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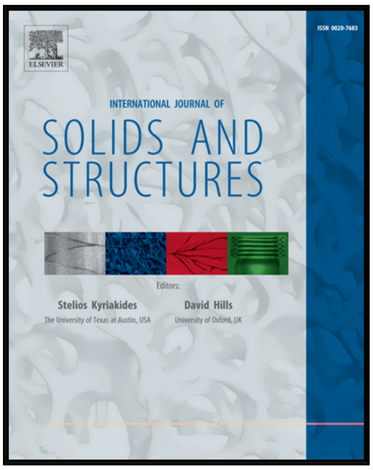

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On the choice of boundary conditions for micromechanical simulations based on 3D imaging

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Abstract

The present paper addresses the challenge of conducting Finite Element (FE) micromechanical simulations based on 3D X-ray data, and quantifying errors between simulations and experiments. This is of great interest, for example, in the study of ductile fracture as local comparisons and error indicators would help understanding the limitations of current plasticity and damage models. Standard methods used in the literature to conduct FE simulations at the microscale are often based on multiscale schemes. Relevant mechanical fields computed in an FE simulation at the specimen scale are used as boundary conditions for the micromechanical simulation, where the real microstructure is meshed from 3D X-ray images. These methods hence rely on an identification of material behavior at the macroscale, say, using force measurements and 2D surface images. In an earlier work by the authors, a method for conducting micromechanical simulations using measured boundary conditions thanks to Digital Volume Correlation (DVC) was proposed. The interest of this DVC-FE approach is that it uses solely 3D X-ray images acquired *in-situ* during the experiments. Thus,

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