

DROUGHT STUDY MISSES UNDERLYING CLIMATE CONNECTIONS

In a [new report](#), Martin Hoerling and his team of NOAA researchers investigated the underlying causes of the devastating (and still ongoing) drought of 2012 using computer modeling. The report provides a valuable contribution to understanding the immediate factors driving the occurrence of droughts but misses the underlying ways in which global warming makes drought conditions more likely and more severe. It also ignores two key science developments: the link between climate change and new jet stream patterns that affect drought in the U.S. and elsewhere and new research indicating that climate-drought links will show up sooner in regions of the U.S. outside the focus of Hoerling's team.

The facts:

The NOAA report rules out two possible links between the drought and global warming but does not investigate every possible link. Likewise, the report shows that the jet stream did impact the 2012 drought, but does not prove that it was the only factor, or that global warming was not an underlying cause of these changes.

To understand the difference between immediate and underlying causes, consider the metaphor of a car crash. The immediate cause of a car crash might be a sharp turn, but the underlying cause might be that the driver was speeding. In this case the drought is the crash and changes to the jet stream are the sharp turn, while the extra speed that makes the turn so dangerous is climate change.

Three immediate causes contribute to drought, and all are linked to the underlying cause of climate change:

- **Reduced snow pack.** Shorter winters and faster melts caused by global warming have been shown to contribute to an overall reduction in snow pack. Normally, snows provide moisture to the surrounding areas as they slowly melt over the course of the spring, but less snow means less moisture and a higher chance of drought. In the central U.S., snow pack was at record low levels during the winter and spring immediately before the drought.
- **Decreased soil moisture.** Warmer temperatures cause moisture to evaporate from the soil at a faster rate. Especially in areas receiving less-than-normal moisture to begin with, hotter temperatures and faster evaporation contributes significantly to drought. The summer of 2012 was the [third hottest](#) on record for the U.S.
- **Changing wind patterns due to melting Arctic ice.** Previously NOAA has published a [report](#) showing that melting Arctic ice may be altering the distribution of cold and warm air, thereby changing wind patterns including the jet stream. Another [recent study](#) linked these airflow changes to extreme weather (including drought) in mid-latitudes. NOAA's new report states that changes in the jet stream played a big part in causing the 2012 drought but does not mention these studies linking such changes to global warming.

The claim:

The NOAA report states, "Climate simulations and empirical analysis suggest that neither ocean surface temperatures nor changes in greenhouse gases induced a substantial reduction in summertime precipitation over the central Great Plains during 2012." From this, Hoerling and his team concluded in [interviews](#) that the drought was due to an "unusual and unpredictable change" in the position of the jet stream, and therefore was not affected by man-made global warming.

Finally, this NOAA drought report studied only the central states. Models of the climate as the world warms have repeatedly predicted an increase in severe droughts in both the central and southwestern states, with drought being the most severe in the southwest. So the report is missing a big piece of the puzzle.

More study is required to refine our understanding of immediate causes of drought as well as regional differences. But it's important to remember the models' overall predictions. Droughts like the one of 2012 will become more frequent and more severe, and we need to prepare for their impacts, even as we continue to learn more.

Straight from scientists:

- Dr. Jennifer Francis of the Institute of Marine and Coastal Sciences at Rutgers University has commented on the 2012 drought:

“Increased drought in much of southern North America has long been a robust feature in climate model projections. A variety of factors are believed to play a role in the model patterns, and those factors have recently emerged as signals in the real world: reduced snowpack in the Rocky Mountains, a tendency for drought one year to favor drought in the next, a general increase in temperatures (particularly night-time minima), and more recently, the record-smashing loss of snow on high-latitude land areas in late spring.”

- Dr. Kevin Trenberth of the National Center for Atmospheric Research has stated concerning the NOAA report:

“This report has some useful material in it describing aspects of the drought in 2012 in the central US. But it is quite incomplete in many respects, and it asks the wrong questions. Then it does not provide very useful answers to the questions that are asked. It fails completely to say anything about the observed soil moisture conditions, snow cover, and snow pack during the winter prior to the event in spite of the fact that snow pack was at record low levels in the winter and spring”

- The University Corporation for Atmospheric Research (UCAR) has published a clear [explanation](#) of the differences between immediate and ultimate causes of extreme weather, as well as different approaches study them. To provide everyday context, UCAR writes:

“Here’s a rough analogy from everyday life to help distinguish among the different approaches: Adding just a little bit of speed to your highway commute each month can substantially raise the odds that you’ll get hurt some day. But if an accident does occur, the primary cause may not be your speed itself: it could be a wet road or a texting driver. In this analogy, [Hoerling and] the NOAA group is looking at accident-causing mechanisms of all types, including speed... Meanwhile, Trenberth is the safety expert pointing out that, as a rule, extra speed is dangerous.”