

# Changes in solar activity affect local climate

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Raimund Muscheler is a researcher at the Department of Earth and Ecosystem Sciences at Lund University in Sweden. In the latest issue of the journal *Science*, he and his colleagues have described how the surface water temperature in the tropical parts of the eastern Pacific varied with the sun's activity between 7 000 and 11 000 years ago (early Holocene). Contrary to what one might intuitively believe, high solar activity had a cooling effect in this region.

"It is perhaps a similar phenomenon that we are seeing here today", says Raimund Muscheler. "Last year's cold winter in Sweden could intuitively be seen to refute global warming. But the winter in Greenland was exceptionally mild. Both phenomena coincide with low solar activity and the sun's activity probably influences the local climate variations."

Today there is a lot of debate about whether the sun's activity could have influenced the earth's climate over thousands or millions of years.

"The key processes in this influence are still mostly unclear. This is why the present [climate models](#) probably do not include the full effect of solar activity", says Raimund Muscheler.

By reconstructing surface water temperatures from plankton stored in a sediment core taken from the seabed off the west coast of Baja California Sur, Mexico, researchers have now made new findings. The results suggest that solar activity has influenced the sea's surface water temperature by changing local circulation processes in the sea. Previous studies have shown that the surface water temperature in the tropical

Pacific Ocean is linked to atmospheric and seawater circulation through the regional weather phenomena El Niño and El Niña.

"We know that El Niño brings a warmer climate, while El Niña brings a cooler [climate](#) in the eastern part of the Pacific Ocean", says Raimund Muscheler. "If we presume that this connection existed during the early Holocene, this means that there could be a link between solar activity and El Niño/El Niña on long time scales."

In his research, Raimund Muscheler works to reconstruct previous changes in solar activity by studying how cosmogenic isotopes, for example of beryllium-10 and carbon-14, have been stored in both ice cores and annual rings in trees. Cosmogenic isotopes are formed in the atmosphere as a result of cosmic radiation from space. When solar activity is high, a small amount of the cosmic radiation reaches the atmosphere and thus a small number of cosmogenic isotopes are formed and stored.

"This is the best and most reliable method we have to reconstruct [solar activity](#)", says Raimund Muscheler.

Provided by Lund University

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