Ray of hope: Can the sun save us from global warming?

by

Dr. David Whitehouse

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[Dr. Whitehouse is not affiliated with SPPI]

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by *Dr David Whitehouse*

Could the Sun's inactivity save us from global warming? David Whitehouse explains why solar disempower may be the key to combating climate change

Between 1645 and 1715 sunspots were rare. It was also a time when the Earth's northern hemisphere chilled dramatically

Something is happening to our Sun. It has to do with sunspots, or rather the activity cycle their coming and going signifies. After a period of exceptionally high activity in the 20th century, our Sun has suddenly gone exceptionally quiet. Months have passed with no spots visible on its disc. We are at the end of one cycle of activity and astronomers are waiting for the sunspots to return and mark the start of the next, the so-called cycle 24. They have been waiting for a while now with no sign it's on its way any time soon.

Sunspots – dark magnetic blotches on the Sun's surface – come and go in a roughly 11-year cycle of activity first noticed in 1843. It's related to the motion of super-hot, electrically charged gas inside the Sun – a kind of internal conveyor belt where vast sub-surface rivers of gas take 40 years to circulate from the equator to the poles and back. Somehow, in a way not very well understood, this circulation produces the sunspot cycle in which every 11 years there is a sunspot maximum followed by a minimum. But recently the Sun's internal circulation has been failing. In May 2006 this conveyor belt had slowed to a crawl – a record low. NASA scientist David Hathaway said: "It's off the bottom of the charts... this has important repercussions for future solar activity." What's more, it's not the only indicator that the Sun is up to something.

Sunspots can be long or short, weak or strong and sometimes they can go away altogether. Following the discovery of the cycle, astronomers looked back through previous observations and were able to see it clearly until they reached the 17th century, when it seemed to disappear. It turned out to be a real absence, not one caused by a lack of observations. Astronomers called it the "Maunder Minimum." It was an astonishing discovery: our Sun can change. Between 1645 and 1715 sunspots were rare. About 50 were observed; there should have been 50,000. Ever since the sunspot cycle was discovered, researchers have looked for its rhythm superimposed on the Earth's climate. In some cases it's there but usually at low levels. But there was something strange about the time when the sunspots disappeared that left scientists to ponder if the sun's unusual behaviour could have something to do with the fact that the 17th century was also a time when the Earth's northern hemisphere chilled with devastating consequences.

Scientists call that event the "Little Ice Age" and it affected Europe at just the wrong time. In response to the more benign climate of the earlier Medieval Warm Period, Europe's population may have doubled. But in the mid-17th century demographic growth stopped and in some areas fell, in part due to the reduced crop yields caused by climate change. Bread prices doubled and then quintupled and hunger weakened the population. The Italian historian Majolino Bisaccioni suggested that the wave of

bad weather and revolutions might be due to the influence of the stars. But the Jesuit astronomer Giovanni Battista Riccioli speculated that fluctuations in the number of sunspots might be to blame, for he had noticed they were absent.

Looking back through sunspot records reveals many periods when the Sun's activity was high and low and in general they are related to warm and cool climatic periods. As well as the Little Ice Age, there was the weak Sun and the cold Iron Age, the active sun and the warm Bronze Age. Scientists cannot readily explain how the Sun's activity affects the Earth but it is an observational correlation that the Sun's moods have a climatic effect on the Earth.

Today's climate change consensus is that man-made greenhouse gases are warming the world and that we must act to curb them to reduce the projected temperature increase estimated at probably between 1.8C and 4.0C by the century's end. But throughout the 20th century, solar cycles had been increasing in strength. Almost everyone agrees that throughout most of the last century the solar influence was significant. Studies show that by the end of the 20th century the Sun's activity may have been at its highest for more than 8,000 years. Other solar parameters have been changing as well, such as the magnetic field the Sun sheds, which has almost doubled in the past century. But then things turned. In only the past decade or so the Sun has started a decline in activity, and the lateness of cycle 24 is an indicator. Astronomers are watching the Sun, hoping to see the first stirrings of cycle 24. It should have arrived last December. The United States' National Oceanic and Atmospheric Administration predicted it would start in March 2007. Now they estimate March 2008, but they will soon have to make that even later. The first indications that the Sun is emerging from its current sunspot minimum will be the appearance of small spots at high latitude. They usually occur some 12-20 months before the start of a new cycle. These spots haven't appeared yet so cycle 24 will probably not begin to take place until 2009 at the earliest. The longer we have to wait for cycle 24, the weaker it is likely to be. Such behaviour is usually followed by cooler temperatures on Earth.

The past decade has been warmer than previous ones. It is the result of a rapid increase in global temperature between 1978 and 1998. Since then average temperatures have held at a high, though steady, level. Many computer climate projections suggest that the global temperatures will start to rise again in a few years. But those projections do not take into account the change in the Sun's behaviour. The tardiness of cycle 24 indicates that we might be entering a period of low solar activity that may counteract man-made greenhouse temperature increases. Some members of the Russian Academy of Sciences say we may be at the start of a period like that seen between 1790 and 1820, a minor decline in solar activity called the Dalton Minimum. They estimate that the Sun's reduced activity may cause a global temperature drop of 1.5C by 2020. This is larger than most sensible predictions of man-made global warming over this period.

It's something we must take seriously because what happened in the 17th century is bound to happen again some time. Recent work studying the periods when our Sun loses its sunspots, along with data on other Sun-like stars that may be behaving in the same way, suggests that our Sun may spend between 10 and 25 per cent of the time in this state. Perhaps the lateness of cycle 24 might even be the start of another Little Ice Age. If so, then our Sun might come to our rescue over climate change, mitigating mankind's influence and allowing us more time to act. It might even be the case that the Earth's response to low solar activity will overturn many of

our assumptions about man's influence on climate change. We don't know. We must keep watching the sun.

Dr David Whitehouse *is an astronomer and the author of 'The Sun: A Biography' (John Wiley, 2004)*

Seasons of the Sun

Modern Solar Minimum
(2000-?)

Modern Climate Optimum
(1890–2000) – the world is getting warmer. Concentrations of greenhouse gas increase. Solar activity increases.

Dalton Solar Minimum
(1790–1820) – global temperatures are lower than average.

Maunder Solar Minimum
(1645–1715) – coincident with the 'Little Ice Age'.

Spörer Solar Minimum
(1420-1530) – discovered by the analysis of radioactive carbon in tree rings that correlate with solar activity – colder weather. Greenland settlements abandoned.

Wolf Solar Minimum
(1280–1340) – climate deterioration begins. Life gets harder in Greenland.

Medieval Solar Maximum
(1075–1240) – coincides with Medieval Warm Period. Vikings from Norway and Iceland found settlements in Greenland and North America.

Oort Solar Minimum
(1010-1050) – temperature on Earth is colder than average.
There seem to have been 18 sunspot minima periods in the last 8,000 years; studies indicate that the Sun currently spends up to a quarter of its time in these minima.

http://www.solarcycle24. com/
The Great Frost of 1683: http://www.londononline.co.uk/history/thames/4/

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http://news.independent.co.uk/sci_tech/article3223603.ece