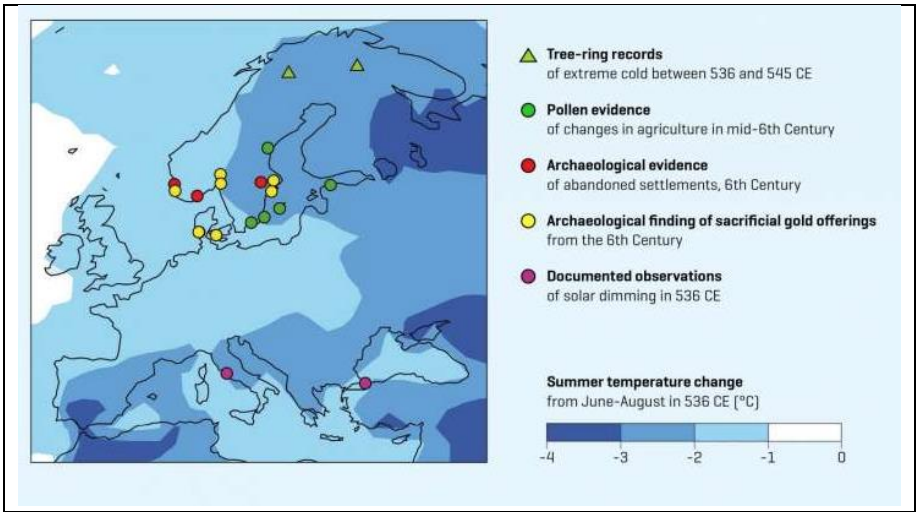
18.2 Krakatoa, Severe Weather, and Threats to Civilizations
Sources: https://phys.org/news/2016-04-volcanoes-trigger-crises-late-antiquity.html
https://www.livescience.com/28186-krakatoa.html



Background: Natural phenomenon like volcanic eruptions give scientists clues to how climate can rapidly change and the impact of these changes on human civilizations. Krakatoa is a volcanic island in the Sunda Strait between Java and Sumatra. It is about 3 miles wide and less than miles long. Prior to a massive eruption in 416 AD it was actually an isthmus connecting the other two islands. There were also volcanic eruptions in 535, 850, 950, 1050, 1150, 1320, 1530, 1680, and 1883.

The 1883 eruption spewed so much volcanic ash into the atmosphere that average global temperatures fell by 2.2 °F the following year and weather patterns did not return to normal until 1888. Some scholars speculate that the reddish sky in the painting *The Scream* by Norwegian artist Edvard Munch depicts the actual impact of the eruption on the sky. The 535 eruption combined with suspected volcanic activity in Central America and Iceland in 540 to low average global temperature by 3.6°F producing the coldest decade in the last 2,000 years. A sun-blocking blanket of sulfur particles in the stratosphere led to famine across much of Europe, the continents first recorded pandemic of Bubonic Plague, and may have been the final blow causing the end of the Roman Empire. The eruptions also contributed to crop failure and mass starvation in China where it snowed in August, drought in Peru, a dense fog covering North Africa and Southwest Asia, the decline of native civilizations in Mesoamerica, and the migration of Mongolian tribes westward. The Javanese Book of Kings describes the 416 AD eruption and histories by Procopius of Byzantium describe the impact of the 535-540 eruptions on the Mediterranean world.

A. "A thundering sound was heard from the mountain Batuwara which was answered by a similar noise from Kapi, lying westward of the modern Bantam. A great glowing fire which reached the sky, came out of the last-named mountain; the whole world was greatly shaken and violent thundering, accompanied by heavy rain and storms, took place, but not only did not this heavy rain extinguish the eruption of the fire of the mountain Kapi, but augmented the fire; the noise was fearful, at last the mountain Kapi with a tremendous roar burst into pieces and sank into the deepest of the earth. - Javanese Book of Kings (416 AD)	**Questions** 1. How does natural phenomenon like volcanic eruptions help scientists better understand the potential impact of climate change? 2. Why have eruptions of Krakatoa been important for the development of historic and scientific understanding? 3. What was a local impact of the 416 AD eruption? 4. How have the eruptions of Krakatoa affected more distant civilizations?

B. "And it came about during this year that a most dread portent took place. For the sun gave forth its light without brightness, like the moon, during this whole year, and it seemed exceedingly like the sun in eclipse, for the beams it shed were not clear nor such as it is accustomed to shed." - Byzantine historian Procopius (536 AD).

C. "Sudden fever…but the body showed no change in its original color, neither was it as hot as expected when struck by a fever, nor did any inflammation occur…but the fever was of such a lethargic kind….[within a couple of days] a bubonic swelling developed there in the groin of the body, which is below the abdomen, but also in the armpit, and also behind the ear and at different places on the thighs… Up to this point, then, everything occurred in the same way all who had taken the disease. But from then on very distinct differences developed for there ensued for some a deep coma, with others violent delirium." Procopius, *Histories of the wars*