

Solar activity heads for lowest low in four centuries

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The sun's activity is in free fall, according to a leading space physicist. But don't expect a little ice age. "Solar activity is declining very fast at the moment," Mike Lockwood, professor of space environmental physics at Reading University, UK, told *New Scientist*. "We estimate faster than at any time in the last 9300 years."

Lockwood and his colleagues are reassessing the chances of this decline continuing over decades to become the first "grand solar minimum" for four centuries. During a grand minimum the normal 11-year solar cycle is suppressed and the sun has virtually no [sunspots](#) for several decades. This summer should have seen a peak in the number of sunspots, but it didn't happen.

Lockwood thinks there is now a 25 per cent chance of a repetition of the last grand minimum, the late 17th century Maunder Minimum, when there were no sunspots for 70 years. Two years ago, Lockwood put the chances of this happening at less than 10 per cent (*Journal of Geophysical Research*, DOI: [10.1029/2011JD017013](https://doi.org/10.1029/2011JD017013)).

Little ice age

The Maunder Minimum coincided with the worst European winters of the [little ice age](#), a period lasting centuries when several regions around the globe experienced unusual cooling. Tree ring studies suggest it cooled the northern hemisphere by up to 0.4 °C.

But Lockwood says we should not expect a new grand minimum to bring on a new little ice age. Human-induced global warming, he says, is already a more important force in global temperatures than even major solar cycles. Temperatures have risen by 0.85 °C since 1880, with more expected, according to [the most recent assessment of the Intergovernmental Panel on Climate Change](#).

There may still be noticeable consequences. For instance, long term cold winters in the UK are common when solar activity is low. And [less solar activity can slow the jet stream](#), triggering [a suite of interlinked extreme weather events](#) like the Russian heatwave of 2010, and the devastating floods in Pakistan that same year.

Isotope trail

There have been 24 grand solar minima in the past 10,000 years. Their history is reconstructed by looking for isotopes like carbon-14 that cosmic rays generate in the atmosphere. Solar activity boosts the solar wind which deflects cosmic rays coming at Earth, so less solar activity means more cosmic rays and more of these isotopes.

How the isotopes vary over time can be measured by looking at things like tree rings, which absorb carbon-14, or ice cores, which accumulate beryllium-10.

The current long-term decline in solar activity set in after the last grand solar maximum peaked

in 1956, says Lockwood. The decline has accelerated recently, and the absence of sunspots this summer has set alarm bells ringing.

The precise extent to which solar cycles influence global temperatures is still debated, including whether the recent decline may have helped cause [the current hiatus in the pace of global warming](#).

"Mike is probably right that there is a chance of the sun returning to a level of activity similar to the Maunder Minimum," says atmospheric physicist Joanna Haigh of Imperial College. But she adds: "Even under the most optimistic scenario [of minimal global warming and a deep solar minimum] the solar cooling would only just offset greenhouse gas warming. So no ice age."

It is more likely that it will simply reduce the warming a little, and set us up for greater warming if it receded.