Special Issue on New Advances in Acoustic Emission and Microseismic Monitoring Technologies in Civil Engineering

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Editorial

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Editorial

Special Issue on New Advances in Acoustic Emission and Microseismic Monitoring Technologies in Civil Engineering

Guang-Liang Feng [1], Sanichiro Yoshida [2] and Giuseppe Lacidogna [3,*]

[1] State Key Laboratory of Geomechanics and Geotechnical Engineering, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wuhan 430071, China
[2] Department of Chemistry and Physics, Southeastern Louisiana University, Hammond, LA 70402, USA
[3] Department of Structural Engineering and Geotechnics, and Building, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy
* Correspondence: giuseppe.lacidogna@polito.it

Acoustic emission (AE) and microseismic (MS) monitoring technologies have been successfully applied to material performance analysis, material detection, building and rockmass structure stability, and for early warnings in civil engineering. Small-scale damage is detectable prior to failure, and the cracks in rock masses and material may produce elastic waveforms with frequencies that range from a few Hz to kHz; these waveforms are derived from AE sources and contain valuable information about material damage and failure processes. In the 1970s, MS technology began to be used to monitor the deep mining process; it then gradually became an important tool in the safety management of mines.

In recent years, AE and MS monitoring technologies have been increasingly used in civil engineering. This Special Issue aimed to collect and present new advances in AE and MS monitoring technologies in civil engineering, including those related to the installation and arrangement of AE/MS sensors, AE/MS signals analysis, health and stability monitoring of civil engineering, AE/MS activity characteristics in disaster development processes of civil engineering, building and rockmass stability analysis and warnings based on AE/MS information.

A total of seven papers are presented in this Special Issue, including studies of AE and MS monitoring technologies used in church, mine, sandwich design, and composite material structures. Alessandro Grazzini and Giuseppe Lacidogna [1] studied the mechanical properties of historic masonry stones by performing in situ non-destructive tests on the St. Agostino church in Amatrice (Italy). A methodology was calibrated which, by combining the results of the ultrasonic and impact tests, makes it possible to reach a good estimate of the compression strength and elastic modulus of sandstone. By considering the evaluation indexes of geological condition, mining process, and MS data, a quantitative risk assessment for deep tunnel failure based on the normal cloud model was performed at the ASHELE Copper Mine, China [2]. By using AE, the internal interfacial debonding phenomena on sandwich façade insulated panels were detected and tracked [3]. A high-accuracy location method of MS events in a strong inhomogeneous mining environment was proposed by using optimized global full waveform inversion [4]. An algorithm for correcting the deformation and misalignment of the bogie part was developed to solve the deterioration in the accuracy and reliability of inspection to ensure the integrity of composite material structures [5]. A fast ray-tracing method for locating mining-induced seismicity by considering underground voids was proposed [6]. MS signal denoising and separation based on a fully convolutional encoder–decoder network is described in paper [7].

Although submissions for this Special Issue have been closed, in-depth research in the field of AE and MS technologies should continue to address the challenges we face today in civil engineering, such as application of the technologies in health and stability monitoring and disaster warning in complex geo-environment.

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