

# EOS

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SCIENCE NEWS BY AGU

A Cataclysmic Start to Subduction

Antarctica's Disappearing Meteorites

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# The Career Issue

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made it through a maze  
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coauthor and food scientist Angel Antonio Carbonell Barrachina, also from Universidad Miguel Hernández de Elche. In the future, these analyses could help the group understand the reach of the pollution in the area. Some from the group plan to return to Ecuador later this year to continue the work.

#### Future for Farmers

Farmers in volcanic regions face “unique challenges,” said Octavio Pérez Luzardo, a toxicologist at the Universidad de Las Palmas de Gran Canaria in Spain who was not involved with the new research. “Although soils can become enriched with beneficial minerals thanks to volcanoes, there’s a risk of heavy metal contamination, especially in the short term, that can be hazardous to both human health and ecosystem health,” he said. Pérez Luzardo noted that the Tungurahua study was similar to a 2022 study he coauthored on the effect of volcanic ash on bananas in the Canary Islands ([bit.ly/La-Palma-ash](https://bit.ly/La-Palma-ash)).

“Not all volcanic materials are the same,” said Budiman Minasny, a soil scientist at the University of Sydney in Australia, who has studied volcanic ash and soil from recent volcanic eruptions in Indonesia but was not

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**“Happily, we were all very satisfied with the results of the study.”**

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involved in the Tungurahua work. “The study in Ecuador is valid,” he said, adding that given that some volcanic materials have elevated heavy metal levels, precautionary monitoring such as that done at Tungurahua, as well as establishing a baseline of these metals in the soil, is important.

International studies have shown that compost can help clean up pollution, said study coauthor and project leader Irene Gavilanes-Terán, a chemist at ESPOCH. “Compost has a large cocktail of microorganisms with the ability to remove heavy metals,” Gavilanes-Terán said. Researchers are studying bioremediation in the area using compost.

“Happily, we were all very satisfied with the results of the study,” Egas said.

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By **Andrew J. Wight**, Science Writer

## Antarctic Meteorites Are Going, Going, May Soon Be Gone



Researchers collect a meteorite in Antarctica's Miller Range. Credit: NASA/JSC/ANSMET

For decades, scientists hunting for meteorites have known exactly where to go: the bottom of the world. Antarctica is a veritable treasure trove of space rocks, thanks to its shifting ice and relatively pristine surface. More than half of the meteorites ever found have been plucked from the frozen continent. But that may not hold for long.

A new study published in *Nature Climate Change* estimates that hundreds of thousands of meteorites could sink through the Antarctic ice and be out of reach by 2100 as the climate warms ([bit.ly/Antarctic-meteorites](https://bit.ly/Antarctic-meteorites)). Already, some 5,000 meteorites are likely being lost each year, the study authors estimate, a trend that could persist after 2050 should we fail to get global warming under control. Once in the ice, the meteorites are unlikely ever to be recovered.

“We estimate that the meteorites are being lost much quicker than we can find them at the moment,” said Veronica Tollenaar, a glaciologist and doctoral candidate at Université libre de Bruxelles and a coauthor of the study.

Tollenaar and her colleagues estimate that for every one tenth of a degree of warming,

another 1%–2% of Antarctic meteorites will be lost. It should be a wake-up call to scientists and their funders, they argue.

“It’s not a future problem,” said Harry Zekollari, a glaciologist at Vrije Universiteit Brussel and a study coauthor. “We need to act rapidly to save this unique archive.”

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**“It’s not a future problem.”**

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#### A Gold (or Rock) Mine for Meteorites

One of the most pristine places on Earth, Antarctica sees very little of the natural processes such as rain, snowfall, and erosion that quickly bury or degrade meteorites that fall elsewhere. In rare patches of bare “blue ice” in Antarctica, thousands of meteorites have accumulated over thousands or even millions of years because of ice flows. They are simply sitting on the ice, waiting to be picked up.

To date, around 50,000 meteorites have been gathered from Antarctica, representing around 60% of all meteorites ever found. The tally includes the first meteorite identified as coming from Mars, as well as the first lunar meteorites.

Scientists already knew that meteorites, which are dark, absorb far more radiation from the Sun than the ice on which they sit does. Even at temperatures well below freezing, a meteorite can melt the ice beneath it and sink into a puddle of its own making, eventually becoming locked invisibly beneath the surface.

The magic temperature, the researchers found, is about  $-10^{\circ}\text{C}$  ( $14^{\circ}\text{F}$ ). “If temperatures go above this, even if it’s not often...you’re very unlikely to find meteorites,” Zekollari said.

The researchers started with a database of Antarctic meteorite locations that Tollenaar had built as part of her Ph.D. research.

To create that data set, she used machine learning to combine estimates of ice flow speeds, snow levels, and temperatures and information on the ice surface to determine where meteorites are most likely to be found in Antarctica. For the more recent study, the researchers did much the same thing, this time using different temperatures drawn from climate models to simulate where meteorites might disappear in the future. The result considers how multiple variables interact, Tollenaar said.

“It’s not simply setting a [temperature] threshold,” she said. “It’s really integrating all the observations that we know are important.”



Areas of blue ice like this are a treasure trove of meteorites, with many simply lying on the ice. Credit: José Jorquera (Antarctica.cl), University of Santiago, Chile

The number of meteorites Antarctica stands to lose varies depending on how much global temperatures warm. Under current policies, which would create an estimated  $2.7^{\circ}\text{C}$  ( $4.8^{\circ}\text{F}$ ) of warming by 2100, 28%–30% of Antarctic meteorites could disappear. That number rises to 55% and 76% with  $4^{\circ}\text{C}$  and  $6^{\circ}\text{C}$  ( $7.2^{\circ}\text{F}$  and  $10.8^{\circ}\text{F}$ ) of warming, respectively. No matter the scenario, those numbers amount to hundreds of thousands of meteorites being lost.

“I don’t think that I realized or recognized just how significant it could be,” said Meenakshi Wadhwa, a planetary scientist at Arizona State University who wasn’t affiliated with the research. “It will be a significant loss if we’re not able to access many of these materials.”

#### Scientific Funders, Take Heed

In addition to being easy to find, most Antarctic meteorites are largely untouched by

Earth’s environment, thanks to the continent’s ice. That lack of contamination means that these space rocks can give scientists far more information on planets and asteroids in the solar system than meteorites found elsewhere. Antarctic meteorites, though not easy to get to, are relatively cheap to acquire.

They’re “a poor person’s space probe,” Wadhwa said. Instead of sending a mission to space, “for a fraction of the cost, you can actually do a lot of science on these materials.”

Indeed, this research may matter more to funding agencies than to scientists themselves, said Geoffrey Evatt, an applied mathematician who works with the United Kingdom’s Lost Meteorites of Antarctica project.

**“It will be a significant loss if we’re not able to access many of these materials.”**

“It really helps answer a question and poses this challenge to funders,” Evatt said. “We globally need to work together and actually have a concerted effort to collect these meteorites before many, many of them sink into the ice.”

By **Nathaniel Scharping** (@nathanielscharp), Science Writer

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