

## Accepted Manuscript

Title: Investigation of the Damage Variable Basic Issues in Continuum Damage and Healing Mechanics

Author: George Z. Voyiadjis Peter I. Kattan

PII: S0093-6413(15)00031-2  
DOI: <http://dx.doi.org/doi:10.1016/j.mechrescom.2015.02.006>  
Reference: MRC 2935



To appear in:

Received date: 5-10-2014  
Revised date: 3-12-2014  
Accepted date: 11-2-2015

Please cite this article as: Voyiadjis, G.Z., Kattan, P.I., Investigation of the Damage Variable Basic Issues in Continuum Damage and Healing Mechanics, *Mechanics Research Communications* (2015), <http://dx.doi.org/10.1016/j.mechrescom.2015.02.006>

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.

# Investigation of the Damage Variable Basic Issues in Continuum Damage and Healing Mechanics

George Z. Voyiadjis<sup>1</sup> and Peter I. Kattan<sup>2</sup>

**Highlights** □ Independent/dependent damage is discussed. Exact expressions for the processes are presented. □ The concept of healing processes occurring in series and in parallel are discussed. □ Systematic and consistent equations of healing consecutively or simultaneously are presented. □ A new concept of small healing in damaged materials is presented. □ Special damage processes are discussed using a systematic and original formulation.

*Consistent mathematics and mechanics are used here to properly interpret the damage variable within the confines of the concept of reduced area due to damage. In this work basic issues are investigated for the damage variable in conjunction with Continuum Damage and Healing Mechanics. First, the issue of the additive decomposition of the damage variable into damage due to voids and damage due to cracks in Continuum Damage Mechanics is discussed. The accurate decomposition is shown to be non-additive and involves a term due to the interaction of cracks and voids. It is shown also that the additive decomposition can only be used for the special case of small damage. Furthermore, a new decomposition is derived for the evolution of the damage variable. The second issue to be discussed is the new concept of independent and dependent damage processes. For this purpose, exact expressions for the two types of damage processes are presented. The third issue addressed is the concept of healing processes occurring in series and in parallel. In this regard, systematically and consistently, the equations of healing processes occurring either consecutively or simultaneously are discussed. This is followed by introducing the new concept of small healing in damaged materials. Simplified equations that apply when healing effects are small are shown. Finally, some interesting and special damage processes using a systematic and original formulation are presented.*

---

<sup>1</sup> Boyd Professor, Department of Civil and Environmental Engineering, Louisiana State University, Baton Rouge, LA 70803, USA – email: voyiadjis@eng.lsu.edu

<sup>2</sup> Visiting Professor, Department of Civil and Environmental Engineering, Louisiana State University, Baton Rouge, LA 70803, USA – email: pkattan@orange.jo

Download English Version:

<https://daneshyari.com/en/article/7178834>

Download Persian Version:

<https://daneshyari.com/article/7178834>

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