

Electromagnetic anomalies associated with the 2024 Hualien Earthquake in Taiwan

Hideaki Hase¹, Jian-Cheng Lee², Chien-Chih Chen³, Hsin-Hua Huang², Cheng-Horng Lin², Sheng-Rong Song⁴, Yi-Chia Lu³, En-Chao Yeh⁵, Gong-Ruei Ho⁶, Chuang-Hsiang Mu², Yu-Chang Chan², Li-Wei Kuo³, Yue-Gau Chen⁴, Sun-Lin Chung²

¹Geothermal and Energy Research & Development (GERD) Co., LTD., Tokyo, Japan, hase@gerd.co.jp

²Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan, jcline@earth.sinica.edu.tw

³Department of Earth Sciences National Central University, Chungli, Taiwan

⁴Department of Geosciences, National Taiwan University, Taipei, Taiwan

⁵National Taiwan Normal University, Taipei, Taiwan

⁶Centre of Environmental Change Research, Academia Sinica, Taipei, Taiwan

SUMMARY

On April 3, 2024, a magnitude $w7.4$ earthquake struck Hualien area, located in the middle east region of Taiwan. This was the first major earthquake exceeding magnitude 7 in Taiwan in 25 years, since the Chi-Chi earthquake in 1999, which killed at least 18 people and injured more than 1,100 people. The intensity of the earthquake was 6+ in Hualien City and 5- in Taipei City in the northern part of the island (CWA Earthquake Report).

The island of Taiwan is located in a subduction zone of the Philippine Sea Plate and the Eurasian Plate, which are subducting at a rate of 75 mm/h in the Hualien area where the earthquake occurred. In southern Taiwan, the oceanic crust of the Eurasian Plate is subducting beneath the Philippine Sea Plate, forming the Luzon Arc, an island arc. In Taiwan, all of the oceanic crust has subducted and the arc is colliding with the continental crust of the Eurasian Plate. To the north of Taiwan, the Philippine Sea Plate, in contrast, is subducting beneath the Eurasian Plate, forming the Ryukyu Arc. Thus, the complex plate motions in Taiwan sometimes cause large earthquakes periodically.

A group led by Academia Sinica in Taiwan began MT surveys in February 2024 to investigate geothermal resources in an area measuring 15 km east-west by 10 km north-south, centered on the Tatun volcanic area, and had conducted 94 MT surveys by the end of June. MT surveys were also being conducted on April 3, when the earthquake occurred, and 10 MT equipment units were being used to make measurements at the time of the earthquake.

The seismic intensity of the earthquake was estimated to be 3 to 4 in the area where the MT survey was conducted (CWA Earthquake Report). In this presentation, we will report on the status of the observed electromagnetic fluctuations and discuss the mechanism of their occurrence.

Keywords: 2024 Hualien Earthquake, Tatun volcano, electromagnetic anomalies associated with earthquake
