Study finds possible link between Arctic change and extreme mid-latitude weather

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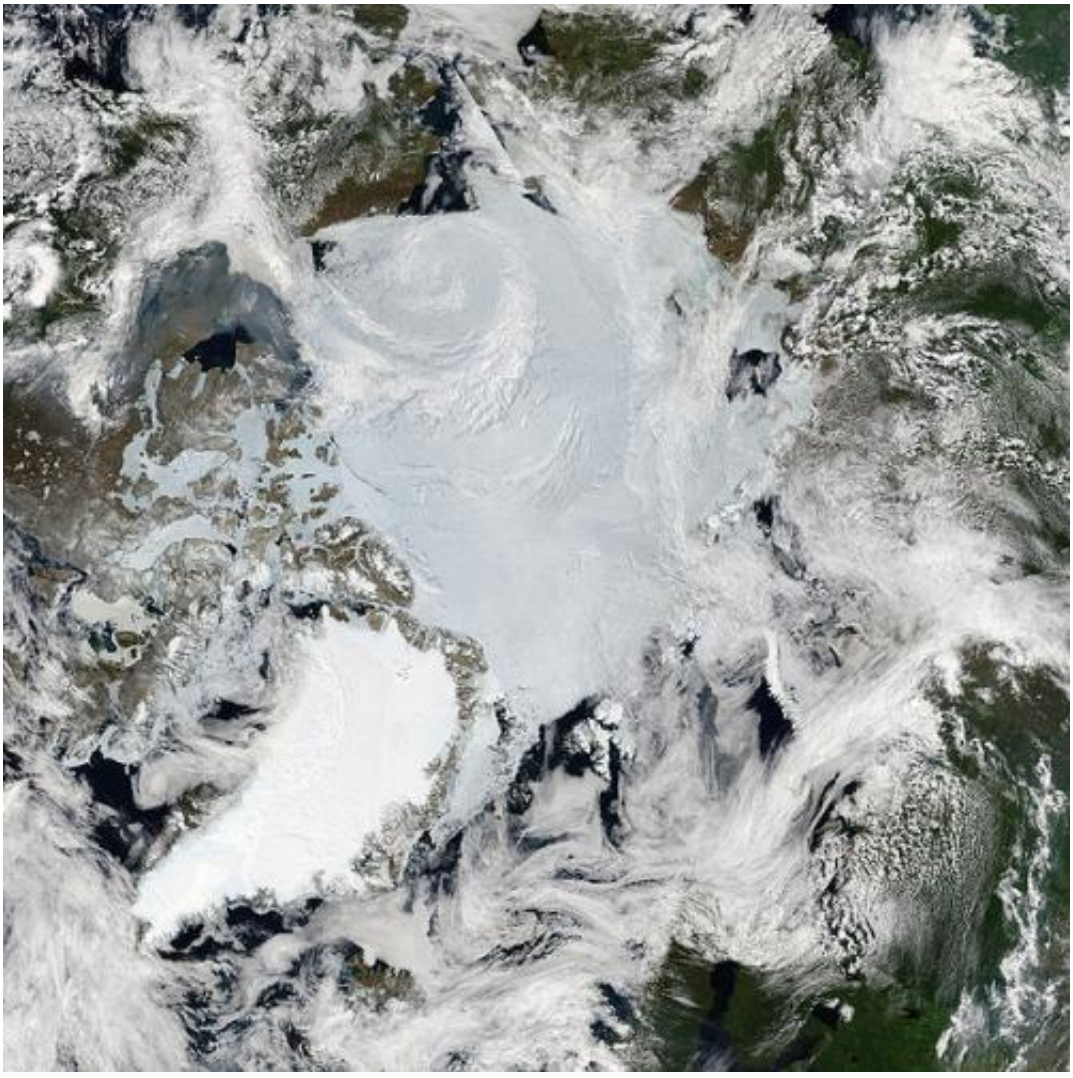

Mosaic of images of the Arctic by MODIS. Credit: NASA

(Phys.org) —A team of researchers with members from Europe and the U.S. has found a possible link between Arctic amplification and severe weather in the northern mid-latitude parts of the planet. In their paper published in the journal *Nature Geoscience*, the researchers describe how they conducted a review of the findings of other researchers looking for a connection between Arctic warming and extreme weather events and what they found as a result.

For the past several years planetary researchers have begun to wonder if Arctic warming is causing changes to weather in the northern mid-latitudes. They note, as just one example, the exceedingly harsh 2013/14 winter—very low temperatures in parts of North America and well above average rainfall in parts of Europe.

Scientists have grown concerned as measurements have indicated that the Arctic is warming faster than expected—twice as fast as the rest of the planet (Arctic amplification), which means snow and ice is melting faster than expected as well. During the same time period, the mid-latitudes have experienced some unusual weather—stronger storms, colder winters and hotter summers. Several groups have looked to see if a discernible link between the two trends could be found. And while no single team has been able to find concrete evidence, many have found what appears to an indirect link. In this new effort, the researchers suggest that such studies, when looked at as a single entity, provide a strong case for such a link, and they even suggest how: changes to the jet stream, to storm tracks and to planetary waves and their associated energy propagation.

Taken together, the researchers report, the data indicates that a weaker temperature gradient between the Arctic region and the northern latitudes, is leading to changes in the atmosphere in the northern hemisphere and because of that, unpredictable changes to weather patterns.

The researchers are careful to note that despite the mounting evidence of an Arctic-northern latitude weather link, the degree to which it is likely occurring remains highly uncertain. They suggest more research be undertaken and more models developed to help better understand what a fast warming Arctic may mean for the northern hemisphere in general as the future unfolds.

More information: Recent Arctic amplification and extreme mid-latitude weather, *Nature Geoscience* (2014) DOI: 10.1038/ngeo2234

Abstract

The Arctic region has warmed more than twice as fast as the global average—a phenomenon known as Arctic amplification. The rapid Arctic warming has contributed to dramatic melting of Arctic sea ice and spring snow cover, at a pace greater than that simulated by climate models. These profound changes to the Arctic system have coincided with a period of ostensibly more frequent extreme weather events across the Northern Hemisphere mid-latitudes, including severe winters. The possibility of a link between Arctic change and mid-latitude weather has spurred research activities that reveal three potential dynamical pathways linking Arctic amplification to mid-latitude weather: changes in storm tracks, the jet stream, and planetary waves and their associated energy propagation. Through changes in these key atmospheric features, it is possible, in principle, for sea ice and snow cover to jointly influence mid-latitude weather. However, because of incomplete knowledge of how high-latitude climate change influences these phenomena, combined with sparse and short data records, and imperfect models, large uncertainties regarding the magnitude of such an influence remain. We conclude that improved process understanding, sustained and additional Arctic observations, and better coordinated modelling studies will be needed to advance our understanding of the influences on mid-latitude weather and extreme events.