# Known Earthquakes and Volcanic eruptions in Europe

In recent years humanity has experienced a series of very strong and disastrous earthquakes as well as some minor volcanic eruptions that remind us the power of the Earth and the influence of those phenomena in modern societies. Some characteristic examples of past disasters are not only a ringing bell but also a treasure of knowledge to improve our behaviors, policies and priorities.

# The Minoan Eruption of the Santorini Volcano (Greece, ca. 1613 BC)

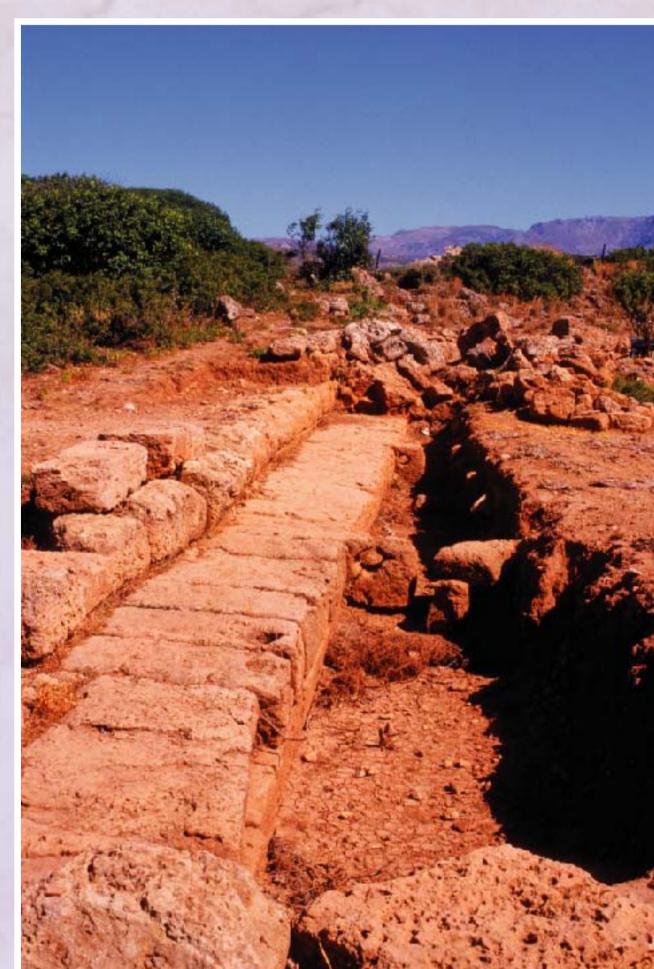
Santorini Island is the most well-known and active volcano of Greece, in the south Aegean Sea. The most recent large eruption is "the Minoan Eruption", one of the biggest known in historic time worldwide emitting in the atmosphere at least four times more volcanic products than Krakatoa eruption. It occurred at around 1613 BC (late Bronze Age) in four phases.

Activity began with a plynian eruption of hot pumice falling out from the eruption column that reached about 40 km height. The pumice fall-out blanketed the whole of the island, the surrounding Aegean islands and the coasts of Middle East and Turkey. The second phase resulted in base surge deposits and enabled the entrance of sea water into the magmatic chamber. The third phase produced large quantities of mud flows whereas the last eruption was a typical pyroclastic eruption. The removal of such a large volume of magma from underneath the volcano caused it to collapse into the emptied magma chamber, producing a large crater (a caldera) in the place of the volcano.

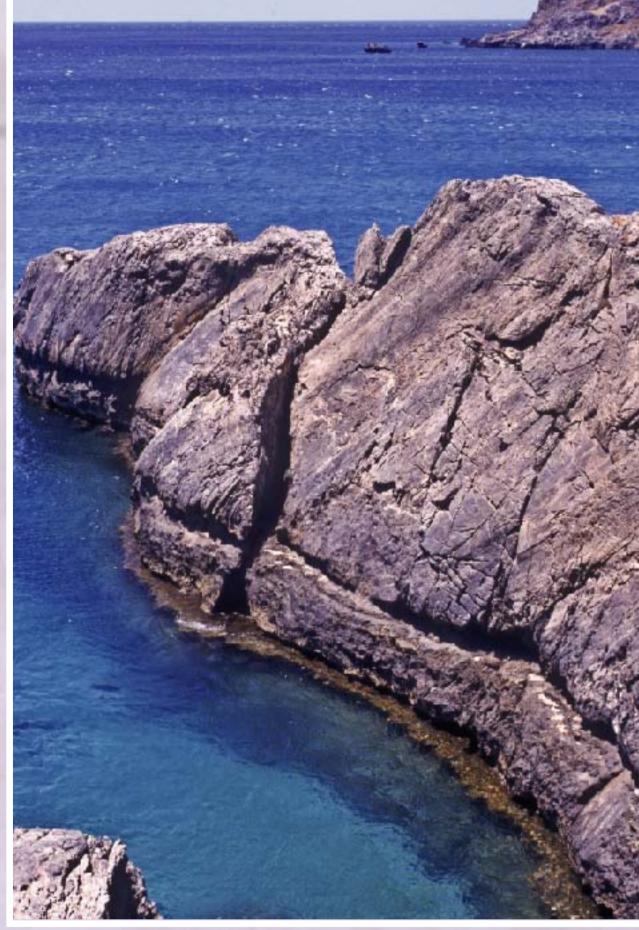
The eruptions were then followed by a huge tsunami that affected in several minutes the Aegean islands and Crete and soon after all eastern Mediterranean. It devastated not only Santorini, but had a deep impact on the whole of the Eastern Mediterranean, destroying communities and agricultural areas on nearby islands and on the coast of Crete resulting in the collapse of Minoan civilisation. In Santorini it buried out the Cycladic/Minoan settlement Akrotiri, often called the "Pompeii of the Bronze Age" to stress the similarity to the Roman city buried under the pumice of Vesuvius. Since no human remains have been found at the site, it is assumed that preliminary seismic and volcanic activity gave people time to evacuate their island before the eruption. The spectacular discoveries have induced speculations that relate the destruction of Santorini island to Plato's story of Atlantis.

### Phalassarna Earthquake

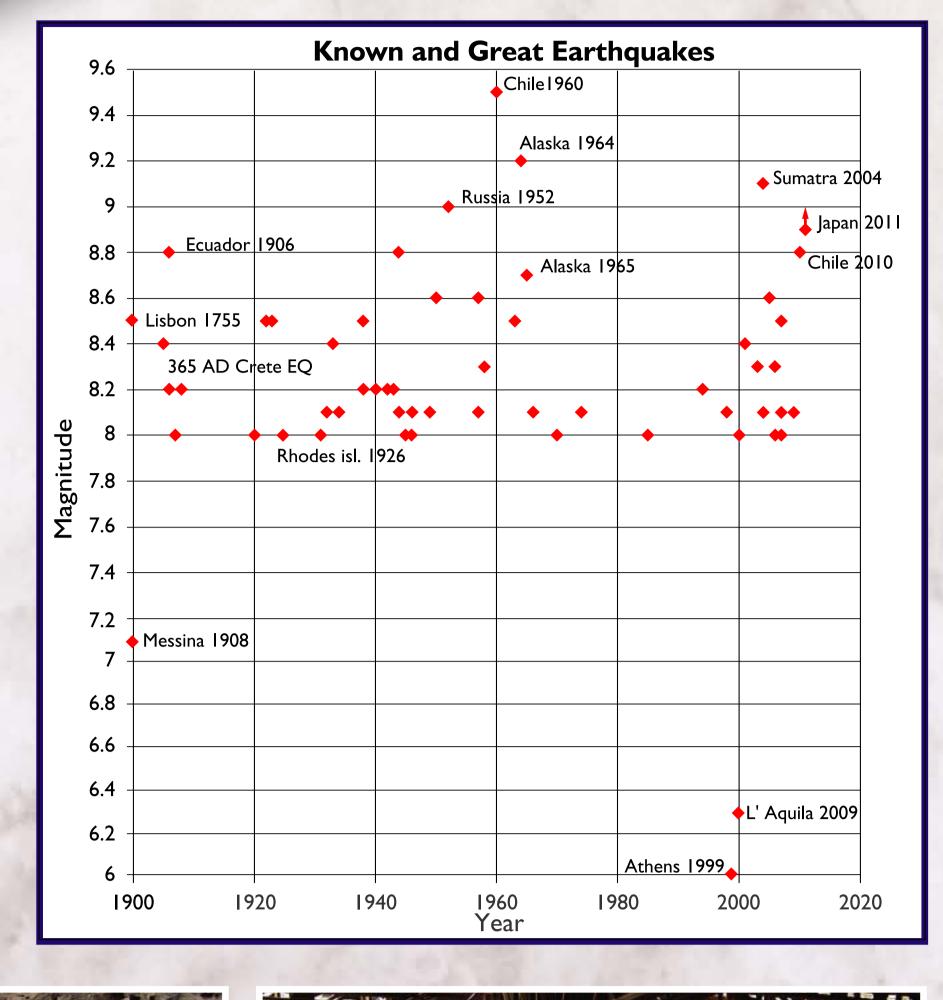
On the 21st of July 365 AD a very strong earthquake stroke eastern Mediterranean that was recorded by the majority of the historians and travelers of the era. A strong tsunami was also produced that travelled all over eastern Mediterranean. Initiated south-west of Crete island the earthquake resulted in the instantaneous uplift of the half part of the island ranging from 9 meters in the area of Paleochora in the southwest, to I meter in central Crete. More than 100 towns in Crete changed to ruins, Alexandria in Egypt, Sicily and Cyprus were also heavily damaged, whereas the coastal town of Phalassarna at the northwestern Crete was devastated. The earthquake is related to the subduction of the African plate underneath Europe that takes place south of Crete. Such strong earthquakes in southern Greece take place approximately every 5-6 centuries. Based on the ground observations, the swallow focal depth and the reported damages the magnitude of the Phalassarna earthquake was estimated at the 8,3 Richter scale, which place the event at the top of the Mediterranean seismicity.



Falassarna old harbor exists today 6 meters over present sea level



The 365 AD sea level occurs in central Crete one meter over present sea level



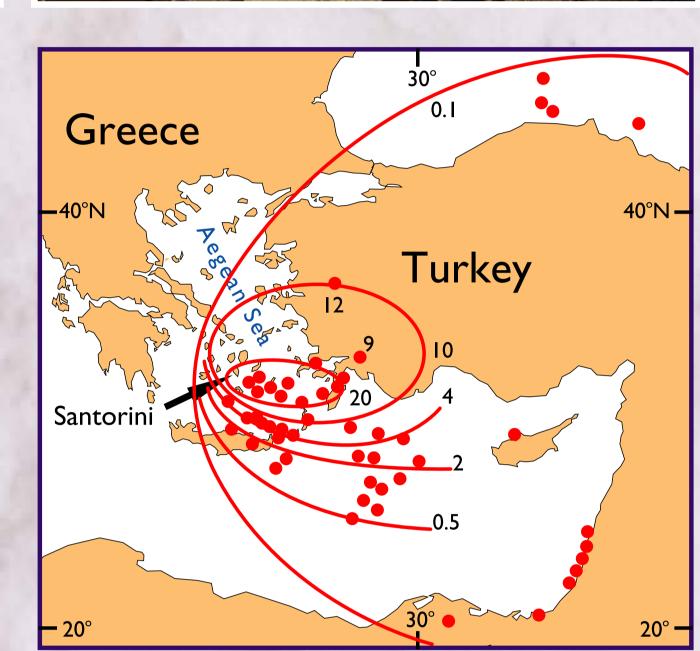


Volcanic deposits in Santorini

### The Pompeii burial



Pompeii ruins and Vesuvius at the background



Ash deposits from Minoan eruption (in cm)

The 79 A.D. Pompeii eruption undoubtedly is Vesuvius' most famous eruption, described by Pliny the Younger in two well-known letters to Tacitus, which constitute valuable documentation for volcanologists.

In Roman times, at the beginning of the first millennium, Vesuvius was not considered to be an active volcano, and several cities flourished on its slopes attracted by the fertility of the soil and beauty of the area. On 24th August 79 A.D. activity on Vesuvius resumed after a period of quiescence which had probably lasted for eight centuries, spreading about 4 km<sup>3</sup> of magma in the form of pumice and ash over the surrounding areas in little more than thirty hours. The eruption column made of gas, ash, pumice and lithic fragments rose up into the air to a height of about 15 km above the volcano while frequent earthquakes stroke the area. During the night many people took advantage of an apparent lull in the eruptive activity, to go back to their homes which they had abandoned in haste. But they were surprised during the course of the morning by the reawakening of the volcano. This time there was a total collapse of the eruption column, causing the formation of pyroclastic flows which led to the total destruction of the areas of Ercolano, Pompei and Stabia. During the final part of the eruption, probably in the late morning of 25th August, pyroclastic flows continued to form; their deposits totally buried the surrounding villages while a dense cloud of ash spread into the atmosphere.

## Lisbon Earthquake

The great Lisbon earthquake of 1755 marked the beginning of the modern era of seismology. Following this earthquake, there were systematic efforts to catalogue the times and locations of earthquakes and to study their physical effects. Until then, earthquakes and volcanic eruptions were thought to be God's punishment for human wrongdoings.



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