

Implications of Limestone Mining to Noise Level on The Site KAPI (CTBTO) with Analysis of Power Spectral Density

Armansyah¹, Gatut Daniarsyad², Irwan Slamet^{1,2}, Jamroni¹

¹Agency for Meteorology, Climatology and Geophysics (BMKG) Region IV, Makassar, Indonesia

²Agency for Meteorology, Climatology and Geophysics (BMKG) Headquarter, Jakarta, Indonesia

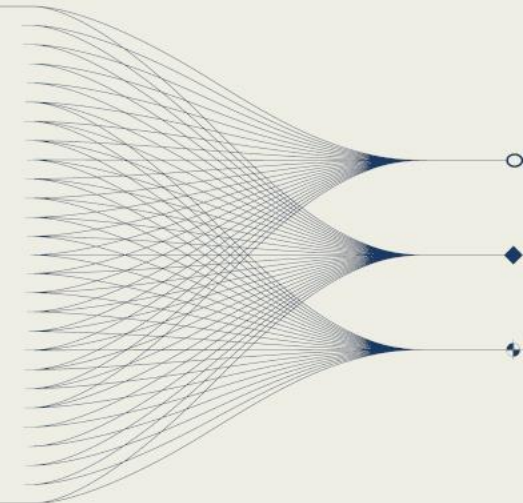
*Corresponding email: armansyah@bmkg.go.id



INTRODUCTION AND MAIN RESULTS

This presentation demonstrates the analysis on the effect of mining activities around the KAPI (AS044) based on waveform power spectral density recorded by two seismometers which is installed at different depths.

The results show that the limestone mining activities contribute to increasing the noise levels around the site of KAPI. Seismometer located at shallow depth yields more significant noise level increase compared to the sensor at the deeper depth in period less than 0.1 second.



Introduction and Methods

Site KAPI (AS044) is one of CTBTO networks located in Indonesia, in Kappang hamlet, Labuaja Village, Maros Regency, South Sulawesi Province. At this site, there are two seismic sensors for monitoring activities, namely KAPI-00 and KAPI-10. The KAPI-00 sensor is placed at a depth of 61 meters below the surface using a Nanometrics Trillium 360 Seismometer. Meanwhile, the KAPI-10 sensor is placed at a depth of 7 meters below surface using a Nanometrics Trillium 120 Seismometer.

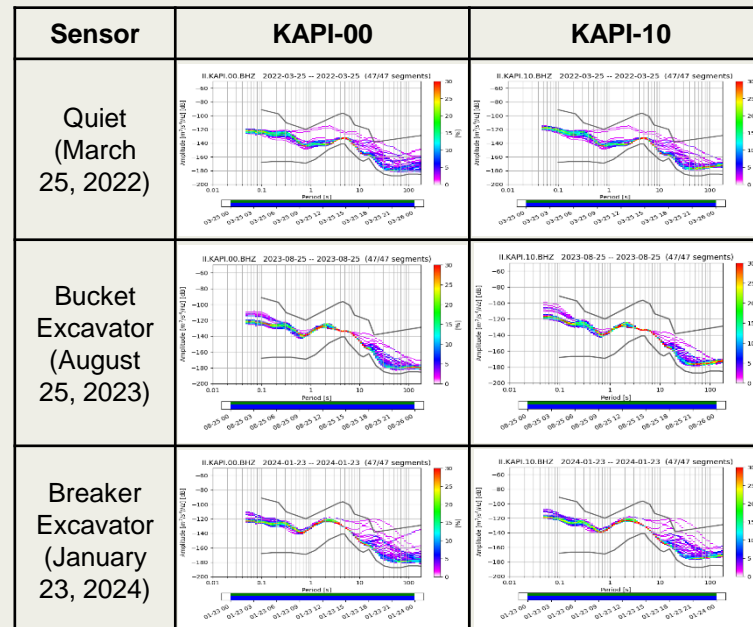
BMKG Region IV Makassar Team has visited the site to do observation and inspection. It was discovered that there was an opening in the land area for limestone mining around the site. On August 25, 2023 there was heavy equipment activity using bucket excavator and January 23, 2024 there was heavy equipment activity using breaker excavator.

The purpose of this research is to analyze the effect of limestone mining activities on the noise level of two KAPI sensors placed at different depths. The noise at the site KAPI when mining activities is processed using *Power Spectral Density (PSD)* and compared with the results of background noise records during quiet conditions on March 25, 2022 before the mining started.

Results and Discussion

Based on the results of signal analysis with Power Spectral Density, it can be seen that there is an increase in noise levels which is indicated by an increase in spectral amplitude when mining activities occur.

In KAPI-00 and KAPI-10, it is seen that the spectral amplitude increases significantly during mining activity compared to quiet conditions at periods of less than 0,1 second (s). As is known, periods of less than 0,1 s indicate the presence of heavy equipment activity near the sensors and contribute to an increase in the high-frequency spectrum.



Conclusion and Acknowledgements

Limestone mining activities around the site KAPI have caused an increase in noise levels both in sensors KAPI-00 and KAPI 10, especially at periods less than 0,1 s. A greater increase in noise levels occurred in the KAPI-10 compared to KAPI-00. This may be due to the location of KAPI-10 at a shallow depth. Conversely, the KAPI-00 sensor, which is placed at a deeper depth, causes attenuation of energy at low periods (high frequencies) as it travels through the propagation medium from the mining site to sensor.

As a follow up to resolve this issue, the leader and BMKG Region IV Makassar team have been in intensive communication with local government, mining contractors and representatives of local community leaders considering the need for a concrete solution to maintain the existence and quality data of site KAPI to support the global monitoring network. The result is an agreement that the area around the site must be sterilized and mining activities were stopped.

We would like to express our gratitude to the entire BMKG Region IV Makassar team who have contributed, to CTBTO who provided equipment support at site KAPI and especially SnT 2025 Conference Committee who facilitated and sponsored us so that we can take a part in this event.