The Ilopango volcanic eruption that shocked the Maya's civilization 1590 years ago

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In 431 CE, 1590 years ago, the Maya civilization was laid waste as the Ilopango volcano erupted, killing every living thing within 40 km around the volcano, according to a new study carried out by an international

team of scientists and with the participation of Dario Pedrazzi, researcher at Geosciences Barcelona–CSIC (GEO3BCN). The article has been published in the journal *PNAS*.

As previous studies have shown, there had been a major volcanic eruption in the region, but the date was still unknown. This new research lead by Victoria Smith, associate professor from the University of Oxford and head if the Tephrochronology group, has established the precise date and nature of this eruption.

To do so, the scientists analyzed an ice core recovered from Greenland and also carried out radiocarbon measurements from a charred tree found in the TBJ ash deposits. Hence, they were able to date accurately the massive eruption to within just a couple of years, in 431 CE.

The research team used a 3-D tephra dispersal model to estimate that the eruption plume rose to 45 km and that the Ilopango's ash was dispersed more than 7,000 km, as far away as Greenland.

Dario Pedrazzi sampling in an outcrop near Tazumal. Credit: Dario Pedrazzi

"This work follows previous studies that were published in 2019 and in which we described, thanks to an extensive analysis of the ash deposits in El Salvador, the main physical parameters of this violent eruption that reached its climax with a series of pyroclastic flows linked a caldera collapse," said Dario Pedrazzi, researcher at GEO3BCN and co-author of the study. "A great part of this research has been possible thanks to all the data acquired during three field campaigns carried out in El Salvador during which we conducted a detailed mapping of the ash deposits present in an area of 200,000 km^2."

Around 55 km^3 of magma erupted from Ilopango. "More than 2 million km^2 of Central America was covered with at least a half centimeter of ash, and it would have been dark over this region for at least a week," said Victoria Smith.

Panoramic view of the Ilopango's caldera at present day. Credit: Dario Pedrazzi

Smith says, "The Ilopango Eruption was more than 50 times bigger than that of Mount Saint Helens," which occurred in 1980. "The pyroclastic flows from the eruption of Ilopango were 10 times the volume of those from Vesuvius, which erupted in 79 CE, preserving the Roman city of Pompeii in ash," she added.

The explosion took place during the Maya Early Classic Period, which extended from 300 to 600 CE, as the civilisation saw growth across Central America. But Smith says, "The explosion would have killed every living thing within 40 km and there would have been no inhabitants for many years or decades in the vicinity." The enormous eruption did not, however, have a marked impact on the Maya elsewhere.

Ilopango was thought to have been responsible for the anomalously cold decade in the Northern Hemisphere around 540 CE. But the work shows this date is at odds with archeological evidence (pottery production), which actually suggests a date near the start of the Early Classic period.

The Ilopango Caldera is located less than 10 km from San Salvador City, the capital of El Salvador, and it's a part of Volcanic Arc of El Salvador, which includes a total of 21 active volcanoes, being one of the most active segments of the Central America Volcanic Arc.

More information: Victoria C. Smith et al. The magnitude and impact of the 431 CE Tierra Blanca Joven eruption of Ilopango, El Salvador, *Proceedings of the National Academy of Sciences* (2020). DOI: 10.1073/pnas.2003008117

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