The Arctic may influence Eurasian extreme weather events in just two to three weeks

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Previous research studies have revealed how rising temperatures and melting ice in the Arctic may impact the rest of Earth's climate over seasons, years and even longer. Now, two researchers from Fudan

University in Shanghai, China, are making the argument that the effects may actually be felt in a matter of weeks, but more robust, observational-based analysis is needed to fully understand how quickly Arctic events impact the rest of Earth.

They published their analysis of current studies and future plans on March 30 in the peer-reviewed journal *Advances in Atmospheric Sciences*.

"Many investigations have been conducted to reveal the influences of the Arctic on Eurasian extreme weather events from the perspective of climatological statistics," said Guokun Dai, paper co-author and postdoctoral researcher in the Department of Atmospheric and Oceanic Sciences at Fudan University. "We think it's now important to investigate the relationship using case studies at weather time scales due to the sensitivity and nonlinearity of the atmospheric circulations in midlatitude to Arctic conditions."

Dai noted that the mechanism for extreme event formation may vary, depending on the Arctic conditions and the eventual weather event, pointing to the need for further investigation to understand the cause and effect fully. The researchers are specifically focusing on weather events in Eurasia, the continental land area encompassing all of Asia and Europe. It's the largest land mass on Earth. Such extreme weather events could include record-breaking temperatures, massive snow fall and other unusual, although more frequent, occurrences.

Mu Mu, co-author and professor in the Department of Atmospheric and Oceanic Sciences at Fudan University and in the Institute of Atmospheric Physics, said their work is specifically focused on improving how extreme events are forecast with a foundation of accurate initial and boundary conditions.

"Data based on the Arctic have large uncertainties since there are few observations there, and these uncertainties could have a great impact on numerical weather predictions, especially for extreme weather events," Mu said. "We are going to investigate and work to understand what kind of Arctic sea ice uncertainty and Arctic atmospheric uncertainty would have large influences on Eurasian extreme weather event predictions."

Mu and Dai are now identifying the more sensitive connections between the Arctic's ocean-ice-air systems to extreme winter weather events in Eurasia, with the goal of targeting specific observations. They will develop simulation experiments to fine tune a forecast model using shifts in the Arctic systems to predict events likely to occur in Eurasia within two weeks of the initial shift.

"Our ultimate goal is to provide the scientific support for conducting the Arctic targeted observations and improving the forecast skill of the Eurasian winter extreme weather events," Mu said.

More information: Guokun Dai et al, Influence of the Arctic on the Predictability of Eurasian Winter Extreme Weather Events, *Advances in Atmospheric Sciences* (2020). DOI: 10.1007/s00376-019-9222-7

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