- The jet stream's poleward shifts are caused by global warming or the ozone hole.

If it is a permanent change in the jet stream due to warming, "you'd have drought a lot more often and you'd never really recover from a particular drought," although there would still be some wet years, Russell says.

Jet stream movements toward the poles since 1979 have been documented in University of Washington research. Links between the jet stream movement and droughts are explored in two still-unpublished papers by Russell and the UA's Connie Woodhouse.

Qiang Fu, an atmospheric sciences professor at the University of Washington who helped write the jet-stream-movement study, says he also believes the jet stream is at least partially tied to this drought.

The most crucial connection — the link between climate change and the jet stream — has only been strongly suggested or hinted at in studies.

One study, published in Nature Geoscience journal this year, showed jet stream movement has expanded the tropics north and south toward the poles since 1979 at rates previously predicted to occur in the entire 21st century.

Russell describes that fact as a "smoking gun" backing up her theory.

Not so fast, counters Fu's University of Washington colleague, Atmospheric Sciences professor John Michael Wallace. Because the jet stream is moving faster than predicted, it's more likely that the cause is something else, such as the ozone hole, Wallace says.

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