

## New Method to Monitor Magma Activity Based on Data Processing of Earthquakes Occurring Directly Under Mt. Fuji.

A research group led by [Kazuyoshi Nanjo \(NaDiR\)](#), Yohei Yukitake ([ERI](#)), and [Takao Kumazawa \(ISM\)](#), has developed a new method for monitoring magma activity based on data processing of earthquakes occurring directly under Mt. Fuji. This research is important for volcanic disaster prevention because it will contribute to the expansion of the observation system of the mountain. The results were published in the electronic edition of the British scientific journal *Scientific Reports* on June 30, 2023 (Japan Standard Time).

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### Key points of the research

We studied low-frequency earthquakes that have been pointed out to be related to magmatic activity deep inside Mt. Low-frequency earthquakes are those that produce slower shaking than normal earthquakes. Because the magnitude of low-frequency earthquakes that occur at Mt. Fuji is very small, some low-frequency earthquakes are not recognized as seismic motion because they are buried in the noise contained in the observed shaking data.

We introduced a matched filter method to detect seismic motion among the noise, and extracted waveforms that harmonize with the waveforms of low-frequency earthquakes observed by the JMA through data processing from shaking data recorded at 16 stations around Mt. Fuji from January 2003 to July 2019. We were also able to pick up low-frequency earthquakes not observed by the JMA, such as those mixed with noise. We detected about 6,000 low-frequency earthquakes, about three times the number observed by the JMA.

After the earthquake in eastern Shizuoka (M6.4), which occurred at the foot of Mt. Fuji four days after the March 11, 2011 Tohoku earthquake (M9.0), the JMA reported that low-frequency earthquakes were quiet (Reference 1), and fears of a Mt. Fuji eruption were dispelled, but this study revealed that low-frequency earthquakes were occurring.

Using the ETAS model, which predicts and evaluates seismic activity, for low-frequency earthquakes, we found that activity was heightened by earthquakes in eastern Shizuoka. The activity level did not return to the pre-earthquake level in eastern Shizuoka, suggesting that the magmatic system of Mt.

The study inferred that the increase in low-frequency seismic activity was caused by cracks in the bedrock around the magma reservoir that were created by the earthquake in eastern Shizuoka, allowing magma to enter. This study observed a weak signal of the magma system that was not captured by crustal movement observations (GNSS and tiltmeters) around Mt.

### Comments from the Authors

Fuji magma system has become sensitive to external stimuli such as earthquakes in eastern Shizuoka, and there is a possibility that magmatic activity will continue to change in response to external stimuli. Fuji, we believe it is necessary to develop a mechanism to operate this technology in real time in order to carefully monitor Mt. Fuji, which has a limited budget, because it does not require the establishment of a new observatory or the purchase of expensive observation equipment