Proceedings of

ICADD-4

Fourth International Conference on
Discontinuous Deformation Analysis

Edited by
Nenad Bićanić

UNIVERSITY
of
GLASGOW

Glasgow, Scotland, UK
6th-8th June 2001

Proceedings **ICADD-4**
Discontinuous Deformation Analysis
Edited by Nenad Bićanić
Published by University of Glasgow, June 2001, pp 494
ISBN 0-85261-735-6

Cover Photo - Basaltic columns of the discontinuous geological formation at the island of Staffa, off the West Coast of Scotland. The island houses Fingal's Cave, which was an inspiration for Mendelssohn's Hebrides Symphony

Preface

Modelling of discontinuous behaviour is a subject of intensive research among scientists and engineers in widely differing disciplines. The restrictions imposed by continuum framework are often difficult to reconcile when dealing with fracturing, granular and discontinuous media and possibilities of alternative discontinuous frameworks are explored. Recent developments are accompanied with an increased mathematical rigour and algorithmic robustness in the implementations for DDA, DEM, Keyblock Analysis, Lattice Modelling, Combined FEM/DEM, DG and Manifold Method. These developments have helped the discontinuum based methodologies to become more readily recognised and more frequently applied in engineering practice.

The **ICADD-4** conference follows in the footsteps of the three earlier **ICADD** conferences held in Taipei, ROC in 1995, Kyoto, Japan in 1997 and Vail, Colorado in 1999 and it is the first time that the conference is held in Europe. The intention is for the series will continue at regular two year intervals and **ICADD-5** is already scheduled for 2003 in Capetown, South Africa. The conference also draws on the two discrete element conferences held in Golden 1990 and Boston 1993, covering a more comprehensive range of related computational frameworks dealing with discontinuous behaviour.

The main objective is to bring together researchers and practising engineers involved in computational modelling of complex problems concerned with discontinuous behaviour in rock mechanics, structural engineering, geology, geophysics, and solid mechanics in general – e.g. jointed rock, fracturing media, fragmentation, granular and particulate media, bulk solids, glacier movements, plate tectonics and structural masonry.

ICADD-4 Proceedings comprise over 40 contributions, which discuss new developments and more complex applications within a whole range of discontinuous computational frameworks. The real value of the conference appears to lie in the fact that many contributions consider similar physical problems, but simulate them using different frameworks. We can look forward to fruitful discussions and a very stimulating conference.

The University of Glasgow is very proud of its engineering heritage. We are delighted to welcome you in Scotland and to act as the host for the conference in the **ICADD** Series.

Nenad Bićanić
ICADD-4 Chairman

ICADD-4

Glasgow, Scotland, UK

Technical Advisory Panel

Bernard Amadei
Josip Dvornik
Max Ma
Jeen-Shang Lin
Ante Munjiza
Graham Mustoe
Yuzo Ohnishi
Roger Owen
Ekkehard Ramm
Friedrich Scheele
Gen-Hua Shi
John Tinucci
Jan van Mier
Chung-Yue Wang
John Williams

Local Organising Committee

Nenad Bićanić
Chris Pearce
Barbara Grant

Supported by American Rock Mechanics Association (ARMA)

PROCEEDINGS ICADD-4

4th International Conference on Discontinuous Deformation Analysis University of Glasgow, 6th-8th June 2001

Table of Contents