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SEISMIC ANALYSIS OF MASONRY STRUCTURES APPLYING AND COMPARING DIFFERENT NUMERICAL APPROACHES: FINITE ELEMENT AND MACRO-ELEMENT METHODS

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Abstract. *Building rehabilitation is increasingly important in the construction sector, both to improve functional aspects and for conservation of architectural heritage. Masonry structures are a large portion of the existing building stock and have proven to be vulnerable to seismic loads. Indeed, in earthquake-prone areas, buildings safety and conservation rely on the assessment of its seismic vulnerability. Different numerical modelling approaches have been proposed for seismic analysis of masonry structures, but the criteria for their use need to be better defined. This work aims at comparing different numerical approaches for seismic analysis in order to establish suitable application criteria.*
Two modelling methods, i.e. a finite element macro-model in DIANA software and a discrete macro-element method in 3DMacro software, are compared in predicting the damage pattern and the stiffness and strength evolution of masonry buildings under incremental static loading. Pushover analyses are performed on a building complex of the University of Padova. Geometrical data were available from a previous survey, but the masonry mechanical characteristics were unknown. So, a comprehensive estimation of the material properties within the range of values recommended in the literature and design codes is performed. Parametric analysis is then carried out to evaluate the influence of given parameters, such as mesh resolution and masonry tensile and shear strengths, on the global response of the models. A good agreement has been found with respect to the crack patterns and base shear capacity obtained from the two modelling approaches. The advantages and limitations in using each of them are identified.

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