

# Global warming determined to be “unequivocal”

CLIMAS researcher Jonathan Overpeck discusses a recent United Nations report

BY STEPHANIE DOSTER

A University of Arizona geosciences professor was among the world's leading scientists to issue a recent climate change report that asserted for the first time that global warming is “very likely” driven by human activity.

Jonathan Overpeck, director of the UA's Institute for the Study of Planet Earth and a coordinating lead author of the United Nation's latest Intergovernmental Panel on Climate Change (IPCC) report, said the document represents an international scientific consensus on climate change.

“The most striking thing to me is that we now have presented a much clearer picture of climate change and its causes, both past and future,” Overpeck said. “The word we used for the evidence of climate change and global warming is now ‘unequivocal.’ That is a very strong statement.”

The assessment was released in Paris after 113 governments unanimously agreed to the language in the report.

In the last IPCC report, issued in 2001, scientists concluded that industrial emissions “likely” caused a rise in temperatures over the last century. That warming is manifested in observed increasing air, deep ocean, and sea surface temperatures; melting snow, ice, and permafrost; and rising sea levels, said Overpeck, who also is a Climate Assessment for the Southwest investigator.

“All of these observations and others mentioned in the report are consistent and give us a much firmer basis for asserting that climate change is indeed real and that warming has been significant,” he said. “I think everyone is pretty comfortable now in saying that

we see the climate change and that you cannot get the kind of climate change we're seeing without human-generated greenhouse gases.”

Scientists have observed heat-trapping greenhouse gases in the atmosphere, particularly carbon dioxide and methane, at levels that far surpass those seen in the last 650,000 years, Overpeck said. Unless steps are taken to curb these gases, droughts likely will become more frequent. Hurricanes are projected to intensify, boosting the potential for destruction. Some areas, like the Maldives in the Indian Ocean and Tuvalu, a nation of islands and atolls in the Pacific Ocean, could disappear if sea levels rise just three feet. Much more sea level rise will likely be unstoppable over coming centuries if global warming continues unabated.

In the western and southwestern United States and in northern Mexico, climate models agree that winter precipitation will decrease sharply in this century, Overpeck said. The model projections also align with what has actually been happening in the region over the last several years.

One reason for the drying out is that in the winter, the jet stream and the average position of storms will enter the western United States in a more northerly position, bypassing the Southwest, Overpeck said. On top of that, he said, the West has seen a steady downward trend in late spring snowpack because of warmer temperatures and earlier snow melt. Snowpack acts as the region's



natural water reservoir and is especially crucial in the dry period that follows winter. A decline in snowpack and streamflow would cut into water supply resources. And with warmer-than-average temperatures continuing into summer, demand for water would spike further still.

The climate models are less certain when it comes to the future of the monsoon, the region's primary source of summer precipitation, and the El Niño Southern Oscillation (ENSO), which is linked to variability in winter precipitation, Overpeck said.

While the region is expected to dry out, it paradoxically is likely to see larger, more destructive flooding as hurricanes, also known as tropical cyclones or typhoons, intensify in all of the oceans.

The largest floods in the Southwest tend to occur when a remnant tropical storm in the fall or late summer hits a frontal storm from the north or northwest,

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## GW “unequivocal,” continued

providing enough energy to wring out the moisture in the remnant tropical storm, Overpeck explained.

Overall, he said, the Southwest should brace for a number of far-reaching climate changes as the planet warms.

“You take all of these things together and you can clearly see in the report a strong case that the western U.S. and particularly the Southwest—Southern California into Texas—will probably be one of the hardest and soonest hit parts of the country,” he said.

*Stephanie Doster is an information specialist for the Institute for the Study of Planet Earth. The SWCO feature article archive can be accessed at the following link: <http://www.ispe.arizona.edu/climas/forecasts/swarticles.html>*

### Related Links

#### Climate Change Projections

[http://www.geo.arizona.edu/dgesl/research/regional/projected\\_US\\_climate\\_change/projected\\_US\\_climate\\_change.htm](http://www.geo.arizona.edu/dgesl/research/regional/projected_US_climate_change/projected_US_climate_change.htm)

#### IPCC

<http://www.ipcc.ch/>

#### Climate change and Southwest Hydrology

[http://www.swhydro.arizona.edu/archive/V6\\_N1/](http://www.swhydro.arizona.edu/archive/V6_N1/)

#### UA Global Climate Change Lecture Series podcasts

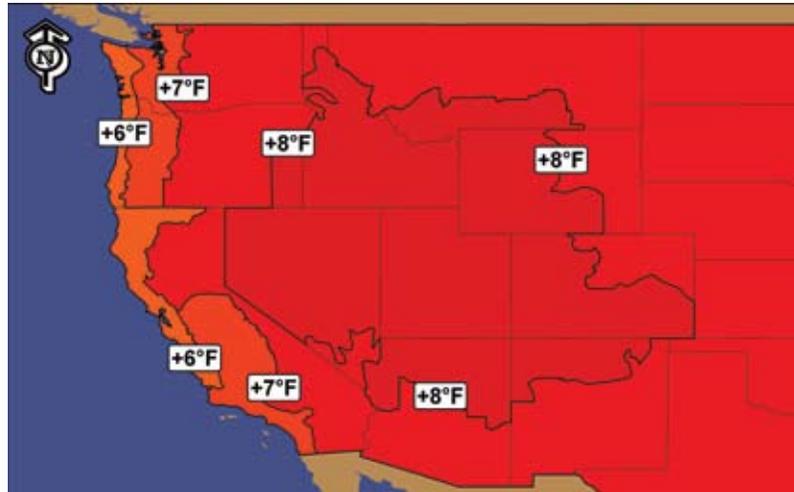
<http://podcasting.arizona.edu/globalclimatechange.html>

#### Jonathan Overpeck ISPE webpage

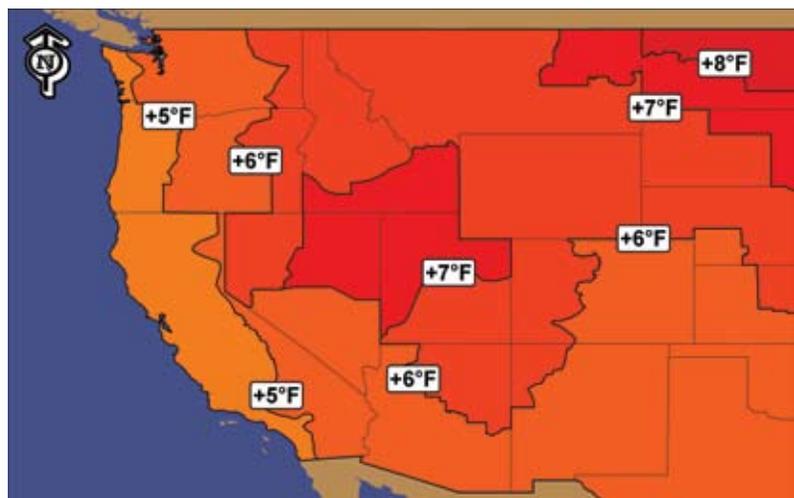
<http://www.ispe.arizona.edu/about/staff/peck.html>

#### UA News release on IPCC report

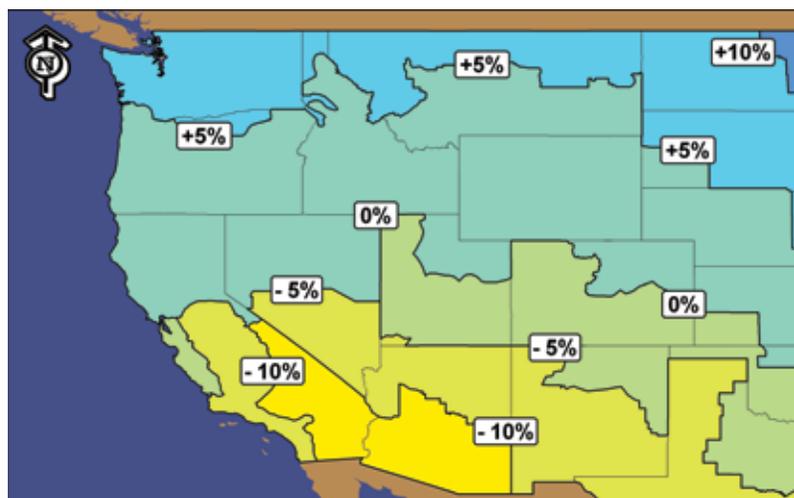
<http://uanews.org/cgi-bin/WebObjects/UANews.woa/5/wa/MainStoryDetails?ArticleID=13547>



**Figure 1.** Projected June–August temperature changes from 2091 to 2100.\*



**Figure 2.** Projected December–February temperature changes from 2091 to 2100.\*



**Figure 3.** Projected annual precipitation changes from 2091 to 2100.\*

\*Changes are relative to 1971–2000 averages. Credit: Three maps drawn by JL Weiss, UA; Data from Hoerling and Eischeid NOAA ESRL



# What can we do about global warming in the SW?

By CASEY THORNBRUGH

## Mitigation and Response

The driving force behind global warming is the emission of greenhouse gases, mainly carbon dioxide (CO<sub>2</sub>), from burning fossil fuels, such as coal, oil, and gasoline. Mitigating global warming means taking actions to reduce greenhouse gas sources or enhance greenhouse gas “sinks”—places where greenhouse gases are safely taken up, such as trees, which use carbon dioxide to grow. The United States, home to only 5 percent of the Earth’s population, is responsible for 25 percent of global CO<sub>2</sub> emissions. Mitigating global warming in industrialized nations presents the challenge of changing energy production methods while addressing the need for energy to serve economic growth and quality of life.

This is especially true for the U.S. Southwest, the fastest growing region in the country. Here solar and wind power offer promise of generating energy from renewable and low emission sources.

Governors Janet Napolitano of Arizona and Bill Richardson of New Mexico have created policy initiatives to mitigate global warming, including the Arizona and New Mexico climate change advisory groups, which build political and business partnerships to develop plans to reduce greenhouse gases. Federal, private, and non-profit organizations also provide information

describing everyday measures that everyone can take to reduce emissions.

## Adaptation

According to the latest scientific consensus, societies will need to adapt to climate changes. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

During the last 100 years, temperatures in the southwestern United States have been increasing about twice as fast as the global average temperature. The latest Intergovernmental Panel on Climate Change (IPCC) temperature projections show that further warming is likely in the Southwest. Scientists are less sure of the magnitude of regional precipitation changes. Nevertheless, in the arid Southwest, where water resources are already vulnerable to multi-year drought, communities will likely have to adapt to changes in water resource reliability. Land use managers may also need to adapt to ecosystem changes created by longer growing seasons and altered fire regimes.

Adaptation to global warming also means seizing new opportunities when they arise, such as implementing improved irrigation techniques, “water banking” (storing water in underground aquifers), and using reclaimed effluent, where feasible.

## Related Links

This list offers selected resources that provide information on what governments, businesses, and individuals can do about global warming. It is not meant to be comprehensive. Material included in this list does not imply an endorsement of commercial services and products offered on these websites or the political agendas of any agency or company.

### AZ Climate Change

<http://www.azclimatechange.us/>

### NM Climate Change

<http://www.nmclimatechange.us/>

### An Inconvenient Truth

<http://www.climatecrisis.net/takeaction/>

### Pew Center

[http://www.pewclimate.org/what\\_s\\_being\\_done/](http://www.pewclimate.org/what_s_being_done/)

### Seattle Climate Action Plan

<http://www.seattle.gov/climate/getInvolved.htm>

### EPA Climate Change

<http://epa.gov/climatechange/wycd/index.html>

### American Solar Electric

[http://www.americanpv.com/c\\_about.php](http://www.americanpv.com/c_about.php)

### Database of State Incentives for Renewables and Efficiency

<http://www.dsireusa.org/>

### Geothermal-biz.com

<http://www.geothermal-biz.com/home.htm>

### NM Energy Coalition for Clean and Affordable Energy

<http://www.nmccae.org>



**Figure 4.** Springerville Generating Station in Springerville, Arizona. Credit: Tucson Electric Power

