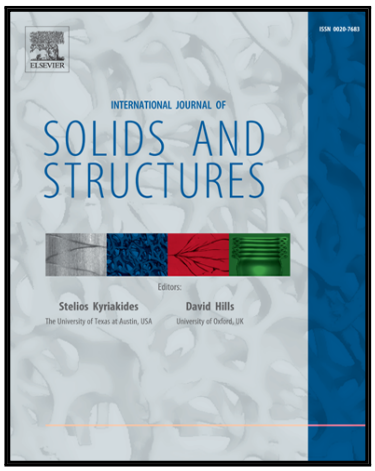

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Modified Cavity Expansion Formulation for Circular Indentation and Experimental Validation

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Abstract

An experimental study of plane-strain circular indentation of a model strain hardening material was made to provide direct *in situ* observations of the evolving deformation field and associated material response. High-resolution images of the deformation zone and simultaneous load measurement were captured during the indentation process using an *in situ* imaging platform. Particle image velocimetry enabled mapping of the deformation zone in terms of the evolving displacement, strain rate and strain fields from the optical images. The quantitative image analyses revealed the presence and evolution of material stagnation zones in the deformation field, as well as the accumulation of deformation in the form of banded segments underneath the indenter that exhibited high incremental strains. These experimental measurements enabled calibration of an expanding cavity model for describing the deformation in terms of the underlying deformation zone geometry. The calibrated expanding cavity model was shown to provide for better predictive estimates of the deformation and loading response in comparison to a traditional expanding cavity model approach.

Keywords: Indentation, Particle Image Velocimetry, Expanding Cavity Model

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