IEAGHG Information Paper: 2015-IP14;
Is a Mini Ice Age on the Way that will Stop Global Warming?

This Information Paper was spurred on by a recent article in the UK's Telegraph newspaper; "Earth heading for 'mini ice age' within 15 years" (see http://www.telegraph.co.uk/news/science/11733369/Earth-heading-for-mini-ice-age-within-15-years.html).

The article is based on a presentation given recently National Astronomy Meeting in Llandudno, Solar researchers at the University of Northumbria (http://astronomynow.com/2015/07/09/royal-astronomical-societys-national-astronomy-meeting-2015-report-4/).

The presentation was given by Prof. Valentina Zharkova of Northumbria University, UK, on behalf of a team of scientists that included Professor Simon Shepherd of Bradford University, Dr Helen Popova of Lomonosov Moscow State University and Dr Sergei Zarkhov of Hull University. Using data from the magnetic field observations from the Wilcox Solar Observatory in California, the team created a new model that produces unprecedentedly accurate predictions of irregularities within the Sun's 11-year heartbeat. The model draws on dynamo effects in two layers of the Sun, one close to the surface and one deep within its convection zone. Predictions from the model suggest that solar activity will fall by 60 per cent during the 2030s to conditions last seen during the 'mini ice age' that began in 1645. See the brief at https://www.ras.org.uk/news-and-press/2680-irregular-heartbeat-of-the-sun-driven-by-double-dynamo.

The result of this convergence will be similar to freezing conditions experienced in the late 17th century. They predict an effect called a 'Maunder Minimum'[1]. The Maunder Minimum was the name given to the period between 1645 and 1715, when Europe and North America experienced very cold winters due to low sunspot activity.

It also seems that that the Met Office in the UK had commissioned a study on the prospect of a Maunder Minimum, which can be found on their website at http://www.metoffice.gov.uk/mobile/news/article/news/releases/archive/2015/solar-activity. The report has been published in Nature Communications.

As part of the study a group of scientists used a climate model to simulate conditions between 2050 and 2099 under the RCP 8.5 scenario[2] – which assumes 'high-end' future carbon concentrations – but crucially included a solar output decreasing to Maunder Minimum levels. In line with other studies, they found the global impact from reduced solar output was relatively small - with a cooling effect of around -0.1 °C. This is much smaller than the amount of warming expected due to greenhouse gases, which is several degrees for this experiment.

However, on a regional level, the study found a bigger cooling effect for northern Europe, the UK and eastern parts of North America – particularly during winter. For example, for northern Europe the cooling is in the range -0.4 to -0.8 °C.

Met Office scientist and lead author Sarah Ineson, is also directly quoted as saying:

"A return to low solar activity not seen for centuries could increase the chances of cold winters in Europe and eastern parts of the United States but wouldn't halt global warming".

[1] https://en.wikipedia.org/wiki/Maunder_Minimum
[2] http://link.springer.com/article/10.1007%2Fs10584-011-0149-y

"This research shows that the regional impacts of a grand solar minimum are likely to be larger than the global effect”

"This study shows that the sun isn't going to save us from global warming, but it could have impacts at a regional level that should be factored in to decisions about adapting to climate change for the decades to come".

In researching this topic it seems that concern of a Maunder Minimum was also raised by scientists at Reading University in the UK in 2013 and was featured in an article on the BBC web site, at http://www.bbc.co.uk/blogs/paulhudson/entries/6d50a6bd-779a-32d6-bfca-06e4484d6835.

Overall the impression one gets is that there is good science behind the lead headline. The consensus is that despite the cyclical reduction in solar activity, in global terms the effect is minimal with respect to reducing global warming. However, the regional impacts in eastern USA, UK and other parts of Northern Europe could be significant. Policy makers therefore need to be aware of the impacts of this effect on transport infrastructure for example, whilst also developing policies to avert climate change.

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