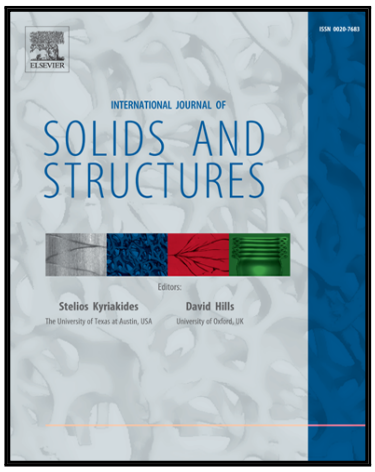

Using ultrasonic investigations to develop anisotropic damage models for initially transverse isotropic materials undergoing damage to remain transverse isotropic

Louise Olsen-Kettle

PII: S0020-7683(18)30009-X
DOI: 10.1016/j.ijsolstr.2018.01.007
Reference: SAS 9856

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

Received date: 21 August 2017
Revised date: 11 December 2017
Accepted date: 6 January 2018

Please cite this article as: Louise Olsen-Kettle, Using ultrasonic investigations to develop anisotropic damage models for initially transverse isotropic materials undergoing damage to remain transverse isotropic, *International Journal of Solids and Structures* (2018), doi: 10.1016/j.ijsolstr.2018.01.007

Using ultrasonic investigations to develop anisotropic damage models for initially transverse isotropic materials undergoing damage to remain transverse isotropic

Louise Olsen-Kettle[a]

[a]*Swinburne University of Technology, School of Science, Mathematics Department, Hawthorn Vic 3122, Australia*

Abstract

A severe limitation imposed by many continuum damage mechanics models is the assumption of initial isotropy in many anisotropic damage models. This may place unrealistic assumptions about the material being modelled or restrict the application of continuum damage mechanics to materials without significant anisotropy. It remains a challenge to use anisotropic continuum damage mechanics to model common rocks and materials with significant initial anisotropy, for example sedimentary rocks or brittle composite materials. We show how ultrasonic investigations in experiments where an initially transverse isotropic material undergoes damage-induced anisotropy can be used to guide the development of transverse isotropic damage models. We provide a robust way to validate and advance models of general anisotropic damage evolution based on continuum damage mechanics.

Keywords:
continuum damage mechanics, anisotropy, ultrasonics stiffness reduction, damage tensor

1. Introduction

Modelling and analysis of fracture propagation and progressive damage evolution are integral for damage-tolerant design in manufacturing, mechani-

Email address: lolsenkettle@swin.edu.au (Louise Olsen-Kettle)