

Study sheds new light on how the Sun affects the Earth's climate

6 October 2010



The Sun's activity has recently affected the Earth's atmosphere and climate in unexpected ways, according to a new study published today in the journal *Nature*. The study, by researchers from Imperial College London and the University of Colorado, shows that a decline in the Sun's activity does not always mean that the Earth becomes cooler.

It is well established that the Sun's activity waxes and wanes over an 11-year cycle and that as its activity wanes, the overall amount of radiation reaching the Earth decreases. Today's study looked at the Sun's activity over the period 2004-2007, when it was in a declining part of its 11-year activity cycle.

Although the Sun's activity declined over this period, the new research shows that it may have actually caused the Earth to become warmer. Contrary to expectations, the amount of energy reaching the Earth at visible wavelengths increased rather than decreased as the Sun's activity declined, causing this warming effect.

Following this surprising finding, the researchers behind the study believe it is possible that the

inverse is also true and that in periods when the Sun's activity increases, it tends to cool, rather than warm, the [Earth](#). This is based on what is already known about the relationship between the Sun's activity and its total energy output.

Overall solar activity has been increasing over the past century, so the researchers believe it is possible that during this period, the [Sun](#) has been contributing a small cooling effect, rather than a small warming effect as had previously been thought.

Professor Joanna Haigh, the lead author of the study who is Head of the Department of Physics and member of the Grantham Institute for [Climate Change](#) at Imperial College London, said: "These results are challenging what we thought we knew about the Sun's effect on our [climate](#). However, they only show us a snapshot of the Sun's activity and its behaviour over the three years of our study could be an anomaly.

"We cannot jump to any conclusions based on what we have found during this comparatively short period and we need to carry out further studies to explore the Sun's activity, and the patterns that we have uncovered, on longer timescales. However, if further studies find the same pattern over a longer period of time, this could suggest that we may have overestimated the Sun's role in warming the planet, rather than underestimating it."

Professor Sir Brian Hoskins, the Director of the Grantham Institute for Climate Change at Imperial College London, added: "We know that the Earth's climate is affected both by human activity and by natural forces and today's study improves our understanding of how the Sun influences our climate. Studies like this are vital for helping us to create a clear picture of how our climate is changing and through this, to work out how we can best protect our planet."

The researchers used satellite data and computer modelling to analyse how the spectrum of radiation and the amount of energy from the Sun has been changing since 2004. Instruments on the SORCE satellite have been measuring the Sun's energy output at many different wavelengths. The researchers fed the data from SORCE into an existing computer model of the Earth's atmosphere and compared their results with the results obtained using earlier, less comprehensive, data on the solar spectrum.

More information: "An influence of solar spectral variations on radiative forcing of climate" *Nature*, 7 October 2010

Provided by Imperial College London

APA citation: Study sheds new light on how the Sun affects the Earth's climate (2010, October 6) retrieved 23 September 2020 from <https://phys.org/news/2010-10-sun-affects-earth-climate.html>

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