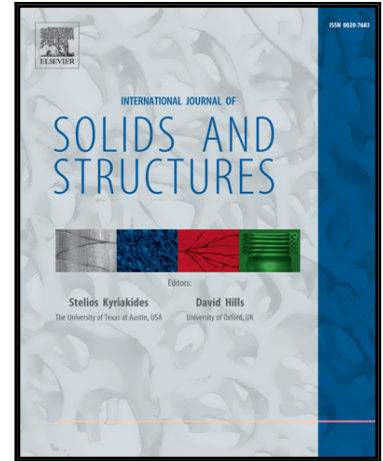


# Accepted Manuscript

Modified Cavity Expansion Formulation for Circular Indentation and Experimental Validation

Z. Wang, S. Basu, T.G. Murthy, C. Saldana

PII: S0020-7683(16)30196-2  
DOI: [10.1016/j.ijsolstr.2016.07.035](https://doi.org/10.1016/j.ijsolstr.2016.07.035)  
Reference: SAS 9252



To appear in: *International Journal of Solids and Structures*

Received date: 27 October 2015  
Revised date: 13 June 2016  
Accepted date: 25 July 2016

Please cite this article as: Z. Wang, S. Basu, T.G. Murthy, C. Saldana, Modified Cavity Expansion Formulation for Circular Indentation and Experimental Validation, *International Journal of Solids and Structures* (2016), doi: [10.1016/j.ijsolstr.2016.07.035](https://doi.org/10.1016/j.ijsolstr.2016.07.035)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## Modified Cavity Expansion Formulation for Circular Indentation and Experimental Validation

Z. Wang<sup>1</sup>, S. Basu<sup>1</sup>, T. G. Murthy<sup>2</sup>, C. Saldana<sup>1,\*</sup>

---

### 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

---

\*Corresponding author

Email address: christopher.saldana@me.gatech.edu (C. Saldana)

<sup>1</sup>George W. Woodruff School of Mechanical Engineering, 801 Ferst Drive, Georgia Institute of Technology, Atlanta, GA USA 30332-0405

<sup>2</sup>Department of Civil Engineering, Indian Institute of Science, CV Raman Ave, Bangalore, India

Download English Version:

<https://daneshyari.com/en/article/4922785>

Download Persian Version:

<https://daneshyari.com/article/4922785>

[Daneshyari.com](https://daneshyari.com)