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# Post-eruptive flooding of Santorini caldera and implications for tsunami generation

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Caldera-forming eruptions of island volcanoes generate tsunamis by the interaction of different eruptive phenomena with the sea. Such tsunamis are a major hazard, but forward models of their impacts are limited by poor understanding of source mechanisms. The eruption of Santorini 3600 years ago was one of the largest of eruptions known worldwide from the past 10,000 years – and was at least 3 times larger than the catastrophic eruption of Krakatoa. This huge eruption evacuated large volumes of magma, causing collapse of the large caldera, which is now filled with seawater. Tsunamis from this eruption have been proposed to have played a role in the demise of the Minoan culture across the southern Aegean, through damage to coastal towns, harbors, shipping and maritime trade.

Before the eruption, there was an older caldera in the northern part of Santorini, partly filled with a shallow lagoon. In our study, we present bathymetric and seismic evidence showing that the caldera was not open to the sea during the main phase of the eruption, but was flooded once the eruption had finished. Following subsidence of the caldera floor, rapid inflow of seawater and landslides cut a deep 2.0–2.5 km3 submarine channel into the northern flank of the caldera wall. Hydrodynamic modelling indicates that the caldera was flooded through this breach in less than a couple of days. It was previously proposed that collapse of the caldera could have led to the formation of a major tsunami; but this is ruled out by our new evidence. Any tsunami's generated were most likely caused by entry of pyroclastic flows into the sea, combined with slumping of submarine pyroclastic accumulations. This idea is consistent with previous assertions that pyroclastic flows were the main cause of tsunamis at Krakatau.