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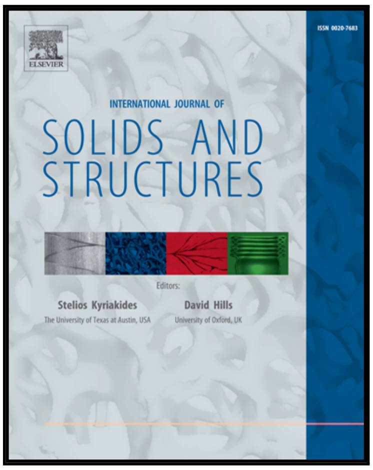


# Numerical homogenization model for effective creep properties of microcracked masonry

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# Numerical homogenization model for effective creep properties of microcracked masonry

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**Abstract**

This paper provides finite elements predictions for the effective tangent properties of microcracked viscoelastic masonry. This model relies on two steps. The first one is based on the identification at the short and long terms of an approximate analytical creep function for the mortar. Following Nguyen et al. [32] for a microcracked homogeneous material, this step rests on the coupling between the Griffith's brittle fracture theory and stress-based dilute homogenization scheme. It allows to avoid recourse to 'heavy' numerical inversion of the Laplace-Carson transform. The second step provides orthotropic overall properties of masonry by means of finite elements method used to carry out periodic homogenization on masonry. This step relies on the calculation of the localization strain tensors in each phase (brick and mortar). This paper proposes an alternative model to an incremental homogenization of masonry which is heavier to carry out since it depends on additional parameters such as time increment and prestresses in viscoelastic phases added to the crucial computation step of strain localization tensors in each phase. In this work, for the sake of simplicity and as a first approach, only time-dependent crack densities [42, 37] are considered at short and long-terms. Results provided by the proposed finite elements model can be considered as reference solution enabling a rigorous assessment of recently analytical model proposed by Rekik et al. [30, 43] as a generalization of the Cecchi & Taliercio model [8] initially available for uncracked masonries. This comparison is carried out for different mortar thicknesses and brick's dimensions. The case of a compressed wall is also considered at the long term.

*Key words:* Masonry; Creep; Microcracks; Brittle fracture; Homogenization techniques; Finite elements method.