

The sun has more impact on the climate in cool periods

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The activity of the Sun is an important factor in the complex interaction that controls our climate. New research now shows that the impact of the Sun is not constant over time, but has greater significance when the Earth is cooler.

There has been much discussion as to whether variations in the strength of the Sun have played a role in triggering climate change in the past, but more and more research results clearly indicate that solar activity - i.e. the amount of radiation coming from the Sun - has an impact on how the climate varies over time.

In a new study published in the scientific journal *Geology*, researchers from institutions including Aarhus University in Denmark show that,

during the last 4,000 years, there appears to have been a close correlation between solar activity and the sea surface temperature in summer in the North Atlantic. This correlation is not seen in the preceding period.

Since the end of the Last Ice Age about 12,000 years ago, the Earth has generally experienced a warm climate. However, the climate has not been stable during this period, when temperatures have varied for long periods. We have generally had a slightly cooler climate during the last 4,000 years, and the ocean currents in the North Atlantic have been weaker.

"We know that the Sun is very important for our climate, but the impact is not clear. Climate change appears to be either strengthened or weakened by solar activity. The extent of the Sun's influence over time is thus not constant, but we can now conclude that the climate system is more receptive to the impact of the Sun during cold periods - at least in the North Atlantic region," says Professor Marit-Solveig Seidenkrantz, Aarhus University, who is one of the Danish researchers in the international team behind the study.

A piece of the climate puzzle

In their study, the researchers looked at the sea surface temperatures in summer in the northern part of the North Atlantic during the last 9,300 years. Direct measurements of the temperature are only found for the last 140 years, when they were taken from ships.

However, by examining studies of marine algae - diatoms - found in sediments deposited on the North Atlantic sea bed, it is possible to use the species distribution of these organisms to reconstruct fluctuations in sea surface temperatures much further back in time.

The detailed study makes it possible to draw comparisons with records

of fluctuations of solar energy bursts in the same period, and the results show a clear correlation between [climate change](#) in the North Atlantic and variations in [solar activity](#) during the last 4,000 years, both on a large time scale over periods of hundreds of years and right down to fluctuations over periods of 10-20 years.

The new knowledge is a small but important piece of the overall picture as regards our understanding of how the entire climate system works, according to Professor Seidenkrantz.

"Our climate is enormously complex. By gathering knowledge piece by piece about the way the individual elements work together and influence each other to either strengthen an effect or mitigate or compensate for an impact, we can gradually get an overall picture of the mechanisms. This is also important for understanding how human-induced [climate change](#) can affect and be affected in this interaction," she says.

More information: *Geology*, G36377.1, first published on February 2, 2015. geology.gsapubs.org/content/ea...6377.1.full.pdf+html

Provided by Aarhus University

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