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Volcanoes lower sea level

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Volcanic eruptions can mask some of the effects of climate change by lowering sea levels, new research says.

Australian marine and atmospheric scientist Dr John Church of the CSIRO says volcanoes spew particles into the stratosphere that reflect the Sun's radiation away from the Earth. This cools the oceans, allowing seawater to expand.

Church and his colleagues report their research in the journal *Nature* today.

Church says the eruption of Mount Agung in Indonesia in 1963, El Chichon in Mexico in 1982 and Mount Pinatubo in the Philippines in 1991 resulted in a total 6 millimetre fall in sea level over that period.

He says the impact of volcanic eruptions on climate patterns is well researched but this is the first time a specific connection with sea level has been made this way.

Australian researcher Associate Professor Colin Murray-Wallace, at the University of Wollongong, says Church has come up with a novel and credible hypothesis.

"There's no doubt that volcanoes have been linked to aspects of sea level changes in the longer geological record," he says.

A new explanation

Church says sea levels are rising faster today than they have for several thousand years.

He says this is caused mainly by thermal expansion of the water and melting glaciers and ice sheets, which many scientists believe is a result of human-induced climate change.

Church says when he tried to come up with estimates of sea level rise he discovered curious fluctuations.

"I constructed a curve showing global average sea level rise from 1950-2000 and it had this variability in it which I couldn't understand," he says.

"I tried to correlate it with all sorts of things ... and couldn't get any



Mexico's Fire Volcano erupting last year. Could events like this put the brakes on rising sea levels? (Image: Reuters/Bernardo de Niz)

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Particles thrown into the air by volcanic eruptions reflect solar radiation away from the Earth (Image: US Geological Survey)

sound relationship until I noticed there was this series of volcanic eruptions prior to these falls in sea level."

He found the global sea level fell by several millimetres in the months after a large eruption, followed by a slow rise lasting a decade or more.

Satellite observations for the rate of sea level rise since 1993, 18 months after Mount Pinatubo, a showed steep increase, which Church says demonstrates recovery from the eruption.

How do volcanoes cool oceans?

When volcanoes erupt they eject sulfate gases into the air that are converted into sulfate aerosols in the stratosphere.

These particles reflect the Sun's radiation away from the Earth, reducing the amount of short-wave radiation striking the surface of the oceans.

But as the aerosols fall out of the stratosphere the oceans begin to warm again, and sea levels rise.

Going up, up, up ...

In a commentary in *Nature*, Dr Anny Cazenave of France's [Centre National d'Etudes Spatiales](#), says the sea level has been rising by roughly 1.8 millimetres a year since 1950 and about 3 millimetres a year during the 1990s.

"Climate-model predictions indicate that sea levels will continue to rise in the coming decades, and even centuries," she says.

"But Church ... clearly demonstrates that volcanic eruptions can partially and temporarily mask the effect."

Church says volcanic activity alone isn't enough to counter creeping sea levels and he isn't suggesting we set off a string of volcanic eruptions to counter any possible effects of climate change.

Rather, he says the value of his work lies in providing a means of better understanding sea level rise and making more robust predictions for the future.

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