Influence of sea-ice loss on Arctic warming is shaped by temperatures in the Pacific Ocean

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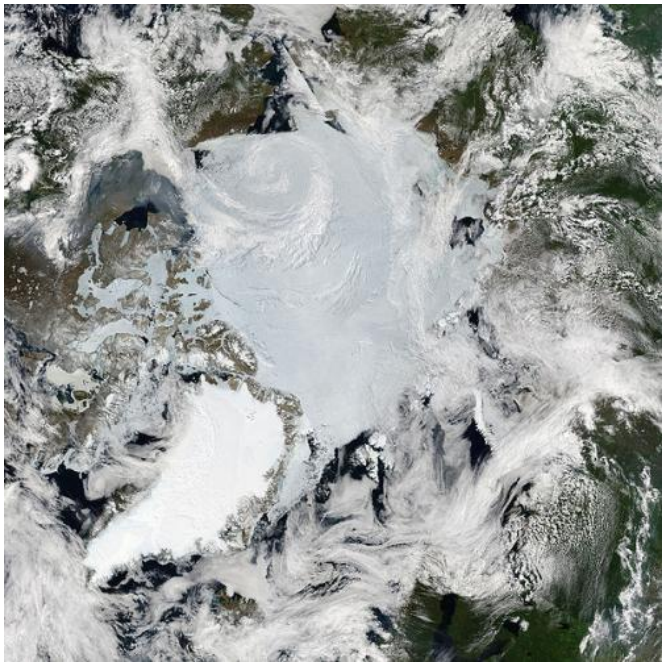

Mosaic of images of the Arctic by MODIS. Credit: NASA

Influence of sea-ice loss on Arctic warming is shaped by varying temperatures in the Pacific Ocean, new study shows

The crucial role that sea-ice loss plays in rapid Arctic warming is regulated by variable climate patterns taking place in the Pacific Ocean, a pioneering new study has found.

The Arctic amplification phenomenon refers to the faster rate of warming in the Arctic compared to places farther south. Arctic amplification has been linked to a spike in the number of persistent cold spells experienced in recent years over Europe and North America.

New research led by University of Exeter expert Dr James Screen and published in leading scientific journal *Nature Climate Change* has shown that the influence of sea-ice loss on warming in the far north during winter is dependent on a recurring ocean temperature pattern in the North Pacific.

In the study, Dr Screen identified the role that the Pacific Decadal Oscillation (PDO)—a cyclical pattern of warm and cool ocean temperatures in the Pacific—plays on the impact of sea-ice loss on Arctic warming.

The study used observations and new climate model experiments to show that the warming effect of sea-ice loss is dependent on the PDO's phase: the same amount of sea-ice loss leads to greater Arctic warming in the 'negative' phase of the PDO compared the 'positive' phase.

During the 'negative' phase of PDO there are colder-than-normal ocean temperatures along the west coast of North America and warmer temperatures in the western Pacific. The pattern is opposite for the 'positive' phase.

This pattern is known to also affect coastal sea and continental surface air temperatures from Alaska to California. However, that it also regulates the contribution of sea-ice loss to Arctic amplification had not been previously known.

Dr Screen, a Senior Lecturer in Mathematics at the University of Exeter, said: "The study shows an important interaction between natural climate variability and one of the most conspicuous aspects of human-induced climate change—the loss of Arctic sea ice."

"Given the nature of the PDO, which oscillates between periods of cooling and warming of the

Pacific waters over a recurrent period of around a decade, this study could help give us a greater understanding and ability to predict trends in both Arctic, and sub-Arctic climate."

Prof Jennifer Francis, a Research Professor at Rutgers University and study co-author added: "One of the most interesting areas of research now is unravelling the ways in which human-caused changes in the climate system are interacting with natural climate fluctuations, such as the PDO and El Niño.

"Our findings surprised us, and they're also concerning because the extremely warm winter that just occurred in the Arctic may have been even worse if the PDO had been in a negative phase. When the PDO shifts back again, it could be bad news for the already rapidly changing Arctic region."

'Contribution of sea-ice loss to Arctic amplification is regulated by Pacific Ocean decadal variability', by James Screen and Jennifer Francis, is published in N*ature Climate Change* online, on Monday, May 2.

More information: Contribution of sea-ice loss to Arctic amplification is regulated by Pacific Ocean decadal variability, *Nature Climate Change*, DOI: 10.1038/nclimate3011

Provided by University of Exeter