

## A handbook against climate denialism in the axial decade

*Three arguments are often given for the claim that global warming is due to natural causes: orbital or Milanković cycles, solar cycles and volcanoes. All three have been refuted.*

Juan Bordera / Fernando Valladares / Antonio Turiel

Crops fail in half of Spain and many other places amidst everlasting droughts and catastrophic floods that sweep the world. Extreme events are becoming more and more virulent, causing expressions such as sixth-generation fires, level four hailstorms or medicanes (hurricanes in the Mediterranean) to become normal in places where they were not usual. [The oceans are burning at temperatures beyond all logic](#), astonishing the scientific community.

What do [India](#), [Turkey](#), [the UK](#), or [Spain](#) have in common? They coexist in that space between a sea boiling with accumulated heat and a sky overloaded with progress. And the energy retained for decades in the oceans is not being lost, it is being transformed. In the meantime, a coterie of know-it-alls and scholars keeps trying to deny the undeniable, to negotiate with the non-negotiable. To become Kafkaesque confirmation biases with little legs.

Until this historic July, the hottest day ever recorded was in 2016, with an average temperature of 16.92°C across the globe. That figure was surpassed on Monday, 3 July (17.01°C), but it was the shortest possible record because it



lasted exactly one day. On Tuesday, 4 July and Wednesday, 5 July, the record was smashed by a new record, which was repeated —17.18°C—, and on Thursday, 6 July, another one, 17.23°C. The temperature remained above the previous record during the following days until 13 July—[eleven days in a row for history](#). And new records could still be broken, as temperature peaks are usually reached in the second half of July.

The events are so severe, evident and recurrent that no one can longer deny climate change. However, too many people still do not understand the urgency and seriousness of the issue due to the lack of educational work by the mainstream media, which does not give the subject the importance it deserves.

In the face of the wave of abrupt phenomena (and we will see a few more in the coming months), the attempts to divert the climate debate are becoming more subtle and elaborate. It is now a matter of implying that "we are not sure of the causes", that "they are natural cycles", and other such nonsense. Unfortunately, examples can be found both on the so-called left, as in [the case of Voltaire Network founder Thierry Meyssan](#), and on the right of the balcony pots, especially among the far right, where denialists are even more common.

In a recent interview, Vox's anti-abortionist María de los Llanos Massó Linares, newly elected president of the Corts Valencianes thanks to a pact with the PP, said: "One thing is climate change, and another thing is that it is anthropogenic, that is, that man is to blame for climate change. Climate change has existed as long as the Earth has existed, as long as the climate has existed. It's just that now, since it's not studied, we don't know about it. But glaciations have always existed. These phases have always existed. Other members of the party have made similar statements.

Curiously, both Meyssan and Massó - with apparently antagonistic ideological positions - join hands in an attempt to contradict something that admits no scientific discussion whatsoever. Anyone who does not seek to reaffirm their confirmation bias and analyses the data can see that current climate change, of unprecedented speed, is undoubtedly anthropogenic in origin.

### *You will deny me three times, Massó*

Three arguments are usually given to affirm that global warming is due to natural causes: the orbital or Milanković cycles (to which Meyssan also refers), solar cycles and volcanoes.

Let's dismantle all three to provide arguments for those who face these increasingly marginalised and residual positions but seem reluctant to give up. We all know (and perhaps love) someone who refuses to understand the enormous danger posed by such statements, especially from political "decision-makers".

### *Milanković Cycles*

The story of the genius Milutin Milanković would deserve much more recognition. Without any computer or calculator, he was able to estimate and demonstrate that cyclical changes in climate were mainly due to three factors, three major orbital cycles operating on a geological time scale: precession (26,000 years), obliquity of the Earth's axis (41,000 years) and eccentricity of the orbit (two overlapping cycles, one with a duration of 100,000 years and the other of 413,000 years).

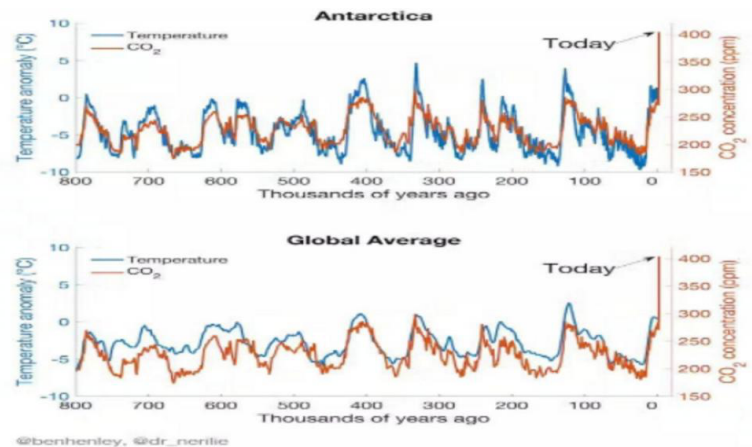
These three cycles are directly responsible for natural climate changes because they increase or decrease the Earth's radiative balance. Other endogenous factors, such as volcanic eruptions, and exogenous factors, such as comets, can also have a circumstantial influence.

Climate changes are like fires: some are natural, and some are caused by fire. Orbital variations are responsible for more or less solar radiation reaching the Earth's surface and are directly responsible for glacial and interglacial cycles and the evident periodicity of these.

Graphically Seeing it helps to understand the undeniable relationship that has existed over the last 800,000 years, especially with the cycle of the eccentricity of our planet's orbit - because not only the Sun gravitationally pulls the Earth, but also Jupiter or Saturn, the orbit and the amount of radiation vary - making it the main responsible for the alternation between glaciations and warmer interglacial periods in the last million years.

Two things are striking in the graph. The first is the most obvious: temperature and CO<sub>2</sub> are intertwined in an unquestionable mutual dependence: when temperature rises, CO<sub>2</sub> concentration rises, and vice versa.

For millions of years, solar radiation increased the temperature and caused the CO<sub>2</sub> concentration in the atmosphere to rise, whereas today, it is the other way around. As the concentration of CO<sub>2</sub> increases, it is CO<sub>2</sub> that causes the temperature to rise. It is basic chemistry. It is undeniable. It is ridiculous that there are still people pretending to deny it.



The other striking thing about the graph is perhaps more interesting, especially for Massó, who was talking about glaciations: the warm periods - the peaks in the graph - usually occur every 100,000 years. 100,000 years. Where have we seen that figure before? Indeed, in the cycle of the eccentricity of the orbit.

Warm periods, such as the current one known as the Holocene, in which all known civilisations flourished, are usually short-lived, and we would now be approaching a cold period were it not for the great experiment we are conducting with the atmosphere. We are accelerating towards [a place that would be the end of civilisation](#) as we know it.

The linked study, perhaps one of the most important in recent years, clearly points to the fact that feedback loops will cause us to skip those natural cycles and drive the Earth into a state that this team, made up of many of the best scientists on the planet, called Cooking Earth, or Greenhouse Earth. Nothing good will happen if we reach that point of no return, which we are close to. The authors in 2018 put it at around 2°C. At the rate the process is going, it is more likely to be below than above.

### Solar cycles

Over the last few thousand years, solar activity has been oscillating, altering the radiation striking the Earth and, logically, the temperature. Fluctuations in the amount of energy emitted by the sun affect luminosity and the solar wind or magnetic field, which are interrelated with visible effects such as sunspots. Despite these fluctuations, the average value of solar radiation,  $1366 \text{ W/m}^2$ , hardly changes: fluctuations caused by the sunspot cycle do not go beyond  $1 \text{ W/m}^2$ . The most crucial solar variation is the sunspot cycle, which lasts 11 years before returning to the same value of sunspots and radiation.

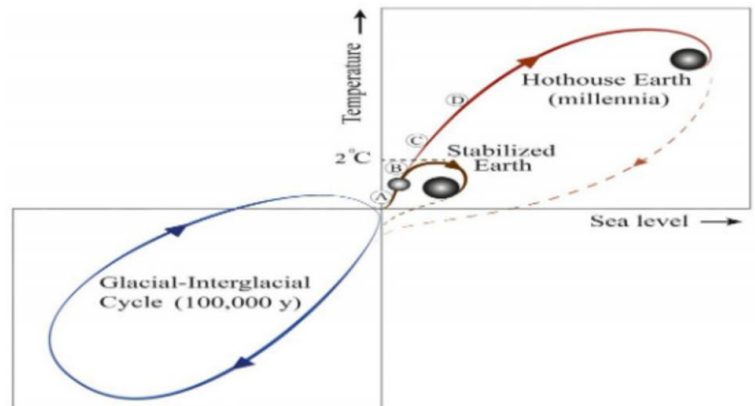
There are other cycles of longer duration, notably the Gleissberg cycle, with a period of 72-83 years, which caused the famous Maunder Minimum that led to the Little Ice Age. But when one superimposes the evolution of temperatures and solar activity, it becomes evident that they bear [no relation to what has happened in the last century](#).

### Volcanoes

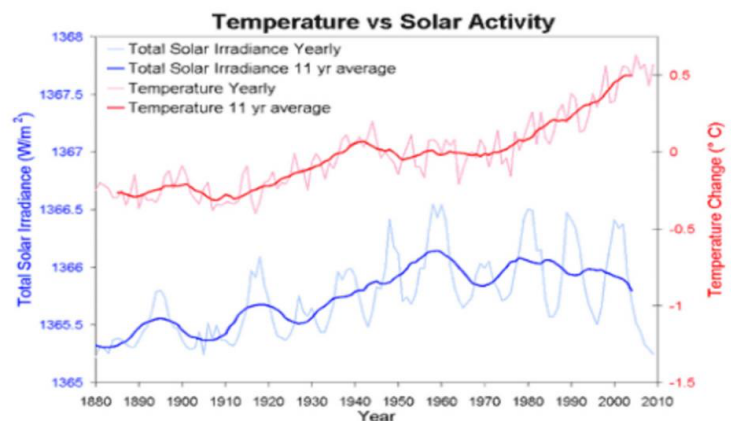
The effect of volcanoes on climate is highly variable. Because they emit greenhouse gases (water vapour, carbon sulphur oxides, etc.), they contribute to warming the atmosphere, as was the case with [the underwater volcano in Tonga in 2022](#). Emitting particles, ash, and aerosols increase the fraction of solar radiation reflected back to outer space, as was the case with [the Tambora volcano that generated a whole year without summer](#) with major crop failures due to lack of sufficient heat. Whether one or the other effect predominates depends on each volcano. Still, the alteration of the eruptions is temporary, and after a few years (exceptionally four or five), their impact on the local or global temperature fades away. As in the case of orbital cycles, which occur on scales of thousands of years, or solar cycles, which occur on the scale of decades, volcanoes are a source of natural climate variation that bears no relation to what has been observed over the last century.

*while some people give their opinions  
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the world are leaving their homes.*

with science in one hand, can deny this, even if they have a bible in the other.



Fuente: [PNAS](#)



Temperatura vs. actividad solar. / Fuente: [NASA](#)

[No physical climate model can reconstruct climate history](#) from the mid-20th century to the present without considering the effect, known as radiative forcing, of greenhouse gases emitted in large quantities from burning fossil fuels. There is no one who,

Despite the scientific evidence, it is more comfortable to believe the opinions of Massó or Meyssan and their ideas so convenient to the immobility of the great economic powers that have been financing think tanks and buying

"scientists" for decades in order to be able to continue with their industries. [In the United States alone, hundreds of millions of dollars are invested to finance denialism.](#)

At least Meyssan admits [to having no knowledge of climate research](#). But while some people give their opinions without knowing, millions of people around the world are leaving their homes because of crop failures or directly because of temperatures incompatible with human physiology. Climate change hits the lives of so many people, and we have to listen to policymakers talk so carelessly about a matter of life and death.

While the evidence and disasters pile up, in this Spain that is fading towards black and white, we are giving rise to outlandish theories and cheap superciliousness such as those of [the child meteorologist of the cabañuelas, who will take part in an event at the CEU San Pablo University together with the president of Andalusia, Juan Moreno Bonilla.](#)

The German philosopher Karl Jaspers defined the Axial Age - the axis-time - as the time when "the spiritual foundations of humanity were laid simultaneously and independently in China, India, Persia, Judea and Greece". From 800 BC to 200 BC, in barely 600 years, many frameworks of thought that still survive today were built. We are in a kind of 'axial decade' of which we have already covered almost a third. Either we use the remaining time to win the battle against pseudoscience and economic interests, or we will pay dearly for the following centuries.

In this 'axial decade', decisions must be taken in the most scientific way possible, with the participation of citizens and leaving economic powers out of the equation due to their evident conflicts of interest. Only in this way will we avoid falling into the same mistake as always and into the infernal hole of a Cooking Ground already making its growing heat felt.

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