Extreme cold winters fuelled by jet stream and climate change

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Credit: Larisa Koshkina/public domain

The research, carried out by an international team of scientists including the University of Sheffield, has found that warming in the Arctic may be intensifying the effects of the jet stream's position, which in the winter can cause extreme cold weather, such as the winter of 2014/15 which saw record snowfall levels in New York.

Scientists previously had two schools of thought. One group believe that natural variability in the jet stream's position has caused the recent severe cold winter weather seen in places such as the Eastern United States and the UK. The other camp includes scientists who are finding possible connections between the warming of the Arctic – such as melting sea ice, warming air temperatures, and rising sea surface temperatures – and the emerging pattern of severe cold winter weather.

Now, Professor Edward Hanna and Dr Richard Hall from the University's Department of Geography, together with Professor. James E. Overland from the US Oceanographic and Atmospheric Administration (NOAA), have brought together a diverse group of researchers from both sides of the debate.

The researchers have found that the recent pattern of cold winters is primarily caused by natural changes to the jet stream's position; however, the warming of the Arctic appears to be exerting an influence on cold spells, but the location of these can vary from year to year.

Previous studies have shown that when the jet stream is wavy there are more episodes of severe cold weather plunging south from the Arctic into the mid-latitudes, which persist for weeks at a time. But when the jet stream is flowing strongly from west to east and not very wavy, we tend to see more normal winter weather in countries within the mid-latitudes.

"We've always had years with wavy and not so wavy jet stream winds, but in the last one to two decades the warming Arctic could well have been amplifying the effects of the wavy patterns," Professor Hanna said. He added: "This may have contributed to some recent extreme cold winter spells along the eastern seaboard of the United States, in eastern Asia, and at times over the UK (e.g. 2009/10 and 2010/11).

"Improving our ability to predict how climate change is affecting the jet stream will help to improve our long-term prediction of winter weather in some of the most highly populated regions of the world.

"This would be hugely beneficial for communities, businesses, and entire economies in the northern hemisphere. The public could better prepare for severe winter weather and have access to extra crucial information that could help make live-saving and cost-saving decisions."

More information: James E. Overland et al. Nonlinear response of mid-latitude weather to the changing Arctic, *Nature Climate Change* (2016). DOI: 10.1038/nclimate3121

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