

# The world has been warming faster than expected. Scientists now think they know why

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Clouds over the Atlantic Ocean at sunrise in Lido Beach, New York, September 23, 2022. Shannon Stapleton/Reuters

**CNN —**

Last year was the hottest on record, oceans boiled, glaciers melted at alarming rates, and it left scientists scrambling to understand exactly why.

They know the extraordinary heat was fueled by a number of factors, predominantly planet-heating pollution from burning fossil fuels and the natural climate pattern El Niño. But those alone did not explain the unusually rapid temperature rise.

Now a new study published Thursday in the journal *Science* says it has identified the missing part of the puzzle: clouds.

To be more specific, the rapid surge in warming was supercharged by a dearth of low-lying clouds over the oceans, according to the research — findings which may have alarming implications for future warming.

In simple terms, fewer bright, low clouds mean the planet “has darkened,” allowing it to absorb more sunlight, said Helge Goessling, a report author and climate physicist at the Alfred Wegener Institute in Germany.

This phenomenon is called “albedo” and refers to the ability of surfaces to reflect the sun’s energy back into space.

The Earth’s albedo has been declining since the 1970s, according to the report, due in part to the melting of light-colored snow and sea ice, exposing darker land and water which absorb more of the sun’s energy, heating up the planet.

Low clouds also feed into this effect as they reflect away sunlight.

The scientists scoured NASA satellite data, weather data and climate models and found the decline in low clouds reduced the planet’s albedo to record lows last year. Areas including parts of the North Atlantic Ocean experienced a particularly significant fall, the study found.

Last year fits into a decade-long decline of low cloud cover, Goessling told CNN.

What the study can’t yet explain for certain is why this is happening. “This is such a complex beast and so hard to disentangle,” Goessling said.

He believes it is likely the result of a combination of factors. The first is a reduction in shipping pollution due to regulations aimed at reducing the industry’s harmful sulfur emissions. While this has been a win for human health, this type of pollution was also helping cool the planet by brightening clouds.

Natural climate variabilities, including changing ocean patterns, may also have contributed. But Goessling points to a third, more alarming factor: global warming itself.

Low-level clouds tend to thrive in a cool and moist lower atmosphere. As the planet’s surface heats up, this can cause them to thin or dissipate entirely, setting up a complicated feedback loop where low clouds are disappearing because of global warming, and their disappearance then drives further warming.

If this is happening, future warming projections may be underestimated and “we should expect rather intense warming in the future,” Goessling said.

Mark Zalkina, an atmospheric scientist at the Lawrence Livermore National Laboratory who was not involved in the study, said “the fact that clouds play a key role in the story makes sense, as they essentially act as Earth’s sunscreen.”

Small changes in cloud cover can “drastically change Earth’s albedo,” he told CNN. Tapio Schneider, a climate scientist at the California Institute of Technology, said the worrying implication of the research is if global warming is responsible for a substantial amount of cloud cover change, “we may see stronger global warming than previously predicted.”

Clouds may seem simple, even mundane, but they are endlessly complex and scientists remain far from unraveling how they behave. They are “one of the biggest headaches” in climate science, Goessling said.

But figuring out how clouds will respond to global warming is key, Zalkina said. “It literally determines how much future warming is in store.”