

What do cold snaps have to do with climate change?

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The eastern U.S. has been in the grip of blizzards and cold snaps, with more forecasted in the coming week. What's climate change got to do with it? Credit: DeShaun Craddock via Flickr

A record-shattering cold gripped the Northeastern United States during

late December and early January. Meanwhile, a so-called bomb-cyclone brought in Winter Storm Grayson with its blizzard winds and heavy snowfall. Is all of this extreme weather normal, a product of global warming, or perhaps bone-chilling evidence that our climate is not really heating up after all?

Lamont-Doherty Earth Observatory post-doctoral fellow Deepti Singh studies human impact on climate and [extreme weather](#). She believes the reasons for the big chill and powerful snow storm may be linked to climate change, and that this is only the beginning of the [weather](#) impacts humanity can expect.

"The [global warming](#) that has occurred so far is merely a fraction of what we're going to see in the future, and global warming does not mean we're not going to have winters," Singh explained.

Breaking it down, the 10-day spate of extremely frigid days was the result of typical [winter](#) weather patterns, intensified by a clash in temperatures between the western US, which is experiencing global warming at a faster pace than the eastern US.

"It's normal in that it's winter time and we can have snaps of [cold weather](#). It's abnormal because it has covered such a wide part of the US. And it's also abnormal because it persisted for a couple of weeks," said Singh.

"The reason we get cold weather on the east coast is the configuration of the jet stream in the winter, which normally directs storms to the western U.S. and generally directs colder air from the Arctic towards the eastern US. This year we're having an extreme configuration of that," she said .
"In the western US, a region of high pressure is pushing the jet stream much further north than it usually is. Associated with that, it is much further south over the eastern US than it usually is."

Hence, we had an extreme North American Winter Temperature Dipole, or contrast between the weather conditions of the eastern half of the US and the western half.

"The west is generally warmer than the east in wintertime, and that is associated with a region of higher pressure over the west and related lower pressure over the east. The region of lower pressure brings cooler air from the higher latitudes into the eastern U.S.," explained Singh. During the extended cold snap, parts of the western U.S. were between eight to 10 degrees warmer than average while the east went into a deep freeze. Essentially, the higher the contrast between west and east, the more extreme the variation of the winter temperature dipole.

Singh's current research seeks to discern how human-induced climate change may be driving the process that produced the recent brutal cold snap.

"It is linked to climate change insofar as these contrasting temperatures have increased over the last 40 years. We've found that the increase in the frequency of concurrent warm conditions in the west and cool conditions in the east is more likely with human caused climate change than it would be in a world without climate change. Precisely how that happens is still an active area of research."

Singh and her Lamont colleagues research [climate change impacts](#) on weather patterns by analyzing weather trends in daily temperatures, precipitation, and atmospheric patterns that have occurred during the past 40 years, in the post-satellite era.

"We analyze publicly available datasets of climate to look at how these conditions are changing over time," Singh explained. "Our studies show that the eastern US, although it has not warmed as much as the western US during the last 40 years, is supposed to start to warm up almost as

quickly."

Theoretically, that would mean the contrast between east and west would start to reduce. "So, we might not get these kinds of events as frequently as we've been getting them. We're starting to see this in our simulations moving forward into the 21st century. However, even at the end of the century in a much warmer climate, such events can occur occasionally but likely less frequently than in today's climate."

What is certain to Singh is that [climate](#) change is packing a punch.

"We're seeing many extreme events occurring throughout the world and that often have large humanitarian and economic impacts. And that is representative of [climate change](#)."

As for the rest of the winter, Singh says the forecasts are showing a couple more icy snaps as soon as mid-January.

"Cold conditions are already affecting parts of the central U.S. and that is forecast to engulf the eastern U.S. over the next couple of days.," said Singh on Friday, January 12. "The next blast is expected closely following on the heels of that."

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