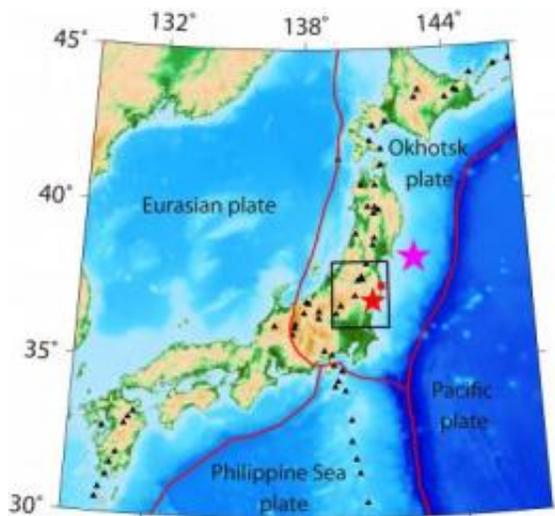


Fukushima faces increased quake risk - study

February 14 2012



This is a map of Japan's islands indicating the area of study (black box). The purple star marks the epicentre of the March 11 earthquake and the red star the Iwaki epicentre. Fukushima Daiichi is highlighted by a red square. Black triangles indicate active volcanoes. Numbers on the side of the image represent latitude and longitude. Credit: Ping Tong, Dapeng Zhao and Dinghui Yang

Japan's crippled nuclear plant at Fukushima needs to beef up safety measures to face the risk of a large earthquake, scientists said on Tuesday.

The alarm was sounded by a trio of seismologists in Japan and China, who say the risk is an indirect cause of the March 11 tsunami-generating

super-quake.

"The security of the nuclear plant site should be strengthened to withstand potential large earthquakes in the future," the team said in a study published in a specialist journal.

The concern stems from a computer model of the crust and mantle lying under northeastern Japan.

Using a technique called seismic tomography, the team analysed data from a vast network of sensors which record waves of energy propelled through the ground by earth tremors.

By noting the type of wave and the time it takes for the wave to travel between sensors, scientists can build a picture of the layers of sub-surface rock, rather like a CAT scan in medicine shows a cross-section of the body.

The study looked at the aftermath of a magnitude 7.0 quake that occurred on April 11 6.4 kilometres (4.06 miles) beneath Iwaki, 60 kilometres (37.5 miles) southwest of the Fukushima Daiichi plant.

It was one of the heftiest aftershocks of the 9.0-magnitude March 11 quake and the biggest that was recorded on land.

The picture points to a low-activity fault that was jolted furiously into life by the big quake.

From March 11 to October 27 last year, the carpet of sensors around Iwaki recorded an astonishing 24,108 shocks measuring at least 1.5 magnitude, 23 of them notching up a powerful 5.0 or more.

By comparison, from June 3 2002 to March 11 2011, there was only

1,215 such events.



This aerial view taken by an unmanned aerial vehicle (UAV) of the Air Photo Service in March 2011 shows Tokyo Electric Power Co (TEPCO) Fukushima Daiichi nuclear plant following the damage caused in the aftermath of the earthquake and tsunami. Japan's crippled nuclear plant at Fukushima needs to beef up safety measures to face the risk of a large earthquake, scientists said.

What set off the Iwaki fault?

The authors, led by Dapeng Zhao, a professor of geophysics at Tohoku University in Sendai, Japan, believe the answer lies in the Pacific plate of the Earth's crust.

It is diving under the Okhotsk plate which comprises most of northern Japan.

The friction from this mighty plate "subduction" not only caused the great quake of March 11.

It also increased the temperature and pressure of minerals in the plate, says the paper.

The heat caused watery fluids to be driven off the minerals and rise up to the upper crust.

There, they acted as a sort of lubricant, making it easier for the Iwaki fault to slip.

The seismic tomography also says that after March 11, the Iwaki fault suffered a dramatic change in the direction of stress from the overriding Okhotsk plate.

A shock change in horizontal thrust, helped by the weakening effect of the ascending fluids, are what made this previously untroublesome fault to rip open, they theorise.

The worry is that something similar could happen at Fukushima because it shares a similar subterranean topography, although such an event is impossible to pinpoint in time, they say.

"There are a few active faults in the nuclear power plant area, and our results show the existence of similar structural anomalies under both the Iwaki and the Fukushima Daiichi areas," Zhao said in a press release.

"Given that a large earthquake occurred in Iwaki not long ago, we think it is possible for a similarly strong earthquake to happen in Fukushima."

The paper appears in *Solid Earth*, a peer-reviewed open-access journal published by the European Geosciences Union (EGU).

"Much attention should be paid to (...) seismic safety in the near future" at the nuclear plant, it says.

The Fukushima Daiichi plant was swamped by towering waves that paralysed cooling systems and sent three reactors into meltdown.

Radioactive materials leaked into the air, soil and the sea in what was the world's worst nuclear accident since Chernobyl a quarter-century earlier.

Tuesday's study was published several hours after a 6.0 magnitude earthquake rocked a different fault to the east of Japan's main island of Honshu. Tokyo Electric Power Co. (TEPCO) said the stricken plant remained stable.

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Citation: Fukushima faces increased quake risk - study (2012, February 14) retrieved 20 September 2024 from <https://phys.org/news/2012-02-fukushima-quake-.html>

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