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ANN and MLR-based estimation of allowed blast-induced vibrations for safe constructions at Hardovac limestone quarry (Bosnia and Herzegovina)

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Abstract

In present paper, we consider the impact of blast-induced vibrations on constructions by analyzing the blasting results at limestone quarry Hardovac near Doboj (Bosnia & Herzegovina) recorded in period 2012–2015. Analysis is conducted using the multiple linear regression (MLR) and artificial neural networks (ANN) for establishing the correlation between the peak particle velocity, vibration frequency and several controlling factors (number of boreholes and their average depth, distances between the boreholes, between the arrays of boreholes and between the blasting and recording point, total and immediately detonated amount of explosive). As a result, we formulate explicit nonlinear models for estimation of safe distance between blasting points and different neighboring structures, including the construction of safe distance isolines. Suggested approach provides results which are comparable to the commonly used techniques but indicate the important effect of the examined controlling factors on safe distance, which is usually underestimated in common practice.

Keywords Blasting · Vibration frequency · Peak particle velocity · Artificial neural networks · Multiple linear regression · Safe distance