

Mount Merapi Volcano Eruptions: Volcanologists and Their Ability to Predict the ‘Big One’

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By [LBG1](#)



Mt. Merapi eruption [Photo - Jakarta Post]

According to [TIME](#), ‘just after midnight Friday morning’, Mt. Merapi, located in central Java, erupted ‘sending heat clouds and ashes more than 4 miles (6.5 km) into the air’, with ‘49 people killed in the blast’. The eruption, ‘the most violent since 1872’ when an eruption killed 1400 people. The total death toll since Mt. Merapi ‘roared back to life’ on Oct. 25, ‘more than 90 people’. According to [CNN](#), ‘more than 80,000 people have had to flee the latest eruptions’. According to the latest report from the [Jakarta Globe](#), the death toll stands at ‘122’ with the city of Yogyakarta and its 400,000 [residents](#) on the ‘highest alert’.

[Jakarta Globe:](#)

Heavy rain overnight Wednesday triggered lahars that cascaded down the Kuning, Gendol, Woro, Boyong, Krasak and Opak rivers on the slopes of the volcano.

There is a strong smell of sulphur around the mountain, adding to the general unease in cities near the volcano.

[Photos](#) of the Mt. Merapi volcano

Included in the TIME report, ‘Volcanologists are unable to say if Mount Merapi’s activity has peaked or when the activity will possibly subside’.

Due to recent activity at Mt. Merapi, the uncertainty of the scientists studying the volcano and their inability to predict what Mt. Merapi will do in the future we contacted Professor [William](#)

Menke at Columbia University's Department of Earth & Environmental Sciences. We contacted Professor Menke after we read Menke's article '[The Most Dangerous Volcano in the World](#)', an article posted on a Columbia website.

We wanted to know if Mt. Merapi had the potential to be the next Tambora whose 1815 eruption was the world's largest eruption in recorded history. An eruption which caused global cooling in 1816, the 'year without a summer'.

[Geology.com](#):

On April 10, 1815, Tambora Volcano produced the largest eruption in recorded history. An estimated 150 cubic kilometers (36 cubic miles) of tephra (exploded rock and ash) **resulted**, with ash from the eruption **recognized** at least 1,300 kilometers (808 miles) away to the northwest. While the April 10 eruption was catastrophic, historical records and geological analysis of eruption deposits indicate that the volcano had been active between 1812 and 1815. Enough ash was put into the atmosphere from the April 10 eruption to reduce incident sunlight on the Earth's surface, causing global cooling, which resulted in the 1816 "year without a summer."

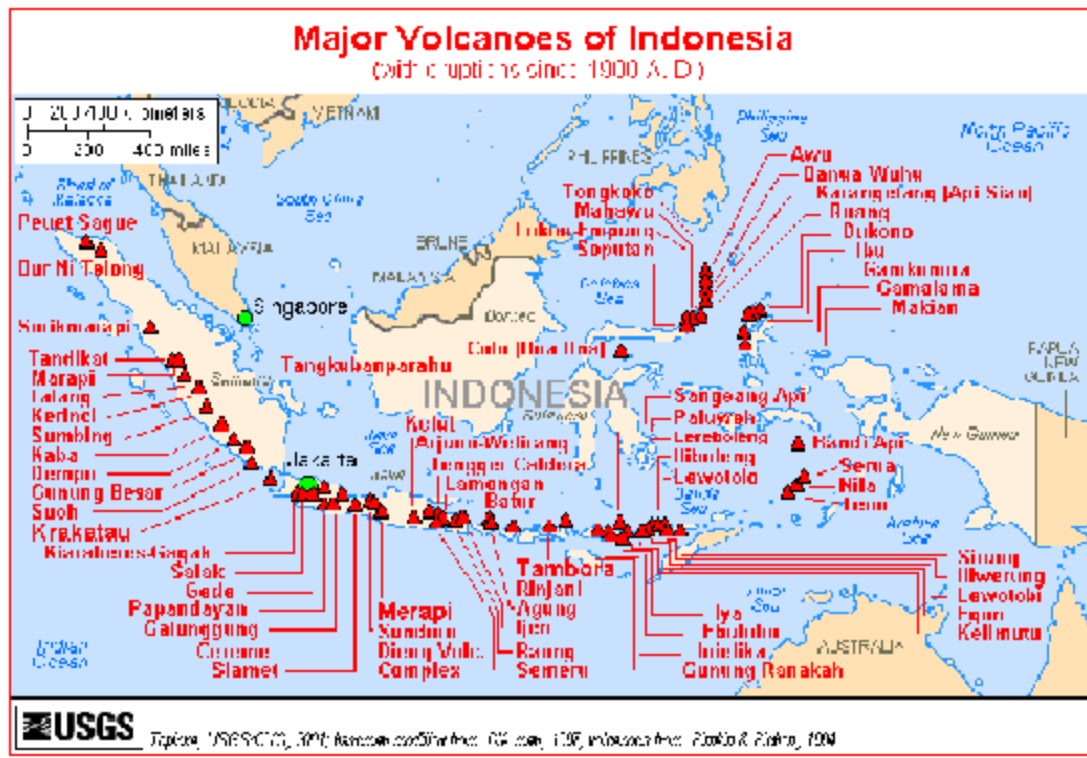
Professor Menke on Mt. Merapi and the **ability** to predict whether Mt. Merapi could potentially erupt on the scale of the 1815 Tambora eruption.

'Mt Merapi is on Java, the most highly populated islands of Indonesia.'



Map Indonesia which includes location of Java

'It is one of about 40 volcanoes on Java.'



USGS [Map of Major Volcanoes in Indonesia](#)

Most, if not all, of these volcanoes are “arc volcanoes”, of a type related to the subduction of the Indian tectonic plate beneath Indonesia. Arc volcanoes are generally understood to be the most explosive kind, due to the introduction of water into the deep earth by the subduction process. The water acts to thicken the magma and to charge it with steam, so that eruptions have a “seltzer bottle” effect. The famous explosive eruptions of history, Tambora, Krakatau, Pinatubo, etc. were all at arc volcanoes.

Mt Merapi is located about halfway between the cities of Semarang (pop 1.3 million) on the north coast of Java, and and Yogyakarta (pop. 0.4 million) which is set back a bit from the south coast. It about 30 miles from Semarang and 20 miles from Yogyakarta. The outer flanks of Mt. Merapi are terraced and actively farmed. Though it is rural countryside, it nevertheless has a substantial population with numerous towns and villages. So far, the eruption has significantly effected only this rural area. A truly large explosion could, however, endanger one or both of these cities, but the degree would depend upon the **details** of the eruption and also on the weather at the time of eruption (whether the wind blows the tephra towards or away from the city, whether rain turns the tephra to more dangerous mud, etc.).

The time between very large (say Volcanic Explosivity Index or VEI of 6 or greater) volcanic eruptions of arc volcanoes is long, probably in the 10,000 year range (though this figure is not so well known). Furthermore, arc volcanoes **typically** have many small eruptions in between large ones. On the one hand, the possibility that a given eruption will escalate into a very large eruption is (as far as we know) always there. On the other hand, only 1 in a 100 do.

We do not know how to judge a given arc volcano's potential to have a large eruption, even for the volcanoes that have been extensively studied (St. Helens, Vesuvius, Pinatubo, Soufriere Hills, Unzen and a few others). Nor is Mt. Merapi among the most well-studied.

Mt. Merapi has had lots of smallish (VEI 2 to 3) eruptions in the last **thousand** years. See

[Mt. Merapi 'eruptive history' at Global Volcanism Program.](#)

We asked Menke about the earlier news reports Indonesian scientists were 'worried that the worst is yet to come'.

Menke:

'Its fine to worry and to be prudent to prepare for the worst. But we have no idea whether this eruption will fizzle out or escalate to a truly large one. The odds are that it will fizzle.'

In response to our question as to whether Mt. Merapi could be the next Tambora, Menke stated:

I would say that all arc volcanoes have the potential for a 1816 Mt. Tambora eruption, or at least as far as we know. When you look at the layers of tephra preserved in the geological record around arc volcanoes, you find ample evidence for big eruptions in the geological past, though the most recent for a given volcano may have been ten thousand years in the past. There no reason to think that Mt. Merapi is any different. But neither do we have any reason to think that Mt. Merapi is in any sense 'due for a big one'.

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