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Did climate change cause Superstorm Sandy? Not exactly.

By Jason Samenow - 11/20/2012

The complex connection between climate change and Superstorm Sandy

When it comes to climate change and its effect on Superstorm Sandy, it seems that the loudest voices fall into two camps:

l The all-in camp: Climate change is making the weather more extreme. Sandy is the poster child for that and a sign of things to come.

l The no-effect camp: Climate change played no role in Sandy, and there's no cause for concern about the future.

The inconvenient truth falls in the middle. Considering hurricane history, a careful read of peer-reviewed literature on hurricanes and climate change, and the views of a range of scientists, the following five ideas best capture current understanding of the role of climate change on Superstorm Sandy:

Climate change did not cause Sandy.

Climate change does not cause storms; storms form when certain weather ingredients come together. History shows that violent storms have struck the Northeast repeatedly.

In the tropics, the formation of hurricanes requires rising air (from converging winds), heat and moisture. These ingredients led to the genesis of Sandy just as they have led to the formation of many storms in the tropics year after year.

In the 1950s, several hurricanes made landfall along the Mid-Atlantic and Northeast coast. Hazel, which made landfall in the Carolinas as a Category 4 hurricane, was arguably more intense than Sandy, producing wind gusts of more than 90 mph from South Carolina to New York state.

What made Sandy unusual was its interaction with an extratropical low pressure system along the East Coast and its transformation into a "hybrid" storm. But Martin Hoerling, a NOAA meteorologist, disputes the idea that climate change had anything to do with this. "In this case, the immediate cause is most likely little

more that the coincidental alignment of a tropical storm with an extratropical storm," he told the New York Times.

Climate change may have injected Sandy with more energy and power.

It's well established that, all other things being equal, warm ocean water energizes hurricanes. The warmer the water, the more intense a hurricane can become. According to Texas Tech atmospheric science professor Katherine Hayhoe, elevated ocean temperatures in the Atlantic might have given Sandy some extra fuel. "October surface ocean temperatures have warmed by two degrees over the last hundred years," Hayhoe told NPR. "So when any given hurricane comes along, on average there's warmer water than there would have been otherwise," she noted, "which gives it more energy, and gives it more strength."

Sea-level rise from man-made climate change increased the water level along the Northeast coast.

Sea levels have risen around 10 to 15 inches over the last 100 years along the East Coast. About half of that rise is from natural causes (sinking land); the other half can be reasonably attributed to man-made warming. So, one could say climate change added six to eight inches to Sandy's storm surge, worsening flooding.

Still, there's little agreement on the significance of this additional water. Chip Knappenburger, a climatologist affiliated with the **Cato Institute,** has said that "the overwhelming majority of the damage done by the storm surge would have happened anyway."

Chris Mooney, author of "The Republican War on Science," said that the extra water "matters a lot," and pointed to climate scientist Scott Mandia's estimate that 6,000 more people were impacted for each additional inch of sea-level rise.

Sea levels are projected to continue rising as the Earth warms, raising the maximum water level when hurricanes come ashore and the potential for flooding.

Decreased Arctic sea ice from climate change may have altered steering currents, helping to push Sandy ashore.

This idea is controversial. As Sandy paralleled the Mid-Atlantic coast, well offshore, it suddenly ran into a roadblock - a strong high pressure system in the North Atlantic - and made a sharp left toward the New Jersey shore. Some researchers speculate that the strength of this roadblock was a consequence of record-low Arctic sea ice, which is linked to climate change.

The theory goes like this: Less Arctic sea ice reduces temperature contrasts at

high latitudes and the strength of westerly winds that serve as the atmosphere's steering current. As a result, the atmosphere's flow slows down and bigger blocks develop.

Rutgers University climate researcher Jennifer Francis, who has published research supporting this theory, told New Jersey's Star-Ledger that she "absolutely" thinks Arctic sea ice played a role in Sandy's track. "The block was what scared [Sandy] into the west," Francis said. "It's a very, very unusual pattern for a hurricane to take."

But some prominent climate scientists are skeptical about this theory. "I don't believe it," University Center for Atmospheric Research scientist Kevin Trenberth told the New York Times. The "null hypothesis has to be that this is just 'weather' and natural variability," he said.

Climate change is likely to slowly increase the intensity of hurricanes in the future.

After a hurricane, you often hear experts say something to the effect of "Climate change is increasing the odds of these kinds of events." It's not that simple.

Yes, scientists project gradual increases in hurricane intensity, with heavier rainfall and stronger peak winds. But with the exception of the most intense storms, hurricane frequency is projected to decline.

A clear human influence on hurricane activity may take decades to reveal itself. Although observed warming may be infusing storms with more power, it remains a challenge to quantify the human connection. NOAA hurricane and climate change researcher Tom Knutson put it this way: "It is premature to conclude that human activities - and particularly greenhouse gas emissions that cause global warming - have already had a detectable impact on Atlantic hurricane activity."

In a commentary in Foreign Policy magazine, MIT professor of atmospheric science Kerry Emanuel stresses that establishing a causal connection between climate change and storms such as Sandy is not needed as a basis for action. The risks inherent in toying with the atmosphere and the possible consequences, Emanuel says, are reason enough to stop "keep kicking the climate can down the road."

"[T]he argument that there is no risk or that we should do nothing is both scientifically and morally indefensible," Emanuel writes.

Indeed, there is a great deal of evidence that man-made climate change is real and poses risks to society and the environment, especially if its pace accelerates. Stronger hurricanes are just one of many possible unwelcome consequences. There's really no need to oversell connections between storms such as Sandy and global warming to build a case for responding to these risks.