Numerical modelling of strengthened dry-stone masonry structures

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Historical structures in seismic active area of south Europe are often made of stone blocks with dry joints. Strengthening of these structures with metal connectors, i.e. clamps and bolts, is traditional approach in increasing their seismic resistance. Some structures were originally built with reinforcements, while others were reinforced later during reconstruction. Behaviour of these structures under the earthquakes and their ultimate capacity load can be analyzed by precise numerical models. This paper presents one such model based on finite-discrete element method which used 3D discrete elements with internal finite element mesh for modelling of stone blocks and line reinforcing elements that connect the blocks, allowing for better structural behaviour and higher load capacity to earthquake action. Presented model is an extension of previously developed 2D model for strengthened dry-stone structures [1] and 3D model for structures without strengthening [2]. The performance of the model was demonstrated on several examples which showed an efficiency of the connecting elements in increasing the seismic energy dissipation and protection of the structure from collapse.

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