Did the Ilopango TBJ Eruption Cause the AD 536 Event?

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Abstract
The most significant atmospheric aerosol loading event of the past 2000 years occurred in the year AD 536. A 9.4°C drop witnessed much of the earth and resulted in prolonged global cooling lasting more than a decade from ca. AD 536-550 (Dull). Tree ring records, terrestrial archives, and archaeological records suggest that effects were especially pronounced in the northern hemisphere, where unusually cold summer temperatures and severe spring-onset winters were observed. This cooling, often referred to as the “Little Ice Age,” may have initiated the so-called “Medieval Climate Anomaly,” which was characterized by widespread cold periods in Europe and North America. Previous studies have invoked either a comet impact or a volcanic eruption to explain the cool climate of the AD 536 global dust event, but physical evidence to tie the climatic event to a specific geographical source has been lacking so far. A recent revision of tree ring chronologies and volcanic ash records from Antarctica (Dull et al. 2008) and Greenland (SisBrook and Stothers 2008) points to a large tropical volcanic eruption as the probable source. Here, we report data on the prehistoric Tierra Blanca Juan (TBJ) eruption of the Ilopango caldera that are consistent with the AD 536 event in terms of chronology, magnitude, and geographic location. Tephra isochron maps give a total erupted volume to the TBJ event of 60 km³, indicating an eruption magnitude of VEI 6 (~200 km³). We suggest that the eruption was probably the source of the AD 536 dust veil and a major contributor to the climatic disturbances that followed.

The Ilopango TBJ Eruption
The volume calculation of the AD 536 eruption is based on limited data and is fraught with uncertainty. Previous estimates (SisBrook and Stothers 2008) are consistent with the TBJ event, which is located on the eastern flank of the Ilopango caldera and larger than the El Salvador calderas, both of which are centered on the central axis of the Ilopango caldera and released ~18 km³ of erupted products. It is possible that the Ilopango eruption was even larger than the El Salvador calderas and released ~45 km³ of erupted products. However, the Ilopango caldera rim is wide, and the Ilopango caldera is much larger than the El Salvador calderas. The Ilopango caldera is wide, and the Ilopango caldera is much larger than the El Salvador calderas. The Ilopango caldera is wide, and the Ilopango caldera is much larger than the El Salvador calderas.

Radionuclide results from previous studies:
A comprehensive study of the AD 536 event was published in 1995, reporting a radiocarbon age of AD 288 ± 114. Subsequent AMS radiocarbon dating of organic material from the Ilopango TBJ eruption has produced a tight clustering of 14C ages, most falling close to 1600 ± 50 years B.P. (Fig. 4).

Radionuclide results from this study:
We examined 100 terrified tree snuts from pith in the AD 536 core to determine the age of the TBJ event. The TBJ eruption dates 14C ages, most falling close to 1600 ± 50 years B.P. (Fig. 4).

Conclusion
The cause of the largest atmospheric aerosol loading event of the past two millennia has been under debate for decades. The duration and severity of the event and its impacts on climate have been studied extensively, with results varying from immediate cooling to long-term changes. The question of whether the AD 536 event was caused by a volcanic eruption or a combination of events remains unresolved. Some models propose that the eruption was a result of a volcanic eruption, while others suggest that it was caused by a combination of events, including a combination of solar activity, volcanic eruptions, and climate change. The AD 536 event has been linked to a variety of events, including the eruption of the Tambora volcano in Indonesia in 1815, which caused a significant drop in temperature and societal disruption. However, the evidence for a direct causal link between the AD 536 event and the Tambora eruption is still debated.

Key References: