Special Issue

The Damage and Fracture Analysis in Rocks and Concretes

Message from the Guest Editors

Rocks and concretes are main building materials widely utilized in the fields of underground mining, tunnelling, civil infrastructure constructions, etc. The damage and fracture process under natural and human-induced conditions are of particular importance for the aforementioned fields, and have therefore long been a research focus of scholars interested in rock mechanics and geotechnical engineering. In this context, this Special Issue features a variation in scales. For example, on a smaller scale, dislocations of the mineral crystal lattice and boundary cracks in rocks cause stress concentrations, which may be seen as the location of damage and serve as a potential source for further crack development. On a larger scale, large faults that may lead to earthquakes are also related to fracture issues. Uncertainty exists in describing the location, shape and condition of natural fractures in rocks, which in turn results in uncertainty in the initial stress fields. Regarding human-induced fractures, comprehensive knowledge of the fracturing processes and mechanisms is also of vital importance for human activities such as rock fragmentation in mining and rock cutting in tunnelling.

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Current urban environments are home to multi-modal transit systems, extensive energy grids, a building stock, and integrated services. Sprawling neighborhoods are composed of buildings that accommodate living and working quarters. However, it is expected that the cities and communities of the future will face complex and enormous challenges, including maintenance, interconnectivity, resilience, energy efficiency, and sustainability issues, to name but a few. A smart city uses advanced technologies and a digital infrastructure to improve the outcomes in every aspect of a city's operations. A smart building optimizes the experience of occupants, staff, and management by using a modern and connected environment. Innovations in technology that can bring dramatic improvements to design, planning, and policy are critical in developing the cities and buildings of the future.

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