Key to predicting climate change could be blowing in the wind, researchers find

February 15 2018, by Paul Alongi

Alex Pullen looks through a microscope at the L.G. Rich Environmental Laboratory at Clemson University. Credit: Clemson University

Dust that blew into the North Pacific Ocean could help explain why the Earth's climate cooled 2.7 million years ago, according to a new study

published in the journal *Science Advances*.

One of the co-authors was Alex Pullen, an assistant professor of environmental engineering and earth sciences at Clemson University.

"Why study the past? It's a great predictor of the future," he said. "The findings of this study were both interesting and very unexpected."

Researchers were interested in dust because when it blows off land and into the ocean, the iron in it fertilizes the water like farmers do their fields. Through photosynthesis, tiny organisms that live in the ocean surface waters pull carbon-dioxide out of the atmosphere, which usually means cooler temperatures.

The biggest surprise in the study was that precipitation, rather than dryness, was the most important factor for adding East Asian dust to the atmosphere and oceans leading up to the ancient climate change, Pullen said.

It may seem counterintuitive, he said, because "most people associate dust emission with aridity and deserts, not with precipitation."

But researchers believe they have an idea of what happened.

The monsoon precipitation intensified, and the increase caused erosion along the Tibetan Plateau and lower elevation areas nearby in what today is China, researchers found. Wind carried the relatively loose sediment into the North Pacific Ocean, where it likely helped spur photosynthesis.

The research focused on a time that marked a change between a period of high carbon-dioxide levels in the atmosphere similar to modern day and much lower levels similar to the period before the industrial revolution, Pullen said.

The research helps explain what caused the Earth to go into the glacial and interglacial periods that have dominated ever since, he said.

But the findings do not suggest humans are off the hook on warming global temperatures, Pullen said.

Researchers were dealing in geologic time— millions of years— and the geologic record isn't always detailed enough to reflect what might have happened in the span of a few hundred years, he said. That would be enough to melt the ice caps and put islands and coastlines underwater, Pullen said.

The future climate could look like the Pliocene Epoch, which was 5.3 million to 2.5 million years ago, said Pullen, who is a geologist.

"Now we just have to figure out what the Pliocene looked like everywhere on Earth," he said. "That's going to be difficult because the Pliocene rock record doesn't exist everywhere. But we need to collect as much information from the Pliocene as we can to improve climate models and have a better understanding of what is in store for our future."

The study was an international collaboration between Junsheng Nie, Wenbin Peng, and Zhao Wang of Lanzhou University in China; Pullen; and Carmala N. Garzione of the University of Rochester.

The team's findings were drawn from detailed analysis of sedimentary rock in the Chinese Loess Plateau, an area of East China that has been collecting dust for at least the past 8 million years.

David Freedman, chair of Clemson's Department of Environmental Engineering and Earth Sciences, congratulated Pullen and the team on their work.

"Publishing in *Science Advances* is a significant accomplishment," he said. "Dr. Pullen is helping draw positive attention to the department, boosting our reputation for excellent research."

The article is titled, "Pre-Quaternary decoupling between Asian aridification and high dust accumulation rates."

More information: Junsheng Nie et al. Pre-Quaternary decoupling between Asian aridification and high dust accumulation rates, *Science Advances* (2018). DOI: 10.1126/sciadv.aao6977

Provided by Clemson University