

# Kinematic Approach for Seismic Vulnerability Assessment of Masonry Churches

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## ABSTRACT

The application of reliable predictive methods for the seismic vulnerability assessment of the historical buildings represents a challenging issue in the process of risk mitigation at regional/national scale, in order to undertake appropriate policies aimed at achieving acceptable safety levels. For the application of such policies, the availability of adequate procedures for correct assessment of seismic risk of specific assets, like churches, is a fundamental issue, in particular in all those territories characterized by a significant seismic hazard. In fact, the damage scenarios observed in Italy in the aftermath of the last seismic events (i.e. Friuli, 1996; Umbria and Marche, 1998; Molise, 2002; L’Aquila, 2009; Emilia, 2012 and Central Italy, 2016) stressed the high vulnerability of historical masonry constructions, and in particular of masonry churches. In literature, different methodologies, with various levels of precision and complexity, have been developed for the vulnerability assessment of existing masonry buildings [1-5]. In this paper, a simple procedure based on the linear and non-linear kinematic approach is applied to evaluate the seismic capacity of masonry churches, as well as the effectiveness of specific retrofitting interventions in relation to the most relevant damage mechanisms. In particular, by using the proposed failure mechanism approach, the influence in modifying the seismic behaviour of the considered structures in terms of spectral acceleration and spectral displacement is assessed. To check the reliability of such a procedure, the obtained results have been compared with the damage scenario observed on a population of churches analysed by the research group in the aftermath of the 2009 L’Aquila earthquake [6].

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