

Increased solar radiation requires an extra reduction in CO2 emissions

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(PhysOrg.com) -- The recently observed reduction in air pollution implies that more solar radiation reaches the Earth's surface. This could lead to a far more rapid increase in the Earth's temperature in the coming decades. These are the claims of econometricians Jan Magnus, Bertrand Melenberg, and Chris Muris from Tilburg University (The Netherlands) based on unique solar radiation data collected from weather stations between 1959 and 2002.

Their calculations show that in order to prevent an increase in global temperatures of more than two degrees we will have to reduce CO2 emissions by an additional 50 million tonnes to compensate for the increased solar radiation reaching the Earth's surface.

Everyone is familiar with the effect of CO2 emissions on the Earth's temperature: the [greenhouse effect](#). Less well known is the effect of solar radiation reaching the Earth's surface, and its development over time. Besides solar fluctuations, the amount of radiation is also affected by small particles called aerosols. The more aerosols are present in the atmosphere, the less solar radiation reaches the Earth. Large quantities of aerosols actually help to cool down the Earth and to temper ('dim') the greenhouse effect. Without this reduction in solar radiation, the Earth's temperature would have increased by an additional one degree during the last fifty years.

Man-made pollution affects the quantity of aerosols in the atmosphere: soot particles emitted by cars, for example, exacerbate aerosol

concentrations. Measures to reduce soot emissions and the subsequent pollution have been adopted by numerous countries in recent years. These measures have reduced the quantity of aerosols in the atmosphere, thus allowing more solar radiation to reach the [Earth](#)'s surface, and increasing global temperatures.

The [statistical analysis](#) in this study uses solar radiation data over a forty-year period. Based on these data, the researchers at Tilburg University conclude that, given the increased levels of solar radiation, existing global warming forecasts for the next few years could be far too conservative. They claim that in order to compensate for the increased levels of solar radiation, greater efforts will be needed to reduce CO₂ emissions. If action is not taken soon, global warming could accelerate and temperatures could soar by more than four degrees instead of the agreed maximum target of two degrees. The researchers developed a statistical model to separate the impact on temperature of the two effects. This produces different scenarios that demonstrate the effect on temperature of varying [solar radiation](#) levels and [CO₂ emissions](#).

Provided by Tilburg University

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