

## **Volcanic eruptions that changed human history**

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**Washington:** Reconstruction of timing and related radiative forcing of nearly 300 individual volcanic eruptions dated as far as the early Roman period shows that large volcanic eruptions were drivers of climate change, says new study.

The study was led by scientists from the Desert Research Institute (DRI), US.

"Using new records, we are able to show that large volcanic eruptions in the tropics and high latitudes were the dominant drivers of climate variability, responsible for numerous and widespread summer cooling extremes over the past 2,500 years," said study's lead author Michael Sigl.

"These cooler temperatures were caused by large amounts of volcanic sulfate particles injected into the upper atmosphere, shielding the Earth's surface from incoming solar radiation," Sigl added.

The study, published in the journal *Nature*, shows that 15 of the 16 coldest summers recorded between 500 B.C and 1,000 A.D followed large volcanic eruptions - with four of the coldest occurring shortly after the largest volcanic events found in record.

Throughout human history, sustained volcanic cooling effects on climate have triggered crop failures and famines. These events may have also contributed to pandemics and societal decline in agriculture-based communities.

These phenomena included diminished sunlight, discolouration of the solar disk, the presence of solar coronae, and deeply red twilight skies.

Tropical volcanoes and large eruptions in the Northern Hemisphere high latitudes (such as Iceland and North America) - in 536, 626, and 939 CE, for example - often caused severe and widespread summer cooling in the Northern Hemisphere by injecting sulfate and ash into the high atmosphere.

These particles also dimmed the atmosphere over Europe to such an extent that the effect was noted and recorded in independent archives by numerous historical eyewitnesses.

Climatic impact was strongest and most persistent after clusters of two or more large eruptions.

The authors noted that their findings also resolve a long-standing debate regarding the causes of one of the most severe climate crises in recent human history, starting with an 18-month "mystery cloud" or dust veil observed in the Mediterranean region beginning in March 536, the product of a large eruption in the high-latitudes of the Northern Hemisphere.

"This new reconstruction of volcanic forcing will lead to improved climate model simulations through better quantification of the sensitivity of the climate system to volcanic influences during the past 2,500 years," said Joe McConnell, a DRI research professor.

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